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Assist. Prof. Dr. Mustafa GÜLEN
Van Yüzüncü Yıl University, Faculty of Architecture and Design, Department of Architecture, Van-Türkiye
Assist. Prof. Dr. Murat DOĞRUYOL
Siirt University, Faculty of Engineering, Department of Civil Engineering, Siirt-Türkiye
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Assist. Prof. Dr. Sadia FAROOQ
University of Home Economics, Lahore, PAKISTAN
Assist. Prof. Dr. Shirin IZADPANAH
Antalya Bilim University, Department of Interior Architecture and Environmental Design, Antalya -Türkiye
Assist. Prof. Dr. Saliha TAŞÇIOĞLU
Kilis 7 Aralik University Technical Sciences Vocational School Department of Park and Horticulture - Türkiye
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Breda University of Applied Sciences, Netherlands.
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The University of Naples Federico II, Department of Civil, Architectural and Environmental Engineering, Napoli, Italy
Dr. Mehmet Sinan YUM
Istanbul Commerce University, Faculty of Architecture and Design, Industrial Design Undergraduate Program, Istanbul
Dr. Oleksandr ZINENKO
V. Karazin Kharkiv National University, Kharkiv, 61022, Ukraine

PARTICIPATION
- Zoom Meeting

CONGRESS LANGUAGE
English and Turkish

SUPPORTING INSTITUTIONS
Bakü Engineering University (BMU)- Bakü Azerbaijan
Economic Development and Social Research Association (IKSAD)
Technic and Polytechnic Research, Development, and Implementation Association, Ankara, Türkiye (TP.RDiA)
Design and Planning Accreditation Association (TAPLAK)- Ankara-Türkiye
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- -Planning

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- -Design

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- -Sociology / Psychology / Art / Philosophy / History / Identity / Theory / Aesthetics,
- -Protected Areas / Natural and Cultural Heritage Protection / Documentation / Renovation / Repair / Restoration /
- -Tourism / Recreation / Cultural Tourism / Nature Tourism / Ecotourism / Archeology/Sit
- -Climate Change / Renewable Energy / Water / Sustainability / Ecology/ Environment / Sustainable Development
- -Smart and Ecological Cities / Urbanizm / Landscape / Open and Green Spaces / Green infrastructure / Transportation / Urban Agriculture/ Urban Renewal / Transformation
- -Building Materials / Green Buildings / Urban Accessories and Furniture / Landscape Materials Landscape Plant Materials and Using/ Plant Cultivation and Use
- -Technology / Artificial Intelligence/ Digital Architecture and 3D Software and Printer
- -Health / Pandemic / Food/ Occupational Health and Safety
- -Higher Education in Architectural Sciences / R&D/ Scientific Researches/ Publications
- -Future of Architectural Sciences / Utopia / Space Architecture / Water Architecture
- -Economic / Policies / Legislation / Management / Governance / Practices / Sectoral Problems
- -Planning and Design Project Competitions and Processes /Applied Projects

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Türkiye, Algeria, Azerbaijan, Egypt, Ethiopia, Finland, Georgia, Indonesia, India, Iran, Israel, Iraq, Italy, Kazakhstan, Macedonia, Moldova, Morocco, Nigeria, Pakistan, Portugal, Phipinas, Romania, Serbia, South Africa, Tunisia

TOTAL ACCEPTED ARTICLE
Turkey: 117
Other Countries: 122

Date: 09.09.2022

Ankara Time: 10.00 -11.45

INVITED OPENING SPEECHES

Announcer: Atabek MOVLYANOV

	SPEAKERS	AFFILIATION
1	**Prof. Atila GÜL**	*President of the Organizing Board (IArcSAS-2022) and Chief Editor, Journal of Architectural Sciences and Applications*
2	**Prof. Havar MEMMEDOV**	*Rector of Bakü Engineering University, Bakü Azerbaijan*
3	**Assoc. Prof. Afer ELIFOV**	*Dean of Faculty of Architecture- Bakü Engineering University, Bakü-Azerbaijan*
4	**Dr. Mustafa Latif EMEK**	*President of the Economic Development and Social Research Association (İKSAD)*
5	**Assoc. Prof. Dr. Şirin Gülcen EREN**	*President of Technic and Polytechnic Research, Development, and Implementation Association, Ankara, Türkiye (TP.RDiA)*
6	**Senior Architect, Caner ATASEVEN**	*Head of Chamber of Architects Isparta Representative, Isparta Türkiye*
7	**Orxan HACIYEV**	*Netcad Software Company, Bilkent Ankara, Türkiye*
8	**Prof. Şükran ŞAHİN**	*Board Member of the Design and Planning Accreditation Association (TAPLAK), Ankara -Türkiye*

INVITED PRESENTATIONS

FRIDAY- 09.09.2022
Ankara Time 12:00-13:30

SESSION-1, HALL-1/OTURUM-1, SALON-1
MODERATOR: Prof. Öner DEMİREL

TITLE	AUTHORS	AFFILIATION
1999-2002, "Public Creativity is National Wealth" Competitions Why Were They Significant Regarding Their Contribution to The Cultural Sustainability of the Azerbaycani Traditional Spatial Culture	• **Prof. Önder Küçükerman** • **Julide Edirne**	• Haliç University, Faculty of Architecture, Department of Industrial Design, İstanbul-Türkiye
The Importance of LEED Certification in Urbanism	• **Sahil Ganbarlı**	• Landscape Architect, Prokon LLC, Technical Office Specialist, Bakü- Azerbaijan
Nature Based Regeneration of City of İzmir	• **Prof. Koray Velibeyoğlu**	• İzmir Institute of Technology, Faculty of Architecture, Department of City and Regional Planning, İzmir -Türkiye
Resilient and Climate-Proof Cities: The Role of Urban Green and Open Spaces	• **Dr. Floriana Zucaro**	• University of Naples Federico II/ UNINA Department of Civil, Architectural and Environmental Engineering, Italy

FRIDAY- 09.09.2022
Ankara Time 14:00-15:45

SESSION-2, HALL-1/OTURUM-2, SALON-1
MODERATOR: Prof. Kağan GÜNÇE

TITLE	AUTHORS	AFFILIATION
Examination of Innovative Approaches in Smart Home Systems in Context of Comfort Conditions	• Merve Özdoğan, • Nilay Coşgun	Gebze Technical University
Evaluation of Traditional Buildings Within The Scope of Certification Criteria Applied to Modern Structures	• Çisem Bozbek, • Evrim Solhan	Altınbaş University
Determination of Damages and Deteriorations in the Facade Applications of Residence Buildings in Ankara	• Mustafa Furkan Gündüz, • Zeynep Yeşim İlerisoy	Gazi Üniversitesi
Comparative Analysis of The Modern And Conventional Building Structures For The Arid Regions	• Dhananjay R. Mishra, • Suyash Tiwari, • Dharmendra Kumar Shukla	Jaypee University of Engineering and Technology
A Review of Life Cycle Assessment Method For Residential Building: The Case of Morocco	• Redouan Assadıkı, • Fouzi Belmir	Sidi Mohamed Ben Abdellah University
Examination of Sustainability Criteria in Building Shell Design: Astana Case	• Sennur Hilmioğlu, • Erdem Çoban	Haliç University

FRIDAY- 09.09.2022
Ankara Time 14:00-15:45

SESSION-3, HALL-2/OTURUM-3, SALON-2
MODERATOR: Prof. Seden Acun ÖZGÜNLER

TITLE	AUTHORS	AFFILIATION
A Research on Deterioration Problems of The Yellow Stone Used In Hıstorical Structures In Cyprus	• Mustafa Kemal Öge, • Seden Acun Özgünler, • Sibel Onat Hattap	Istanbul Technical University
Conservation Problems In Stone Structures Found on The Coast Sections In The Example of The Historical Yason Church	• Kıral Gülçin, • Gülferah Çorapçioğlu	Istanbul Arel University
Potential utilization of a hybrid nano metal oxide photo-active and self-cleaning window system	• Nurhidayatullaili Muhd Julkaplı, • Mohd Azam Mohd Adnan	University Malaya
Types and Uses of Special Concrete in Construction	• Oussama Benmerabet, • Salah Messioud	Mohamed Seddik Ben Yahia University of Jijel
Synthesis of organic compounds using homogeneous catalysis	• Oussama Riouchi, • Nassima Riouchi, • Abdelhamid Bouyenzer, • Eduard Bardaja Rosriguez, • Adyl Oussaid, • Arachid Touzani	Université Mohammed Premier
Culture and Perception of Home Among The Elderly: A Case Study In Nigeria	• Iyabode Abiodun Adediran	Obafemi Awolowo University

FRIDAY- 09.09.2022
Ankara Time 14:00-15:45

SESSION-4 HALL-3/OTURUM-4, SALON-3
(Face to Face)
MODERATOR: Assoc. Prof. Zahid MEMMEDOV

TITLE	AUTHORS	AFFILIATION
The Impact of Hıstorıcal Constructions Found In Archaeological Excavations In Recent Years on The Lessons of The History of Architecture	• Arzu Mammadova	Baku Engineering University
Impact of Configuration Irregularities on The Sıısmic Capacity of Buildings with Foundation Settlement	• Sadiq Nuraliyev, • Shukufa Mammadova, • Shahin Huseynli	Baku Engineering University
A Hybrid Study Module Between Architecture Schools and Architecture Firms	• Erenalp Büyüktopçu, • Yusuf Berrak, • Zeynep Helin Kaya	Istanbul Technical University
The Visual Evolution of Baku	• Laman Abdullazade	Baku Engineering University
The Role of Architectural Education in the Legibility of Fatih Mosque Complex	• Elif Atıcı	Eskişehir Osmangazi University
Public Places Changed By Neoliberalism In Turkey: Converting From Neighborhood To Gated Communities	• Özlem Büyüktaş	Eskişehir Osmangazi University
In the example of Baku city, the great history of industrial infrastructures of cities *Regeneration *Renovation problems	• Aysel Hüseynzadə	Baku Engineering University

FRIDAY- 09.09.2022
Ankara Time 16:00-17:45

SESSION-5, HALL-1/OTURUM-5, SALON-1
MODERATOR: Assist. Prof. Özgür YILDIZ

TITLE	AUTHORS	AFFILIATION
Investigation of Structural Problems of Huseynik Historical Buildings	• Ebru DOĞAN, • Özgür YILDIZ	Malatya Turgut Ozal University
Büyükada Greek Orphanage Architectural Features and Periodic Changes	• Sema Kızılelma, • Miskine Akar	Atatürk University
An Evaluation of the Use of Outrigger Frame Systems in High-Rise Buildings	• İsmet Serhan Güneş, • Yenal Takva, • Zeynep Yeşim İlerisoy	Gazi University
Designer Identity As Architect: Vison of Self on Architectural Design, Zaha Hadid (1950-2016).	• Khalifa Ya'u Hamza, • Ayten Aozsavas Akcay	Near East University
Smart Materials at The Service of Tomorrow's Buildings: Towards Innovation in Green Building Envelopes	• Ayadi Nour El Houda, • Arigue Bidjad, • Derradji Mohamed, • Sriti Leila	University of Salah Boubnider Constantine
An Example of Low-Cost Housing From The 1990s: Denizli Şirinköy Low-Cost Housing Area	• Halime Nur Yilmaz • Berna Güç	Süleyman Demirel University

FRIDAY- 09.09.2022
Ankara Time 16:00-17:45

SESSION 6, HALL-2/OTURUM-6, SALON-2
MODERATOR: Prof. Sevgi YILMAZ

TITLE	AUTHORS	AFFILIATION
Production of Erzurum City Thermal Comfort Map For Climate Oriented Design	• Sevgi Yılmaz, • Mehmet Akif Irmak, • Hasan Yilmaz, • Emral Mutlu	Atatürk University
Political Developments and Media Reflections Caused By Earthquakes in Turkey After The Establishment of The Republic	• Hanım Ceren Sinav • Engin Kepenek	Akdeniz University
Estimation of Future Climate Change in Erzurum City for Urban Design Using UrbClim Model	• Sevgi Yılmaz, • Cihad Bilge, • Mehmet Akif Irmak • Dr. Shu Yang	Atatürk University
Measures to Be Taken Against Nightlife Noise	• Derin Hilal Bilmez	Mimar Sinan Fine Arts University
Smart Economics: Achieving Sustainable Development Goals	• Olena Budiakova	Kyiv National University of Technologies and Design
Stormwater Management Low Impact Development Analysis: The Case of Malatya City Center	• Turgut Dinçer • Sevgi Yılmaz	Atatürk University
Effect of Glass Microfiber Reinforcement on The Performance of A Structural Adhesive	• Guılherme S.M. Tavares • Raul D.S.G. Campilho, • Paulo J.R.O. Nóvoa, • Isidro J. Sánchez-Arce	Instituto Superior de Engenharia do Porto

FRIDAY- 09.09.2022
Ankara Time 16:00-17:45

SESSION-7, HALL-3 /OTURUM-7 SALON-3
(Face to Face)
MODERATOR: Prof. Sabir ORUCOV

TITLE	AUTHORS	AFFILIATION
The Influence of The Social Content of Cities on The Formation of Their Plan-Spatial Infrastructure	• Agil Kazimov	Baku Engineering University
The Modern Role of Traditional Urban Planning Values	• Sabir Orucov	Baku Engineering University
Traditional Islamic City Model	• Sabir Orucov, • Ayten Salimova	Baku Engineering University
The Origins of Design in Prehistoric Times	Nizami Mammadzada Aydin	Baku Engineering University
Use of Dashkesan Pyrophyllite for Removing Low Shrinking Ceramic Sludge in the Production of Decorative Ceramic Tiles	• Y.H. Halilov, • V.R. Mammadov, • M.A. Babayeva	Baku Engineering University
Obtaining Clinker Tile from Dashkesan Pyrophyllite	• Y.H. Halilov, • M.A. Babayeva	Baku Engineering University
The Development of Fractal Theory In Architecture	• Shehla Abbasova, Namiq Abbasov	Azerbaijan University of Architecture and Construction

FRIDAY- 09.09.2022
Ankara Time 18:00-19:45

SESSION-8, HALL-1/OTURUM-8, SALON-1
MODERATOR: Assoc. Prof. Elif SÖNMEZ

TITLE	AUTHORS	AFFILIATION
Comparisons and Evaluations of Historical and Traditional Housing Architecture in Muş Kale Neighborhood on Visual Materials From 2011 and 2021	• Mehmet Bahadır Tosunlar	Siirt University
Mimar Sınan Waterways: An Investigation of Studies on The Architecture and Engineering of Waterways	• Bahadır Mert Çınar	Mimar Sinan Fine Arts University
Building Regulations Domain Knowledge Representations	• Murat Aydın	Ankara University
Investigation of The Use of Bio Based Plastic Material in The Construction Industry: Samples of Mycelium-Based Building Material	• Şebnem Demir, • Nilay Coşgun	Gebze Technical University
Environmental Impact Analysıs of Geopolymer Concrete Facade Cladding: Istanbul Case	• Aslıhan Kayhan, • Seden Acun Özgünler	Istanbul Technical University
Types of Glass Material From Architectural Building Elements and Examples of Use in Turkey	• Güler Çimen, • Arzu Çağlar, • Hakan Çağlar	Ahi Evran University

FRIDAY- 09.09.2022
Ankara Time 18:00-19:45

SESSION-9, HALL-2/OTURUM-9, SALON-2
MODERATOR: Assist. Prof. M. Bihter BİNGÜL BULUT

TITLE	AUTHORS	AFFILIATION
Effets Socio-Économiques Et Environnementaux De Construction Des Infrastructures Sanitaires Dans La Commune D'abomey-Calavi (Benin, Afrique De L'ouest)	• Pamphile Houndji, • Flore Mehinto Dovonou, • Louis Dèdègbê Ahomadikpohou	Universitaire d'Abomey-Calavi
"The Participatory Approach" As The Main Axis of Strategic Planning, Towards A Sustainable Urban Development of Cities; Case of Algeria	• Bidjad Arigue, • Meryem Kadri	University of Mohammed Khider
Shobha De's Ironic Representation of Relationships with Special Reference to Influence of Metro Cities	• Kirti Dorshetwar	Indian Institute of Information Technology
Quantification of Environmental Impacts of Wastewater Treatment Plants Applying Life Cycle Assessment	• Safae Elhir, • Najoua. Labjar, • Mohamed. Dalımı, • Souad. El Hajjaji	Mohammed V University in Rabat
Road Map to Success	• Preeti Pareek	University College of Engineering & Technology
Evaluation of The Durability of Fiber Ceramic Mortar In Aggressive Environments	• Messaouda Belouadah, • Zine El Abidine Rahmouni, • Nadia Tebbal	M'sila University
Industrial And Artisanal Valorization of Moroccan Clays	• Nassima Rıouchı • Oussama Rıouchı, • Mohamed Loutou, • Mohamed Abou-SalamA	Mohamed 1st University,

FRIDAY- 09.09.2022
Ankara Time 18:00-19:45

SESSION-10, HALL-3/OTURUM-10, SALON-3
MODERATOR: Aydan TAHIROVA

TITLE	AUTHORS	AFFILIATION
Identification of 2 Deoxy d ribose as VEGF Equivalent in Stimulation of Angiogenesis – Translational Biomaterials for Clinical Applications	• Muhammad YAR	COMSATS University Islamabad Lahore Campus
A Short Report Making A Comparison Between Artificial Intelligence And Artificial Neural Network	• Vaibhav Kant Singh	Central University
A Parametric Study to Improve the Heat Transfer of Solar Air Heater through CFD Analysis	• Mayank Sharma, • Emarti Kumari, • P.M. Meena	M.B.M. Engineering College
Modeling and Comparison of BOX equalization-based detectors in massive MIMO systems	• Rishika Chauhan, • Shefali Sharma, • Rahul Pachauri	Jaypee University of Engineering & Technology Guna
A Review on The Types of Zeolites As Refining Catalysts	• Isaac Jato, • Habibu Abubakar Wanıyo, • Victor Markus	Federal Polytechnic N'yak Shendam
Study and Analysis of Stresses in Gas Pipelines Corroded By Ansys Workbench	• Samir ZAHAF, • Nouhaila TAIBA	University of Djilali Bounaama-Khamis Meliana
Introduction to Ans Technology	• Vaibhav Kant Singh	Central University

SATURDAY- 10.09.2022
Ankara Time 10:00-11:45

SESSION-11 HALL-1/OTURUM-11, SALON-1
MODERATOR: Assoc. Prof. Hayriye Hale KOZLU

TITLE	AUTHORS	AFFILIATION
A Design Studio Edition and Example In Architecture Education	• Neslihan Demircan, • Büşra Demircan İbiş • Tuncer Çağrı Çkmur	Atatürk University
Importance of Drawing And Painting In The Field of Architecture	• Rachana Kailas Ahire	https://www.artistrachana.com/
The Importance of School Gardens Within The Approach to Outdoor Learning	• Elif Karaca, • Mehmet Karaca, • Hatice İnce	Çankırı Karatekin University
The Impact of The Ventilated Facade on The Thermal Comfort And Aesthetics of The Architectural Envelope In Arid Zones (Case of The City of Ghardaia)	• Arigue Bidjad, • Ayadi Nour El Houda, • Rahmani Soumia, • Sriti Leila	The University of Mohammed Khider, Department of Architecture
Comparison of Trabzon and Kilis Cities In Terms of The Features of Traditional Housing Gardens	• Saliha Taşçıoğlu	Kilis 7 Aralık University
The Thought of Privacy in The Turkish House and The Elements That Make it	• Merve Yilmaz	Suleyman Demirel University

SATURDAY- 10.09.2022
Ankara Time 10:00-11:45

SESSION-12, HALL-2/OTURUM-12, SALON-2
MODERATOR: Prof. Niyazi Uğur KOÇKAL

TITLE	AUTHORS	AFFILIATION
A Research on The Causes and Types of Deterioration In Tradıtional Bricks	• Zeliha Büşra Eryiğit Şenel, • Erol Gürdal, • Seden Acun Özgünler	Istanbul Sabahattin Zaim University
Comparison of Fiber Reinforced Cement Based and Geopolymer Mortars	• İbrahim Yetiş • Niyazi Uğur Koçkal	Akdeniz University
Investigation of Physico-Mechanical Changes of Some Limestones Used In Exterior Cladding Under Freeze-Thaw Effect	• Hüseyin Esad Selek, • İskender Emre Gül, • Mustafa Ali Kuşçu	Akdeniz University
Investigation of The Production of Structural Lightweight Concrete With Using Erzincan Raw Perlite Aggregate	• İsmet Ulusu, • Hayati Ulusu	Erzincan Binali Yıldırım University
Comparison of The Two Calculation Methods Recommended in Ts En 17037:2019 Standard For All Provinces In Turkey	• Gülçin G. Konuk Taştan, • Şensin Yağmur, • H. Gökhan Uyduran, • Işıl İplik	Yıldız Technical University,
Elaboration of Clay-Based Materials, Characterization, and Application to The Elimination of Organic Pollutants	• Nassima Riouchi, • Oussama Riouchi, • Mohamed Loutou, • Mohamed Abou-Salama	Mohamed 1st University

SATURDAY- 10.09.2022
Ankara Time 10:00-11:45

SESSION-13, HALL-3/OTURUM-13, SALON-3
MODERATOR: Nizami MƏMMƏDZADƏ

TITLE	AUTHORS	AFFILIATION
An Experimental Study on The Formation of Al_2O_3 and TiO_2 Layer on AA6061-T3 Alloy Using Sol-Gel Dip Coating	•U. Elaiyarasan, •V. Satheeshkumar, •C. Senthilkumar	Easwari Engineering College
A Short Report On The Basic Artificial Neuron Model	•Vaibhav Kant Singh	Central University
Conscious Level Monitoring from Eeg And Ppg Signal	•Ankita Singh, •Aboorva E R, •Divya D,	Bannari Amman Institute of Technology,
Co-Digestion of Organic Feedstocks for Biogas Production from Anaerobic Digestion Process	•Aniekan Essienubong Ikpe, •Emem Okon Ikpe, •Imaobong Mfon Essen	Akwa Ibom State Polytechnic
Study The Effect of Chemical Activators on Mortars Based on Granulated Slag	•Omri Imen Yamina, •Tebbal Nadia, •Rahmouni Zine El Abidine	Mohamed Boudiaf University
Ketoamides, Derived From 1-(3,4-dimethoxyphenyl) Propane-2-Amine As Ligands in Reaction With Cu (II)	•Petya Marinova, •Slava Tzoneva, •Stoyanka Atanasova	University of Plovdiv Paisii Hilendarski
Introduction To Soft Computing	•Vaibhav Kant Singh	Central University

SATURDAY- 10.09.2022
Ankara Time 12:00-13:45

SESSION-14 HALL-1/OTURUM-14 SALON-1
MODERATOR: Assoc. Prof. İ. Emre KAVUT

TITLE	AUTHORS	AFFILIATION
Investigatıon of Interior Architecture Projects Within The Frame of National and International Regulations Against The Risks That May Occur During Earthquake	• İrem Özpınar Ümit Arpacıoğlu, • Şebnem Ertaş Beşir	Mimar Sinan Fine Arts University
A New Approach to The Space Design Process in The Interior Architecture Basic Design Studio	• Hatice Çınar, • H. Özlem Yurtgün	Selçuk University
The Evaluation of The Spatial Understandings of The New Millennium in The Field of Interior Architecture	• İsmail Emre Kavut, • Elif Özdağlar, • Çağrı Yalçın, • Turgut Kalay, • Seval Yılmaz Yatır	Kütahya Dumlupınar University
User Evaluation of Indoor Comfort Conditions in Reused Bathrooms	• Emine Yavuz Pakih	Adıyaman University
Sustainable Housing Design Suggestions	• Meryem Sevde Doğruer	Niğde Ömer Halisdemir University
Investigation of The Exterior Architecture of Traditional Housing In The Villages of Akcakaya, Resadiye, and Zincidere of Kayseri/Talas District	• Güler Çimen, • Arzu Çağlar, • Hakan Çağlar	Ahi Evran University

SATURDAY- 10.09.2022
Ankara Time 12:00-13:45

SESSION-15, HALL-2/OTURUM-15, SALON-2
MODERATOR: Prof. Dr. Atila GÜL

TITLE	AUTHORS	AFFILIATION
Investigation of in-Between Spaces in The Case of Isparta City Center	• Şehriban AKSIN, • Berna GÜÇ	Süleyman Demirel University
Tiles Fixing Mortar and Techniques Hazrat Mevlâna Tomb Restoration Sample	• Alihan KESKIN	Selçuk University
An Evaluatıon Through Architectural Finds At Daskyleion: The Phrygic Effect	• Kübra Yücel Karabaş	Haliç University
Mechanical Properties of Ceramics Containing Zeolite	• Niyazi Uğur Koçkal • ibrahim Yetiş • Güneş Su Kabaklı	Akdeniz University
Conceptual Approach to Aboveground-Underground Spaces: An Example of Nevşehir Castle	• Emine Akcan Şirin, • Emre Becerir	Mimar Sinan Fine Arts University
Retention of Dyes in Wastewater By Waste-Derived Material	• Mohammed El Amine Zennaki, • Lahcene Tennouga, • Brahim Bouras, • Kouider Medjahed	Tlemcen University
The Search for 'Modern' Identity in Early Republican Period Architecture: A Case Study of Bursa People's House	• Nursah Bütüner	Bursa Uludağ University

SATURDAY- 10.09.2022
Ankara Time 12:00-13:45

SESSION-16, HALL-3/OTURUM-16, SALON-3
MODERATOR: Vaibhav KANT SINGH

TITLE	AUTHORS	AFFILIATION
Dynamic Image/Video Captioning Using Convolutional Neural Networks and LSTM	• Rahul Desai • G M Walunjkar	Army Institute of Technology
Artificial Intelligence In Financial Services	• C. Vijai, • S. Jansirani, • V. Soundara Rajan	Department of Commerce and Business Administration
A Short Report on Credit Assignment Problem (CSP)	• Vaibhav Kant Singh	Central University
Association Between Work-Life Balance And Job Satisfaction of Employees	• Vikram Singh Chouhan	Jaypee University of Engineering & Technology, Guna
Influence of Elevated Temperatures on The Mechanical Performance of Sustainable Fiber Reinforced Recycled Brick Mortar	• Messaouda Belouadah, • Zine El Abidine Rahmouni • Nadia Tebbal	M'sila University
MATLB Virtual Simulation Software in The Context of Wireless Communication Model	• Aijaz Margay, • Ajjaz Maqbool	Devi Ahiliaya University
SVM An Ml Approach for Breast Cancer	• Vaibhav Kant Singh	Central University

SATURDAY - 10.09.2022
Ankara Time 14:00-15:45

SESSION-17 HALL-1/OTURUM-17, SALON-1
MODERATOR: Prof. Murat AKTEN

TITLE	AUTHORS	AFFILIATION
Participatory Management Plans on Protected Area Management:	•Emine Demirci, •Murat Akten	Suleyman Demirel University
Current Situation and Evaluation of Tire (İzmir) Region in Terms of Gastronomy Tourism	•Atila Gül, •Fadime Öncü, •H. Eda Gül	Suleyman Demirel University
Evaluation of The National Park Concept and Management in The Context of Rural Settlements	•Merve Aslı Kara Yüksel	Maltepe University
Nature Walk (Trekking) Route Action Planning; Isparta Example	• Fatma Gözde Akkuş • Atila Gül	Süleyman Demirel University
Global Trends in Nature-Inspired Architectural Design	•Mehtap İzci, •Semra Arslan Selçuk, •Güneş Mutlu Avinç	Gazi University
Investigation of Conservation Works in Malatya/Yeşilyurt Within The Context of Cultural Tourism	•Tuba Nur Olgun	Fırat University

SATURDAY - 10.09.2022
Ankara Time 14:00-15:45

SESSION-18, HALL-2/OTURUM-18, SALON-2
MODERATOR: Assist. Prof. Mert ÇAKIR

TITLE	AUTHORS	AFFILIATION
Investigatıon of Rural Landscape Features of Yıldızkaya Village and Its Surroundings in Olur (Erzurum) District	•Elif Akpınar Külekçi, •Yahya Bulut, •Feran Aşur	Atatürk University
Techniques and Methods Based on Geographical Information Systems in Visual Landscape Quality Evaluation	•Duygu Doğan, •Meryem Bihter Bingül Bulut	Pamukkale University
An Assessment of Accessibility By Experiential Mapping Method: The Case of Mevlana Avenue	•M. Kübra Müezzinoğlu, •Hatice Çınar	Selçuk University
Relationship Between Landscape and Urban Square: Productive Open Space For Citizens	•Ali Abdullah Kazmi, •Saad Mujahid, •Ayesha Mehmood Malik, •Memoona Rashid	University of Management and Technology
Planning and Sustaining Healthy Outdoor Recreation amid the 21st Century COVID-19 Pandemic and Beyond	•Chioma Agatha John-Nsa, •Nkeiru Hope Ezeadichie	University of Nigeria
Evaluation of The Use of Mineral-Doped Hydraulic Lime-Based Repair Mortar in The Repair of Historical Buildings	•Esma Karakoyun Yaşar, •Burak YAŞAR	Niğde Ömer Halisdemir University
Determination of Ecotourism Potential of Tarsus (Mersin) District	•Sümeyye Gencer, •Elif Akpinar Külekçi	Atatürk University

SATURDAY - 10.09.2022
Ankara Time 14:00-15:45

SESSION-19, HALL-3/OTURUM-19, SALON-3
MODERATOR: Hanna KARAKURKCHI

TITLE	AUTHORS	AFFILIATION
The Electrochemical Nanocomposit Multifunctional Coatings: Syntesis And Properties	• Hanna Karakurkchi, • Mykola Sakhnenko	National Defence University of Ukraine named after Ivan Cherniakhovskyi
Apnea Monitoring System	• Prathiga P, • Dinesh A, • Ritika T	Bannari Amman Institute of Technology
Retail 4.0: Optimization Of The Stock Inventory And Decision-Making Centered On Data	• Vagner Aparecido de Moura • Paulo Samir Silva Ferreira dos Santos, • Cleber Costa Santana, • Edson Cezário de Oliveira, • Evandro Reis dos Santos, • Mateus Lima Bonfim	Undergraduate student in Computer Engineering at São Paulo State's Virtual University
Electrochemical Detection of Heavy metal ions by Low Temperature Synthesized of Nanostructured MgNiO2 Based Electrode	• Mohammad Imran, • Eun-Bi Kim, • Mohammad Shaheer Akhtar, • Dong-Heui Kwak, • Sadia Ameen	Jeonbuk National University
The Design of a New Heat Exchanger Model for Application in Renewable Energy	• Firyal Latrache, • Zakia Hammouch, • Karima Lamnaouar, • Benaissa Bellach, • Mohammed Ghammouri	Mechanic, Energetic
Pycaret A Python Implementation For Thyroid Disease	• Vaibhav Kant Singh	Central University
Transform Based Approaches For Image Recognition	• Tharun Kumar • Irene Cyntthiya	Bannari Amman Institute of Technology, Department of Electronics and Instrumentation

SATURDAY - 10.09.2022
Ankara Time 16:00-17:45

SESSION-20 HALL-1/OTURUM-20, SALON-1
MODERATOR: Assoc. Prof. Ömer ATABEYOĞLU

TITLE	AUTHORS	AFFILIATION
On The Relationship of Space Design and Psychological Impact Mechanisms	• Ömer Atabeyoğlu	Ordu University
Production of Publicness Through Art on The University Campus	• Berna Yaylalı • Pınar Kılıç Özkan	Bahçeşehir University
Süleyman Demirel University Campus Within The Scope of Universal Design Principles	• Sibel Akten	Isparta University of Applied Sciences
Landscape Visual Quality Assessment in The Protected Areas	• Emine Demirci, • Murat Akten	Suleyman Demirel University
European Examples of Instantial Roof Approaches in Architectural Buildings	• Emre Çubukçu	Işık University
Relationship and Integration of Building and Landscape Design Projects in Urban Design	• Atila Gül, • Gizem Dinç, • H. Eda Gül	Suleyman Demirel University

SATURDAY - 10.09.2022
Ankara Time 16:00-17:45

SESSION-21, HALL-2/OTURUM-21, SALON-2
MODERATOR:Assoc. Prof. H. Burçin HENDEN ŞOLT

TITLE	AUTHORS	AFFILIATION
Evaluation of Renewable Energy Use in Terms of Sustainable Development	• Nilay Akdeniz Acar • Hatice Burçin Henden Şolt,	Zonguldak Bulent Ecevit University
Does Blockchain Technology Really Help to Achieve a Sustainable Future? Perspective on Energy Efficiency	• Seyda Emekci	Ankara Yıldırım Beyazit University
Contributions of Renewable Energy Sources at The Technical-Economic Optimization of Installations For "Green" Buildings	• Andrei Sărăcuț-Ardelean, • Marius Lolea	University of Oradea
Thermal Analysis of An Existing Residential Structure in The Environment of Lahore Using External Shading.	• Amna Ashraf • Memoona Rashid, • Ayesha Mehmood Malik	University of Management and Technology
Energy Optimization of Electrical Installations in "Green" Buildings. Economic and Technical Implications	• Andrei Sărăcuț-Ardelean, • Marius Lolea	University of Oradea
Investigating Intelligent Energy Control in Iot- Based Homes	• Mehran Yazdı	Shiraz University

SATURDAY - 10.09.2022
Ankara Time 16:00-17:45

SESSION-22, HALL-3/OTURUM-22, SALON-3
MODERATOR: Alina AMANZHOL

TITLE	AUTHORS	AFFILIATION
Partial Shading Impact on The Characteristic Curves and Generated Power of Photovoltaic Modules	• Abdelkader Azzeddine Bengharbi, • Souad Laribi, • Tayeb Allaoui, • Amina Mimouni	University Of Tiaret
GSO-Based Energy-Efficient Clustering Mechanism in Mobile Wireless Sensor Networks using Voronoi Cell Structure	• Aparajita Chowdhury, • Debashis De	Maulana Abul Kalam Azad University of Technology
Reactivity of Clay Modified By Polymerization. Study of The Adsorption of Pollutants From Wastewater	• Nassima Riouchi, • Oussama Riouchi • Mohamed Loutou, • Mohamed Abou-Salama	Mohamed 1st University
Mixed Sand-Based Mortar with Polystyrene and Admixture	• Mekki MAZA	M'sila University
In-Situ Synthesis of Zsm-5 Zeolite From Kankara Clay*	• Isaac Jato, • Habibu Abubakar Wanıyo, • Hebron Abner	Abubakar Tafawa Balewa University Bauchi
Synthesis of New Ligands for Homogeneous and Supported Catalysis	• Oussama Riouchi, • Nassima Riouchi, • Abdelhamid Bouyenzer, • Eduard Bardaja Rosriguez, • Adyl Oussaid, • Arachid Touzani	Université Mohammed Premier
The Influence of Thermal Radiation and Chemical Reaction on MHD Micropolar Fluid in The Presence of Heat Generation/ Absorption	• Binyam Zigta	Wachemo University

SATURDAY -10.09.2022
Ankara Time 18:00-19:45

SESSION-23, HALL-1/OTURUM-23, SALON-1
MODERATOR: Assoc. Prof. Sertaç GÜNGÖR

TITLE	AUTHORS	AFFILIATION
Examination of Shopping Malls on The Usage Preferences of Physical Disabilities: on-Site Evaluation From Konya-Turkey	• Sertaç Güngör, • Neslihan Iyit	Selçuk University
An Examination of Adana Historical City Center in Terms of Urban Lighting	• Nursel Aydin, • Kasım Çelik	Çukurova University
Landscape Observatory: Structural, Strategic, Technological Framework and Its Implementation for Turkey	• Duygu Doğan, • Meryem Bihter Bingül Bulut, • Şükran Şahin	Pamukkale University
The IPCC Reports For 2001 to 2022 Year Evaluation and Urbanization Their Policies on Comparison	• Gamze Seçkin Gündoğan	Çankırı Karatekin Universty
Evaluation of Land Use Efficiency in The Context of Improper Use: A Case Study of The City Center of Çanakkale and Its Immediate Vicinity	• Ayşe Esra Cengiz	Çanakkale Onsekiz Mart University
Investigation of Urban Park Accessibility By Using Space Syntax Method as a Design Tool	• Pelin Şahin Körmeçli	Çankırı Karatekin University

SATURDAY -10.09.2022
Ankara Time 18:00-19:45

SESSION-24, HALL-2/OTURUM-24, SALON-2
MODERATOR: Prof. Erkan POLAT

TITLE	AUTHORS	AFFILIATION
Using Fuzzy Logıc Based Decision Support Systems For New Function Selection in Structures	• Didem Baran Ergül, • Ayşe Berika Varol Malkoçoğlu, • Seden Acun Özgünler	Beykoz Universty
Neuro-Architectural Approach: The Effects of Architecture on The Human Brain	• Zeyneb Ayla Kirenci Eruzun • Aslı Sungur, • Çiğdem Canbay Türkyılmaz	Samsun University
An Overview of The Use of Information Systems in Building Condition Assessment	• Selin Öztürk Demirkıran, • Nilay Coşgun	Gebze Technical University
Selection of Site for the Manufacturing Plant Using Multi-Criteria Decision Making (MCDM) Technique	• Vijay Kumar	Manav Rachna International Institute of Research & Studies
Urban Conservation of a Historic Settlement in Southern Punjab, Pakistan	• Ayaz Mahmood, • Saima Gulzar	School of Architecture and Planning
Community Participation in Conservation of Built Heritage	• Saima Gulzar, • Rummana Khan Sherwani, • Ayesha Mehmood Malik, • Memoona Rashid	University of Management and Technology

SATURDAY -10.09.2022
Ankara Time 18:00-19:45

SESSION-25, HALL-3/OTURUM-25, SALON-3
MODERATOR: Majid Reza RAZAVI

TITLE	AUTHORS	AFFILIATION
Antioxidant Activities of Three Traditional Moroccan Plants Using Simplex Centroid Mixture Design Approach	• Nouıoura Ghizlane, • Tourabi Maryem, • Derwich El Houssine	Sidi Mohammed ben Abdellah University
A Qualitative Evaluation of Cognitive Functioning and Social Maturity of Children Attending Online Classes: A Case Study Method (October 2020-21)	• Happy Baglari	Assam down town University
A Pragmatic Study on Attentiveness of Web Resources Among College Teachers in Kanyakumari District	• K.C. Victor, • R.R. Saravana Kumar, • G.A Robert Gixson	Marthandam Affiliated with Manonmaniam Sundaranar University
Digitalization of Education Through Technology	• Deepanjali Mishra	KIIT University
Analyzing The Effect of Presence in Virtual Social Networks on Metacognitive Awareness and Learning Styles of Secondary School Students	• Nasrin Dorostkar, • Majid Reza Razavi	Islamic Azad University
Analyzing The Model of Using Different Levels of Artificial Intelligence and its Relationship With Job Opportunities and Threats in The Education System From The Point of View of Experts	• Mohammad Sadegh Bostani, • Majid Reza Razavi	Islamic Azad University
Digital Preservation Technology: The Derivative Digitalization for our Modern Day	• Moses Adeolu AGOI • Solomon Abraham	Lagos State University of Education

SUNDAY -11.09.2022
Ankara Time 10:00-11:45

SESSION-26 HALL-1/ OTURUM-26, SALON-1
MODERATOR: Assoc. Prof. Aylin SALICI

TITLE	AUTHORS	AFFILIATION
The Situation of Housing and Its Surrounding Public Spaces in The Global Crisis; A Review on Urban Design	• Ebru Ala, • Halime Gözlükaya	Suleyman Demirel University
Ecological Sensitivity Analysis' Importance in Studies of Village Settlements' Spatial Planning; Hisarardı Village Example	• Çağla Aydemir, • Atila Gül	Süleyman Demirel University
To Build a Sustainable City "As a Living Organism: The City"	• Betül Uçkan	FMV Işık University
Comparison of Sustainability Based Certification Processes in terms of Urban Landscape Quality	• Gizem Dinç Atila Gül	Suleyman Demirel University
Analysis of The New Era In The Formation of Public Space	• Bülent Güneş	Istanbul Yeni Yüzyıl University
Evaluation of Agricultural Landscape Change with A Green Infrastructure Approach: A Case Study of Hatay-Antakya	• Aylin Salıcı, • Ergin Canpolat, • Bilge Çakır	Hatay Mustafa Kemal University

SUNDAY -11.09.2022
Ankara Time 10:00-11:45

SESSION-27, HALL-2/ OTURUM-27, SALON-2
MODERATOR: Assoc. Prof. Elif TOKDEMİR DEMİREL

TITLE	AUTHORS	AFFILIATION
Climatic Changes Regarded as Greatest Threat: An update on Forest Management	• K. R. Padmav, • K. R. Don, • P. Josthna	Sri Padmavati Mahila VisvaVidyalayam (Women's) University
Exploring Peri-Urban Forests: A case study of Gatwala Wildlife Park, Faisalabad	• Shifa Rasool, • Saad Mujahid, • Ayesha Mehmood Malik, • Memoona Rashid	University of Management and Technology
Need of Urban Agriculture in India	• Balamurugan V, • Arunkumar R	Tamil Nadu Agricultural University
Crop Stubble Burning Into Biocomposıte: Problem, Solution And Legal Aspects With Special Study of Indian Gangetic Regions	• Yusuf Jameel, • Mohammad Asif, • Mohammad Afan Khan	Universiti Putra Malaysia
Investigation of Modern Irrigation Systems Based on Artificial Intelligence	• Mehran Yazdi	Shiraz University
Noval Structure of Poly Covered Naturally Ventilated Greenhouse for Agro Applications	• Dhananjay R. Mishra, • Amit Kumar Srivastava, • Nitesh Pandey	Jaypee University of Engineering & Technology

SUNDAY -11.09.2022
Ankara Time 10:00-11:45

SESSION-28, HALL-3/ OTURUM-28, SALON-3
MODERATOR: Maithili N. PAIKANE

TITLE	AUTHORS	AFFILIATION
A Review of Education Sector in Nagpur Region: Exponential growth due to Infrastructural Development	• Maithili N. Paikane	maithilipaikane@hss.vnit.ac.in
Politeness During Social Interactions As The Seminal Aspect in Human Communication and as One of The Characteristics to Maintain Mutual Relationship, Reputation and Social Face Within Bapedi People's Cultural Context.	• Morakeng Edward Kenneth Lebaka	University of Zululand – KwaDlangezwa Campus
Experiential Learning – A Case Study on Measurement and Instrumentation Course	• Ramachandiran Gunabalan	Vellore Institute of Technology, School of Electrica Engineering
Execution HRIMS (Human Rights Information Management System) In Pakistan by Ministry of Human Rights Commission	• Muhammad Faisal	Ministry of Human Rights
The Basis of The British Union Flag	• Agbaka Sourou Arsène, • Seguedeme Alexis Hergie	Laboratory for research in Literature and Civilization
Inventor Video Essay	• Major Gheorghe Giurgiu, • Manole Cojocaru	Titu Maiorescu University
Mechanical and Fracture Testing of Different Sheet Molding Compound	• Pedro M.M. Silva, • Raul D.S.G. Campilho, • Isidro J. Sánchez-Arce	Instituto Superior de Engenharia do Porto

SUNDAY -11.09.2022
Ankara Time 12:00-13:45

SESSION-29 HALL-1/OTURUM-29, SALON-1
MODERATOR: Prof. Ayfer Aybike KARADAĞ

TITLE	AUTHORS	AFFILIATION
• **Evaluation of Popular Recreation Places in Konya In Terms of Safety and Maintenance Criteria: in The Case of Kalehan Ecdat and Japanese Park**	• Sertaç Güngör	• Selçuk University
• **The Determination of the Naturel and Cultural Tourism Potential of Eğirdir and Suggestion of Sustainable Planning** •	• Sibel Akten	• Isparta University of Applied Sciences
• **Prevention Ways and Negative Effects of Fertilization in Sustainable Agriculture**	• Hakan Leventoğlu, • Atila Gül	• Suleyman Demirel University
• **Evaluation of the Effects of Türkiye's 11th Development Plan on Agricultural Landscape**	• Aybike Ayfer Karadağ • Demet Demiroğlu	• Düzce University
• **Recreational Opportunities in Urban Agricultural Areas**	• Enes Akdeniz, • Meryem Bihter Bingül Bulut, • Öner Demirel	• Kırıkkale University
• **Legislations Affecting Türkiye's Agricultural Landscape**	• Demet Demiroğlu • Aybike Ayfer Karadağ	• Düzce University

SUNDAY -11.09.2022
Ankara Time 12:00-13:45

SESSION-30, HALL-2/OTURUM-30, SALON-2
MODERATOR: Assoc. Prof. Şebnem ERTAŞ BEŞİR

TITLE	AUTHORS	AFFILIATION
• **Model Identification with Performance Evaluation Approach for Indoor-Outdoor Sports Venues in Primary Education Buildings**	• Feyza Nur Sağlam, • İrem Bekar, • Şebnem Ertaş Beşir	Akdeniz University
• **The Effect of Using 3D Printing Technology on The Production of Furniture Joining Details**	• Mucahit Gül, • Sebnem Ertaş Beşir	Akdeniz University
• **Examination of Antalya Akseki Traditional Dwelling Examples in Terms of Energy-Efficient Building Design**	• Mikail Açikel, • Büşra Göküz	Akdeniz University
• **A Workshop Experience: E/Spa/S Yeldeğirmeni (Event Space Syntax)**	• H. Meltem Gündoğdu, • Büşra Ertaş, • Gamze Sari	Kırklareli University
• **Evaluating The Traditional Mardin Houses Terraces in The Context of Environmental Identity**	• Zilan Nantu, • Ayten Özsavaş Akçay	Near East University
• **New Building Design Approach in Historical Environment: Design Concepts of Archiprix 21**	• Çiğsem Yağmur Yüksel, • Özlem Şenyiğit	Cukurova University

SUNDAY -11.09.2022
Ankara Time 12:00-13:45

SESSION-31, HALL-3/OTURUM-31, SALON-3
MODERATOR: Khalida MADOUI

TITLE	AUTHORS	AFFILIATION
• **Hagia Sophia: A Pearl of Contemporary Muslim World**	• Khalida Madoui	Ecole Normale Supérieure Assia Djebar Constantine Algeria
• **Obtaining Syrups Based on Echinacea For Diabetics and Non-Diabetics**	• Mahbuba Valiyeva, • Sevil Mehraliyeva, • Mahira Amirova	Azerbaijan Medical University
• **The Characterization of Mental Health in Transgenders Across Life Span**	• Aqsa Rehman, • Mamoona Mushtaq	University of Lahore
• **Malarial Detection from Blood Cell Images**	• Ruthuvershon S, • Gunadharshini C, • Gopıka S, • Makila S	Department of Electronics and Instrumentation Engıneering
• **Heavy Metals and Parasitological Infection Associated With Oxidative Stress and Histopathological Alteration in The Clarias Gariepinus**	• Marwa Ibrahim Saad El-Din	Suez Canal University
• **Relationship Between Work-Life Balance Satisfaction and Burnout Syndrome Among Medical Specialists**	• Rumyana Stoyanova, • Stanislava Harizanova	Medical University of Plovdiv
• **Aspects of Homogeneous Catalysis**	• Oussama Riouchi, • Nassima Riouchi, • Abdelhamid Bouyenzer, • Eduard Bardaja Rosriguez, • Adyl Oussaid, • Arachid Touzani	Université Mohammed Premier

SUNDAY -11.09.2022
Ankara Time 14:00-15:45

SESSION-32 HALL-1/OTURUM-32, SALON-1
MODERATOR: Prof. Deniz HASIRCI

TITLE	AUTHORS	AFFILIATION
Interior Granaries and Cabinets in Traditional Dwelling Use As A Local Identity Component: The Case of Antalya Akseki	• Mikail Açıkel, • Zuhal Kaynakçı Elinç	Akdeniz University
Concept and Scale Focus in Interior Design Education: An Adaptive Reuse Museum Project	• Deniz Hasırcı, • İdil Bakır Küçükkaya, • Zeynep Edes, • Silvia Rolla, • Haluk Tatari, • Müge Çalışkanelli, • Gülçin Kabaçam	Izmir University of Economics
The Relationshıp of Earthquake and Non-Structural Element in Departments of Architecture and Interior Architecture in Educational Programs	• Şeyma Dereci, • Şebnem Ertaş Beşir	Akdeniz University
A Research on Art Museums in Turkey That Are Designed After 2000s	• Seval Öğünlü, • Pınar Kılıç Özkan	Izmir Democracy University
Comparison of Environmental Data and Cost Analysis of An Exterior Wall Element Created From Insulation Materials in Which Life Cycle Assessment (LCA) Data Have Been Defined Using an Exemplary Facade Design	• Hilal Eraslan, • Nuray Benli Yıldız	Düzce University
The Effect of Window Position and Size on Visual Comfort Conditions	• Kasım Çelik	Çukurova University

SUNDAY -11.09.2022
Ankara Time 14:00-15:45

SESSION-33, HALL-2/OTURUM-33, SALON-2
MODERATOR: Assoc. Prof. Şirin Gülcen EREN

TITLE	AUTHORS	AFFILIATION
The Matter of Cultural Transmission in Traditional Turkish House and Modern Housing	• Selma Tufan	Fatih Sultan Mehmet Vakıf University
Determining Spatial Transformation of Historical City Centers By Solid-Void Analysis: İzmir Kemeraltı Case	• İlayda Anaç • Şirin Gülcen Eren	Süleyman Demirel University
Examination of Space Representation in Hayao Mıyazaki Animes: Howl's Moving Castle	• Gizem Özal	Nigde Omer Halisdemir University
Planimetry in Conservation of Cultural Transmission: Example of Traditional Turkish House and Modern Housing	• Selma Tufan	Fatih Sultan Mehmet Vakıf University
Armenia Destroys Azerbaijan's Historical Cultural Heritage	• Kamal Salayev	The Institute of Caucasus Studies of ANAS
Ancient Temple Built in Dur-Kurigalzu by King Kurigalzu I Restored In 1960 as a Cultural Monument	• Natela Popkhadze	Head of Scholarly Information Center at Phassis Academy in Tbilisi in Georgia Republic
Policy Inconsistencies or Planning Shortsightedness? Recurring Costs in Urban Planning	• Bashir Danjuma • Jesugbemi Olaoye Ajiboye	Niger State Polythechnic, School of Environment Studies, Department of Urban and Regional Planning, Zungeru-Nigeria

SUNDAY -11.09.2022
Ankara Time 14:00-15:45

SESSION-34, HALL-3/OTURUM-34, SALON-3
MODERATOR: Ulviya MAMMADOVA

TITLE	AUTHORS	AFFILIATION
Characterization of A Mortar Formulated With Granulated Slag and Metal Fibers	• Nadia Tebbal, • Zine El Abidine Rahmouni • Mekki Maza, • Messaouda Belouadah	M'sila University
Study of The Effect of Steel Fiber Length on The Behavior of Mortar Combined with Inert and Active Filler	• Nadia Tebbal, • Zine El Abidine Rahmouni, • Mekki Maza, • Messaouda Belouadah	M'sila University
Analysis of fluid flow Characteristics Over a Circular Cylinder in a Channel Using CFD Tool	• Om Thakur, • Samith Hegde, • Sonam Swaroop Dash, • Arumuga Perumal D	National Institute of Technology Karnataka
Computation of Deep Lid-Driven Cavity Flow using CFD Tool	• Balachandar Vasan, • Rehan Ahmedabadi, • Arumuga Perumal D	National Institute of Technology Karnataka, Surathkal
Non-Parabolicity Effect on The Diamagnetic Susceptibility for a Donor Confined in a Homogeneous Cylindrical Quantum Dot and Quantum Disk: Applied Magnetic Field Influence is Considered	• Ibrahim Maouhoubi, • Izeddine Zorkani	Sidi Mohamed Ben Abdellah University
Diagnosis Method of an Open circuit fault for a T-Type inverter in PV System.	• Amina Mimouni, • Souad Laribi • Morsli Sebaa • Tayeb Allaoui, • Abdelkader Azzeddine BengharbI	Ibn Khaldoun University
White Cement Mortar with Polysterene	• Mekki Maza, • Nadia Tebbal, • Zine El Abidine Rahmouni	M'sila University

SUNDAY -11.09.2022
Ankara Time 16:00-17:45

SESSION-35 HALL-1/OTURUM-35, SALON-1
MODERATOR: Assoc. Prof. Ümit ARPACIOĞLU

TITLE	AUTHORS	AFFILIATION
Investigation of Virtual Reality and Augmented Reality Applications in Cultural Heritage	• Gizem Özal	Niğde Ömer Halisdemir University
The People Houses As A Cultural Architectural Heritage of Türkiye; The Case of Zonguldak and Sivas	• Ayşe Durukan Kopuz	Tekirdağ Namık Kemal University
The Adaptive Reuse of Dwelling Heritage In Göztepe Region of İstanbul, Türkiye; Hazık Ziyal House	• Ayşe Durukan Kopuz	Tekirdağ Namık Kemal University
Transformation of an Industrial Heritage: Water Towers	• Hande Eyüboğlu, • Serap Faiz Büyükçam	Samsun University
Exploring a Heritage Building's Influence on The Surrounding Streetscape: A Case Study	• Esra İslamoğlu, • Evrim Solhan, • Ümit Arpacıoğlu	Mimar Sinan Fine Art University
Conservation Approaches for Rural Settlements	• Z. Sena Güneş Kaya • K. Kutgün Eyüpgiller	Istanbul Technical University

SUNDAY -11.09.2022
Ankara Time 16:00-17:45

SESSION-36, HALL-2/OTURUM-36, SALON-2
MODERATOR: Prof. Cengiz YÜCEDAĞ

TITLE	AUTHORS	AFFILIATION
The Effect of Demographic Traits on The Indoor and Outdoor Plant Tendencies of The People in The City of Çankırı-Türkiye	• Nuray Çiçek, • Cengiz Yücedağ, • Yağmur Palanci	Burdur Mehmet Akif Ersoy University
Evaluation of Tree Species Diversity of Kılavuzlu Park Kahramanmaraş, Türkiye	• Mert Çakir, • Mahmut Tuğluer	Süleyman Demirel University
Trees in Ritual Landscape and Their Roles	• Feran Aşur, • Elif Akpinar Külekçi	Van Yuzuncu Yıl University
The Effects of Horticultural Expositions (Expo) on The Urban Landscape	• Mahmut Tuğluer, • Şule Kisakürek	Kahramanmaraş Sütçü İmam University
Examination of The Case of Antalya on the Street Planting	• Musa Yasin Torun	Isparta University of Applied Sciences
Determining The Effects of Potassium Silicate Application on Some Quality Parameters of Different Turfgrasses Speices	• Mert Çakir, • Ceren Selim, • Emine Kahraman	Süleyman Demirel University
A Research on the Recreational Use of Visitors in the First National Park in Türkiye	• Cengiz Yücedağ, • Nuray Çiçek, Çağatay Aydın	Burdur Mehmet Akif Ersoy University

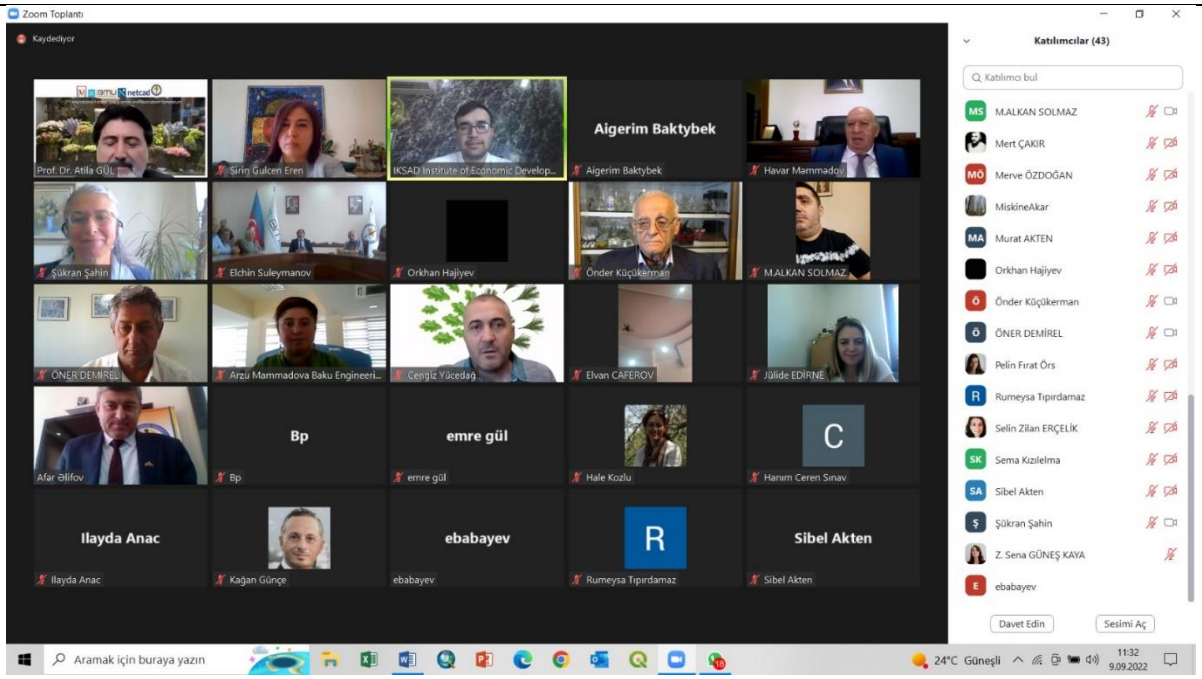
SUNDAY -11.09.2022
Ankara Time 16:00-17:45

SESSION-37, HALL-3/OTURUM-37 SALON-3
MODERATOR: Vorya SHABRAND

TITLE	AUTHORS	AFFILIATION
Developments of The International System Management of The International Crisis Management of The Great Power of The Russian Federation and Us America After The Cold War in The Ukrainian Crisis America is The Cause of The Crisis in Ukrainian and Also Seeks to Management Crisis	• Vorya Shabrandi	University of Guilan
Design of T-S Fuzzy Controller For Steer-By-Wire Based Vehicles	• Nabil El Fezazi	Sidi Mohammed Ben Abdellah University
Uncertainty Calculation For The Determination of Cr2o3 In Leather	• Sarwat Jahan Mahboob, • Rajkumar Dewani, • Muhammad Kashif Pervez, • Tahira Ayaz	• Pakistan Council of Scientific and Industrial Research
Understanding The MicroRNA and WNT Signaling Pathways Behind the Expression Level of Chek2 and LRP1B Genes in Non-Small Cell Lung Cancer (Nsclc)	• Aiza Kamal Khan, • Muhammad Naeem Faisal, • Momna Mehmood	• The University of Agriculture Faisalabad
Unsteadiness on EMHD Nanofluid Flow Over a Vertical Sheet	• Yahaya Shagaiya Daniel	Kaduna State University
Nanoemulsion Loaded Novel Synergistic Gel for the Amelioration of Psoriasis	• Rahmuddin Khan	School of Pharmaceutical Education and Research
Multi-Attribute Optimization of EDM Drilling Process Parameters on Nitinol Using GRA-Assisted PSO	• Amiya Kumar Sahoo • Dhananjay R. Mishra	Jaypee University of Engineering and Technology

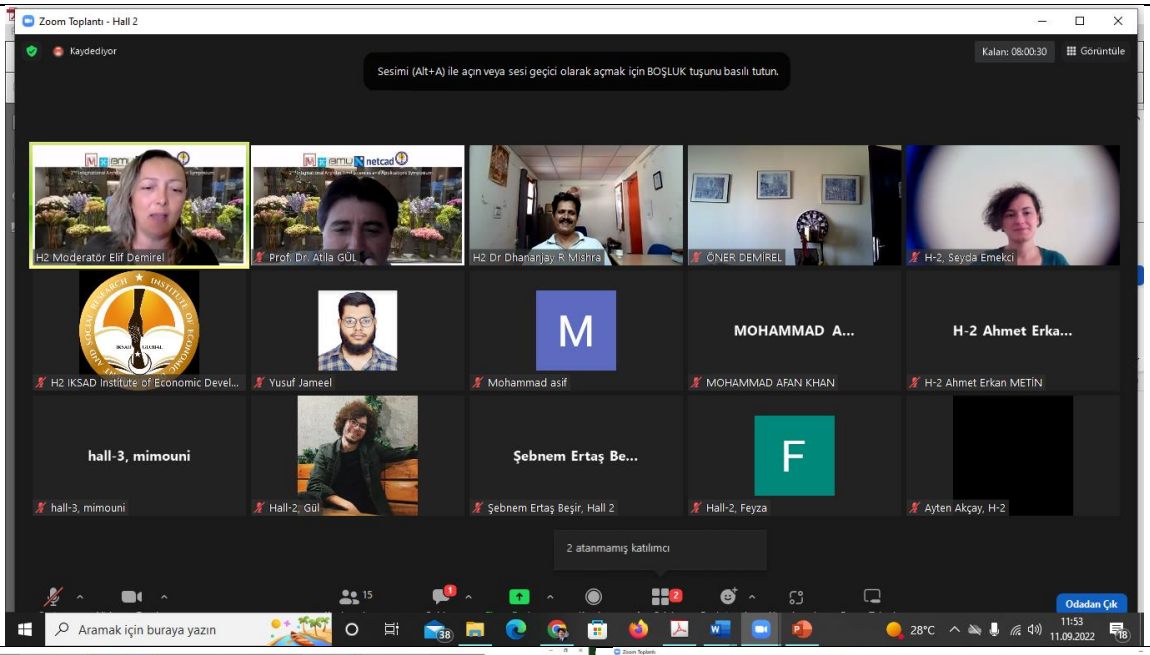
2nd INTERNATIONAL ARCHITECTURAL SCIENCES AND APPLICATIONS SYMPOSIUM

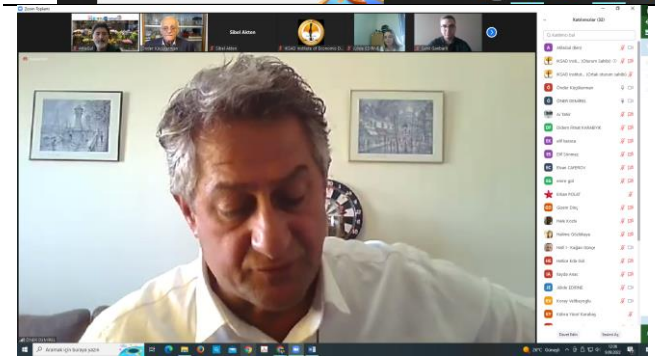
(IArcSAS-2022)

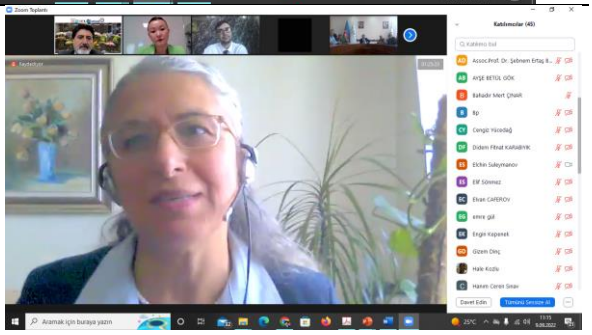


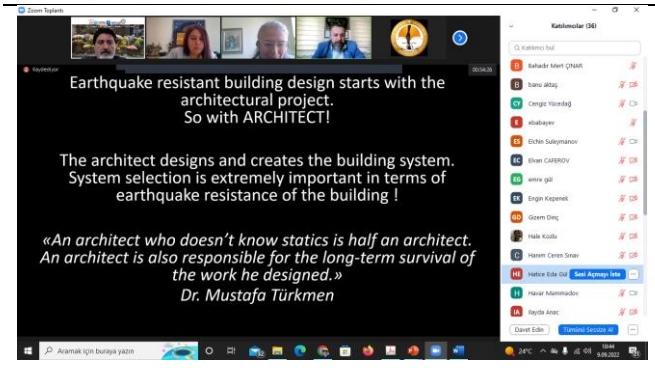


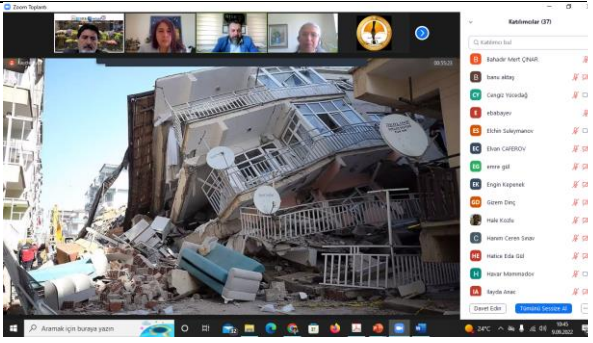



Zoom Toplantı - Hall 2
Kaydediyor
Sesimi (Alt+A) ile açın veya sesi geçici olarak açmak için BOŞLUK tuşunu basılı tutun.
Kalan: 08:00:30
Görüntüle
H2 Moderatör Elif Demirel
Prof. Dr. Atila GÜL
H2 Dr Dhananjay R Mishra
ÖNER DEMİREL
H-2, Seyda Emekci
H2 IKSAD Institute of Economic Devel...
Yusuf Jameel
Mohammad asif
MOHAMMAD A...
MOHAMMAD AFAN KHAN
H-2 Ahmet Erka...
H-2 Ahmet Erkan METİN
hall-3, mimouni
hall-3, mimouni
Hall-2, Gül
Şebnem Ertaş Be...
Şebnem Ertaş Beşir, Hall 2
Hall-2, Feyza
Ayten Akçay, H-2
2 atanmamış katılımcı
Odadan Çık
Aramak için buraya yazın
28°C
11:53
11.09.2022



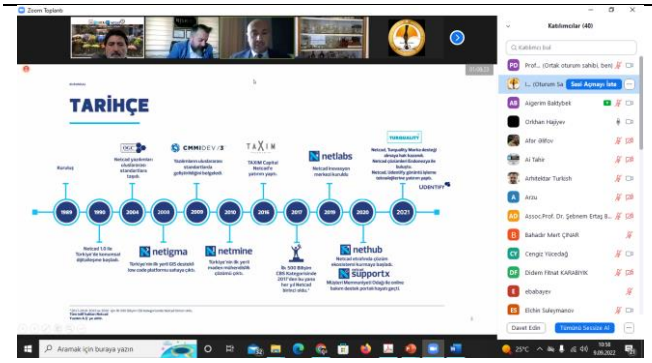



Earthquake resistant building design starts with the architectural project.
So with ARCHITECT!
The architect designs and creates the building system. System selection is extremely important in terms of earthquake resistance of the building !
«An architect who doesn't know statics is half an architect. An architect is also responsible for the long-term survival of the work he designed.»
Dr. Mustafa Türkmen

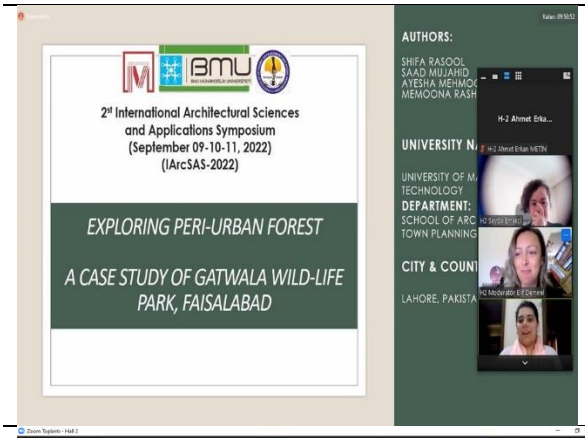


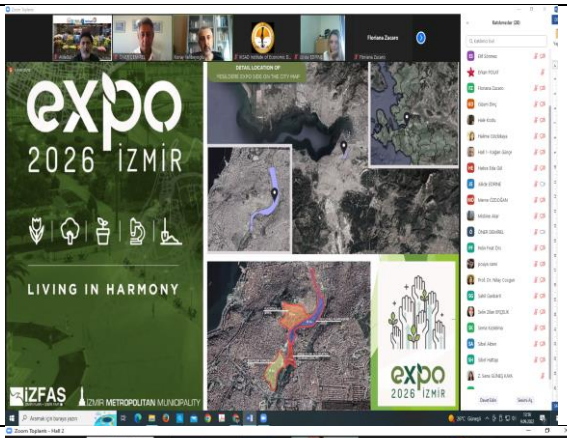

Elvan CAFEROV

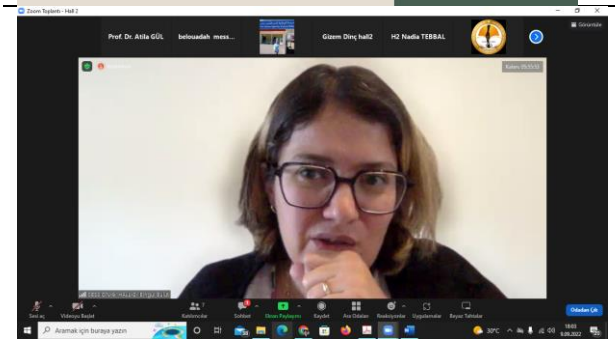

Hall 2 - Observer

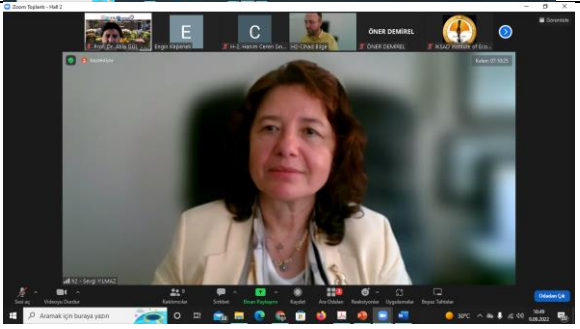

TARİHÇE
netlabs
netigma
netmine
nethub
Supportx

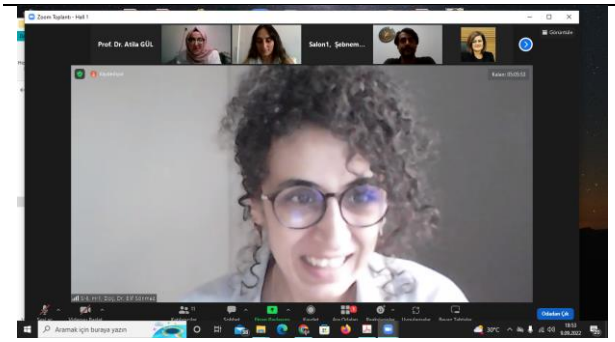



2nd International Architectural Sciences and Applications Symposium
(September 09-10-11, 2022)
(IArcSAS-2022)
EXPLORING PERI-URBAN FOREST
A CASE STUDY OF GATWALA WILD-LIFE PARK, FAISALABAD
AUTHORS:

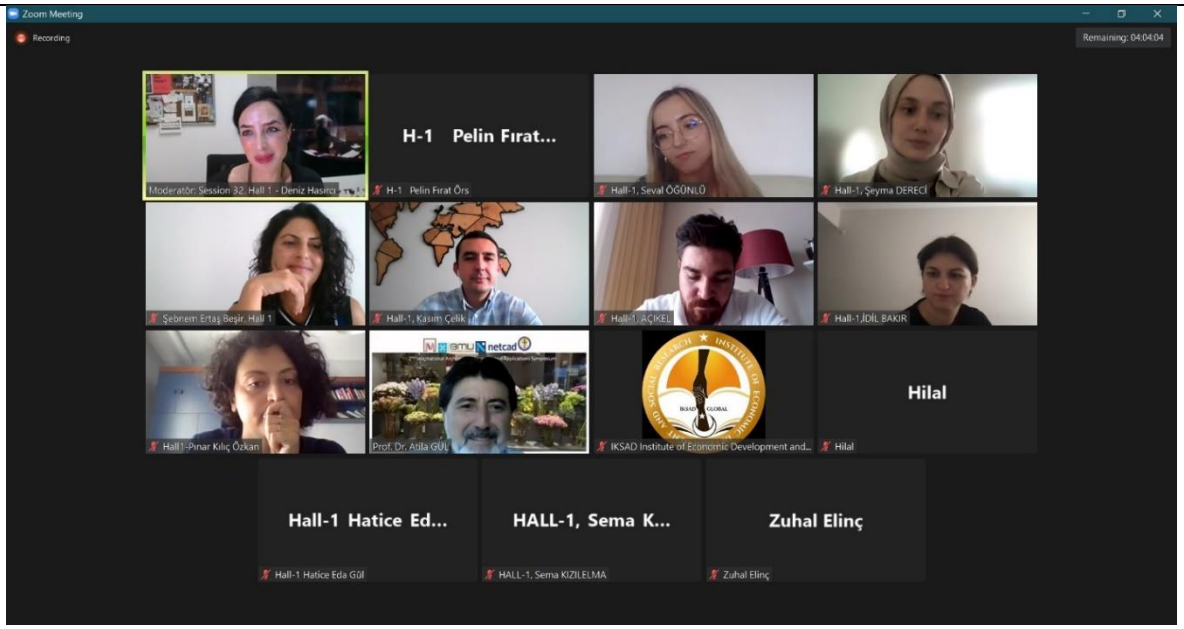

expo
2026 İZMİR
LIVING IN HARMONY
İZFAS
İZMİR METROPOLITAN MUNICIPALITY

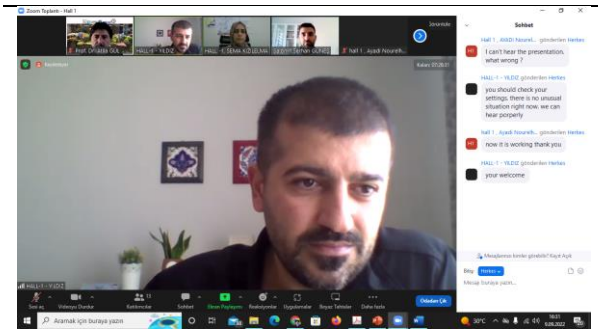




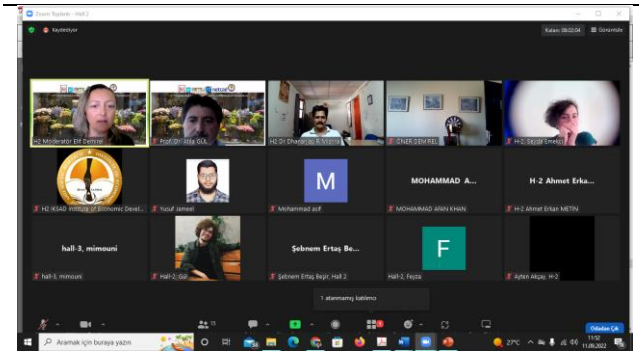


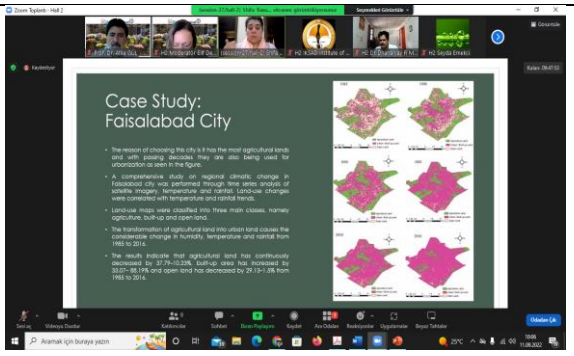

The Growing Pavilion 2019'da Hollanda Tasarım haftası için ses tasarımcısı ve sanatçı Pascal Lebougç ve Amsterdam merkezli Biobased Creations stüdyosunun ortak bir çalışması olar üretildi.
Prof. Dr. Atila GÜL

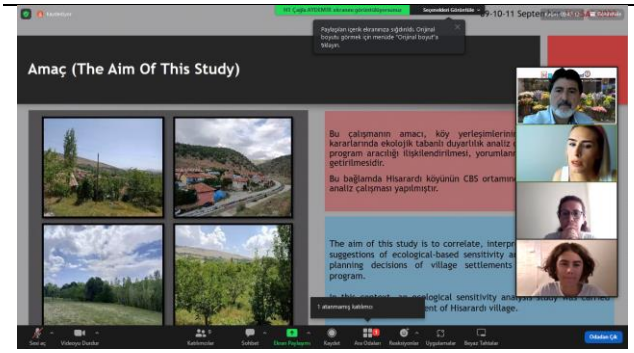

Zoom Meeting
Recording
Remaining: 04:04:04
H-1 Pelin Fırat...
Hall-1 Hatice Ed...
HALL-1, Sema K...
Zuhal Elinç
Hilal

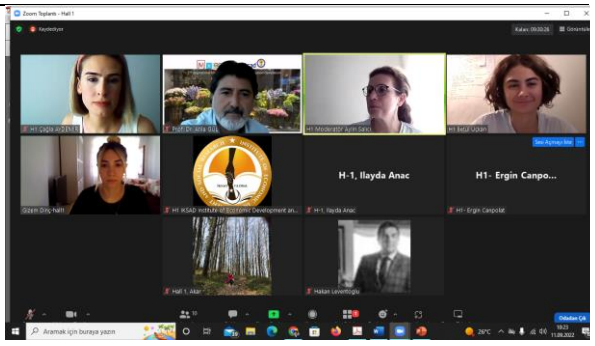


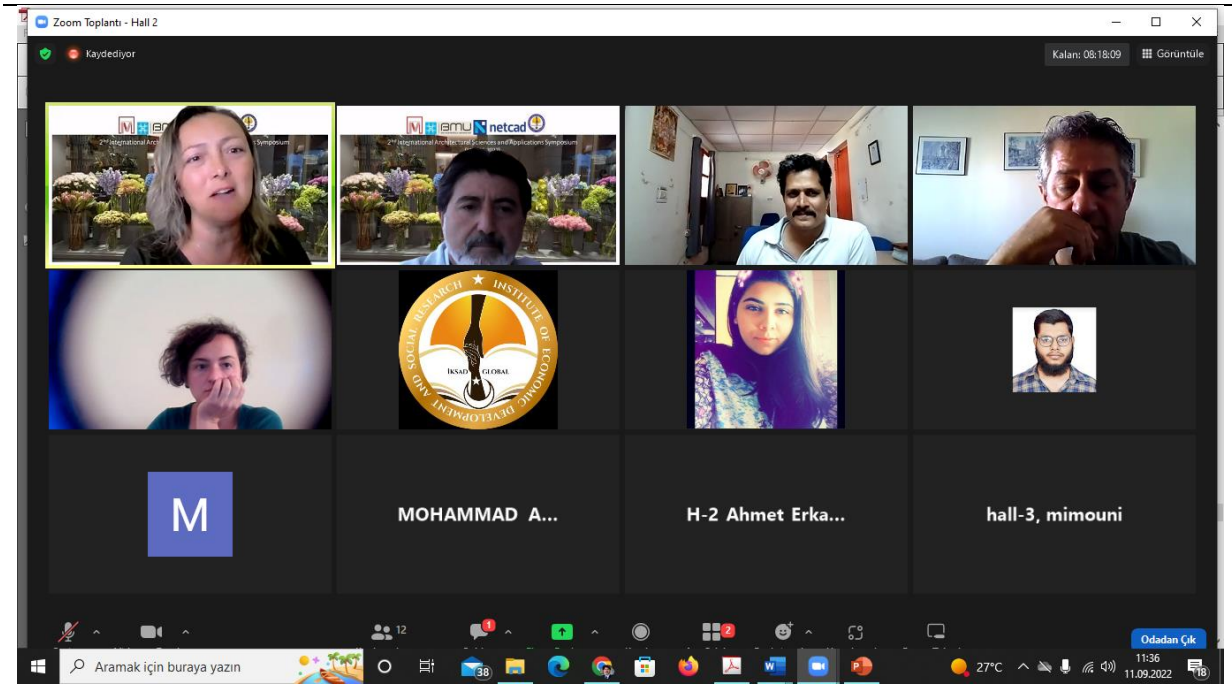

2nd International Architectural Sciences and Applications Symposium
(September 09-10-11, 2022)
(IArcSAS-2022)
CONCEPT AND SCALE FOCUS IN INTERIOR DESIGN EDUCATION:
AN ADAPTIVE REUSE MUSEUM PROJECT

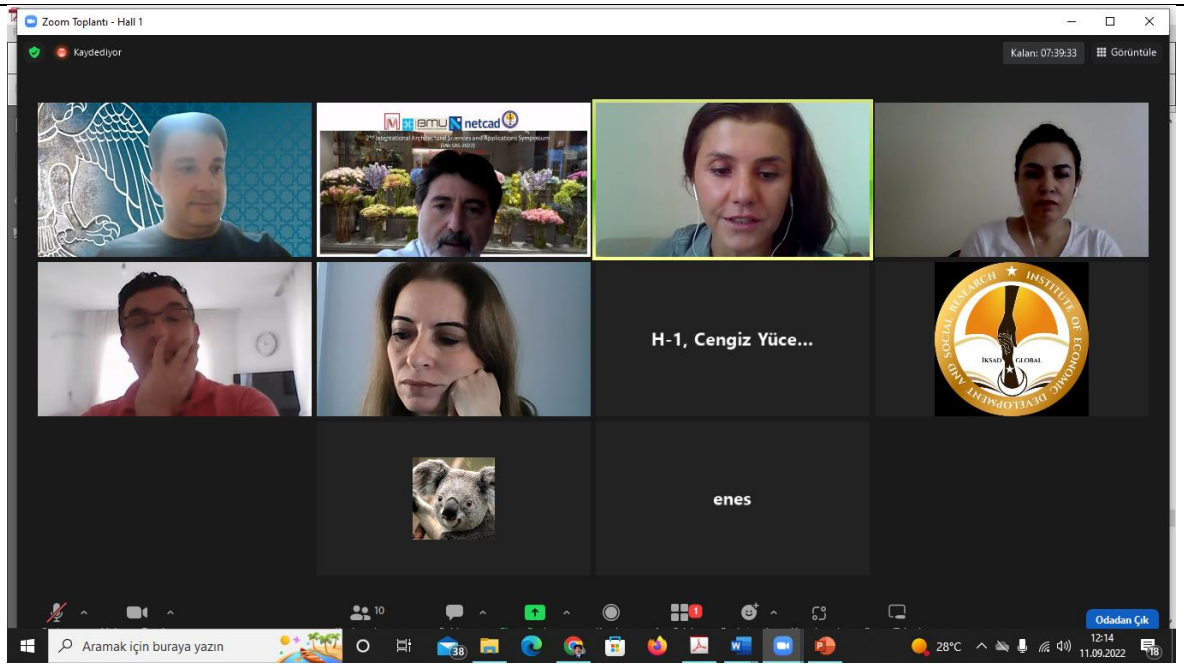


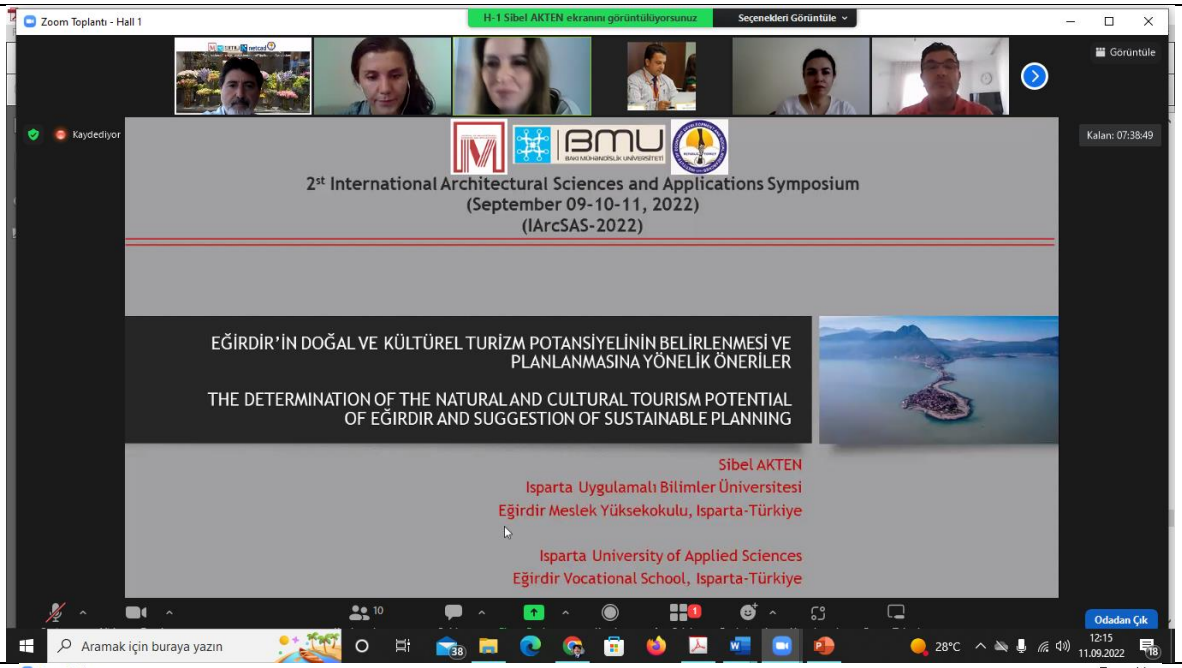

Case Study:
Faisalabad City

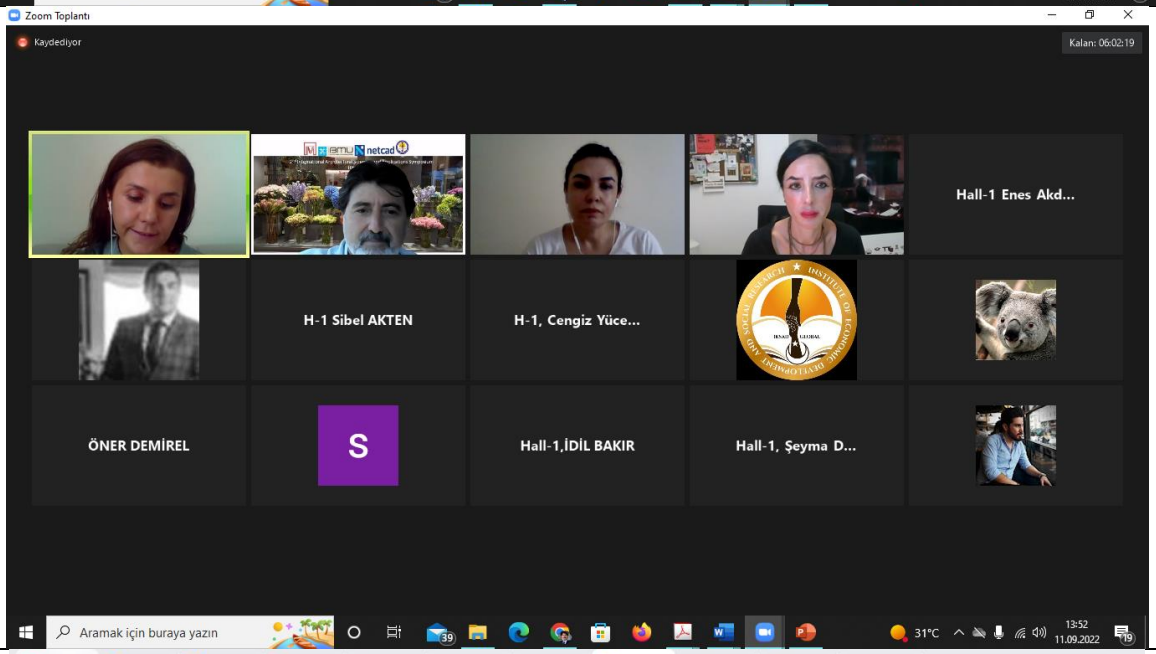

Amaç (The Aim Of This Study)

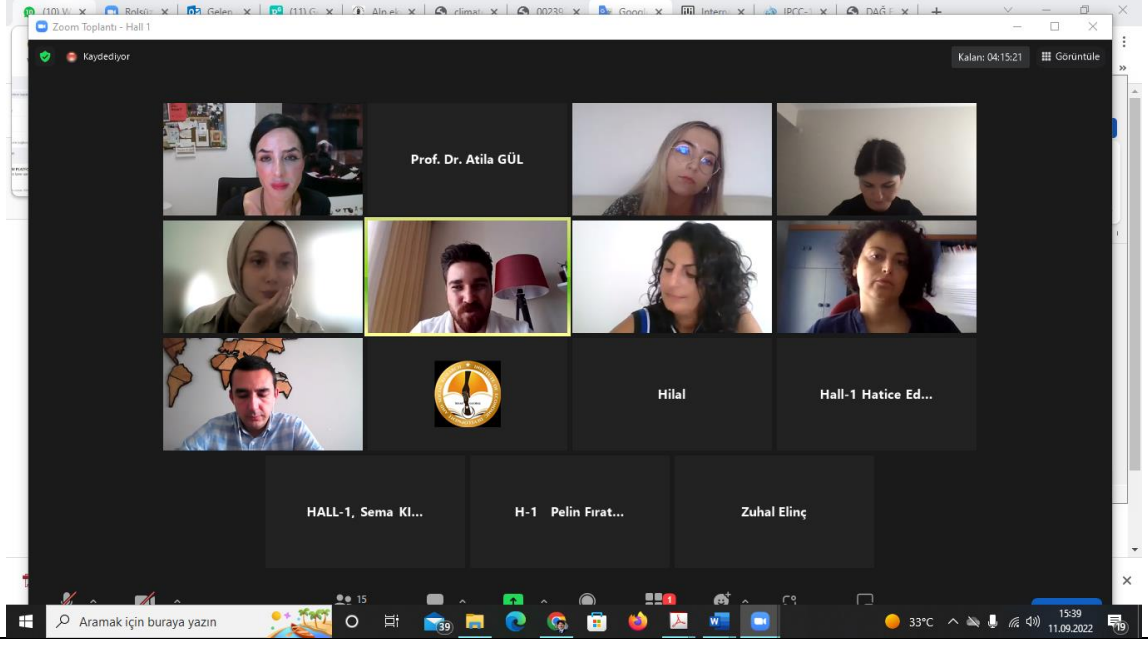

H-1, Ilayda Anac
H1- Ergin Canpo...

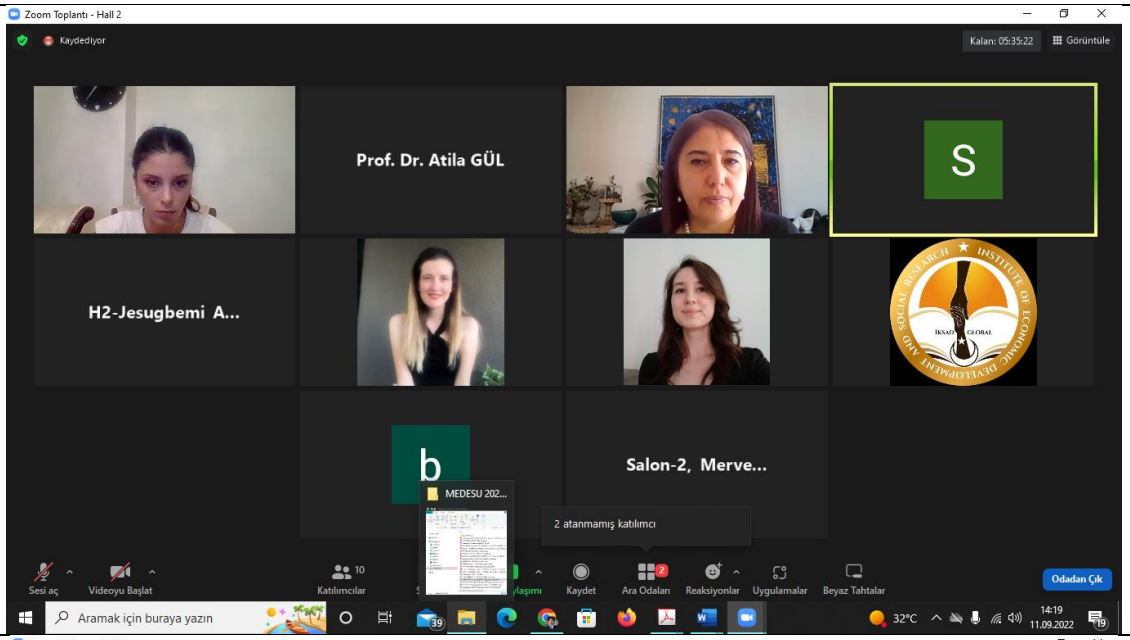

Zoom Toplantı - Hall 2
Kaydediyor
Kalan: 08:18:09
Görüntüle
MOHAMMAD A...
H-2 Ahmet Erka...
hall-3, mimouni
Odadan Çık
Aramak için buraya yazın
27°C
11:36
11.09.2022

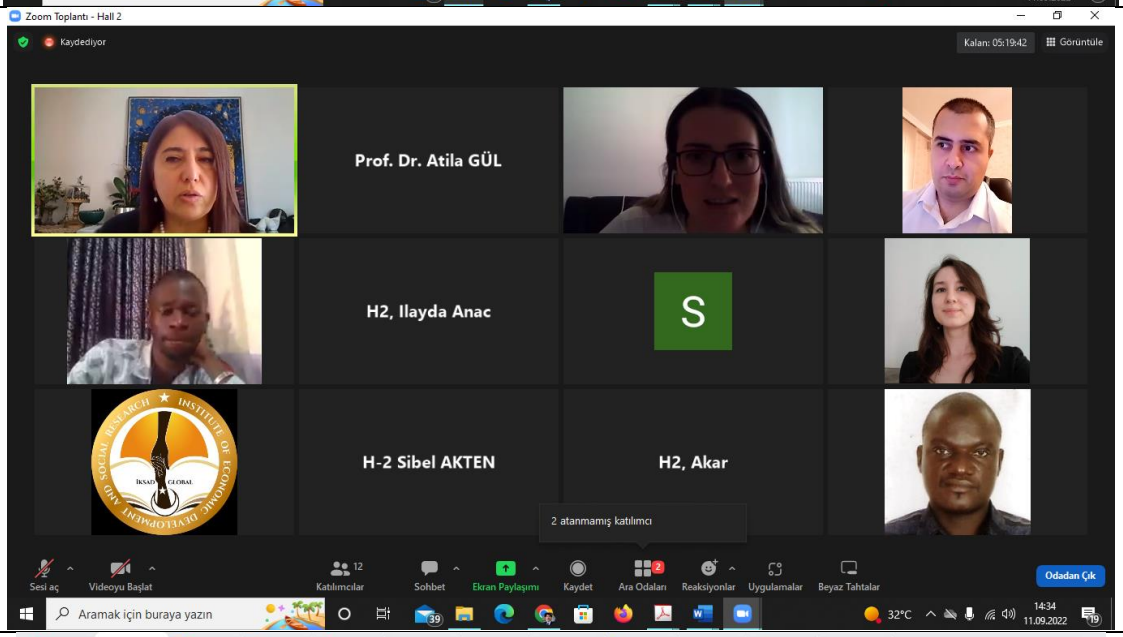

Zoom Toplantı - Hall 1
Kaydediyor
Kalan: 07:39:33
Görüntüle
H-1, Cengiz Yüce...
enes
Odadan Çık
Aramak için buraya yazın
28°C
12:14
11.09.2022

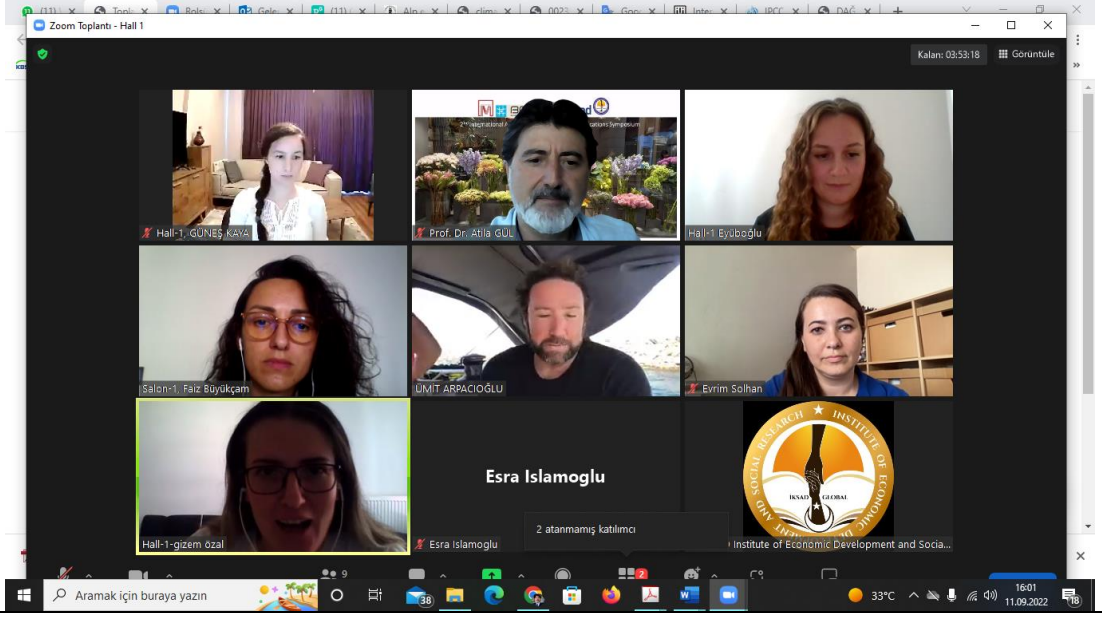

Zoom Toplantı - Hall 1
H-1 Sibel AKTEN ekranını görüntülüyorsunuz
Seçenekleri Görüntüle
Görüntüle
Kaydediliyor
Kalan: 07:38:49
2st International Architectural Sciences and Applications Symposium
(September 09-10-11, 2022)
(IArcSAS-2022)
EĞİRDİR'İN DOĞAL VE KÜLTÜREL TURİZM POTANSİYELİNİN BELİRLENMESİ VE PLANLANMASINA YÖNELİK ÖNERİLER
THE DETERMINATION OF THE NATURAL AND CULTURAL TOURISM POTENTIAL OF EĞIRDIR AND SUGGESTION OF SUSTAINABLE PLANNING
Sibel AKTEN
Isparta Uygulamalı Bilimler Üniversitesi
Eğirdir Meslek Yüksekokulu, Isparta-Türkiye
Isparta University of Applied Sciences
Eğirdir Vocational School, Isparta-Türkiye
Odadan Çık
Aramak için buraya yazın
28°C
12:15
11.09.2022

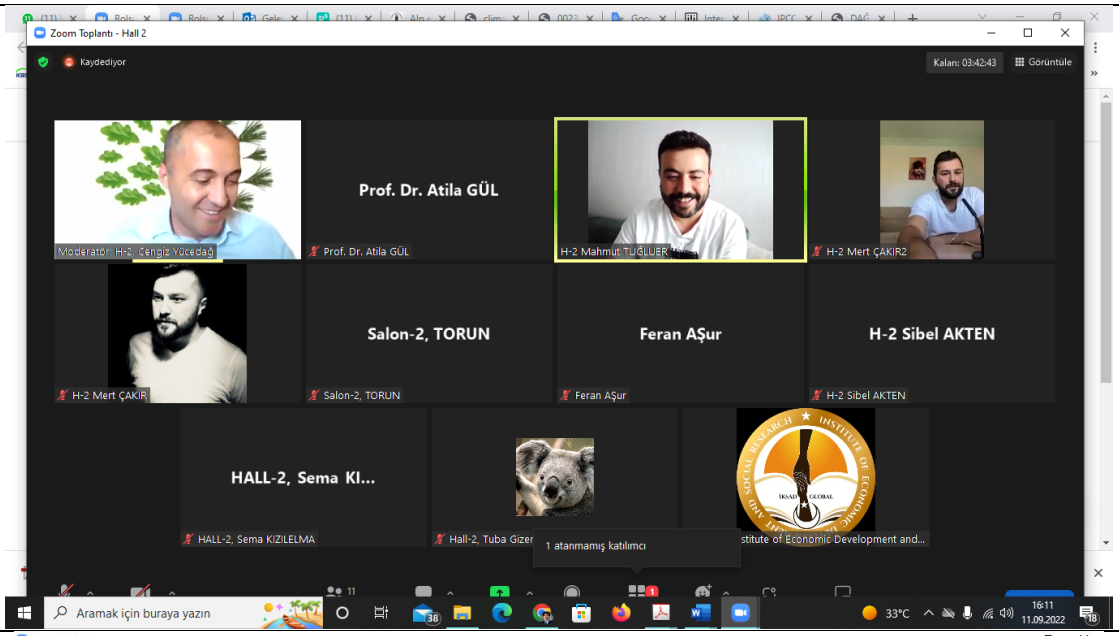

Zoom Toplantı
Kaydediliyor
Kalan: 06:02:19
Hall-1 Enes Akd...
H-1 Sibel AKTEN
H-1, Cengiz Yüce...
ÖNER DEMİREL
S
Hall-1,İDİL BAKIR
Hall-1, Şeyma D...
Aramak için buraya yazın
31°C
13:52
11.09.2022

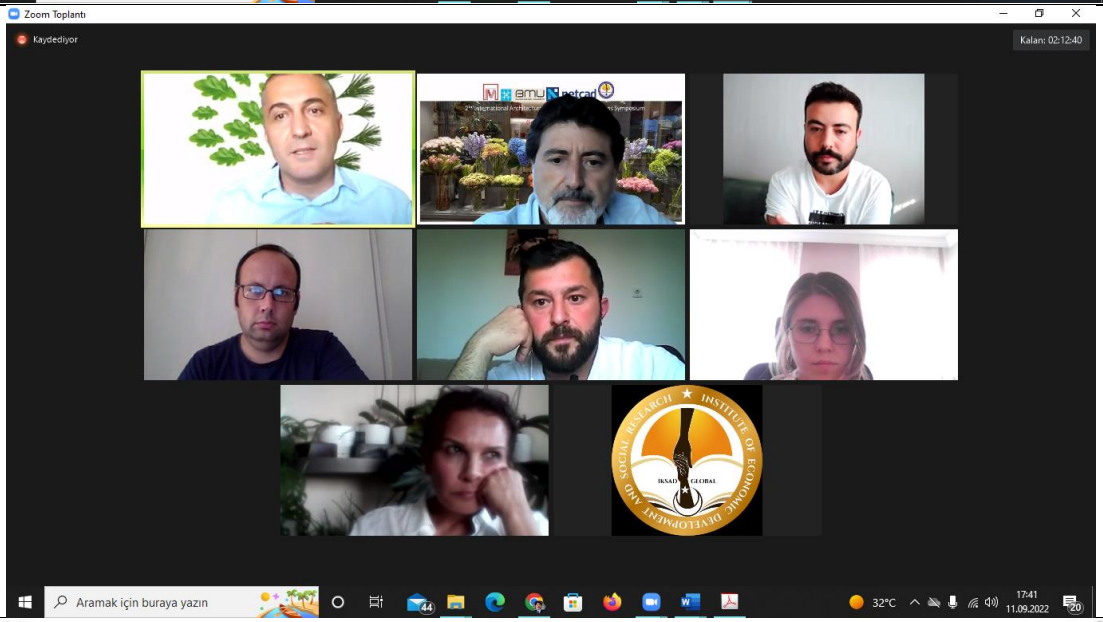

Zoom Toplantı - Hall 1
Kaydediliyor
Kalan: 04:15:21
Görüntüle
Prof. Dr. Atila GÜL
Hilal
Hall-1 Hatice Ed...
HALL-1, Sema KI...
H-1 Pelin Fırat...
Zuhal Elinç
Aramak için buraya yazın
33°C
15:39
11.09.2022

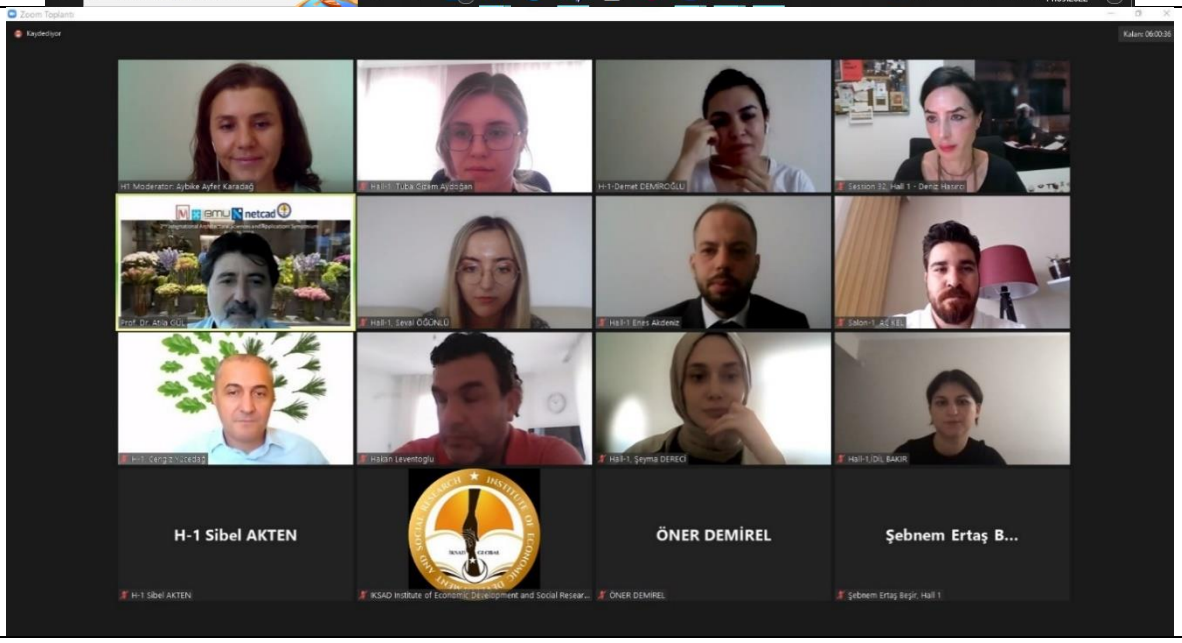

Zoom Toplantı - Hall 2
Kaydediyor
Kalan: 05:35:22
Görüntüle
Prof. Dr. Atila GÜL
S
H2-Jesugbemi A...
Salon-2, Merve...
MEDESU 202...
2 atanmamış katılımcı
Sesi aç
Videoyu Başlat
Katılımcılar
Kaydet
Ara Odaları
Reaksiyonlar
Uygulamalar
Beyaz Tahtalar
Odadan Çık
Aramak için buraya yazın
32°C
14:19
11.09.2022

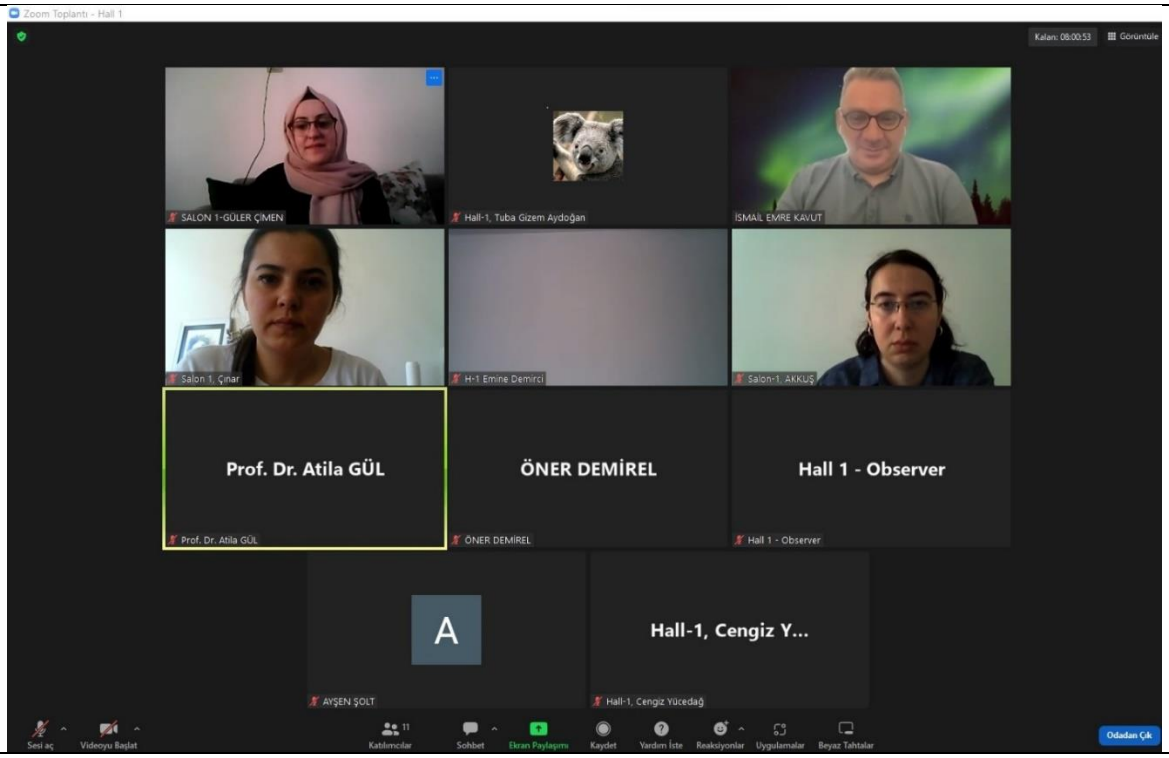

Zoom Toplantı - Hall 2
Kaydediyor
Kalan: 05:19:42
Görüntüle
Prof. Dr. Atila GÜL
H2, Ilayda Anac
S
H-2 Sibel AKTEN
H2, Akar
2 atanmamış katılımcı
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydet
Ara Odaları
Reaksiyonlar
Uygulamalar
Beyaz Tahtalar
Odadan Çık
Aramak için buraya yazın
32°C
14:34
11.09.2022


Zoom Toplantı - Hall 1
Kalan: 03:53:18
Görüntüle
Hall-1, GÜNEŞ KAYA
Prof. Dr. Atila GÜL
Hall-1 Büyüoğlu
Salon-1, Faiz Büyükçam
ÜMİT ARPACIOĞLU
Evrim Solhan
Hall-1-gizem özal
Esra Islamoglu
Esra Islamoglu
2 atanmamış katılımcı
Institute of Economic Development and Socia...
Aramak için buraya yazın
33°C
16:01
11.09.2022


Zoom Toplantı - Hall 2
Kaydediliyor
Kalan: 03:42:43
Görüntüle
Prof. Dr. Atila GÜL
Salon-2, TORUN
Feran AŞur
H-2 Sibel AKTEN
HALL-2, Sema KI...
1 atanmamış katılımcı
Aramak için buraya yazın
33°C
16:11
11.09.2022


Zoom Toplantı
Kaydediliyor
Kalan: 02:12:40
Aramak için buraya yazın
32°C
17:41
11.09.2022


H-1 Sibel AKTEN
ÖNER DEMİREL
Şebnem Ertaş B...


Zoom Toplantı - Hall 1
Kalan: 08:00:53
Görüntüle
SALON 1-GÜLER ÇİMEN
Hall-1, Tuba Gizem Aydoğan
İSMAİL EMRE KAVUT
Salon 1, Çınar
H-1 Emine Demirci
Salon-1, AKKUŞ
Prof. Dr. Atila GÜL
ÖNER DEMİREL
Hall 1 - Observer
A
AYŞEN ŞOLT
Hall-1, Cengiz Y...
Hall-1, Cengiz Yücedağ
Ses aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydet
Yardım İste
Reaksiyonlar
Uygulamalar
Beyaz Tahtalar
Odadan Çık


Zoom Toplantı - Hall 2
Kaydediliyor
Kalan: 02:12:58
Görüntüle
H-2 Mahmut TUĞLUER
Salon-2, TORUN
H-2 Mert ÇAKIR
Prof. Dr. Atila GÜL
Feran AŞut
İKSAD Institute of Economic Development and Social Researches
Ses aç
Videoyu Durdur
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydet
Yardım İste
Reaksiyonlar
Uygulamalar
Beyaz Tahtalar
Odadan Çık

2nd INTERNATIONAL ARCHITECTURAL SCIENCES AND APPLICATIONS SYMPOSIUM

(IArcSAS-2022)

ISBN: 978-625-8246-12-4

IArcSAS 2022

SYMPOSIUM DECLARATION

The Moderators of the IArcSAS 2022 Symposium have reached a common consent upon the issues stated below:

1. Today, joint multi-disciplinary and inter-disciplinary science studies primarily address 7 seven key societal challenges of the International Union for Conservation of Nature (IUCN): Adaptation and Mitigation to Climate Change, Reducing Disaster Risk, Reversing Ecosystem Degradation and Biodiversity Loss, Human Health, Socio-economic Development, Food Safety, and Water Security).
2. Ecological or nature-based solutions should be produced in the adaptation process to climate change in cities, and interdisciplinary joint studies should be expanded under the umbrella of Architectural Sciences.
3. Cities should be planned/designed and managed with concepts such as green urbanism, green economy, green buildings, green infrastructure, green technology, and zero carbon in a sustainable, ecological and smart city organization.
4. Cultural transfer and professional cooperation from the past have weakened in periphery countries like Turkey and Azerbaijan. For this reason, interdisciplinary cooperation has become mandatory in terms of the studies of architectural sciences and their practice in building environment terms and planning and design processes.
5. Urban design and conservation studies should be handled holistically, as the building environment (City, neighborhood, street, landscape, and housing).
6. Urban design processes, standards of production, and methods of intervention should be determined.
7. Due to the different ecological, historical, economic, and socio-cultural characteristics of cities, there is a need for sustainable urban planning and strategic management policies that apply to generating or preserving urban identity and protecting the natural and cultural heritage.
8. In urban areas, planning/design, implementation, management, monitoring, inspection, and control processes should be included in the legislation as a whole in Türkiye.

9. Different architectural disciplines (building architect, landscape architect, city planning, interior architect) in the Faculty of Architecture should contribute to the region, the society, and the individual by making joint applied /experimental projects in the planning and design studios for enabling the professional experience of their students.
10. The Higher Education Quality process should be handled as a whole, simultaneously and coordinated by the departments within the faculty.
11. A database of natural and cultural landscape inventory of public institutions and organizations should be created and made accessible. For this purpose, landscape observatories should be built.
12. The public interest conceptual context, approach, discourse, and limits of action should be discussed and clarified on an academic platform by spatial planning and design disciplines.
13. The possibilities of using space syntax as a design tool for the accessibility of urban parks should be targeted.
14. In urban design practices, universal design criteria should be taken into account to include all citizens, who are the elderly, children, and physically handicapped individuals.
15. The dangers that the world faces due to climate change and global warming have shown the importance of urban agriculture to humanity. Architectural sciences emphasize the importance of agricultural areas in terms of life. In this context, I, II, and II degree agricultural areas should be accepted and registered as agriculturally protected areas. All kinds of land use decisions that will disrupt its structure should be prevented, and scientific efforts and studies that will contribute to this prevention should be increased.
16. Urban planning practices and discipline studies should take into account and give priority to the recent urban agriculture approaches.
17. A database for the natural and cultural heritage of each region or district should be established and archived.
18. The Faculty of Architecture curriculum should cover courses on the protection, planning, design, and restoration of natural and cultural heritage structured by the common consent of the related disciplines.
19. Joint projects, workshops, and large-scale inter-institutional events for natural and cultural heritage should be organized.
20. Historical city centers should be rehabilitated and improved, and Urban development plans and practices should be revised. Academic studies proposing new methods and alternatives should be supported.
21. The effects of wars and terrorism destroy cities, places, people's memories, and belongings. All humanity should be responsible for protecting, restoring, documenting, and transferring natural and cultural heritage and values, to the future. Related academic studies must be supported and sustained.

22. Giving priority to economic use only for tourism/recreation purposes in legally protected natural areas (especially National Parks and Nature Parks) causes damage to resources. For this reason, the basic approach should be to create a sustainable balance between conservation and conservation-compliant uses in these areas.
23. An effective governance organization must be established in protected areas and participation must be ensured in all processes, and an Advisory Board consisting of all the related stakeholders must be established.
24. Local plant species should be preferred instead of exotic species in urban open and green areas.
25. The existing old and monumental trees in urban and rural areas should be protected and kept alive.
26. EXPO events in any country/city are important for their role in the urban ecosystem and contribution in terms of the national and international tourism generated. Based on the former experiences, future EXPO event planning and designs must (i.e. EXPO -2023, Kahramanmaraş) be sensitive to academic knowledge and insight for achieving multifaceted added value and better spatial quality.

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ABSTRACTS

2nd. International Architectural Sciences and Applications Symposium
"IArcSAS-2022"
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ISBN: 978-625-8246-12-4

TITLE	AUTHORS	Pages
Comparative Analysis of the Modern and Conventional Building Structures for the Arid Regions	• Dhananjay R. Mishra, • Suyash Tiwari, • Dharmendra Kumar Shukla	1
A Review of Life Cycle Assessment Method for Residential Building: The Case of Morocco	• Redouan Assadıkı, • Fouzi Belmir	2
Examination of Sustainability Criteria in Building Shell Design: Astana Case	• Sennur Hilmioğlu, • Erdem Çoban	3
Conservation Problems in Stone Structures Found on the Coast Sections in the Example of the Historical Yason Church	• Kıral Gülçin, • Gülferah Çorapçioğlu	4
Potential Utilization of a Hybrid Nano Metal Oxide Photo-Active and Self-Cleaning Window System	• Nurhidayatullaili Muhd Julkaplı, • Mohd Azam Mohd Adnan	5
Types and Uses of Special Concrete in Construction	• Oussama Benmerabet, • Salah Messioud	6
Synthesis of Organic Compounds Using Homogeneous Catalysis	• Oussama Riouchi, • Nassima Riouchi, • Abdelhamid Bouyenzer, • Eduard Bardaja Rosriguez, • Adyl Oussaid, • Arachid Touzani	7
Culture and Perception of Home Among the Elderly: A Case Study in Nigeria	• Iyabode Abiodun Adediran	8
Impact of Configuration Irregularities on the Seismic Capacity of Buildings with Foundation Settlement	• Sadiq Nuraliyev, • Shukufa Mammadova, • Shahin Huseynli	9
In the Example of Baku City, the Great History of Industrial Infrastructures of Cities	• Aysel Hüseynzadə	10
Designer Identity as Architect: Vison of Self on Architectural Design, Zaha Hadid (1950-2016)	• Khalifa Ya'u Hamza, • Ayten Aozsavas Akcay	11
Smart Materials at the Service of Tomorrow's Buildings: Towards Innovation in Green Building Envelopes	• Ayadi Nour El Houda, • Arigue Bidjad, • Derradji Mohamed, • Sriti Leila	12

ISBN: 978-625-8246-12-4

An Example of Low-Cost Housing from the 1990s: Denizli Şirinköy Low-Cost Housing Area	• Halime Nur Yilmaz • Berna Güç	13
Measures to Be Taken Against Nightlife Noise	• Derin Hilal Bilmez	14
Smart Economics: Achieving Sustainable Development Goals	• Olena Budiakova	15
Effect of Glass Microfiber Reinforcement on the Performance of a Structural Adhesive	• Guilherme S.M. Tavares • Raul D.S.G. Campilho, • Paulo J.R.O. Nóvoa, • Isidro J. Sánchez-Arce	16
The Influence of the Social Content of Cities on the Formation of their Plan-Spatial Infrastructure	• Agil Kazimov	17
The Modern Role of Traditional Urban Planning Values	• Sabir Orucov	18
Traditional Islamic City Model	• Sabir Orucov, • Ayten Salimova	19
Obtaining Clinker Tile from Dashkesan Pyrophyllite	• Y.H. Halilov, • M.A. Babayeva	20
The Development of Fractal Theory in Architecture	• Shehla Abbasova, • Namiq Abbasov	21
Comparisons and Evaluations of Historical and Traditional Housing Architecture in Muş Kale Neighborhood on Visual Materials From 2011 and 2021	• Mehmet Bahadır Tosunlar	22
Building Regulations Domain Knowledge Representations	• Murat Aydın	23
Effets Socio-Économiques Et Environnementaux De Construction Des Infrastructures Sanitaires Dans La Commune D'abomey-Calavi (Benin, Afrique De L'ouest)	• Pamphile Houndji, • Flore Mehinto Dovonou, • Louis Dèdègbê Ahomadikpohou	24
Shobha De's Ironic Representation of Relationships with Special Reference to Influence of Metro Cities	• Kirti Dorshetwar	25
Quantification of Environmental Impacts of Wastewater Treatment Plants Applying Life Cycle Assessment	• Safae Elhir, • Najoua. Labjar, • Mohamed. Dalımı, • Souad. El Hajjaji	26
Road Map to Success	• Preeti Pareek	27

ISBN: 978-625-8246-12-4

Industrial and Artisanal Valorization of Moroccan Clays	• Nassima Rıouchi • Oussama Rıouchi, • Mohamed Loutou, • Mohamed Abou-Salama	28
Identification of 2 Deoxy d ribose as VEGF Equivalent in Stimulation of Angiogenesis – Translational Biomaterials for Clinical Applications	• Muhammad YAR	29
A Short Report Making a Comparison Between Artificial Intelligence and Artificial Neural Network	• Vaibhav Kant Singh	30
Study and Analysis of Stresses in Gas Pipelines Corroded by Ansys Workbench	• Samir ZAHAF, • Nouhaila TAIBA	31
Introduction to Ans Technology	• Vaibhav Kant Singh	32
A Design Studio Edition and Example in Architecture Education	• Neslihan Demircan, • Büşra Demircan İbiş	33
Importance of Drawing and Painting in the Field of Architecture	• Rachana Kailas Ahire	34
The Importance of School Gardens Within the Approach to Outdoor Learning	• Elif Karaca, • Mehmet Karaca, • Hatice İnce	35
Comparison of Trabzon and Kilis Cities in Terms of the Features of Traditional Housing Gardens	• Saliha Taşçıoğlu	36
The Thought of Privacy in the Turkish House and the Elements That Make it	• Merve Yilmaz	37
Investigation of the Production of Structural Lightweight Concrete with Using Erzincan Raw Perlite Aggregate	• İsmet Ulusu, • Hayati Ulusu	38
Elaboration of Clay-Based Materials, Characterization, and Application to the Elimination of Organic Pollutants	• Nassima Riouchi, • Oussama Riouchi, • Mohamed Loutou, • Mohamed Abou-Salama	39
An Experimental Study on the Formation of Al_2O_3 and TiO_2 Layer on AA6061-T3 Alloy Using Sol-Gel Dip Coating	• U. Elaiyarasan, • V. Satheeshkumar, • C. Senthilkumar	40
A Short Report on the Basic Artificial Neuron Model	• Vaibhav Kant Singh	41
Conscious Level Monitoring from EEG and PPG Signal	• Ankita Singh, • Aboorva E R, • Divya D,	42

ISBN: 978-625-8246-12-4

Co-Digestion of Organic Feedstocks for Biogas Production from Anaerobic Digestion Process	• Aniekan Essienubong Ikpe, • Emem Okon Ikpe, • Imaobong Mfon Essen	43
Ketoamides, Derived From 1-(3,4-dimethoxyphenyl) Propane-2-Amine as Ligands in Reaction with Cu (II)	• Petya Marinova, • Slava Tzoneva, • Stoyanka Atanasova	44
Introduction to Soft Computing	• Vaibhav Kant Singh	45
A New Approach to the Space Design Process in the Interior Architecture Basic Design Studio	• Hatice Çınar, • H. Özlem Yurtgün	46
The Evaluation of the Spatial Understandings of the New Millennium in the Field of Interior Architecture	• İsmail Emre Kavut, • Elif Özdağlar, • Çağrı Yalçın, • Turgut Kalay, • Seval Yılmaz Yatır	47
Sustainable Housing Design Suggestions	• Meryem Sevde Doğruer	48
Investigation of in-Between Spaces in the Case of Isparta City Center	• Şehriban AKSIN, • Berna GÜÇ	49
Tiles Fixing Mortar and Techniques Hazrat Mevlâna Tomb Restoration Sample	• Alihan KESKIN	50
An Evaluation Through Architectural Finds at Daskyleion: The Phrygic Effect	• Kübra Yücel Karabaş	51
Conceptual Approach to Aboveground-Underground Spaces: An Example of Nevşehir Castle	• Emine Akcan Şirin, • Emre Becerir	52
Retention of Dyes in Wastewater by Waste-Derived Material	• Mohammed El Amine Zennaki, • Lahcene Tennouga, • Brahim Bouras, • Kouider Medjahed	53
The Search for 'Modern' Identity in Early Republican Period Architecture: A Case Study of Bursa People's House	• Nursah Bütüner	54
Dynamic Image/Video Captioning Using Convolutional Neural Networks and LSTM	• Rahul Desai • G M Walunjkar	55
A Short Report on Credit Assignment Problem (CSP)	• Vaibhav Kant Singh	56
Association Between Work-Life Balance and Job Satisfaction of Employees	• Vikram Singh Chouhan	57
Influence of Elevated Temperatures on the Mechanical Performance of Sustainable Fiber Reinforced Recycled Brick Mortar	• Messaouda Belouadah, • Zine El Abidine Rahmouni • Nadia Tebbal	58

ISBN: 978-625-8246-12-4

MATLB Virtual Simulation Software in the Context of Wireless Communication Model	• Aijaz Margay, • Ajjaz Maqbool	59
SVM An Ml Approach for Breast Cancer	• Vaibhav Kant Singh	60
Investigation of Conservation Works in Malatya/Yeşilyurt Within the Context of Cultural Tourism	• Tuba Nur Olgun	61
Techniques and Methods Based on Geographical Information Systems in Visual Landscape Quality Evaluation	• Duygu Doğan, • Meryem Bihter Bingül Bulut	62
An Assessment of Accessibility by Experiential Mapping Method: The Case of Mevlana Avenue	• M. Kübra Müezzinoğlu, • Hatice Çınar	63
Relationship Between Landscape and Urban Square: Productive Open Space For Citizens	• Ali Abdullah Kazmi, • Saad Mujahid, • Ayesha Mehmood Malik, • Memoona Rashid	64
Planning and Sustaining Healthy Outdoor Recreation amid the 21st Century COVID-19 Pandemic and Beyond	• Chioma Agatha John-Nsa, • Nkeiru Hope Ezeadichie	65
Evaluation of the Use of Mineral-Doped Hydraulic Lime-Based Repair Mortar in The Repair of Historical Buildings	• Esma Karakoyun Yaşar, • Burak YAŞAR	66
The Electrochemical Nanocomposit Multifunctional Coatings: Syntesis and Properties	• Hanna Karakurkchi, • Mykola Sakhnenko	67
Apnea Monitoring System	• Prathiga P, • Dinesh A, • Ritika T	68
Retail 4.0: Optimization of the Stock Inventory And Decision-Making Centered On Data	• Vagner Aparecido de Moura • Paulo Samir Silva Ferreira dos Santos, • Cleber Costa Santana, • Edson Cezário de Oliveira, • Evandro Reis dos Santos, • Mateus Lima Bonfim	69
Electrochemical Detection of Heavy metal ions by Low Temperature Synthesized of Nanostructured $MgNiO_2$ Based Electrode	• Mohammad Imran, • Eun-Bi Kim, • Mohammad Shaheer Akhtar, • Dong-Heui Kwak, • Sadia Ameen	70
The Design of a New Heat Exchanger Model for Application in Renewable Energy	• Firyal Latrache, • Zakia Hammouch, • Karima Lamnaouar, • Benaissa Bellach, • Mohammed Ghammouri	71
Pycaret a Python Implementation for Thyroid Disease	Vaibhav Kant Singh	72

ISBN: 978-625-8246-12-4

Transform Based Approaches for Image Recognition	• Tharun Kumar • Irene Cyntthiya	73
On the Relationship of Space Design and Psychological Impact Mechanisms	• Ömer Atabeyoğlu	74
Production of Publicness Through Art on the University Campus	• Berna Yaylalı • Pınar Kılıç Özkan	75
European Examples of Instantial Roof Approaches in Architectural Buildings	• Emre Çubukçu	76
Contributions of Renewable Energy Sources at the Technical-Economic Optimization of Installations For "Green" Buildings	• Andrei Sărăcuț-Ardelean, • Marius Lolea	77
Thermal Analysis of an Existing Residential Structure in the Environment of Lahore Using External Shading.	• Amna Ashraf • Memoona Rashid, • Ayesha Mehmood Malik	78
Energy Optimization of Electrical Installations in "Green" Buildings. Economic and Technical Implications	• Andrei Sărăcuț-Ardelean, • Marius Lolea	79
Partial Shading Impact on the Characteristic Curves and Generated Power of Photovoltaic Modules	• Abdelkader Azzeddine Bengharbi, • Souad Laribi, • Tayeb Allaoui, • Amina Mimouni	80
GSO-Based Energy-Efficient Clustering Mechanism in Mobile Wireless Sensor Networks using Voronoi Cell Structure	• Aparajita Chowdhury, • Debashis De	81
Reactivity of Clay Modified By Polymerization. Study of the Adsorption of Pollutants From Wastewater	• Nassima RIOUCHI, • Oussama RIOUCHI, • Mohamed LOUTOU, • Mohamed ABOU-SALAMA	82
Mixed Sand-Based Mortar with Polystyrene and Admixture	• Mekki MAZA	83
Synthesis of New Ligands for Homogeneous and Supported Catalysis	• Oussama Riouchi, • Nassima Riouchi, • Abdelhamid Bouyenzer, • Eduard Bardaja Rosriguez, • Adyl Oussaid, • Arachid Touzani	84
The Influence of Thermal Radiation and Chemical Reaction on MHD Micropolar Fluid in the Presence of Heat Generation/ Absorption	• Binyam Zigta	85
Examination of Shopping Malls on the Usage Preferences of Physical Disabilities: on-Site Evaluation from Konya-Turkey	• Sertaç Güngör, • Neslihan Iyit	86

ISBN: 978-625-8246-12-4

Landscape Observatory: Structural, Strategic, Technological Framework and Its Implementation for Turkey	• Duygu Doğan, • Meryem Bihter Bingül Bulut, • Şükran Şahin	87
Evaluation of Land Use Efficiency in the Context of Improper Use: A Case Study of the City Center of Çanakkale and Its Immediate Vicinity	• Ayşe Esra Cengiz	88
Neuro-Architectural Approach: The Effects of Architecture on the Human Brain	• Zeyneb Ayla Kirenci Eruzun • Aslı Sungur, • Çiğdem Canbay Türkyılmaz	89
An Overview of the Use of Information Systems in Building Condition Assessment	• Selin Öztürk Demirkıran, • Nilay Coşgun	90
Selection of Site for the Manufacturing Plant Using Multi-Criteria Decision Making (MCDM) Technique	• Vijay Kumar	91
Urban Conservation of a Historic Settlement in Southern Punjab, Pakistan	• Ayaz Mahmood, • Saima Gulzar	92
Community Participation in Conservation of Built Heritage	• Saima Gulzar, • Rummana Khan Sherwani, • Ayesha Mehmood Malik, • Memoona Rashid	93
Antioxidant Activities of Three Traditional Moroccan Plants Using Simplex Centroid Mixture Design Approach	• Nouıoura Ghizlane, • Tourabi Maryem, • Derwich El Houssine	94-95
A Pragmatic Study on Attentiveness of Web Resources Among College Teachers in Kanyakumari District	• K.C. Victor, • R.R. Saravana Kumar, • G.A Robert Gixson	96
Digitalization of Education Through Technology	• Deepanjali Mishra	97
Analyzing The Effect of Presence in Virtual Social Networks on Metacognitive Awareness and Learning Styles of Secondary School Students	• Nasrin Dorostkar, • Majid Reza Razavi	98
Analyzing the Model of Using Different Levels of Artificial Intelligence and its Relationship with Job Opportunities and Threats in the Education System from the Point of View of Experts	• Mohammad Sadegh Bostani, • Majid Reza Razavi	99
Ecological Sensitivity Analysis' Importance in Studies of Village Settlements' Spatial Planning; Hisarardı Village Example	• Çağla Aydemir, • Atila Gül	100
To Build a Sustainable City "As a Living Organism: The City"	• Betül Uçkan	101
Analysis of the New Era in the Formation of Public Space	• Bülent Güneş	102

ISBN: 978-625-8246-12-4

Evaluation of Agricultural Landscape Change with a Green Infrastructure Approach: A Case Study of Hatay-Antakya	• Aylin Salıcı, • Ergin Canpolat, • Bilge Çakır	103
Climatic Changes Regarded as Greatest Threat: An update on Forest Management	• K. R. Padmav, • K. R. Don, • P. Josthna	104
Exploring Peri-Urban Forests: A Case Study of Gatwala Wildlife Park, Faisalabad	• Shifa Rasool, • Saad Mujahid, • Ayesha Mehmood Malik, • Memoona Rashid	105
Need of Urban Agriculture in India	• Balamurugan V, • Arunkumar R.	106
Investigation of Modern Irrigation Systems Based on Artificial Intelligence	• Mehran Yazdi	107
Noval Structure of Poly Covered Naturally Ventilated Greenhouse for Agro Applications	• Dhananjay R.Mishra, • Amit Kumar Srivastava, • Nitesh Pandey	108
A Review of Education Sector in Nagpur Region: Exponential growth due to Infrastructural Development	• Maithili N. Paikane	109
Politeness During Social Interactions as the Seminal Aspect in Human Communication and as One of the Characteristics to Maintain Mutual Relationship, Reputation and Social Face Within Bapedi People's Cultural Context	• Morakeng Edward Kenneth Lebaka	110
Execution HRIMS (Human Rights Information Management System) In Pakistan by Ministry of Human Rights Commission	• Muhammad Faisal	111
The Basis of the British Union Flag	• Agbaka Sourou Arsène, • Seguedeme Alexis Hergie	112
Inventor Video Essay	• Major Gheorghe Giurgiu, • Manole Cojocaru	113
Mechanical and Fracture Testing of Different Sheet Molding Compound	• Pedro M.M. Silva, • Raul D.S.G. Campilho, • Isidro J. Sánchez-Arce	114
Evaluation of Popular Recreation Places in Konya in Terms of Safety and Maintenance Criteria: in the Case of Kalehan Ecdat and Japanese Park	• Sertaç Güngör	115
A Workshop Experience: E/Spa/S Yeldeğirmeni (Event Space Syntax)	• H. Meltem Gündoğdu, • Büşra Ertaş, • Gamze Sari	116
Evaluating the Traditional Mardin Houses Terraces in the Context of Environmental Identity	• Zilan Nantu, • Ayten Özsavaş Akçay	117

ISBN: 978-625-8246-12-4

New Building Design Approach in Historical Environment: Design Concepts of Archiprix 21	• Çiğsem Yağmur Yüksel, • Özlem Şenyiğit	118
Hagia Sophia: A Pearl of Contemporary Muslim World	• Khalida Madoui	119
The Characterization of Mental Health in Transgenders Across Life Span	• Aqsa Rehman, • Mamoona Mushtaq	120
Malarial Detection from Blood Cell Images	• Ruthuvershon S, • Gunadharshini C, • Gopıka S, • Makila S	121
Heavy Metals and Parasitological Infection Associated with Oxidative Stress and Histopathological Alteration in the Clarias Gariepinus	• Marwa Ibrahim Saad El-Din	122
Relationship Between Work-Life Balance Satisfaction and Burnout Syndrome Among Medical Specialists	• Rumyana Stoyanova, • Stanislava Harizanova	123
Aspects of Homogeneous Catalysis	• Oussama Riouchi, • Nassima Riouchi, • Abdelhamid Bouyenzer, • Eduard Bardaja Rosriguez, • Adyl Oussaid, • Arachid Touzani	124
Concept and Scale Focus in Interior Design Education: an Adaptive Reuse Museum Project	• Deniz Hasırcı, • İdil Bakır Küçükkaya, • Zeynep Edes, • Silvia Rolla, • Haluk Tatari, • Müge Çalışkanelli, • Gülçin Kabaçam	125
The Matter of Cultural Transmission in Traditional Turkish House and Modern Housing	• Selma Tufan	127
Examination of Space Representation in Hayao Miyazaki Animes: Howl's Moving Castle	• Gizem Özal	128
Planimetry in Conservation of Cultural Transmission: Example of Traditional Turkish House and Modern Housing	• Selma Tufan	129
Armenia Destroys Azerbaijan's Historical Cultural Heritage	• Kamal Salayev	130
Ancient Temple Built in Dur- Kurigalzu by King Kurigalzu I Restored In 1960 as a Cultural Monument	• Natela Popkhadze	132
Policy Inconsistencies or Planning Shortsightedness? Recurring Costs in Urban Planning	• Bashir Danjuma • Jesugbemi Olaoye Ajiboye	133

ISBN: 978-625-8246-12-4

Analysis of Fluid Flow Characteristics Over a Circular Cylinder in a Channel Using CFD Tool	• Om Thakur, • Samith Hegde, • Sonam Swaroop Dash, • Arumuga Perumal D	134
Computation of Deep Lid-Driven Cavity Flow using CFD Tool	• Balachandar Vasan, • Rehan Ahmedabadi, • Arumuga Perumal D	135
Non-Parabolicity Effect on the Diamagnetic Susceptibility for a Donor Confined in a Homogeneous Cylindrical Quantum Dot and Quantum Disk: Applied Magnetic Field Influence is Considered	• Ibrahim Maouhoubi, • Izeddine Zorkani	136
Diagnosis Method of an Open circuit fault for a T-Type inverter in PV System	• Amina Mimouni, • Souad Laribi • Morsli Sebaa • Tayeb Allaoui, • Abdelkader Azzeddine Bengharbl	137
White Cement Mortar with Polysterene	• Mekki Maza, • Nadia Tebbal, • Zine El Abidine Rahmouni	138
The Adaptive Reuse of Dwelling Heritage in Göztepe Region of İstanbul, Türkiye; Hazık Ziyal House	• Ayşe Durukan Kopuz	139
Transformation of an Industrial Heritage: Water Towers	• Hande Eyüboğlu, • Serap Faiz Büyükçam	140
Conservation Approaches for Rural Settlements	• Z. Sena Güneş Kaya • K. Kutgün Eyüpgiller	141
Examination of the Case of Antalya on the Street Planting	• Musa Yasin Torun	142
Developments of the International System Management of the International Crisis Management of the Great Power of the Russian Federation and Us America After the Cold War in the Ukrainian Crisis America is the Cause of the Crisis in Ukrainian and Also Seeks to Management Crisis	• Vorya Shabrandi	143
Design of T-S Fuzzy Controller for Steer-By-Wire Based Vehicles	• Nabil El Fezazi	144
Uncertainty Calculation for the Determination of Cr_2O_3 in Leather	• Sarwat Jahan Mahboob, • Rajkumar Dewani, • Muhammad Kashif Pervez, • Tahira Ayaz	145
Understanding The MicroRNA and WNT Signaling Pathways Behind the Expression Level of Chek2 and LRP1B Genes in Non-Small Cell Lung Cancer (NSCLC)	• Aiza Kamal Khan, • Muhammad Naeem Faisal, • Momna Mehmood	147

ISBN: 978-625-8246-12-4

Unsteadiness on EMHD Nanofluid Flow Over a Vertical Sheet	• Yahaya Shagaiya Daniel	148
Nanoemulsion Loaded Novel Synergistic Gel for the Amelioration of Psoriasis	• Rahmuddin Khan	149
The Characterization of Mental Health in Transgenders Across Life Span	• Aqsa Rehman • Mamoona Mushtaq	150

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FULL TEXT

ISBN: 978-625-8246-12-4

Title	• Authors	Pages
1999-2002, "Public Creativity is National Wealth" Competitions Why Were they Significant Regarding Their Contribution to The Cultural Sustainability of the Azerbaycani Traditional Spatial Culture	• Prof. Önder Küçükerman • Julide Edirne	151
The Importance of LEED Certification in Urbanism	• Sahil Ganbarlı	169
Resilient and Climate-Proof Cities: the Role of Urban Green and Open Spaces	• Dr. Floriana Zucaro	172
Examination of Innovative Approaches in Smart Home Systems in Context of Comfort Conditions	• Merve Özdoğan, • Nilay Coşgun	176
Evaluation of Traditional Buildings Within the Scope of Certification Criteria Applied to Modern Structures	• Çisem Bozbek, • Evrim Solhan	186
Determination of Damages and Deteriorations in the Facade Applications of Residence Buildings in Ankara	• Mustafa Furkan Gündüz, • Zeynep Yeşim İlerisoy	199
A Research on Deterioration Problems of the Yellow Stone Used in Historic Structures in Cyprus	• Mustafa Kemal Öge, • Seden Acun Özgünler, • Sibel Onat Hattap	212
The Impact of Historical Constructions Found in Archaeological Excavations in Recent Years on the Lessons of The History of Architecture	• Arzu Mammadova	230
A Hybrid Study Module Between Architecture Schools and Architecture Firms	• Yusuf Berrak • Zeynep Helin Kaya • Erenalp Büyüktopçu	249
The Visual Evolution of Baku	• Laman Abdullazade	257
The Role of Architectural Education in the Legibility of Fatih Mosque Complex	• Elif Atıcı	263
Public Places Changed by Neoliberalism in Turkey: Converting From Neighborhood to Gated Communities	• Özlem Büyüktaş	276

ISBN: 978-625-8246-12-4

Investigation of Structural Problems of Huseynik Historical Buildings	• Ebru Doğan, • Özgür Yıldız	288
Büyükada Greek Orphanage Architectural Features and Periodic Changes	• Sema Kızılelma, • Miskine Akar	295
An Evaluation of the Use of Outrigger Frame Systems in High-Rise Buildings	• İsmet Serhan Güneş, • Yenal Takva, • Zeynep Yeşim İlerisoy	312
Production of Erzurum City Thermal Comfort Map for Climate Oriented Design	• Sevgi Yılmaz, • Mehmet Akif Irmak, • Hasan Yilmaz, • Emral Mutlu	330
Political Developments and Media Reflections Caused by Earthquakes in Turkey After the Establishment of the Republic	• Hanım Ceren Sinav • Engin Kepenek	346
Estimation of Future Climate Change in Erzurum City for Urban Design Using UrbClim Model	• Sevgi Yılmaz, • Cihad Bilge, • Mehmet Akif Irmak • Dr. Shu Yang	363
Stormwater Management Low Impact Development Analysis: The Case of Malatya City Center	• Turgut Dinçer • Sevgi Yılmaz	370
The Origins of Design in Prehistoric Times	• Nizami Mammadzada Aydin	377
Use of Dashkesan Pyrophyllite for Removing Low Shrinking Ceramic Sludge in the Production of Decorative Ceramic Tiles	• Y.H. Halilov, • V.R. Mammadov, • M.A. Babayeva	401
Mimar Sınan Waterways: An Investigation of Studies on the Architecture and Engineering of Waterways	• Bahadır Mert Çınar	410
Investigation of the Use of Bio Based Plastic Material in the Construction Industry: Samples of Mycelium-Based Building Material	• Şebnem Demir, • Nilay Coşgun	433
Environmental Impact Analysıs of Geopolymer Concrete Facade Cladding: Istanbul Case	• Aslıhan Kayhan, • Seden Acun Özgünler	453

ISBN: 978-625-8246-12-4

Types of Glass Material From Architectural Building Elements and Examples of Use in Turkey	• Güler Çimen, • Arzu Çağlar, • Hakan Çağlar	469
"The Participatory Approach" As the Main Axis of Strategic Planning, Towards A Sustainable Urban Development of Cities; Case of Algeria	• Bidjad Arigue, • Meryem Kadri	478
Evaluation of the Durability of Fiber Ceramic Mortar in Aggressive Environments	• Messaouda Belouadah, • Zine El Abidine Rahmouni, • Nadia Tebbal	483
A Parametric Study to Improve the Heat Transfer of Solar Air Heater through CFD Analysis	• Mayank Sharma, • Emarti Kumari, • P.M. Meena	494
Modeling and Comparison of BOX equalization-based detectors in massive MIMO systems	• Rishika Chauhan, • Shefali Sharma, • Rahul Pachauri	512
A Review on the Types of Zeolites As Refining Catalysts	• Isaac Jato, • Habibu Abubakar Wanıyo, • Victor Markus	525
The Impact of the Ventilated Facade on the Thermal Comfort And Aesthetics of the Architectural Envelope in Arid Zones (Case of the City of Ghardaia)	• Arigue Bidjad, • Ayadi Nour El Houda, • Rahmani Soumia, • Sriti Leila	540
A Research on the Causes and Types of Deterioration in Tradıtional Bricks	• Zeliha Büşra Eryiğit Şenel, • Erol Gürdal, • Seden Acun Özgünler	550
Comparison of Fiber Reinforced Cement Based and Geopolymer Mortars	• İbrahim Yetiş • Niyazi Uğur Koçkal	569
Investigation of Physico-Mechanical Changes of Some Limestones Used in Exterior Cladding Under Freeze-Thaw Effect	• Hüseyin Esad Selek, • İskender Emre Gül, • Mustafa Ali Kuşçu	575
Comparison of the Two Calculation Methods Recommended in Ts En 17037:2019 Standard for All Provinces in Turkey	• Gülçin G. Konuk Taştan, • Şensin Yağmur, • H. Gökhan Uyduran, • Işıl İplik	583

ISBN: 978-625-8246-12-4

Study the Effect of Chemical Activators on Mortars Based on Granulated Slag	• Omri Imen Yamina, • Tebbal Nadia, • Rahmouni Zine El Abidine	592
Investigation of Interior Architecture Projects within the Frame of National and International Regulations Against the Risks that May Occur During Earthquake	• İrem Özpınar • Ümit Arpacıoğlu, • Şebnem Ertaş Beşir	601
User Evaluation of Indoor Comfort Conditions in Reused Bathrooms	• Emine Yavuz Pakih	620
Investigation of the Exterior Architecture of Traditional Housing in the Villages of Akcakaya, Resadiye, and Zincidere of Kayseri/Talas District	• Güler Çimen, • Arzu Çağlar, • Hakan Çağlar	636
Mechanical Properties of Ceramics Containing Zeolite	• Niyazi Uğur Koçkal • ibrahim Yetiş • Güneş Su Kabaklı	648
Artificial Intelligence in Financial Services	• C. Vijai, • S. Jansirani, • V. Soundara Rajan	653
Participatory Management Plans on Protected Area Management:	• Emine Demirci, • Murat Akten	660
Current Situation and Evaluation of Tire (İzmir) Region in Terms of Gastronomy Tourism	• Atila Gül, • Fadime Öncü, • H. Eda Gül	671
Evaluation of the National Park Concept and Management in the Context of Rural Settlements	• Merve Aslı Kara Yüksel	688
Nature Walk (Trekking) Route Action Planning; Isparta Example	• Fatma Gözde Akkuş • Atila Gül	701
Global Trends in Nature-Inspired Architectural Design	• Mehtap İzci, • Semra Arslan Selçuk, • Güneş Mutlu Avinç	713

ISBN: 978-625-8246-12-4

Investigatıon of Rural Landscape Features of Yıldızkaya Village and Its Surroundings in Olur (Erzurum) District	• Elif Akpınar Külekçi, • Feran Aşur • Yahya Bulut,	721
Determination of Ecotourism Potential of Tarsus (Mersin) District	• Sümeyye Gencer, • Elif Akpinar Külekçi	737
Süleyman Demirel University Campus Within the Scope of Universal Design Principles	• Sibel Akten	756
Landscape Visual Quality Assessment in the Protected Areas	• Emine Demirci, • Murat Akten	776
Relationship and Integration of Building and Landscape Design Projects in Urban Design	• Atila Gül, • Gizem Dinç, • Hatice Eda Gül	788
Evaluation of Renewable Energy Use in Terms of Sustainable Development	• Nilay Akdeniz Acar • Hatice Burçin Henden Şolt, •	815
Does Blockchain Technology Really Help to Achieve a Sustainable Future? Perspective on Energy Efficiency	• Seyda Emekci	823
Investigating Intelligent Energy Control in Iot- Based Homes	• Mehran Yazdı	828
In-Situ Synthesis of Zsm-5 Zeolite From Kankara Clay*	• Isaac Jato, • Habibu Abubakar Wanıyo, • Hebron Abner	833
An Examination of Adana Historical City Center in Terms of Urban Lighting	• Nursel Aydin, • Kasım Çelik	845
The IPCC Reports For 2001 to 2022 Year Evaluation and Urbanization Their Policies on Comparison	• Gamze Seçkin Gündoğan	859
Investigation of Urban Park Accessibility by Using Space Syntax Method as a Design Tool	• Pelin Şahin Körmeçli	873
Using Fuzzy Logıc Based Decision Support Systems For New Function Selection in Structures	• Didem Baran Ergül, • Ayşe Berika Varol Malkoçoğlu, • Seden Acun Özgünler	886

ISBN: 978-625-8246-12-4

A Qualitative Evaluation of Cognitive Functioning and Social Maturity of Children Attending Online Classes: A Case Study Method (October 2020-21)	• Happy Baglari	899
Digital Preservation Technology: The Derivative Digitalization for our Modern Day	• Moses Adeolu • Solomon Abraham	905
The Situation of Housing and Its Surrounding Public Spaces in The Global Crisis; A Review on Urban Design	• Ebru Ala, • Halime Gözlükaya	911
Comparison of Sustainability Based Certification Processes in terms of Urban Landscape Quality	• Gizem Dinç • Atila Gül	940
Crop Stubble Burning Into Biocomposıte: Problem, Solution And Legal Aspects With Special Study of Indian Gangetic Regions	• Yusuf Jameel, • Mohammad Asif, • Mohammad Afan Khan	941
Experiential Learning – A Case Study on Measurement and Instrumentation Course	• Ramachandiran Gunabalan	947
The Determination of the Naturel and Cultural Tourism Potential of Eğirdir and Suggestion of Sustainable Planning	• Sibel Akten	954
Prevention Ways and Negative Effects of Fertilization in Sustainable Agriculture	• Hakan Leventoğlu, • Atila Gül	975
Evaluation of the Effects of Türkiye's 11th Development Plan on Agricultural Landscape	• Aybike Ayfer Karadağ • Demet Demiroğlu	988
Recreational Opportunities in Urban Agricultural Areas	• Enes Akdeniz, • Meryem Bihter Bingül Bulut, • Öner Demirel	1001
Legislations Affecting Türkiye's Agricultural Landscape	• Demet Demiroğlu • Aybike Ayfer Karadağ	1008
Model Identification With Performance Evaluation Approach For Indoor-Outdoor Sports Venues In Primary Education Buildings	• Feyza Nur Sağlam, • İrem Bekar, • Şebnem Ertaş Beşir	1020

ISBN: 978-625-8246-12-4

The Effect of Using 3D Printing Technology on the Production of Furniture Joining Details	• Mucahit Gül, • Sebnem Ertaş Beşir	1039
Examination of Antalya Akseki Traditional Dwelling Examples in Terms of Energy-Efficient Building Design	• Mikail Açikel, • Büşra Göküz	1051
Interior Granaries and Cabinets in Traditional Dwelling Use as a Local Identity Component: The Case of Antalya Akseki	• Mikail Açıkel, • Zuhal Kaynakçı Elinç	1067
The Relationshıp of Earthquake and Non-Structural Element in Departments of Architecture and Interior Architecture in Educational Programs	• Şeyma Dereci, • Şebnem Ertaş Beşir	1082
A Research on Art Museums in Turkey that are Designed After 2000s	• Seval Öğünlü, • Pınar Kılıç Özkan	1096
Comparison of Environmental Data and Cost Analysis of an Exterior Wall Element Created From Insulation Materials in Which Life Cycle Assessment (LCA) Data Have Been Defined Using an Exemplary Facade Design	• Hilal Eraslan, • Nuray Benli Yıldız	1119
The Effect of Window Position and Size on Visual Comfort Conditions	• Kasım Çelik	1138
Determining Spatial Transformation of Historical City Centers By Solid-Void Analysis: İzmir Kemeraltı Case	• İlayda Anaç • Şirin Gülcen Eren	1147
Characterization of a Mortar Formulated with Granulated Slag and Metal Fibers	• Nadia Tebbal • Zine El Abidine Rahmouni • Mekki Maza, • Messaouda Belouadah	1160
Study of the Effect of Steel Fiber Length on the Behavior of Mortar Combined with Inert and Active Filler	• Nadia Tebbal, • Zine El Abidine Rahmouni, • Mekki Maza, • Messaouda Belouadah	1166
Investigation of Virtual Reality and Augmented Reality Applications in Cultural Heritage	• Gizem Özal	1173

ISBN: 978-625-8246-12-4

The People Houses as a Cultural Architectural Heritage of Türkiye; The Case of Zonguldak and Sivas	• Ayşe Durukan Kopuz	1184
Exploring a Heritage Building's Influence on the Surrounding Streetscape: A Case Study	• Esra İslamoğlu, • Evrim Solhan, • Ümit Arpacıoğlu	1191
The Effect of Demographic Traits on the Indoor and Outdoor Plant Tendencies of the People in the City of Çankırı-Türkiye	• Nuray Çiçek, • Cengiz Yücedağ, • Yağmur Palanci	1206
Evaluation of Tree Species Diversity of Kılavuzlu Park Kahramanmaraş, Türkiye	• Mert Çakir, • Mahmut Tuğluer	1214
Trees in Ritual Landscape and Their Roles	• Feran Aşur, • Elif Akpinar Külekçi	1222
The Effects of Horticultural Expositions (Expo) on the Urban Landscape	• Mahmut Tuğluer, • Şule Kisakürek	1233
Determining the Effects of Potassium Silicate Application on Some Quality Parameters of Different Turfgrasses Speices	• Mert Çakir, • Ceren Selim, • Emine Kahraman	1240
A Research on the Recreational Use of Visitors in the First National Park in Türkiye	• Cengiz Yücedağ, • Nuray Çiçek, Çağatay Aydın	1251
Multi-Attribute Optimization of EDM Drilling Process Parameters on Nitinol Using GRA-Assisted PSO	• Amiya Kumar Sahoo • Dhananjay R. Mishra	1259
Comparisons and Evaluations of Historical and Traditional Housing Architecture in Muş Kale Neighborhood on Visual Materials from 2011 and 2021	• Mehmet Bahadır Tosunlar	1277

1999-2002, "Public Creativity is National Wealth" Competitions Why Were They Significant Regarding Their Contribution to the Cultural Sustainability of the Azerbaycani Traditional Spatial Culture

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Abstract

This article is about an interesting competition called "Public Creativity is National Wealth" in Azerbaijan between 1998-2001. The main aim of the project was how to carry and sustain the craftsmanship and products of a valuable spatial culture dating back several thousand years into the future. Therefore, this competition was not just an effort to preserve the traditional arts of Azerbaijan. Because all the works invited to the "Public Creativity is National Wealth" competition were symbolic products of traditional space culture and traditions. In other words, the aim of this competition was to redefine the designs that represent a traditional and original space as a whole, to support the cultural sustainability of those who produce them and to continue to consolidate their economic results in this context. Today, this project has been evaluated as an important and meaningful model for "perpetuating the culture of building a place".

Keywords: Cultural Heritage, Azerbaijani culture, spatial culture, cultural sustainability.

Introduction

Why Are "Public Creativity is National Wealth" Competitions Considered Important In Sustaining Azerbaijan Traditional Space Culture?

Evaluations regarding an interesting competition project that was organized in Azerbaijan between 1998-2001 are covered in this article. Entitled "Public Creativity is National Wealth," this project was implemented by the staff of the Ministry of Culture of Azerbaijan, Minister of Culture (Minister of Civilization of the Republic of Azerbaijan) Polat Bülbüloğlu. In addition, the project had just one sponsor, the owner of Caspian TransCo, R. Okan Tapan and his team. I was also the coordinator of the project served as the chairman of the international jury.

In taking a careful look at what is conveyed in the article, the main objective of the project, which was actually implemented, was how to carry and sustain the craftsmanship and products of a valuable spatial culture dating back several millennia into the future. Thus, if the project is carefully examined, it is clear that it was not merely an attempt to preserve the traditional arts of Azerbaijan.

That is because, as a matter of fact, almost all of these tasks, which were invited to participate in the "Public Creativity is National Wealth" competition, were symbolic products of traditional spatial culture and traditions.

In other words, the purpose of this competition was to redefine designs that represent a traditional and original space as a whole, to support the cultural sustainability of those who produced them, and to continue to reinforce their economic results in this regard.

In this regard, works that were featured in the competition and received awards at the end achieved meaning through the contributions of the Azerbaijan Ministry of Culture, Mr. Polat Bülbüloğlu and his appreciative team, along with distinguished Azerbaijani artists, who sincerely participated in this exhausting process and provided encouragement to everyone.

It should emphatically be stated that this wasn't actually a design competition in which only traditional craftsmen, craftsmanship and products were evaluated under the heading "Folk Creativity is National Wealth."

On the contrary, it bore significant meaning and importance as a model to "conserve the culture of establishing a venue."

Creator and Sponsor of the Project, Dr. H.C. Rifat Okan Tapan

The creator and sponsor of this project, which was initiated in Azerbaijan in 1998 as an interesting cultural continuity project and continued for three years, was my art connoisseur friend Okan Tapan, who is also passionate about creativity. Tapan had previously founded a cultural gift design company called JEST in Turkey in the 1980s. For this purpose, he established a special research team and made great efforts to redesign those traditional cultural products on the verge of disappearing all over Turkey with a contemporary perspective. Tapan even found masters who continued these crafts. This resulted in the creation of an incredible archive of traditional cultural heritage. In achieving successful results with this pioneering initiative, Tapan established his company named JEST.

In the following years, we worked with Tapan on the Design Advisory Board established at the Sümerbank Headquarters on cultural design heritage in Turkey and, particularly on developing the traditional carpet business.

In early 1996, a phone call came from Okan Tapan. He had recently gotten involved in oil. He established a 60 MW power plant in Nakhchivan, a 115-km high-voltage transmission line between Iğdır and Sederek, as well as a system that brought Central Asian oil to global markets in 1996. Meanwhile, Azerbaijan and Georgia had become transit countries.

Tapan founded the company, Caspian TransCo, which was based in Baku and whose main line of work was transporting oil from Central Asia to the Black Sea via Azerbaijan. In short, Tapan established a large company in Azerbaijan and became very powerful.

Tapan was also a fine collector. For this reason, he continued to support regional artists in various ways in various art fields, commissioning both contemporary and traditional artworks. What he requested from me was the implementation of a kind of "Public Creativity Design Contest" project in conjunction with the Azerbaijani Government and the Ministry of Culture. Moreover, he said that he would throw his full support behind this project. In short, he wanted to reignite his goals in cultural design and traditional creativity, this time in Azerbaijan.

1999 AZERBAIJAN: "1st People's Public Creativity is National Wealth" Competition

Of course, this subject was very interesting and such a thing was unprecedented in Azerbaijan. They invited me to Baku to discuss the issue. I landed at Baku airport on a hot, muggy day in the month of July. I was allocated office space in a building belonging to the Presidency, the room overlooked Baku. The president back then was Haydar Aliyev. Baku was a very rich, very developed city, but its cultural areas were preserved as if they hadn't been touched for centuries.

The next day we went to the Ministry of Culture to discuss the matter at hand. The Ministry was in a magnificent, but a little dilapidated building along the shores of the Caspian Sea. Upon entering the minister's office, I was even more surprised when I saw a beautiful grand piano with its lid propped open, in front of his desk. It was his work piano.

We met the Minister of Culture, Polat Bülbüloğlu, whom it was evident from the first moment was very cordial and with good intentions. He was also a famous composer and pianist. He was also the one who composed and sang the renowned tune "*Gel ey seher*" in 1968. To tell the truth, I had never met a Minister of Culture with an open grand piano in his office; I saw this for the first time in Baku.

The subject of organizing a design competition in order to preserve the traditional cultural continuity in Azerbaijan was brought up with Mr. Polat Bülbüloğlu. What could be done to protect and develop traditional folk arts, which were in danger of disappearing during the time Azerbaijan was under the influence of Russia? That was the subject.

In fact, this was also one of my most sensitive subjects. I was very excited and suggested the name of this competition: "Public Creativity is National Wealth"

The proposal was accepted immediately, but bureaucrats in the ministry hadn't experimented much in the area of organizing such a design competition. Minister Polat Bülbüloğlu called his undersecretary, whom it was immediately obvious was a very experienced person. But he also didn't have such experience. I'd already come prepared for such a possibility, and I had the lists of conditions from many competitions I'd organized in previous years.

I spread the documents out and clearly explained how a design competition is prepared, its aims, scope, general organization, formation of the jury, that is, all that I knew about the subject. Notes were taken and they told me that they needed a couple of days to clarify this issue.

In fact, when we returned to the Ministry of Culture two days later, they carried out a very serious feasibility study by making use of the samples I brought them. Nevertheless, such traditional cultural heritage issues involved many subtleties. That's why we took the work one step further by sitting opposite one another again at the table to come up with a much more detailed work plan.

Accordingly, the Ministry would first determine the families who continued with the traditional arts in Azerbaijan. It was a huge task which meant identifying thousands of families across the country. Despite this, they said they could do it without any hesitation. And indeed they did it quite meticulously.



Figure 1. (Left) Panoramic view of Baku in 1999, (Middle) Emblem of the competition and lapel pin, (Right) Emblem of sponsor of the competition, Caspian TransCo Inc.

Criteria that can be Used in the Evaluation of the Works of Craftsmen

As a result, it was decided that these families and works could be selected and evaluated according to the basic tenets I suggested below:

1 -Continuing the tradition in the best way **without changing it**

2 -Continuing the tradition by **developing it** in the best way

3- Keeping the tradition alive without changing it **from the earliest times**

4- Continuing the **family tradition** without ruining it

5- Developing the old tradition **by themselves**

6- Continuing traditional art **with his family**

Thus, more than 4000 products in all regions of the country and the families that continue to produce them were identified. Ministry officials worked for months to compile important information about all these families. They did an amazing job.

When this difficult prep work was completed, another meeting was held in Baku. These families were ranked according to production topics and priorities, wereas sample photos of their crafts were taken. Then through a process of elimination, 1000 of these families or masters were selected once again. Sonra da bu 800 üründen 500 adedi seçildi. Subsequently, the number of products was narrowed down to 800, then 500. After another re-assessment, 50 traditional products were selected whereupon the decision was made to exhibit them in Baku. Later on, these selected master families were invited to Baku with their works. Meanwhile, summer had arrived. We arrived in Baku on a very warm day. We formed an international jury, and I was the chairman.

The jury was comprised of the following names:

- Prof.Dr. Önder Küçükerman (Turkey / Mimar Sinan University, Head of Industrial Design Department)
- Prof. Hasan Guliyev (Azerbaijan / Branch Director, Vice-President of the Archaeology and Ethnography Institute)
- İbrahim Zeynalov (Azerbaijan / Director of Incesanat Museum on behalf of R. Mustafayev)
- Röya Tagiyeva (Azerbaijan / Director of the Azerbaijan State Museum of Carpet Applied Art)
- Alla Bayramova (Azerbaijan / Director of the State Museum of Musical Civilization)
- Nezih Başgelen (Turkey / Director of Archaeology and Art Publications)
- Haldun Erkman (Turkey / Director of Erkman Architecture and Construction Company)
- Nadia Mabrouk (The Netherlands / handicrafts expert)
- Ferhad Khalilov (Azerbaijan / President of the Painters Alliance)
- Tahir Tahirov (Azerbaijan / State National Drama Theatre, painter)



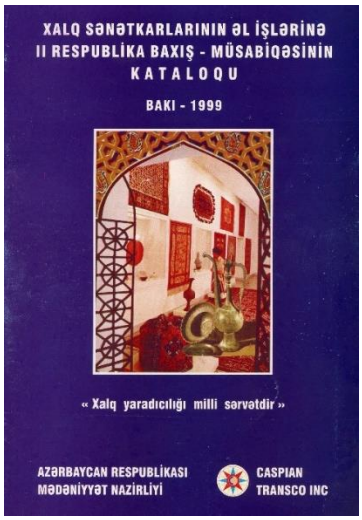
Figure 2. (Left), the team that initiated and implemented the "Folk Creativity is National Wealth" projects: Polat Bülbüloğlu, R. Okan Tapan and colleagues. (Right), Jury members and lady who won top prize.



The team that initiated and implemented the "Public Creativity is a National Wealth" project: Polat Bülbüloğlu, R. Okan Tapan, members of the jury and colleagues making a statement on the purpose and results of the competition.



The team that initiated and implemented the "Public Creativity is National Wealth" projects: Polat Bülbüloğlu, R. Okan Tapan and colleagues stating the purpose and results of the competition.



The "Public Creativity is National Wealth" project catalogue



One the folding wooden lecterns featured in the competition



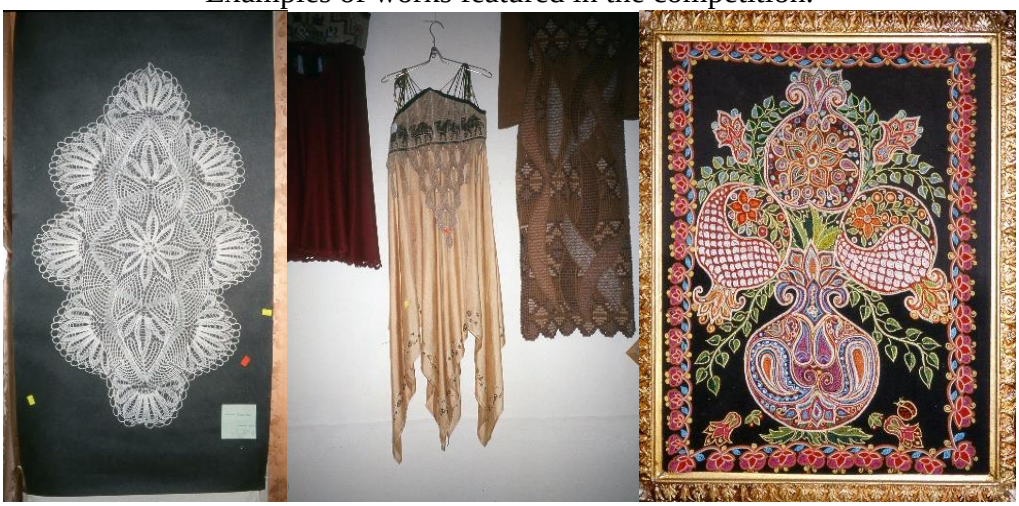
Examples of musical instruments featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.



Examples of works featured in the competition.

Exhibition of Works Featured in the First Competition

However, since it was difficult to find a hall large enough to exhibit such works in Baku in those years, a government office hall of sufficient size was allocated for this purpose. Hundreds of samples were also positioned on walls and floors. Master guildsmen from all over Azerbaijan were also very excited. We, on the other hand, were thrilled to encounter the products of a very rich cultural world that emerged from the depths of history. But as the building wasn't air conditioned at the time, the interior burned like an inferno. Though the windows were opened, which offered little respite.

This first attempt provided very good results, because we encountered an astonishingly rich product group of folk arts we had determined. It took a full day to evaluate these works and determine the award winners. The award ceremony was held the next day, whereas award certificates and prize money were distributed to everyone. We were all very pleased, especially the Minister of Culture, Polat Bülbüloğlu and his team. We completed a very tough job without a hitch.

Our friend and owner of Caspian TransCo, Mr. Okan Tapan was the sole supporter and sponsor of all these works.

In the evening, we celebrated the results with dinner at a nice restaurant on the shores of Baku. A great responsibility and burden had been lifted from us. But we had carried out a very important experiment.




Azerbaijan in 1999: At the award ceremony of the "1st Public Creativity is a National Wealth" competition, jury members are with the Azerbaijan Minister of Culture, Polat Bülbüloğlu and project sponsor, R. Okan Tapan.

A Very Intriguing Carpet Awarded Grand Prize

Towards the autumn, the signups for the competition were completed and we came to Baku for the jury again. This time the organization was even more developed. Not only were we in a nicer hall, the layout of the works and the exhibit arrangement had also changed.

One of the competition headings of that year was the tradition of carpet weaving. And it was at this time we came across a very interesting carpet in this competition, which featured a very different design and structure. We realized this rug was woven by a young lady. It really had a very different design and structure. At the awards ceremony, we realized that this rug was woven by a young lady. Her family had been weaving carpets for a long time, but she had never weaved a carpet before. I asked her, "How did you find the motifs and colors of this carpet?" She replied "… You told us to summarize the traditional design heritage of Azerbaijan. I opened a history book in front of me. I embroidered the historical buildings of Azerbaijan on the carpet in chronological order, starting from the oldest. The colors were as follows. These architectural buildings and motifs were associated with wars and bloody eras. So those were tough times in the country's past. Therefore, the colors of the carpet had to be in black, white and red tones, that is, harsh tones. I made red and other vibrant colors from the fruit of the trees in the garden. For the black tone, şI searched for a mineral on the mountain on the opposites. That was the hardest part…"

Such a simple explanation of the award-winning Ibadova Minara surprised me and everyone on the jury. But she was actually explaining an important truth about the "recording" feature behind the "carpet" culture.

As a matter of fact, when I returned to Istanbul later on, I related this story to Prof. Dr. Oktay Aslanapa. He was very surprised, impressed and told me to definitely publish this situation.

However, because I couldn't find the time due the to the my the workload, the I'm publishing it for the first time now.



Minister of Culture of Azerbaijan, Okan Tapan, head of the jury Önder Küçükerman and the lady who wove the award-winning carpet



"Azerbaijan architectural history symbols" seen on the top prize winning carpet of the competition



Award certificates given for the carpet that won top prize in the competition

2000 AZERBAIJAN: "2nd Public Creativity is National Wealth" Competition

As the results of the "Public Creativity is National Wealth" competition we held in Azerbaijan in 1999 were received in a positive light by the Ministry of Culture of Azerbaijan, they invited me to Baku to organize a second event in 2000.

We hit the road again. In Baku, I prepared a new set of regulations with the team that organized the previous competition. This time, we planned a competition that hit stronger at the objective, compared to the results we achieved in the year before. That's because the groundwork conducted by the Ministry for the previous competition gave us more detailed information about which subjects should be covered.

That's why we narrowed down the design issues a bit and focused especially on the areas of handicrafts that Artesan families preserve and maintain. It was also decided to tackle the shortcomings we experienced the previous year. Moreover, air conditioning was installed in the exhibition hall. Promotional activities covered more ground. Azerbaijan guild organization reps were invited amongst the jury members. In addition, local folk arts experts and museologists were also invited to be members of the jury. In other words, the region's artist and intellectual staff were drawn into this project.

Everything was excellent, but an important matter was still not dealt with. These prized works were bought, but what happens next? With this initiative, I suggested to the Ministry of Culture that a historical building in Baku should be transformed into a permanent exhibition, that these works should be produced, exhibited and acquired there, thereby supporting the production of traditional cultural heritage.

Therefore, a search ensued for buildings that could be utilized for this purpose, whereas detailed studies were made on some of them. But there was actually an important shortcoming here. That's because there were no officials to deal with the regulations related to the economy and employment. The Ministry also viewed this situation as a mere cultural event.

Finally, we as the jury, completed the competition in 2000, prizes were awarded, everyone was satisfied, and we returned to Istanbul.



(Left), Azerbaijan in 2000: "2nd jury members of the "Public Creativity is National Wealth" competition.

(Right), the results are announced with the Minister of Culture of Azerbaijan Polat Bülbüloğlu and project sponsor, R. Okan Tapan



(Left), the responsible managers of Azerbaijan Culture Minister Polat Bülbüloğlu and Okan Tapan
(Right), Okan Tapan is making a press statement.



Examples of the works featured in the competition



Examples of the works featured in the competition

Amongst the traditional products featured in the competition, there was a very interesting example called 'Tile Piercing.' This traditional drill is actually the oldest drill that has emerged from the depths of design history. However, an important element of this old design is that it doesn't crack the tile as it slowly rotates. For this reason, this hand-operated drill,

which doesn't require electrical energy and can be used anywhere, garnered plenty of attention.



Some of the participating artesans



Artesans receiving various awards at the end of the competition.

2001 AZERBAIJAN: "3rd Folk Creativity is National Wealth" Competition

The results of the traditional arts design competition, which we'd been organizing in Azerbaijan for two years, pleased the authorities and everyone else involved. I was again invited back to Baku to organize a new one in 2001. This time, our international jury had more depth. In addition, the Ministry of Culture of Azerbaijan had learned the business. Therefore, we had an easier time preparing the competition's terms and conditions. Everyone was assigned their own tasks and after a few months, I returned to Turkey to meet up again in Baku.

Due to such competitions, I had travelled to some very interesting parts in Asia on many occasions. However, due to my heavy workload, I was unable to check out the environs. This time around, I wanted to see the surroundings a little bit. So, we toured the famous ancient settlements in the immediate vicinity of Baku with archaeologist Nezih Başgelen. For a designer such as myself, the cave period finds here were very impressive.



We're at one of the archaeological sites of Azerbaijan with a jury member of the "Folk Creativity is National Wealth" competition and founder of Archeology and Art Publications, Archaeologist Nezih Başgelen.

2002: AZERBAIJAN: "4. Public Creativity is National Wealth" Competition

I was on the road to Azerbaijan once again as the fourth edition of the competition was to be held in 2002. We flew back to Baku again and began working with the Ministry of Culture. The team there had a good grasp of the business as we had been doing this for the past three years. In evaluating our experiences in the past years, we discussed the results and prepared the terms and conditions for the new competition.

Compared to previous years, some minor changes would be made in the terms and conditions. That's because Azerbaijan's contemporary artists were also requesting some interest in this competition. We made additions to the jury and rearranged the awards accordingly. I then made the public announcements and returned to Turkey.

Meanwhile, our multiculturalist pianist friend, the Minister of Culture Polat Bülbüloğlu, was assigned a different position. In other words, the greatest supporter of this project was no longer there. Which was why the excitement of the competition was beginning to fade.

Under these conditions, we felt the competition would be held for the last time that year. Indeed, that's exactly what happened, and this very important sustainability model research project, which has been cared for for years, came to an end.

Conclusion

As a Design Project

Aiming to Maintain Architectural Design Culture with Traditional Space Products

"Public Creativity is National Wealth"

Competitions

If the aforementioned project, which had continued for four years starting from day one, is considered from an architect's perspective, the results gleaned can be assessed as an important model of cooperation under the main headings listed below:

1- The Azerbaijan administration's view of maintaining the traditional venue culture

2 - The presence of folk artesans who maintain traditional designs

3 - The vibrant support of the private sector, which sincerely believes and contributes to the subject

4- The cooperation of academic institutions

5- The contributions of leading public institutions

6- The contributions of professional artists

7- International and professional jury boards

Nevertheless, in addition to the objectives defined for the competition, another goal that was not clearly stated was the following:

Could the products of traditional creativity that have managed to survive to this day be "transformed into a kind of industrial design" in the future and play a role in the creation of contemporary designs based on Azerbaijani culture and creativity?

In light of these aims, the anticipated aspects of the future of this important project, which were laid out at the onset, were as follows:

1 -Evaluation of all the work done by recording in detail

2- Achieving continuity of the project over time

3 - Supporting and sustaining award-winning traditional designs from a job standpoint

4 - Monitoring / financially supporting families and artists who maintain award-winning designs

5 - Rejuvenating these designs by redesigning them with a contemporary perspective.

6- As a result, modern designs created from these important traditions taking their place in the international environment.

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* All photographs and information in the text were obtained from Ö. Küçükerman's personal archive.

The Importance of Leed Certification in Urbanism

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Abstract

In recent years, many concepts have come to the fore with the rapid developments in all areas of our lives, causing ecological and demographic changes. Among these concepts, the concepts of universal design and sustainable design constitute the main backbone of the study. In the study, where the architectural design is at the intersection of the aforementioned concepts, it is examined. In this context, the LEED certification system, which is an international certification system that creates brand value for building design disciplines and is important in terms of creating environmentally friendly design awareness, was selected and a reading was made on the certified designs.

Keywords: LEED certification, urbanism, building design, green building

What is Leed Certification?

Since 1993, the U.S. Green Building Council has advocated for efficiency, sustainability, and cost-effectiveness in community development. Their certification program, Leadership in Energy and Environmental Design, recognizes achievements in green building practices.

Projects under consideration for LEED status must comply with a number of requirements to receive credits, which earn the project points toward four certification levels: Certified, Silver, Gold, and Platinum. There are eight categories of requirements, which include Materials & Resources, Innovation, and Sustainable Sites.

LEED is the most comprehensive green building rating system in the world. The LEED Green Building Certification is designed as a global tool for measuring and comparing the green performance of building structures. LEED is the most widely accepted and sought-after green building certification in the world.

In the scope of the study, the importance of LEED certification in urbanism and its effective role in city planning were mentioned, and the current coexistence of the concepts of universal design and sustainability was discussed among various design approaches.

LEED certification helps establish confidence and trust with third-party validation of environmentally responsible construction practices. Buildings that meet or exceed LEED requirements cost less to maintain and produce less waste. Features that improve indoor air quality and natural lighting attract tenants. As a result, owners may see low resident and commercial turnover and spend less time and money filling building vacancies.

LEED-certified buildings reduce stress on the environment. They are more energy and resource-efficient. They generate less waste and lower the use of energy, water, and other resources.

Points can be earned for the storage and collection of recyclables, renewable energy use, and indoor water use reduction.

We must note that urbanization is a natural process and should be approached from the point of view of development and progress. What is important is to make efforts to minimize the negative effects and problems of urbanization and to create a livable city.

"Green Building" is the design and construction of buildings with an integrated design approach in harmony with their environment and nature. Since green buildings are designed and built in accordance with certain standards, they cause less harm to residents and the environment than standard buildings do. They consume less energy and water and are healthier for their users. Reducing energy and water consumption, indoor air quality of the building, selection of environmentally friendly materials, and the effect on the land on which the building is located are the key issues considered in green buildings. With these features, green buildings create a more sustainable environment and, ultimately, the city. Green buildings are much more economical for building owners as they have fewer energy, water, and operating expenses. Buildings, with their high-standard indoor environmental qualities, create healthy environments for building users, enabling them to be healthier and more efficient.

The LEED certificate, with the guides to be used, foresees that the buildings should be designed in order to ensure that they are healthy, environmentally friendly, and economical. In this way, buildings become more energy and water efficient, less damaging to the environment and providing healthier livable spaces. In addition, the LEED certificate ensures that the building is recognized internationally, its value increases, and the companies and institutions that make it gain prestige.

They consume less energy, use fewer fossil fuels, and consume more renewable energy, maximizing roof, wall, and window insulation, and saving on heating, cooling, and lighting costs. LEED Certified buildings consume 50% less energy than standard buildings. They have a structure that consumes less water, uses gray water, attaches importance to rainwater harvesting and water treatment, consumes less water for irrigation, and has low-consumption installations. LEED Certified buildings consume 50% less water than standard buildings. They have high internal environmental quality and are designed to be sensitive to human health. Air quality, lighting, and building acoustics are at the highest level. And most importantly, no construction chemicals harmful to human health are used.

We can show the following as the importance of LEED certification in urbanization:

- With LEED, you can gain savings and a competitive advantage. 61% of corporate leaders believe sustainability leads to market differentiation and improved financial performance.
- While LEED-certified buildings receive the highest rents, rental rates typically average 20% above average. Vacancy rates for green buildings are 4% lower than for non-green properties.
- LEED is the world's leading green building project and performance management system. It provides a comprehensive framework for green building design, construction, operations, and performance.

Buildings have to rapidly reduce energy and water costs and be built or renewed in an environmentally friendly manner. Existing classical approaches have lagged behind. Building businesses, which continue with green building construction policies, are increasing their competitive power in the world day by day.

Resilient and Climate-Proof Cities: The Role of Urban Green and Open Spaces

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Extreme phenomena are affecting urban areas with increasing frequency and intensity, and while some of this can be attributed to a natural and cyclical variability climate of the Earth's atmosphere, however, the scientific community has long been agreed that human activities are the major culprit. Primarily for the release of greenhouse gases into the atmosphere from the use of combustible fossil fuels, but also by senseless deforestation, intensive agricultural and industry and whatnot. The consequences of these phenomena on the physical and natural, as well as on the urban environment, for the coming decades are difficult to predict, because how the climate will change and how much the affected communities will be able to absorb its impacts are highly controversial issues governed by profound uncertainty, despite the contribution of new technologies and advances in scientific research.

Considering that the planet's average temperature has already risen by 1°C, mitigation actions may not be enough: the tools for governing the territory must inevitably be geared toward adapting urban systems to the phenomena that global warming entails, increasing their capacity to respond response.

Cities across the planet are seriously threatened by the impacts of climate change, and therefore effective and efficient strategies are required to reduce their exposure and vulnerability to risks related to this phenomenon unprecedented in human history, to prevent potential harm to the population. Despite occupying just 2 percent of the Earth's entire surface area, cities are responsible for 60-80% of climaltering greenhouse gas emissions due to their high concentration of activities and inhabitants; in fact, as of 2018, about two-thirds of the world's energy consumption was concentrated in urban centers, compared to less than half (45 percent) in 1990. After all, urban areas are home to 55 percent of the world's population and generate more than 80 percent of global gross domestic product. The cities are, therefore, an important area of challenge, but also an undeniable opportunity to advance the ecological transition, implement actions to limit the effects of irreversible climate change-related phenomena.

In particular, the fight against climate change has been tackled in accordance with two strategies: mitigation, which is focused on the climate change drivers, and adaptation, which concerns the impacts of climate change. In the beginning, urban studies were addressed to the first strategy. Indeed, also thanks to the pushing effect of the Rio Agreements (1992) and the Kyoto Protocol (1997), urban studies were mainly focused on the analysis of relationships between urban characteristics and drivers of global GHG emissions in order to identify the most suitable urban solutions to implement.

Nevertheless, when it was clear that despite mitigation the impacts of climate change would have increased due to delayed effects of the preceding GHG emissions, researchers also started to analyze the relationships between urban characteristics and climate impacts on the city according to the adaptation concept. In particular, urban planning research has focused mainly on the relationship between urbanized areas and increases in temperature at local level (urban heat island), as highlighted by the several reviews of the topic, as well as the impacts of increased intensity and frequency of precipitation in cities.

In order to face the climate challenge in a more effective way, in recent years the "resilience" concept has been associated to adaptation. Although the use of the term resilience has increased, the description of what it means is often lacking. Resilience can be defined as "the capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation" (Mach et al., 2014). According to Joakim et al. (2015), resilience has several points of contact with vulnerability and both can be considered useful for framing adaptation.

the implementation of Nature-Climate Solutions proves to be particularly effective in terms of mitigation and adaptation, in line with the European Climate Law (EU Regulation, 2021/1119) and the Recovery Found Next Generation (EC, 2021) that are the main pillars for the implementation of the ecological transition in Europe.

Among them, the Nature Based Solutions interventions predominantly refer to urban green spaces, as they appear to be strategic urban services due to their eco-systemic capacities to cool the air through evapotranspirative processes, to runoff rainwater, to reduce the risk and/or extent of possible flooding, to absorb carbon dioxide and in general to reduce the ecological footprint of urban activities.

Be considering some European cities characterized by (i) spatial planning aims related to the improvement of microclimate comfort and quality of life and (ii) consolidated experience in climate change adaptation planning, it can be noted that the greening action is mainly associated with the replacement of existing impermeable surfaces with lawns and filtering materials, highlighting the importance of the ecosystemic role of green areas. For instance, Copenaghen, landscaped parking lots with permeable pavers which reduce runoff volume, improve water quality and help prevent flooding.

Cities like Barcellona and Paris, Stoccarda the use of greening is oriented to "re-stitching" peripheral districts to central and consolidated urban fabrics by mainly transforming streets in pedestrian and cycle paths characterized by shade. Paris is of particular interest as it takes into consideration also schoolyards as useful spaces to extend a green network and to encourage urban farming.

To support local decision-makers in defining a green network by which it is possible to cool and save energy in highly densified urban areas, taking into account their urban and building characteristics, the TeMALab research team of University of Naples Federico II developed a GIS-based decision support tool. Based on the relationship between the green network and urban features, this tool allows to define the sections of urban territory affected by the cooling effects due to the presence of green spaces, because of settlement and building characteristics and to localise the areal elements (urban-scale interventions), punctual and linear elements (building-scale interventions) of the green network.

This methodology was applied in Rione Alto area, located within the district Arenella (V Municipality) in Naples. Rione Alto is representative of urban parts developed during the economic boom of the 1960s, when urban tissue planning was replaced by an often uncontrolled expansion, resulting in the lack of balance between housing demand and the supply of services.

The possible categories of areas in which to carry out greening interventions at urban and building scale, contained in the abacus also built on the basis of the most recent case study (section 2), are: (i) transformation areas characterized by the significant presence of green spaces; (ii) consolidated green areas in which to enhance the eco-systemic functions of the vegetation present; (iii) areas with no greenery that need a significant "greening" action.

The induced of the proposed greening interventions have to be read also in a perspective of "complex" requalification of the Rione Alto area. In fact, the localization of shading squares, street greening and permeable surfaces (which are the most recurrent ones in the

experimentation area) can trigger a process of urban regeneration and building redevelopment able to increase the liveability and attractiveness of Rione Alto.

Within the urban decision-making processes, greening actions would be a driving force for optimizing the use of open spaces, increasing sustainability, efficiency and resilience of urban settlements.

Examination of Innovative Approaches in Smart Home Systems in Context of Comfort Conditions

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Abstract

The act of sheltering, which is associated with daily life; has changed due to factors such as diversification of needs, events that have taken place from the past to the present, culture, climate, geography, and technology. With these changes, there have also been differentiations in the places where the act of sheltering takes place. With the development of technology; new solutions have begun to be offered in housing units that provide comfort, security, and prestige in addition to sheltering for users. Comfort is the attainment of the highest efficiency and satisfaction with the least physical energy under the conditions of the individuals. Comfort in buildings is examined under headings such as thermal, auditory, visual, and indoor air quality. With the change in space organization, construction technique, and materials used, the possibilities of providing comfort conditions for the buildings have also improved. Smart home systems are one of these solutions that increase the quality of life and comfort levels of users in housing design and production. Smart home systems; it is the integration of services such as lighting, heating-cooling, video-sound, and water-electricity applied in buildings such as homes and offices with technological solutions. The aforementioned solutions are provided by residential automation systems. Automation is that the system performs the desired operations in accordance with the prepared scenario without the need for any operator. Smart home automation, which first emerged as an idea in the 1800s, allows users to control the building with smart mobile devices even when they are away from the building. In this way, systems; it is aimed to increase the efficiency obtained from the system by reducing the human interaction in the works that are tiring in the comfort, safety, and saving stages of the buildings. This study; it is aimed to examine smart home systems in the context of comfort conditions. Within the scope of the study, the concept of the smart home was defined and the development of the systems in the historical process was investigated and innovative applications in smart home systems were focused on. In the study, in which comfort and comfort conditions are explained, smart home applications are evaluated in terms of different comfort conditions.

Keywords: Smart home, sheltering, comfort conditions, housing, residential automation, architecture and technology

Introduction

For individuals, the spaces they shelter in not only fulfill the function of shelter but have become more functional over time. In this direction, housing units that provide comfort, prestige, and security in addition to housing for individuals have begun to be designed. Therefore, people's expectations of housing have also increased in this direction. As a result, technological elements such as smart home systems that meet all these criteria have been included in the lives of users. Individuals have started to live their lives more comfortably in the house through smart home systems and housing automation. With housing automation, users can remotely control their houses, save money in various areas and use the spaces more effectively. In this study, it was questioned to what extent and how smart homes provide the

comfort of individuals. This study, it is aimed to investigate which solutions provide physical comfort conditions including thermal, auditory, visual, and indoor air quality in smart home systems.

Comfort Conditions in Buildings

Comfort can be defined as the least mental and physical energy expenditure of the person performing an action. In situations where comfort conditions are provided, the physical, mental, and social performance of individuals can reach the maximum level (Aksoy, 2002; Yıldız, 1989). In the creation of physical comfort conditions, light, heat, color, humidity, odor, sun rays, etc. many physical factors play a role (Şerefhanoğlu Sözen, 2001). With the change in space organization, construction technique, and materials used, the possibilities of providing comfort conditions for the buildings have also improved. When investigating which physical factors affect people's comfort the most; It has been seen that thermal, auditory, visual and indoor air quality are the main factors (Figure 1) (Frontczak & Wargocki, 2011).

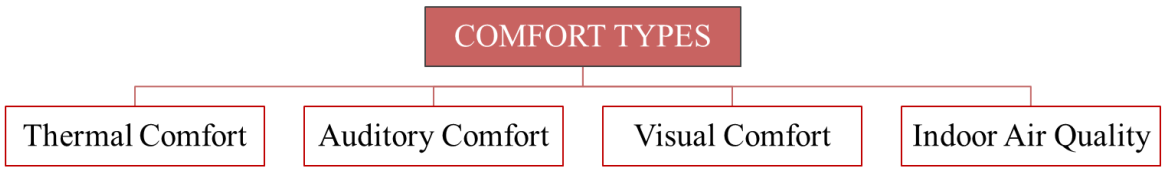


Figure 1. Types of physical comfort (Created using (Frontczak and Wargocki (2011))

If the physical comfort conditions in the buildings are examined;

- *Thermal Comfort:* It defines the temperature range in which the thermal comfort of the residential user can be achieved depending on indoor-outdoor climatic changes. While making this definition, the parameters of the indoors according to the seasons are taken as a basis. In addition to the indoor air temperature, air humidity, and the processes performed by artificial air conditioning devices, the user's level of movement and clothing style affect thermal comfort (Fanger, 1970).
- *Auditory Comfort:* It is possible to define it as a state of satisfaction with acoustic conditions. Auditory comfort not only provides a good acoustic environment but also includes identifying the factors that prevent auditory comfort. Volume acoustics, building acoustics, and indoor and outdoor noise problems constitute auditory comfort (Navai & Veitch, 2003)
- *Visual Comfort:* It is the absence of discomfort while performing visual perception without any trouble. Visual perception plays an important role in the communication of the individual with his environment. The amount of daylight, natural-artificial lighting,

illuminance level, and color selection in spaces are some of the parameters of visual comfort (Şenkal Sezer, 2015).

- *Indoor Air Quality:* It is a complex situation related to indoor air cleanliness. Indoor air quality covers all non-thermal points in the air that affect human health and comfort. It is difficult to make a clear definition of indoor air quality due to the different expectations of individuals from the air in the spaces they are in or the diversity in their perceptions of the air (Karaman, 2009; Schramek, 1999). However, in general, natural-artificial ventilation, and odor problems in indoor areas affect satisfaction with indoor air quality (Şenkal Sezer, 2015).

Smart Home Systems

Smart homes can be defined as homes that can meet the needs of individuals living in the residence through technological elements, facilitate the lives of residents, and offer a more comfortable, safe, and economical life (Stefanov, Bien, & Chul Bang, 2004). Smart home systems; It is the integration of services such as lighting, heating-cooling, video-sound, and water-electricity applied in buildings such as homes and offices with technological solutions (Figure 2). The aforementioned solutions are provided by residential automation systems. Automation is when the system performs the desired operations in accordance with the prepared scenario without the need for any operator (Harper, 2003). Housing automation, on the other hand, aims to increase the quality of life of individuals by using different tools and techniques and to make the house more effective and comfortable (Şahin & Hazer, 2010). Smart homes have devices that contain automatic systems and functions that the user can control remotely (Stefanov et al., 2004).

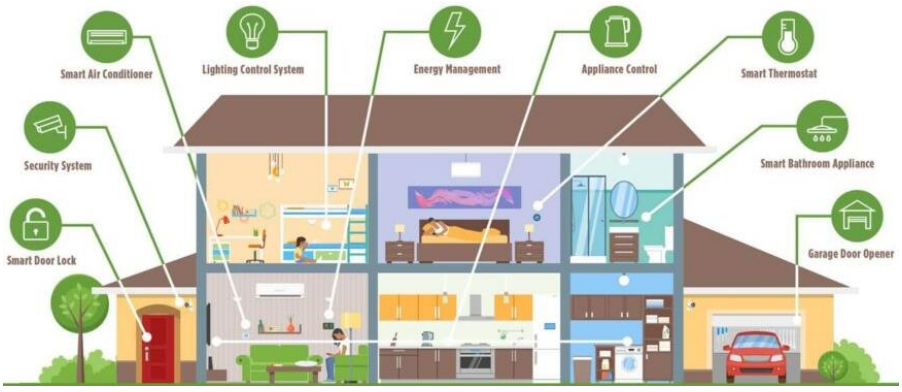


Figure 2. Technological elements used in smart homes (SmartHomeMart, 2022)

The concept of the smart building was first used in the United States in the early 1980s. In 1984, the first application in Turkey was carried out. In the first applications, the home comfort of people without any physical disability was considered (Yumurtacı & Keçebaş, 2009). In the first systems, there was no control mechanism and they only fulfilled the task of

monitoring (Keskin, 2002). Today, automation in smart homes provides informatics and communication without human intervention (Sovacool & Del Rio, 2020).

Smart homes can be grouped under five main headings in accordance with their development (Figure 3) (Şahin & Hazer, 2010; Yumurtacı & Keçebaş, 2009);

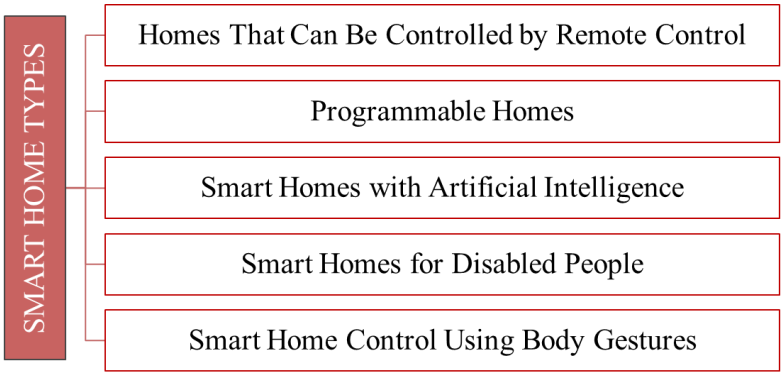


Figure 3. Smart home types (Created using Şahin and Hazer (2010); Yumurtacı and Keçebaş (2009))

- *Homes That Can Be Controlled by Remote Control:* These houses can be considered entry-level smart home systems. Remotely controllable houses are houses where existing devices and systems can be easily controlled with different control systems. In short, these smart homes fulfill the demands of the command they receive as soon as they receive the command (Şahin & Hazer, 2010; Yumurtacı & Keçebaş, 2009).
- *Programmable Homes:* They are more developed compared to remotely controllable houses. It ensures that the commands that the individuals living in the residence have entered before with programming are carried out in a timely manner. The system reacts to the entered command chain/scenario and ensures that the desired action is performed (Aslan, 2014).
- *Smart Homes with Artificial Intelligence:* Although they are similar to programmable houses, they are more advanced than them. In houses with artificial intelligence, scenarios are not entered by human hands, and user actions are learned by the houses. These houses are those that can self-study the movements of individuals and create their own scenarios and settings (Ergin, 2005).
- *Smart Homes for Disabled People:* These are houses designed for elderly and disabled individuals. Smart devices built into homes can keep individuals well under control, in addition to helping residents move (Figure 4) (Aslan, 2014).

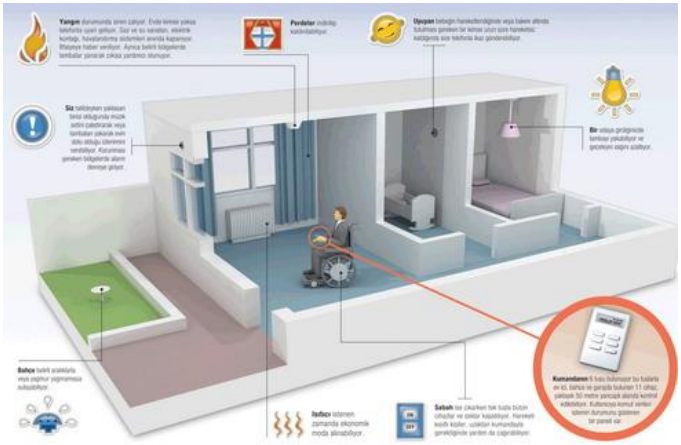


Figure 4. An example of a smart home designed for people with disabilities (Cengiz, 2008)

▪ *Smart Home Control Using Body Gestures:* Another way of providing control in smart homes is the use of individuals' body gestures. They are systems created for users to control the smart home through certain body gestures. Body gestures can be divided into natural and artificial movements. Natural gestures are vague and meaningless body movements. Artificial movements are made through the use of predetermined signs. These gestures are perceived by the system in a meaningful way. Examples of these are body movements used in actions such as turning on the lights, and opening and closing the curtains (Yumurtacı & Keçebaş, 2009).

It is not possible to say that smart home systems, which have many types and offer uses in different figures, have completely positive features. In addition to the positive features of the houses, there are also negative features for the users.

Considering the positive features of smart homes;

- It provides safety, comfort, time, and energy savings.
- It provides ease of life for the elderly and disabled individuals.
- It is possible to control the whole system by pressing a single button with the remote control (Tomaş & Dostoğlu, 2020).
- It helps to save money as it allows controlled use in areas such as heat, water, and electricity in the house (Şahin & Hazer, 2010).

Considering the negative aspects of smart homes;

- The system can be difficult to use for general users.
- Smart home systems are costly (Dönmez Çavdar, A., Kulak, & Torun, 2015)
- Unexpected situations may arise as a result of malfunctions that may occur in the system. These situations may need to be done by professionals.

- It may cause someone else to be included in the system during the remote control of the residences (Tomaş & Dostoğlu, 2020).
- May cause laziness and mechanization in users (Güğül, 2008).

Smart Home Systems in the Context of Comfort Conditions

The applications for smart home systems in terms of thermal comfort, auditory comfort, visual comfort, and indoor air quality conditions affecting the users are mentioned below;

Smart Home Applications Providing Thermal Comfort

- By placing different sensors for each room in the residential unit, different temperature values can be created for each room, and remote management can be provided.
- The room temperature can be automatically detected by the system and the heater fan speed can be changed.
- Smart homes can adjust the indoor air temperature according to the outdoor air temperature (Jabarullah, Shabbir, Abbas, Siddiqi, & Berti, 2019).
- As in heating, the desired temperature of the room can be determined in cooling, and cooling can be adjusted by the system (Göktaş, 2006).
- Heating-cooling systems in the space are activated thanks to the lighting and the automatic closing and opening of the blinds according to the sun's rays.
- Water heating systems are used with the help of solar energy and natural gas.
- With the sensors in the building, the greenhouse effect of the sunlight entering the house is kept under control and the indoor temperature is controlled.
- All elements in the systems are connected to the main control center in the house. The temperature of the house can be adjusted with a mobile phone or a device with internet access (Akyazıcı, 2019).
- Temperature adjustments can be made to prevent the water pipes in the building from freezing while the residents are on vacation during the winter months. On the return of the holiday, the temperature of the house is automatically increased.
- It is possible to use floor heating systems for cooling in summer. As a result of filling the pipes on the ground with water-cooled by solar energy in summer, the cooling of the spaces is realized (MEB, 2015).

Smart Home Applications Providing Auditory Comfort

- Television broadcast systems, music, and sound broadcast systems, and presentation and intercom systems are used in smart homes to provide auditory comfort.

- Video and sound systems supported by a single network connection can be accessed from any place in the residence (Akyazıcı, 2019).
- Different music broadcasts and different loudness can be used in each room.
- It is possible to wake up to the desired music in the morning with pre-made programming or to automatically increase the volume of music in the house when taking a shower (MEB, 2015).
- Virtually all functions can be controlled thanks to the voice control feature in smart homes. This feature provides great convenience, especially for disabled individuals (Dönmez Çavdar et al., 2015).
- By supporting the home theater systems with the panels on the walls, it provides the opportunity to intervene in the entire system (MEB, 2015).
- Home theater systems have products consisting of projectors, screens, video players, amplifiers, and speakers for sound. With these products, the home environment can be turned into a cinema automatically (Çelik, 2014).

Smart Home Applications Providing Visual Comfort

- There are indoor-outdoor lighting, blinds, and shading elements in lighting systems (Finch, 1995).
- All lighting in the house can be controlled from every room.
- With the pre-programming of the lighting conditions, different light levels can be used while reading a book or watching television (MEB, 2015).
- Due to the change of daylight during the day, the effect of the outdoor brightness is calculated and adjusted by producing an average level of light inside the house.
- The light sensors used in the building open and close the blinds, and curtains according to the sunrise and sunset, and turn the lights on and off according to these situations (Akyazıcı, 2019)
- By means of motion sensors in the space, the movements of the user are detected and the lightings work or turn off (Sripan, Lin X., Petchlorlean P., & Ketcham, 2012).

Smart Home Applications Providing Indoor Air Quality

- It adjusts the indoor air quality on the scale and the amount of clean air with the device that works according to the outdoor air conditions (Jabarullah et al., 2019)
- Through ventilation systems, polluted air containing harmful substances such as cigarette smoke, germs, and dust is thrown out and fresh air is taken inside.

- If the fire is detected by the sensors, the ventilations are closed and the growth of the fire is prevented (Akyazıcı, 2019).

Conclusion and Recommendations

As the living conditions change and develop day by day, the comfort levels that individuals expect from their residences are increasing. With the increase in expectations, different technological searches have been made in residences. One of these technological elements is smart home systems. Today, smart home systems applied in residences make people's lives easier, increase comfort and provide savings in various areas.

As a result;

- It has been observed that there are many smart home applications that take into account physical comfort conditions and provide these conditions.
- Smart homes play a major role in making residents' lives easier. However, it should not be overlooked that smart homes have negative features as well as positive features.
- Existing applications are expected to develop and diversify with the advancement of technology.
- It would be beneficial to increase the number of solutions so that individuals with different types of disabilities can live comfortably in their homes.

Today, where sustainability gains importance, it is expected to provide savings at different points with smart home systems and contribute to this process.

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Evaluation of Traditional Buildings within the Scope of Certification Criteria Applied to Modern Structures

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Abstract

Architecture emerged to fulfill the need for housing with the existence of man, and with this need for housing, a constantly evolving and changing design process has occurred with social and cultural evolutions throughout history. In light of these developments and changes, designers have also developed new design methods depending on several factors. Today, taking into account environmental protection and climatic changes in the criteria of natural life, reducing energy consumption in architectural design methods has become one of the main concerns, and architects and designers in different geographies have begun to develop design methods for this concern. As a factor that negatively affects the design approach and effort to reduce energy consumption, the industrial revolution and the development of technology along with the increasing population have begun to harm the environment in various ways. As a result of this situation, problems have arisen in terms of human health. This study aims to evaluate how the preservation and reuse of existing traditional structures will contribute to reducing energy consumption by taking into account energy consumption both in the construction process and in time while using materials and traditional building design criteria. In this study, modern buildings designed by considering certification systems and traditional buildings are examined comparatively in terms of energy efficiency over materials and design criteria. It is aimed to reveal the value of traditional buildings within the scope of sustainability and energy efficiency by comparatively considering traditional and modern buildings through the criteria in the certification systems.

Keywords: Traditional architecture, reducing energy consumption, sustainable design, certification systems.

Introduction

In the past period, environmental problems have been one of the most important concerns of humanity. To prevent these problems, the existing environmental load has been examined and new measures have been developed. The ever-increasing energy needs and resource demands of developed and still developing countries make this situation even worse (Amiri et al., 2019).

As in many areas, importance should be given to the application of sustainability principles in building construction, where energy consumption is the highest. When the current design understanding is evaluated, it can be said that the vast majority of industrial societies are far from the ecological design understanding. The construction that damages the natural environment and human psychology cause environmental disasters. Therefore, it is necessary to use natural resources effectively for construction that protects the environment and human health and serves the understanding of ecology.

Looking at the traditional buildings built in previous periods, it is understood that more ecological solutions have been applied compared to today's buildings. In addition, traditional structures have a design approach that uses local materials, and small forms and pay attention to human needs. Thus, it can be indicated that traditional buildings are practices that can be exemplary in terms of building buildings that are respectful of nature and that resources are used effectively, and that are compatible with the environment (Durak, 2021).

The traditional building design has changed according to changing needs with the industrial revolution and the advancement of technology. This situation jeopardizes the future of the traditional design approach, which is original and environmentally sensitive.

In this study, the importance of traditional building design, which can be an example of modern construction and which is in danger of extinction, was emphasized and the relationship of traditional buildings with sustainable architectural understanding was evaluated. It is aimed to evaluate how the preservation and reuse of existing traditional buildings will contribute to reducing energy consumption, taking into account the energy consumption in the application and use processes, through the materials and traditional building design criteria. In the evaluation, based on the criteria of national and international certification systems, a modern building that has received a Leed Gold certificate and a traditional building in the same region have been compared.

Materials and Methods

Considering the traditional buildings and today's certification systems, a Leed gold certified modern building and a traditional building in the same region were examined in terms of material and design criteria within the scope of energy efficiency. So, it is aimed to reveal the value of traditional buildings within the scope of sustainability and energy efficiency by comparatively considering traditional and modern buildings through the criteria in the certification systems.

In the study, considering BREEAM, HQM, LEED, SBTool, Green Star, B.E.S.T. certification systems, and the literature studies, the criteria for ecological evaluation were formed. The evaluation was made under 5 main headings with the determined criteria.

To evaluate a Leed-certified modern building and a traditional building, a survey was conducted with architects who are experts in building physics and materials. In the survey study; determined by these criteria; a comparison was made between the structures as a result of scoring them as "very weak", "poor", "moderate", "good" and "very good".

Certification Systems

In the construction sector, buildings in the USA and the UK use 45% and 42% of the energy consumed throughout the country, respectively, while OECD countries use 31% of all energy. That is why the necessity has arisen to establish rules for minimizing energy consumption. These rules have required the use of numerous green building certification systems. Thus, many national and international certification systems have started to be used. The British Building Research Establishment Environmental Assessment Method (BREEAM) is the first system created. The most widely used of these is the American Leadership in the Energy and Environmental Design (LEED) certificate, created by the US Green Building Council (USGBC) in 1998. Other certification systems include the Green Standard for Energy and Environmental Design (G-SEED, Korea), the Green Star (Australia), and the Comprehensive Assessment System for Deconstructed Environmental Efficiency (CASBEE, Japan). In October, there are several voluntary standards for energy efficiency in buildings, such as Passivhaus or Energy Star (Amiri et al., 2019). In addition, as the only national green building certification system, for obtaining a National Green Building Certificate for Turkey B.E.S.T - the Housing Certification system has been created.

Certification Systems Criteria

While determining the performance criteria, attention was paid to the analysis of both modern and traditional structures in a way that would be suitable for the study. By considering the certification systems mentioned above, 5 main headings have been determined. These titles are determined as Environmental Energy Conservation, Energy Performance, Water Efficiency, Materials and Resources, and Indoor Environmental Quality. The sub-headings of these titles are also divided into sections in Table 1.

Table 1. Category-specific points in evaluated criteria

Environmental Energy Conservation	Energy Performance	Water Efficiency	Materials and Resources	Indoor Environmental Quality
Land Choice	Providing Energy Conservation for Air Conditioning at the Scale of Building Environmental Design	Reduction of Water Consumption	Ensuring Material Protection Depending on the Choice of Material	Visual Comfort

Land Settlement	Ensuring Energy Conservation for Air Conditioning at the Scale of Building Design	Rainwater Management	Ensuring Material Protection Depending on the Use of Materials	Indoor Air Quality
Transportation	Ensuring Energy Conservation for Air Conditioning at the Scale of Space Design			Thermal Comfort
Waste Management	Ensuring Energy Conservation for Air Conditioning at the Scale of Building Shell Design			Acoustic Comfort
Reduction of Other Pollution	Ensuring Energy Conservation in the Selection and Use of Materials			Accessibility
				Area and Environmental Quality

Field Study

- **Qent İstinye**

Qent İstinye is a medium-sized, multi-user residential project located in the İstinye region of Sarıyer district in Istanbul (Figure 1).

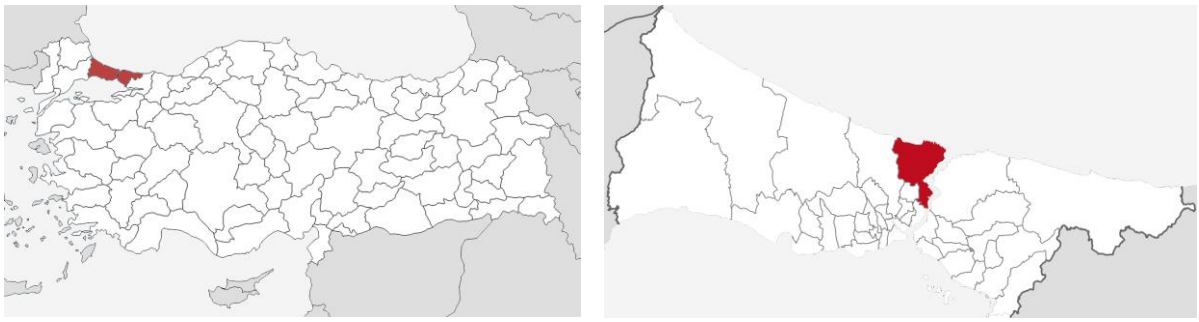


Figure 1. Location of İstanbul and Sarıyer Region.

The project was planned in three low-rise blocks as a contemporary housing project, by the Bosphorus rear view rules, which envisages the preservation of the silhouette. In addition to 18 units and 6 flats in each block, it consists of a total of 22 units, including 4 residences with a garden on the ground floor (Figure 2).



Figure 2. Exterior View of Qent İstinye Residence and Site Plan (URL-1)

The complex has an understanding of space design with high ceilings, making the most efficient use of daylight and scenery, intertwined with nature, and allowing neighbors relations with common areas (Figure 3). The land area of the project, whose construction was completed in 2015, is 3070 m2 and the construction area is 7100 m2. This project has received LEED gold certification (URL-1).



Figure 3. Exterior View of Qent İstinye Residence (URL-1).

To talk about the features that brought this certificate to this project;

• Maximum attention was paid to the protection of natural life on the building site, during and after the construction (Figure 4). Although the rate of areas to be planted in the building land is high, it is aimed to minimize water consumption and chemical fertilizer use by choosing local and adapted plants during planting works (URL-1).



Figure 4. Exterior View of Qent İstinye Residence (URL-1).

• The water armatures and sanitary wares used in the wet areas of the buildings are highly water efficient.

• Energy star-certified products with energy efficiency are used in the lighting and mechanical systems used in the building.

• There are flood, theft, and air quality sensors in the residences.

• A comprehensive waste management plan has been prepared for the recycling of waste generated during construction (Figure 5). During the construction process, measures were taken to protect fertile soil and prevent erosion (URL-2).

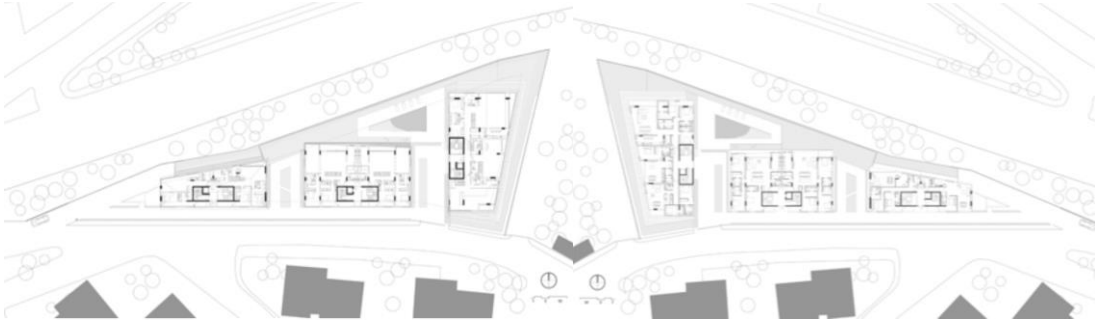


Figure 5. Ground and 1. Floor Plan of Qent İstinye Residence (URL-1).

• Building thermal insulation is designed above international standards. The material types and thermal values used are selected from certified and tested brands.

• Buildings are designed to show the highest performance against earthquakes.

• Houses are protected from humidity, pests, thermal changes, condensation, and natural events.

• The building design is based on maximizing the use of daylight. In this way, it is aimed both to reduce the energy spent on lighting and to use the positive effects of daylight on the people living indoors (Figures 6 & 7) (URL-2).

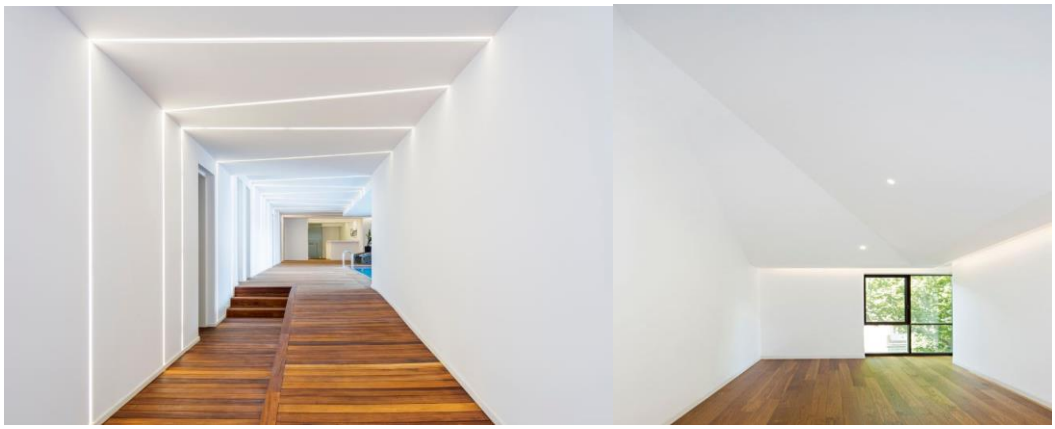


Figure 6. Interior View of Qent İstinye Residence (URL-1).



Figure 7. Interior View of Qent İstinye Residence (URL-1).

- **Huber Kiosk**

The kiosk area is surrounded by the German Embassy Tarabya Summer Residence in the north and the southern. It is bordered by Kalender Street. Huber Kiosk has a view of the Bosphorus due to its location (Figure 8).



Figure 8. Huber Kiosk General View (Eroğlu, 2012) and Site Plan (Tüfekçi, 2015)

While the kiosk is bordered by the historical wall that continues along the coastal road in the east, the South, it is bordered by a new wall until the Presidency's main entrance. On the seafront of the kiosk, the main entrance, the carriage entrance and the service entrance which are not used today (Figure 9).

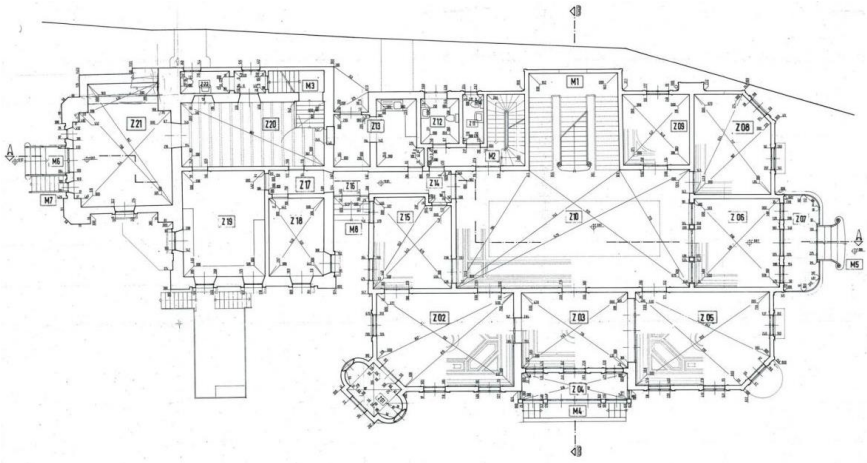


Figure 9. Huber Kiosk Ground Floor Plan (Tüfekçi, 2015)

Huber Kiosk which is located on Yeniköy Tarabya road to the sea is settled on an embankment 5m from the road. The kiosk is consist of the main and additional structures that are articulated to each other. To the north of this building, there is the Old Carriage House Building. On the west side of this building, on the embankment just behind it, The Set Kiosk is located (Figures 10 & 11).



Figure 10. Old Carriage House in Huber Kiosk Complex Huber Kiosk South Façade (Tüfekçi, 2015)



Figure 9. Hunting House Before Restoration (Tüfekçi, 2015) and Set Kiosk in Huber Kiosk Complex (Eroğlu, 2012)

Materials

In the Huber Kiosk; wood, glass, metal, marble, mosaic tiles, cut stone, artificial stone and tiles are used as material. When looking at the whole building, wood is used in some architectural elements, decoration elements, floor coverings, wall and ceiling coverings. The carefully shaped main staircase in the main building is the most important wooden element of the pavilion (Tüfekçi, 2015). In addition, the steps and railings of the stairs and the first and second-floor gallery railings are also wooden (Eroğlu, 2012) (Figure 12).

Looking at the façades, all the façades of the main building, the first and second floors of the additional building's north and east façades, and the north portion of the west façade are covered with wood. Artificial stone is used extensively on the facades of additional buildings. Glass is mostly used for windows, doors in the interior and for decoration in some places (Eroğlu, 2012).

Metal as the material is seen as iron, zinc and lead. Among the metals, iron is mostly used in this building. The roof of the entire building is covered with tiles (Figure 12).



Figure 12. Huber Kiosk Stairs and Interior Pavement (Tüfekçi, 2015)

Findings and Discussion

If we evaluate the result graphs of the survey,

- **Environmental Energy Conservation**

In the scoring of many criteria under the title of Environmental Energy Conservation, higher results were obtained in the traditional structure than in the modern structure. While the modern structure scored better in the land choice criteria, the traditional structure scored higher in the reduction of other pollution criteria (Figure 13).

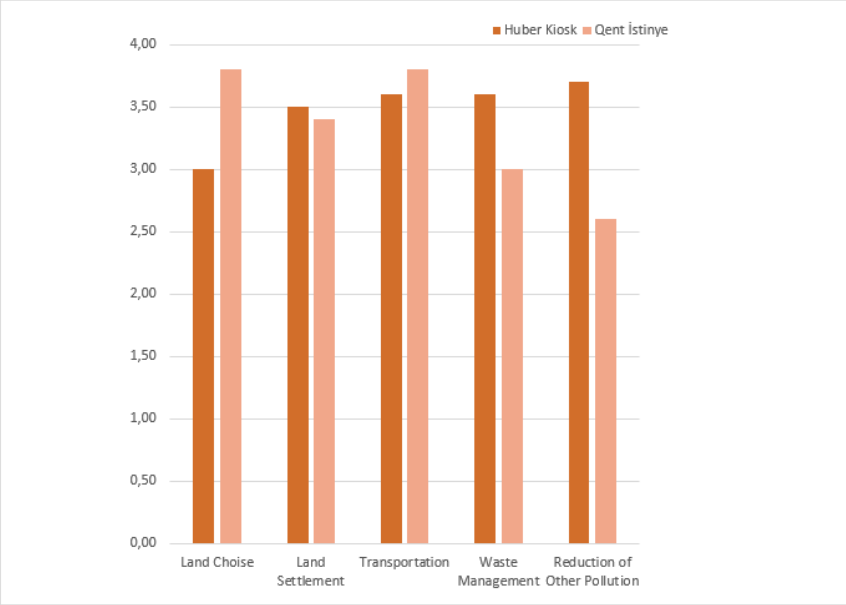


Figure 10. Environmental Energy Conservation Diagram

- **Energy Performance**

When we look at the Energy Performance heading, it is seen that while the traditional building scores higher in almost all of the criteria, the modern building scores slightly higher only in the "Providing Energy Conservation for Air Conditioning at the Scale of Building Environmental Design" criteria (Figure 14).

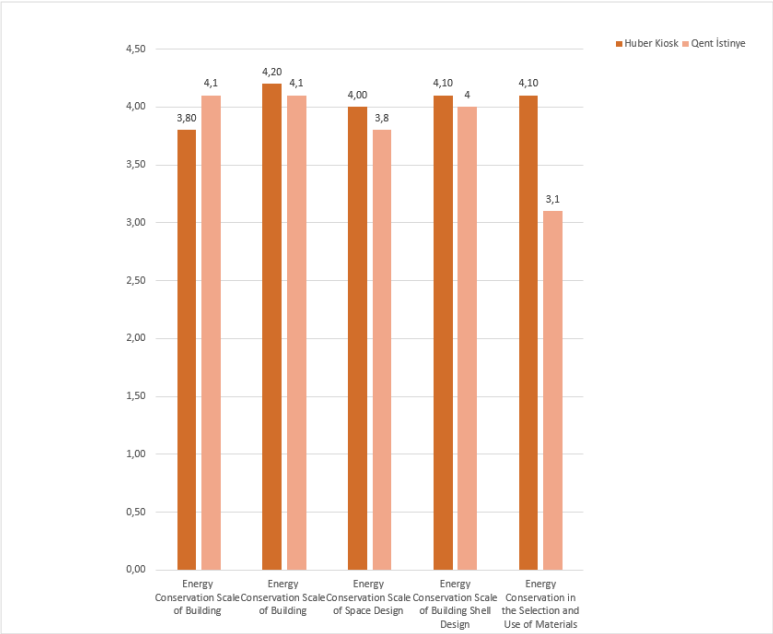


Figure 14. Energy Performance Diagram

- **Water Efficiency**

When the Water Efficiency title was evaluated, it was seen that the traditional structure received a higher score. Only in the "Rainwater Management" criteria, it is seen that both structures receive equal points (Figure 15).

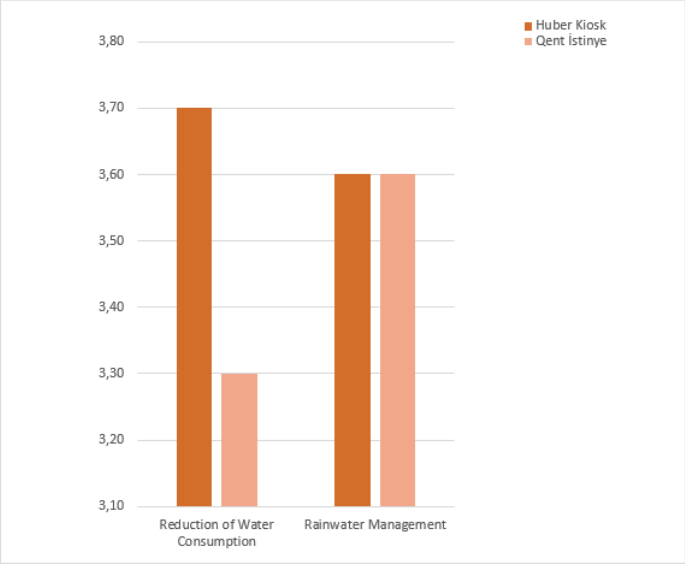


Figure 15. Water Efficiency Diagram

- **Materials and Resources**

When the average of the criteria in the Materials and Resources heading is taken, it is seen that both structures exhibit similar performance. While the traditional structure scores higher in the "Ensuring Material Protection Depending on the Use of Materials" criterion, it is seen that the modern structure scores higher in the "Ensuring Material Protection Depending on the Choice of Material" criterion (Figure 16).

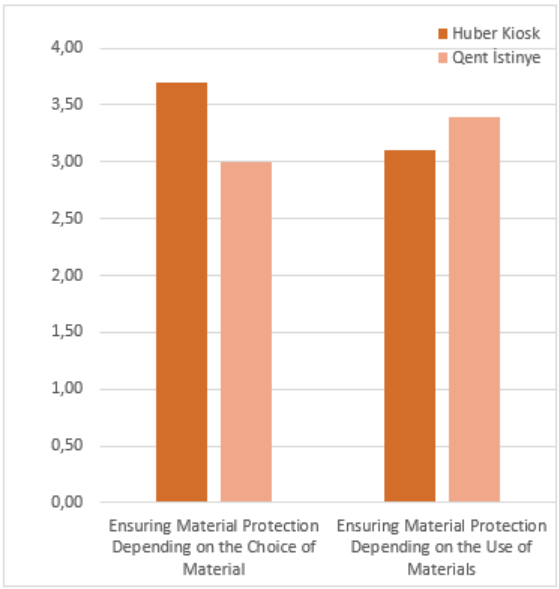


Figure 16. Material and Resources Diagram

- **Indoor Environmental Quality**

When we examined the results of the Indoor Environmental Quality title, a similar performance emerged when looking at the average, and when evaluated based on criteria, the 2 buildings received close scores. While the traditional building has a higher score difference in the "Acoustic Comfort" criteria, it is seen that the modern building has a higher score difference in the "Visual Comfort" criteria (Figure 17).

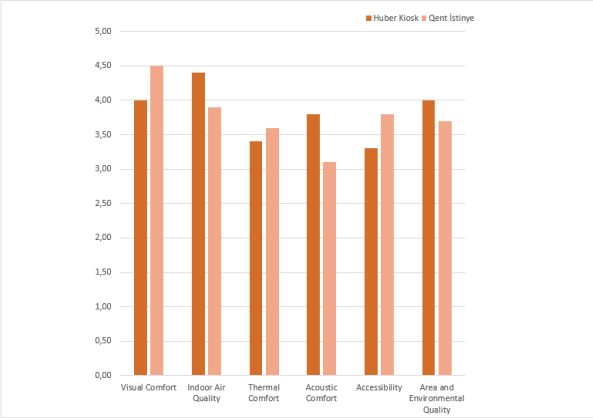


Figure 17. Indoor Environmental Quality Diagram

When the general evaluation of all titles was made, it is seen that the traditional structure gets a higher score in all titles compared to the modern structure (Figure 18).

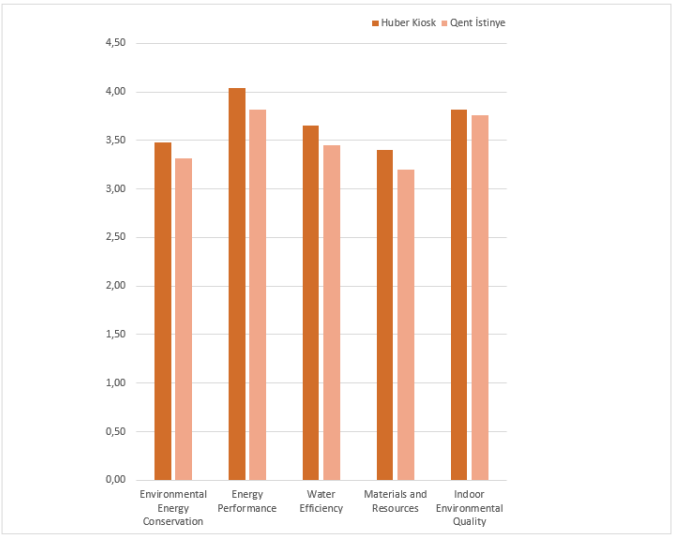


Figure 18. General Evaluation Diagram

Conclusion and Recommendations

As a result, according to the survey participated by architects who are studying building physics, systems and materials; it is seen that a traditional structure designed and built in a period when certification systems did not exist and ecological design criteria were not

documented is more successful in sustainable and ecological design compared to a modern structure with the highest degree in one of these certification systems.

Based on this result, we can say that the preservation of existing traditional structures and the example and application of this building practice in today's building applications are important in terms of producing designs that offer solutions to today's ecological concerns.

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Ankara'daki Rezidans Yapılarının Cephe Uygulamalarında Hasar ve Bozulmaların Tespiti

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Öz

Cepheler, yapılarda dış mekandan ilk algılanan kısım olması sebebiyle tasarım sürecinde ayrıca önem arz eden yapı bölümleridir. Yapı kabuğunun büyük kısmını oluşturan cepheler birçok farklı cephe sistemi ve malzeme ile tasarlanabilmektedir. Teknolojinin gelişmesi ve ilerleyen süreçte yapı malzemesi çeşitliliğinin artmasıyla birlikte cephe sistemleri çeşitliliğinde de artış meydana gelmiş, yapılan çalışmalar genişlemiştir. Giydirme cephe sistemleri de son yıllarda kullanımı artan cephe sistemlerinden biridir. İlk olarak 1960'larda ülkemizde görülmeye başlamış, daha çok ofis yapılarında kullanılmış, günümüzde ise bütün yapılarda kullanımına rastlanmaktadır. Bu çalışmada Ankara'da bulunan rezidans yapılarının cephe uygulamalarındaki hasar ve bozulmaların incelenmesi ve tespit edilmesi odak noktasına alınmıştır. Çalışmanın amacı, belirlenen rezidans yapılarında kullanılan giydirme cephe sistemlerini incelemek, bu sistemlerde meydana gelen hasar ve bozulmaları tespit ederek başta bina tasarımında öncü olan mimarlarda ve bunun yanında cephe tasarımı ile imalat sürecinde yer alan tüm paydaşlarda tasarım, uygulama ve süreç takibine yönelik bilinç oluşturmaktır. Bu doğrultuda, nitel araştırma yöntemlerinden veri toplama ve iz sürme metotları kullanılarak Ankara İlinden çoğunlukla 2015 sonrası yapımına başlanan veya yapımı tamamlanan 10 adet rezidans yapısı seçilmiş ve her bir yapı yerinde ziyaret edilerek gözlemlenmiştir. İncelenen yapıların tümünde giydirme cephe sistemi kullanılmış, çoğunluk olarak kompozit ve cam giydirme cephe sistemleri kullanıldığı tespit edilmiştir. Ayrıca cepheler; kirlenme, cam kırılması, renk atması, panel eksikliği ve panel bozulması açılarından incelenmiş, en yaygın görülen cephe probleminin estetik problemler dahilinde kirlenme ve renk atması olduğu gözlemlenmiştir.

Anahtar Kelimeler: Rezidans, cephe hasarları, giydirme cephe, performans.

Determination of Damages and Deterıorations in the Facade Applications of Residence Buildings in Ankara

Abstract

Facades are the building parts that are also important in the design process, as they are the first part of the buildings to be perceived from the outside. The façades that make up the bulk of the building envelope can be designed with many different façade systems and materials. With the development of technology and the increase in the variety of building materials in the future, the variety of facade systems has also increased, and the studies have expanded. Curtain wall systems are also one of the façade systems whose use has increased in recent years. It was first seen in our country in the 1960s, it was mostly used in office buildings, and today it is used in all buildings. In this study, the focus is on examining and detecting the damage and deterioration in the facade applications of the residence buildings in Ankara. The aim of the study is to examine the curtain wall systems used in the determined residence buildings, to identify the damages and deteriorations in these systems and to create awareness for design, application and process follow-up in the architects who are the pioneers in building design, as well as in all stakeholders involved in the facade design and manufacturing process. In this direction, using data collection and tracing methods from qualitative research methods, 10 residence buildings were selected from Ankara Province, the construction of which was started or completed after 2015, and each building was visited and observed on site. The curtain wall system was used in all of the examined buildings, and it was determined that mostly composite and glass curtain wall systems were used. In addition, facades; It has been examined in terms of contamination, glass breakage, discoloration, lack of panel and panel deterioration, and it has been observed that the most common facade problem is contamination and discoloration within the scope of aesthetic problems.

Keywords: Residence, façade damages, curtain wall, performance.

Giriş

İçeride mekan, dışarıda sınır oluşturan cepheler cepheler, bina içerisinde gerekli koşulları sağlayabilmek için iç ve dış mekanı birbirinden ayıran bölümlerdir. Ayrıca yapıların dışarıdan ilk algılanan kısmı da cephelerdir. Bu sebeple, hem yapı kabuğu performansı açısından hem de estetik açıdan cephelerin daha özenli tasarlanması gerekmektedir (Albayrak, 2014). Binalarda kabuk görevi ile kullanılan cepheler, o günün mimari anlayışına, teknolojik ve teknik seviyesine göre şekillenir. Cepheler taşıyıcı sistemle birlikte veya taşıyıcı sistemden bağımsız şekillerde kullanılabilmektedir. Günümüzde teknik veya estetik sebeplerle giydirme cephe sistemleri kullanılmaktadır (Şekil 1) (Harmankaya &Soyluk, 2010).

Giydirme cephe sistemlerin dünyada kullanımı, yaklaşık 200 yıl öncesine dayanmaktadır. Süreç içerisinde malzeme biliminde ve teknolojide yaşanan gelişmelerle birlikte giydirme cephe sistemlerinde de büyük gelişmeler yaşanmış, kullanılan malzeme ve tekniklerin çeşitlenmesine bağlı olarak tasarımlar da çeşitlenmiştir (Şahin ve Gökuç, 2014).



Şekil 1. Giydirme Cephe Sistemleri

Ülkemizde 1959 yılında Ankara Kızılay Emek İşhanı (Şekil 2a) binasında kullanılmaya başlanan giydirme cephe sistemlerinin kullanımı süreç içerisinde yaygınlaşmış, son 25 yıldır daha büyük bir ivme ile kullanımları artmaktadır. İlk kullanımları büyük çoğunluk ile ofis yapılarında görülse de günümüzde rezidansların (Şekil 2b) da içinde bulunduğu çeşitli yapı tiplerinde giydirme cephe sistemleri kullanılmaktadır.



(a) **(b)**

Şekil 2. (a) Ankara Kızılay Emek İşhanı (b) West Gate Rezidans

Kullanılan cephe sistemlerinin bina ömrü boyunca dayanımını sağlaması ve performansını sorunsuz bir biçimde devam ettirmesi beklenmektedir. Fakat cephe sistemlerindeki tasarım ve yapım-imalat kaynaklı problemler ile birlikte kullanıcı kaynaklı nedenler ve bozucu faktörler cephe sistemlerinde farklı hasar ve bozulmaların meydana gelmesine sebep olmaktadır (Kazmierczak, 2010).

Yapı elemanlarının yaşam ömrünü etkileyen bozucu etmenlerden bahsedilecek olursa; yer çekimi, kinetik enerji, vibrasyon ve ses kaynakları olarak mekanik etkiler; radyasyon, elektrik ve manyetizma kaynaklı elektromanyetik etkiler; büyük sıcaklık değişimleri kaynaklı ısıl etkiler; oksidasyon, asitler, bazlar, tuzlar v.b. kaynaklı kimyasal etkiler; bitki, bikrobiyal ve hayvansal kaynaklı biyolojik etkiler olarak ifade edilebilir. Bahsedilen etkenler doğrultusunda, uzun süreçte cephe sistemlerinde performans kayıpları meydana gelebilmektedir (Yalaz, Tavil ve Çelik, 2016). Cephe sistemlerinden beklenen performans hem kullanıcıları hem de yapı yaşam döngüsünde yer alan bütün paydaşları etkileyen ve yakından ilgilendiren bir husustur. Bu sebeple cephe sistemlerinin performansını azaltıcı yönde etkileyen faktörlerin ve meydana gelebilecek hasarların tespit edilmesi, cephe sistemlerinin uzun süreç performansının iyileştirilmesi ve beklenilene en yakın hale getirilmesi bakımından önem arz etmektedir (Senders & Hargrove, 2012). Tablo1.'de hasarların farklı ölçütlere göre sınıflandırılması ifade edilmiştir.

Tablo 1. Hasarların Farklı Ölçütlere göre Sınıflandırılması (Yalaz, Tavil ve Çelik'in çalışmasından esinlenerek yeniden oluşturulmuştur.)

Hasarların Farklı Ölçütlere göre Sınıflandırılması		
Süreç kaynaklı hasarlar	Sistem-bileşen ilişkisinden kaynaklanan hasarlar	Çevresel etmenlerden kaynaklanan hatalar
Tasarım aşaması		
İmalat aşaması		
Montaj aşaması		
Kullanım aşaması		
Bakım-onarım aşaması		
Denetim aşaması		

Materyal ve Yöntem

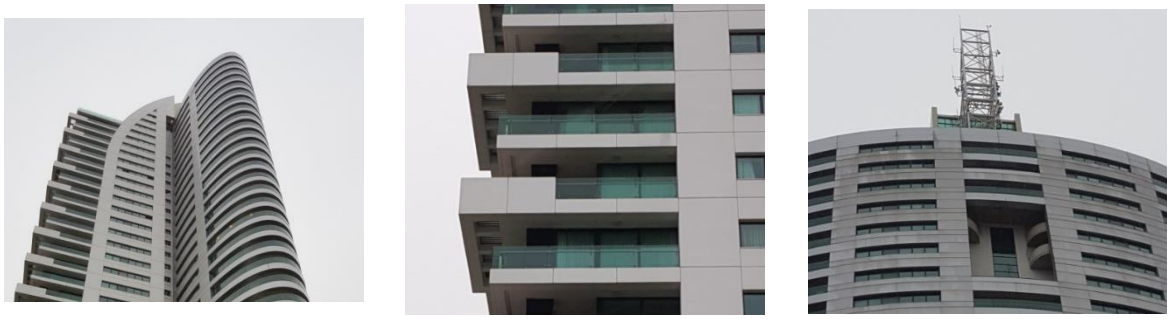
Bu çalışmada Ankara'da bulunan rezidans yapılarının cephe uygulamalarındaki hasar ve bozulmaların incelenmesi ve tespit edilmesi odak noktasına alınmıştır. Çalışmanın amacı, belirlenen rezidans yapılarında kullanılan giydirme cephe sistemlerini incelemek, bu sistemlerde meydana gelen hasar ve bozulmaları tespit ederek başta bina tasarımında öncü olan mimarlarda ve bunun yanında cephe tasarımı ile imalat sürecinde yer alan tüm paydaşlarda tasarım, uygulama ve süreç takibine yönelik bilinç oluşturmaktır. Bu doğrultuda, nitel araştırma yöntemlerinden veri toplama ve iz sürme metotları kullanılarak Ankara İlinden çoğunlukla 2015 sonrası yapımına başlanan veya yapımı tamamlanan 10 adet rezidans yapısı seçilmiş ve her bir yapı yerinde ziyaret edilerek gözlemlenmiştir.

Ankara'da İncelenen Rezidans Yapıları

Bu bölümde belirlenen 10 adet rezidans yapılarının ilk olarak cephe malzemeleri, kat yükseklikleri, yapım yılları ve karşılaşılan problemlere dair bilgiler yer almaktadır. Her bir yapı yerinde incelenmiş ve fotoğraflanmıştır. Ayrıca karşılaşılan problem ve bozulmalar görseller vasıtası ile de ifade edilmiştir.

Portakal Çiçeği Rezidans

Yapı 2006 yılında inşa edilmiştir. Çankaya ilçesinde yer alan yapı 40 katlıdır. Gri renkli kompozit giydirme cephe kaplaması kullanılmıştır. Resim 3'te görüldüğü gibi renk atmaları ve kirlenmeler gözlenmiştir. Kuzey cephesinde, diğer cephelere göre çok daha fazla kirlenme gözlenmiştir. Yapının çatıya yakın kısımlarında daha fazla kirlenme gözlenmiştir.



Şekil 3. Portakal Çiçeği Rezidans

Next Level AVM Rezidans

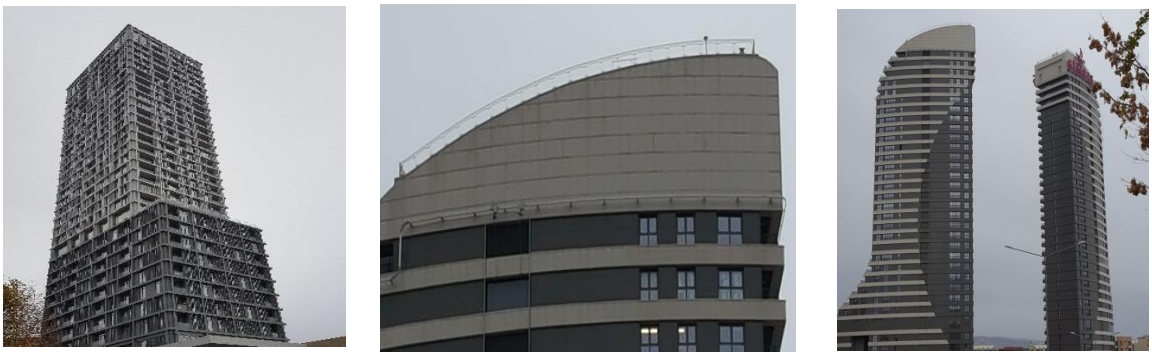
Yapı 2014 yılında kullanıma başlamıştır. Çankaya ilçesinde yer alan yapı 20 katlıdır. Rezidans bloğunun da içinde bulunduğu 2 Blok ve bazadan oluşan yapının büyük bir kısmında cam giydirme cephe sistemi kullanılmıştır. Cam malzeme ile birlikte kompozit malzemenin de kullanıldığı gözlemlenmiştir. Kompozit malzeme füme ve gri renkte tercih edilmiştir. Gri renkli kompozit malzeme üzerinde kirlenmeler mevcuttur. Kompozit panellerin birçoğunun dış hattında renk değişimleri mevcuttur. Resim 4'te görüldüğü üzere aynı zamanda bir bölümde cam kırılmasına rastlanmıştır.



Şekil 4. Next Level Avm ve cephe bozulmaları

Sinpaş Altın Oran

Yapı 2014 yılında inşa edilmiştir. Çankaya ilçesinde yer alan yapı 38 katlıdır. Yapı cephesinde füme ve gri renkte granit-seramik ve kompozit giydirme cephe birlikte kullanılmıştır. Gri renkli panellerde kirlenmenin belli olduğu tespit edilmiştir. Resim 5'te görülen kirlenmelerin bina çatı kısmına yakın bölümlerde arttığı gözlenmiştir.



(a) (b)

Şekil 5. (a) Sinpaş Altın Oran (b) Kumru Ankara

Wings Ankara

Yapı 2015'te inşa edilmiştir. Yenimahalle ilçesinde bulunan yapı 15 katlıdır. Yapıda giydirme cephe sistemi kullanılmıştır. Sistemde cam ve kompozit malzemenin birlikte kullanıldığı gözlemlenmiştir. Gözlem esnasında çoğunlukla göze çarpan problem kirliliktir. Ayrıca sistemde panel bozulmaları da mevcuttur. Kompozit paneller gri, beyaz ve kahverengi olmak üzere 3 ayrı renkte kullanılmıştır. Kirlenme durumu, en fazla beyaz renkli panellerde ve yapının çatı kısmına yakın bölgelerde gözlemlenmiştir. Resim 6(c)'de görüldüğü üzere kompozit malzeme ile zemin kaplaması birleşim detaylarında açıklıklar ve eksiklere rastlanmıştır.



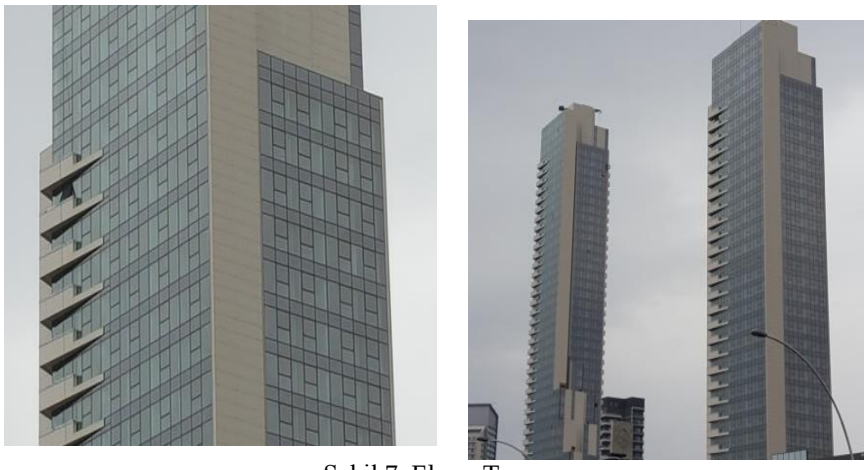
(a) (b) (c)

(d) (e) (f)

Şekil 6. (a) Yapının cam cephesi, (b,c) Kompozit panel kirlenmeleri, (d)Panel bozulması, (e)Birleşim detayı, (f)Panel renkleri

Elmar Towers

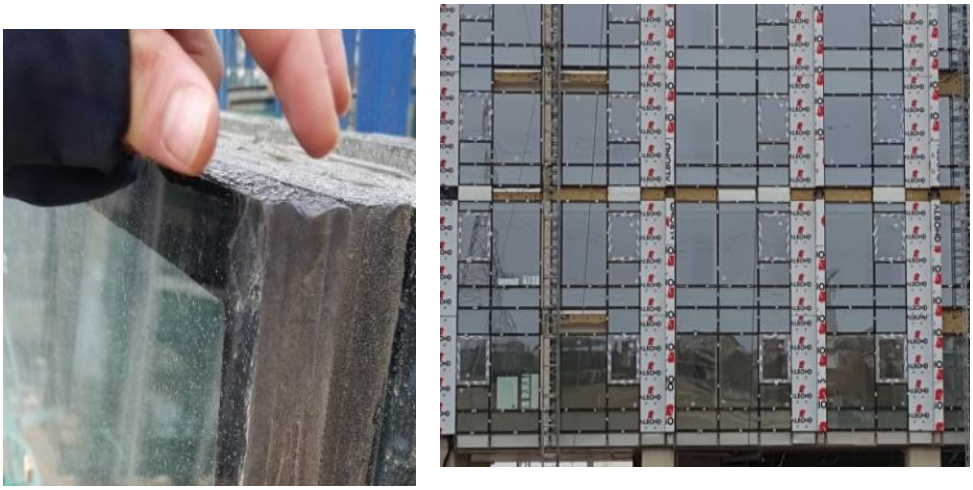
Yapı 2015 yılında inşa edilmiştir. Yenimahalle ilçesinde yer alan yapı ilk bloğu 50 katlı, ikinci bloğu isi 43 katlıdır. Resim 7'de görüldüğü üzere yapıda ağırlıklı olarak cam malzeme kullanılmıştır. Ayrıca gri renkli kompozit panel kullanımı da görülmektedir. Gözlendiği kadarı ile cam ve kompozit kaplama durumu iyidir.



Şekil 7. Elmar Towers

Konum Beytepe

Yapı 2016 yılında inşa edilmiştir. Çankaya ilçesinde yer alan yapı 35 katlıdır. Alüminyum kompozit malzeme ile birlikte cam giydirme cephe kaplaması kullanılmıştır. Konum itibarı ile mevsim şartlarına dayanım açısından Resim 8'deki gibi 8-16-8 mm ölçülerde ısıcam kullanılmıştır.



(a) (b)

Şekil 8. (a) Kullanılan çift katlı cam(8-16-8) (b) Yapı cephesi

Horizon Life Beytepe

Yapı 2017 yılında inşa edilmiştir. Çankaya ilçesinde yer alan yapı 30 katlıdır. Horizon Life Beytepe'de granit-seramik giydirme cephe kullanılmıştır. Tüm cephede aynı malzeme

kullanılmıştır. Beyaz, füme ve kahverengi olarak 3 farklı renk kullanılmıştır. Gözlemlendiği kadarı ile cephe malzemesi durumu ve temizlik durumu iyidir. Resim 9(b)'de görüldüğü üzere bazı birleşimlerde işçiliğin yeterli olmadığı tespit edilmiştir.



(a) (b)

Şekil 9. (a)Horizon Life Beytepe cephe (b) Birleşimdeki işçilik problemleri

West Gate Rezidans

Yapı 2017 yılında inşa edilmiştir. Çankaya ilçesinde yer alan yapı 33 katlıdır. AVM- Ofis - Rezidans olarak tasarlanan sitenin rezidans bloklarında beyaz ve füme olmak üzere iki renkli kompozit panel kaplama kullanılmıştır. Beyaz panellerin bir kısmında renk atması ve birçoğunda kirlenme gözlemlenmiştir. Yapının çatı kısmına yapın bölümlerinde kirlenme daha fazladır. Resim 10'da görüldüğü üzere bazı paneller yerinden çıkmış, bazıları ise yerinden oynamıştır. Ayrıca tek bir kompozit panel düşünüldüğünde panel çevresi, orta kısmına göre daha fazla kirlenmiştir.



Şekil 10. West Gate Rezidans ve panel bozulmaları

Kumru Ankara

Yapı 2018 yılında inşa edilmiştir. Çankaya ilçesinde yer alan yapı 32 katlıdır. Resim 11'de görüldüğü üzere açık ve koyu tonlarda kompozit paneller birlikte kullanılmıştır. Cephede

güneş kırıcı elemanlar bulunmaktadır. Genel olarak cephe ve malzeme durumunda bir bozulmaya rastlanmamıştır.

Elya Tower

Yapı 2020 yılında inşa edilmiştir. Yenimahalle ilçesinde yer alan yapı 45 katlıdır. Alüminyum kompozit cephe ve ağırlıklı olarak cam giydirme cephe sistemi kullanılmıştır. Gri renkli kompozit paneller kullanılmış, sabit ve açılır doğramalar birlikte kullanılmıştır.



(a) (b)

Şekil 11. (a)Kumru Ankara (b) Elya Tower

Bulgular

İncelenen yapılarda genel olarak en çok kompozit ve cam malzeme kullanıldığı tespit edilmiştir. Kompozit kaplama hem daha hafiftir hem de daha ekonomiktir. Aynı zamanda kompozit kaplama ile sınırlar zorlanabilmekte, tasarım çeşitliliği sağlanabilmektedir. Gözlenen en yoğun cephe problemi ise kirlenme yani temizlik problemidir. Ayrıca açık renkli panellerin kiri daha çok göstermesi sebebiyle kirlilik problemini daha net yansıttığı anlaşılmıştır. Belirlenen cephe problemleri, cephe malzemeleri ve diğer bilgiler Tablo 2'de ifade edilmiştir.

Tablo 2. Ankara'da belirlenen rezidans yapılarında cephe problemleri

Yapı ismi	Yapım yılı	Kat Adedi	GC Malzemesi	Bozulma/Problem
Portakal Çiçeği Rezidans	2006	40	kompozit	Kirlenme ve panel renklerinde değişme
Next Level AVM Rezidans	2014	20	cam+kompozit	Kirlenme, cam kırığı ve panel renklerinde değişme
Sinpaş Altın Oran	2014	38	granit-seramik	Kirlenme ve panel renklerinde değişme

Wings Ankara	2015	15	cam+kompozit	Kirlenme ve panel bozulması
Elmar Tower	2015	50-43	cam+kompozit	-
Konum Beytepe	2016	35	cam+kompozit	-
Horizon Life Beytepe	2017	30	granit-seramik	-
West Gate Rezidans	2017	33	kompozit	Kirlenme, panel renklerinde değişme, panel eksikliği ve panel bozulması
Kumru Ankara	2018	32	kompozit	-
Elya Tower AVM Rezidans	2020	45	cam+kompozit	-

Daha önce yapılan sınıflandırmalardan süreç kaynaklı hasarlar bazında incelenen yapılarda bir takım problemler tespit edilmiştir. Örneğin montaj(yapım ve işçilik) esnasında malzemenin düzgün monte edilememesi, iki panel arasında kullanılacak elastik koruma maddesinin uygun işçilikle uygulanmaması gibi durumlarla karşılaşılmıştır.

Bakım-onarım ihtiyacı, sistemlerin tasarım evresinden itibaren göz önünde bulundurulması gereken durumlardır. Sistem ömrünü uzatabilmek ve kullanım performansını üst düzeylerde tutabilmek adına belirli aralıklarla bakımların yapılması şarttır. İncelenen yapıların cephelerinde kirlenme problemi ile karşılaşılmıştır. Bu da bakım sürecinde temizlik uygulamasının aksatıldığını göstermektedir. Bakım sürecinde kullanılan kimyasal maddeler ve yine bakım için kullanılan asansörlerin yanlış kullanımı sonucu cephe elemanına çarpmalar ve bunların sonucunda yine hasarlar meydana gelebilmektedir. Bu sebeple bakım sürecinin profesyonel ekipler eşliğinde titizlikle yürütülmesi gerekmektedir.

Denetim süreci tasarım, imalat, yapım, kullanım, bakım ve onarım süreçlerinin bütününü kapsamaktadır. Bu aşamaların tümünde cephe sistemlerinin sistematik şekilde denetimi bozulmaların ve hasarların oluşumunu engelleyebilmektedir. İncelenen yapıların bir kısmında cephelere dair yapım, kullanım, bakım ve onarım süreçlerindeki denetimin sekteye uğradığı anlaşılmaktadır.

Giydirme cephe sistemleri sızdırmazlık bileşeni, dolgu bileşeni ve taşıyıcı bileşen olmak üzere 3 temel bölümden oluşmaktadır. Taşıyıcı bileşende nem, su ve aşırı yük etkisinden kaynaklanan bozulmalar görülebilmektedir. Dolgu bileşeninde karşılaşılan bozulmalar ise panel ve cam üretimine dair hasarlar, ısıl gerilmeler gibi sebeplerle meydana gelebilmektedir. Sızdırmazlık bileşeninde, uzun süreler kullanıma bağlı eskimeler sonucu oluşan hasarlar, zararlı ışınların etkisiyle meydana gelen bozulmalar ve birleşim fitillerinin işlevini yerine getiremez hale gelmesi veya eksikliği gibi durumlar, bu grupta karşılaşılan bozulmalardır. İncelenen giydirme cephe sistemlerinde dolgu bileşeninde panel ve cam bozulmaları gibi durumlar ile karşılaşılmıştır. Yerinden çıkan veya gevşeyen kompozit paneller, cam kırıkları

gibi durumlar gözlenmiştir. Ayrıca sızdırmazlık için alınan birtakım önlemler esnasında zamanla bozulmalar ve yanlış işçiliklerle problemlerin ortaya çıktığı görülmüştür. Ayrıca farklı iki malzemenin birleşim detaylarında problemler olduğu tespit edilmiştir. Farklı iki malzemenin ısı değişimleri karşısında genleşme kat sayıları birbirinden farklı olacağından, birleşim detayları özenle tasarlanmalı ve uygulanmalıdır (Yalaz, Tavil & Çelik, 2016).

Yapı kabuğunda yer alan cephe elemanları çevresel etmenlerden yoğun bir şekilde etkilenmektedir. Örneğin UV ışınlarının bozucu etkileriyle cephe sistem bileşenlerinde renk değişimleri veya sızdırmazlık bileşenlerinde hasarlar meydana gelmekte, güneşin sıcaklığı arttıran etkisiyle cephe elemanları büzülmeye veya genleşmeye maruz kalmaktadır. Rüzgar etkileriyle cephe sistemi taşıyıcı elemanlarında kırılma veya cephe dolgu bileşenlerinde kopmalar meydana gelebilmektedir. Ayrıca deprem sebebiyle meydana gelen hareket etkilerine cephe kaplama sisteminin uyum sağlayamaması da bozulmaların meydana gelmesine sebep olabilmektedir. İncelene yapıların bazılarının cephe kaplamalarında ışın etkileriyle renk atmalarının meydana geldiği gözlenmiştir. Ayrıca cephe dolgu elemanlarında kopmalar, eksilmeler ve gevşemelerin de varlığı gözlenmiştir.

Sonuç ve Öneriler

Giydirme cephe sistemlerinin kullanımı gün geçtikçe artış göstermektedir. İlk zamanlarda daha çok ofis yapıları ile birlikte kullanılan giydirme cephe sistemleri, teknoloji ve malzeme biliminde yaşanan gelişmelerle birlikte her yapı türünde kullanılmaya başlanmıştır. Ofislerden sonra konut ve rezidanslarda kullanımı görülen giydirme cephe sistemlerinde birçok etkene bağlı olarak bozulmalar, hasarlar ve problemler meydana gelebilmektedir. Bu bozulmalar, hem binanın yapısal bütünlüğüne, hem de iç mekan konforuna olumsuz etkilere neden olmaktadır. Ankara ilinde incelenen 10 adet rezidans yapısının cepheleri gözlenmiştir. Cephe kaplamalarında meydana gelen hasar, problem ve bozulmalar tespit edilmiş, bu hasarlar sınıflandırılmıştır. İncelemelerin ardında çevresel etkiler kapsamında hava kirliliği, organizmalar ve diğer canlıların etkisi, kimyasalların etkisi gibi sebeplerle en çok görülen problem kirlilik olmuştur. Kompozit panellerde ve camlarda rastlanan bu kirlilik çoğunlukla açık renkli yüzeylerde kendini çok daha fazla göstermiştir. Bu anlamda hem üretim evresinde kullanılacak boyaların kir tutmama özelliklerine dikkat edilmesiyle hem tasarım evresinde belirlenecek renkler ile hem de takip sürecinde cephe temizliği adına alınacak önlemler ile bu sorunun çözümüne dair gerekli tedbirlerin alınması gerekmektedir. Yine dış etkenlere bağlı olabileceği gibi malzeme-bileşen ilişkisine bağlı sebeplerle de meydana gelebilecek panel eksilmesi, panel gevşemesi, cam kırılması ve panel bozulması gibi problemler ile

karşılaşılmıştır. Tasarım, üretim, kullanım, bakım-onarım ve takip süreçlerinde alınacak tedbirlerin doğruluğu ile tüm bu problemlerin büyük oranda önüne geçmek mümkündür.

Belirlenen rezidans yapılarında kullanılan giydirme cephe sistemlerini incelemek, bu sistemlerde meydana gelen hasar ve bozulmaları tespit ederek başta bina tasarımında öncü olan mimarlarda ve bunun yanında cephe tasarımı ile imalat sürecinde yer alan tüm paydaşlarda tasarım, uygulama ve süreç takibine yönelik bilinç oluşturacaktır. Mimarlar ve tasarım, üretim, uygulama, bakım-onarım sürecindeki diğer paydaşların bilinçlenmesi ile birlikte daha sağlıklı uygulamalar ortaya çıkacak, giydirme cephe sisteminin ön görülen yaşam süresi gerçeğe en yakın şekilde uzayacaktır.

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A Research on Deterioration Problems of the Yellow Stone Used in Historic Structures in Cyprus

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Abstract

Cyprus is an island that has a rich cultural identity with its history and historic structures. The building material, which comes up with different names such as Cyprus stone, yellow stone, or sandstone, has been used as the common material of most of the various historic structures. For example, Turkish architectural works in Cyprus from the Ottoman period to the present day reflect the use of yellow stone. Yellow stone is a natural building material that needs to be protected and renewed over time. Famagusta walled city, which has a texture consisting of many historic structures built using yellow stone material, is an exemplary region to benefit from to examine this material. This preliminary study aims to introduce Famagusta and Cyprus stones and to restore the historical buildings in this region with suitable material selection, to make an aesthetic and cultural contribution to the city.

Keywords: Cyprus, Famagusta walled city, yellow stone, natural building material, deterioration.

1. Introduction

Cyprus is an island that has a rich cultural identity with its history and historic structures. The cultures that shaped the historical architecture of Cyprus are the Byzantine (395-1191), Lusignan (1191-1489), Venetian (1489-1570), Ottoman (1571-1878), British (1878-1960), and Republican (1960-1963) periods, respectively. The building material, which comes up with different names such as Cyprus stone, yellow stone, or sandstone, has been used as the common material of many historic structures. For example, Turkish architectural works in Cyprus from the Ottoman period to the present day reflect the use of yellow stone. Historical buildings are divided into three classes which are religious, civilian (Figure 1) and military structures (Turkan, 2016).



(a) (b)

Figure 1. a. b. The Kumarcılar Khan is one of the historic structures built using yellow stone material in the Ottoman period in Cyprus (Öge, 2022).

Yellow stone is a natural building material that needs to be protected and renewed over time. In the interventions that will take place in historical buildings, it is necessary to determine the characteristics of the yellow stone, its quarry, the changes that the stone has undergone over time and its workmanship. The visual and physical properties of the stones taken from different quarries show differences. Famagusta walled city (Figure 2) has a texture consisting of many historic structures built using yellow stone. Thus, it is a sample region that can be used to examine yellow stone material. Literature research and studies have classified the deterioration in historic structures in the area as physico-mechanical, chemical and biological deterioration.



(a) (b)

Figure 2. a. A view from Famagusta Walled City Square (Öge, 2021), b. St. Nicholas Cathedral (Lala Mustafa Pasha Mosque) (Öge, 2022).

This preliminary study aims to introduce Famagusta and Cyprus stones, to restore the historical buildings in this region with suitable material selection, to make an aesthetic and cultural contribution to the city. The fact that many historic structures were built with using

yellow stone in the region emphasizes the importance of the study. In addition, this study aims to raise awareness of society and the users living in the region.

2. Materials and Methods

The building material, yellow stone, has been used as the common material of many different historic structures in Cyprus and Famagusta walled city. The stones used have been obtained economically by using natural resources in quarries (Figure 3.a.) or by mining underground in excavations (Figure 3.c.), or by taking them from demolished structures (Figure 3.c.).



(a) (b) (c)

Figure 3. a. Serhatköy Quarry (Öge, 2022), b. Yellow stones extracted from underground during road excavations (Öge, 2022), c. A demolished structure which was built using yellow stone (Öge, 2022).

Yellow stone is the main material of the study. The investigated stone is a type of sandstone with yellow and white tones. During the restoration of the fortification walls, it was determined that the inner layer of the walls was built using rubble stones, and the exterior layer was built using hewn stones (Figure 4). With the technological developments in quarry management, the stones used have started to be produced as hewn stones. As a result, hewn stone gives more successful outcomes than rubble stone with its smooth masonry, high production standard and wall strength.



(a) (b)

Figure 4. a. b. Fortification walls of Famagusta walled city (Öge, 2022).

As the first step in the restoration work of the historical city walls, biological chemicals called herbicide and biocide are used to destroy undesirable plants and algae on the existing yellow stones. These chemicals help to get rid of the organisms on the stone without harming it. The second step is the stone washing method (Figure 5.a.), which cleans the stone from dead organisms, dust and dirt without damaging it. In the final step, the process continues with stone replacement. It is necessary to pay attention to the dimensions and joints of the stones during stone replacement. According to the data obtained from the stone changes in the walls, the thickness of the stones is 35-45 cm, the width is 20-35 cm, and the length is 30-90 cm.



(a) (b)

Figure 5. a. Stone washing method (Öge, 2022), b. Fortification walls of Famagusta Walled City. After (left side of the wall) and before (right side of the wall) stone washing method (Öge, 2022).

The stones come into contact with the air and begin to harden after the stone-cutting process. The final state of the sandstone is a material that can be easily cut and shaped. Thus, gothic motifs can be easily embroidered on the stone. In the past, 360 churches were built in the Famagusta Walled City (Dağlı, 2015). For this reason, gothic motifs have an essential value. The most well-known of the religious buildings famous for their gothic motifs is St. Nicholas Cathedral (Lala Mustafa Pasha Mosque) (Figure 5).



(a) (b)

Figure 5. a. b. St. Nicholas Cathedral (Lala Mustafa Pasha Mosque) (Öge, 2022).

Dust that comes out when cutting sandstone can be used as bonding or joint mortar (Figure 6.a.). For the preparation of the mortar, dust from the stone, natural hydraulic lime and yellow silt are used instead of binding materials such as plaster. After the preparation of samples, the color of the mortar is tested. During the restoration (Figure 6.b.), the mortar sample with the closest color to the stone texture is preferred.



(a) (b)

Figure 6. a. Mixture of sandstone dust, natural hydraulic lime and yellow silt to prepare mortar (Öge, 2022), b. Restoration of the fortification wall (Öge, 2022).

The examination and identification of historical structures in the Gazi Famagusta walled city have been developed by adhering to the norms obtained in previous studies. This preliminary study was carried out using a two-stage methodology. In the first stage of the study, the history of the Famagusta Walled City (Figure 7.a.) was investigated. Then, yellow stone material was researched and yellow stone quarries (Figure 7.b.) were visited. Data about the yellow stone material were collected, observations were made, and photographs were taken by visiting the area where the structures were located.



(a) (b)

Figure 7. Famagusta Walled City enterance (gate) (Öge, 2021), b. Alayköy quarry (stone cutting tool) (Öge, 2022).

In the second stage of the research, the types of structures were examined, and the stone deterioration was classified. Then, by evaluating the created groups and using the properties of the yellow stone, the types of stone deterioration were examined in the photographs. As a result, the problems in the region were evaluated and targets were determined.

3. Findings and Discussion

The building material, yellow stone, has been used as the common material of many different historical structures in Famagusta Walled City. In the interventions that will take place in historical buildings, it is necessary to determine the characteristics of the yellow stone, its quarry, the changes that the stone has undergone over time, and its workmanship. There are two types of yellow stone in Cyprus. The two main types of stone determine the geological period of Cyprus when the island was submerged and emerged from the water (Erhan, 2018).

The first type of sandstone is a mass that had completed its petrification when the island was not underwater. These stones are found in cities like Famagusta and Kyrenia, which are coastal. Their color is dark yellow and brown. These stones have compressive strength even before it comes out of the quarry, and their compressive strength is higher than the second type.

The second type of sandstone completed its petrification when the island was underwater. It has not met its hardness. It gains its hardness after being taken out of the soil (Figure 8.a.) and out of the quarry. This type is divided into two subgroups in itself. The mass completes its formation in the sea; therefore, the difference in the fossil (Figure 8.b.) diameters of the crustaceans causes the stone to be divided into groups within itself.



(a) (b)

Figure 8. a. Extraction of yellow stone from the ground (Öge, 2022), b. Fossils found in the yellow stone (Öge, 2022).

The most apparent difference between these two subgroups is their soil proportions and colors. (lighter and darker yellow color) (Figure 9)



(a) (b)

Figure 9. a. Yellow stone from Serhatköy Quarry (light yellow colored stone) (Öge, 2022), b. Yellow stone from Alayköy Quarry (dark yellow colored stone) (Öge, 2022).

After the stone is cut, it gains its hardness and original color. In the past, stone cutting was done in standard sizes with the dry cutting method (Figure 10.a.) from the ground. Today, the wet cutting method (Figure 10.b.) is preferred, which is a more up-to-date method.



(a) **(b)**

Figure 10. a. Dry stone cutting machine (Serhatköy Quarry) (Öge, 2022), b. Wet stone cutting machine (Alayköy Quarry) (Öge, 2022).

Sandstone material has an average density value, low compressive strength and high water absorption percent by weight when compared to granite, limestone, travertine, slate and marble (Table 1).

Stone Type	Density (gr/cm^3)	Compressive strength (N/mm^2)	Water absorption (% weight)
Granite	2.56 – 3.20	139 – 309	0.002 – 0.22
Limestone	1.95 – 2.88	19 – 193	0.25 – 7.5
Travertine	2.40	32 – 97	2 – 5
Sandstone	2.13 – 2.75	31 – 108	1.5 – 6
Slate	2.80 – 2.88	124 – 185	0.15 – 0.25
Marble	2.88 – 3.04	93 – 162	0.069 – 0.6

Table 1. Properties of various stones (Rosen & Heinemen, 1996).

The quality of the yellow stones extracted from the same quarry may differ. Stones from the same region can have first-class (Figure 11.a.), second-class (Figure 11.b.) and third-class quality. The General Directorate of ancient arts and museums approves using first-class stones in historic building restorations. As the white veins on the yellow stone increase, the quality and class of the stone decrease.



(a) (b)

Figure 11. a. The first-class yellow stone from the Alayköy quarry (Öge, 2022), b. The-second class yellow stone from the Alayköy quarry (Öge, 2022).

The traditional name of the stone from the Alayköy quarry is Yerolakkos stone (Figure 11) and its petrological family is calcarenite. Their typical color is yellow and their place of origin is Cyprus. Cyprus Stone Development Ltd. obtained the test results (Table 2) of the first-class yellow stone from the Alayköy quarry. The test results were obtained according to the characteristics of the stone by using internationally accepted methods.

Table 2. Test results of first-class yellow stones obtained from Alayköy quarry according to their characteristics (Cyprus Stone Development Ltd., 2022).

Characteristics	Declared values	Test method
Dimensions and dimensional tolerance	Variable, Squared rubble stone / rubble stone	EN 772 – 16, EN 772 – 20 and EN 13373
Configuration	N. A.	EN 772 – 16
Apparent density	1400 – 1500 kg/m^3	EN 1936
Compressive strength: Mean	1.9 MPa	EN 772 – 1
Flexural bond strength	NPD	EN 1052 – 2
Shear bond strength	0.15 N/mm^2	EN 998 – 2:2003 Annex C
Reaction to fire	Class A1	EN 13501 – 1
Open porosity	50%	EN 1936
Water absorption by capillarity	48 g/m^{2}s$^{1/2}$	EN 772 – 11
Freeze – thaw resistance	NPD	EN 12371
Thermal conductivity	NPD	EN 1745

3.1 Turkish Architectural Works Built with Yellow Stone, from the Ottoman Period to the Present Day

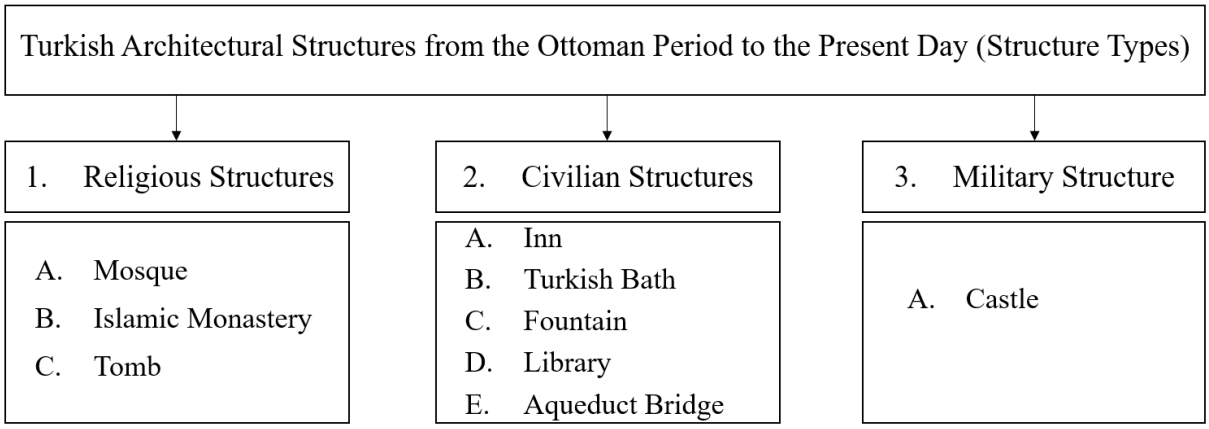
Yellow stone is a local material that forms the architectural texture of Cyprus. The use of yellow stone is found in Turkish architectural works from the Ottoman period (1571-1878) to the present day. These historic structures, which are religious, civilian and military, have completed today's architectural texture of Cyprus (Table 3). The most common structure type that reflects Turkish architecture in Cyprus is mosques. Mosques (Figure 12.a.), Islamic monasteries and tombs are religious structures built using yellow stone in Cyprus. Civilian structures are classified as inns (Figure 12.b.), Turkish baths, fountains, libraries and aqueduct bridges. Castles (Figure 12.c.) are the only subgroup of the military structure.



(a) (b) (c)

Figure 12: a. Arabahmet Mosque (Öge, 2022), b. The Great Inn (Öge, 2021), c. Larnaca Castle (Öge, 2021).

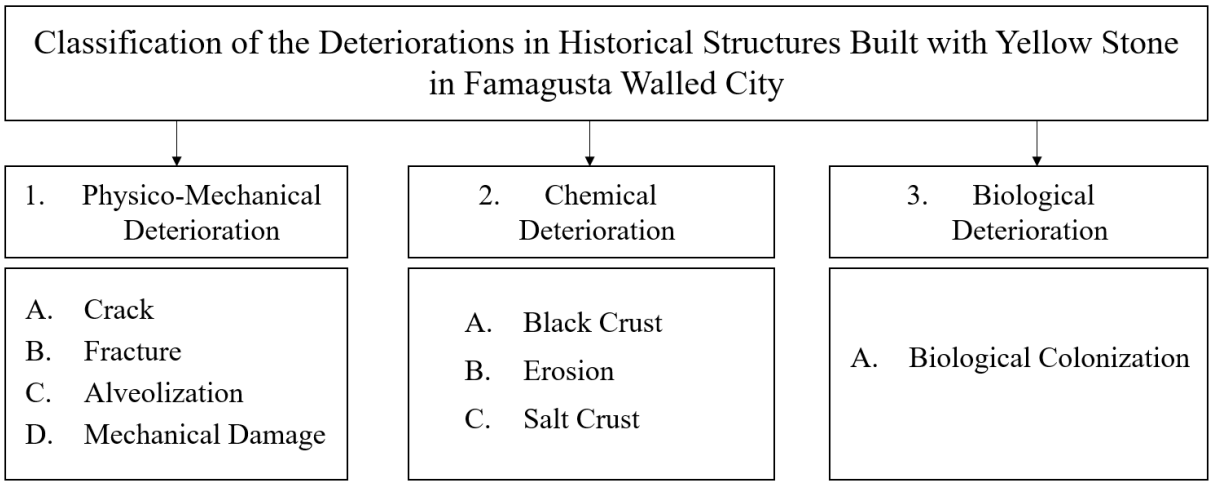
Table 3: Turkish architectural works built with yellow stone, from the Ottoman period to the present day (Turkan, 2016).



3.2 Classification of the Deteriorations in Historical Structures Built with Yellow Stone in Famagusta Walled City

Famagusta walled city, which has a texture consisting of many historical structures built using yellow stone material, is an exemplary region to benefit from examining yellow stone material. This region is close to the seaside, which has high temperature and humidity. Users, other organisms, location, and this type of climate in the region cause deterioration of the stone structures. The rate and extent of deterioration in stone structures depend primarily on climate and time. Literature research and studies have classified the deterioratios in historical structures in the region as physico-mechanical, chemical and biological deterioration (Table 4).

Table 4: Classification of the deteriorations in historical structures built with yellow stone in Famagusta walled city. Definitions are made according to the internationally accepted ICOMOS (2008) source.



Deterioration means the "Process of making or becoming worse or lower in quality, value, character, etc...; depreciation" (ICOMOS, 2008). Each deterioration class is divided into subgroups within itself.

3.2.1. Physico-mechanical Deterioration

Physico-mechanical deteriorations were examined under four sub-titles: crack, fracture, alveolization and mechanical damage. Cracks are hollow folds that occur in a specific direction in a part of the historic structure. The complete separation of components from each other due to harmful external effects of applied force and loss of minerals is called fracture. Alveolization is the formation of independent pits on the surface of a historic structure. Alveolization forms because of the acidic rains and the excess humidity and salt ratio in places near the seaside. The separation of details or parts from historic structures or historical artifacts with an artistic value under the influence of different forces is called mechanical damage.

Cracks; ‘‘Loss of the structure of the binder material which is caused by external factors, the type of stone used, acidic rains, temperature and humidity’’ (ICOMOS, 2008) (Figure 13).



(a) (b)

Figure 13. a. b. Crack in the lower neck part of the lion statue in front of the Othello Castle (Öge, 2022).

Fracture: “Crack that crosses completely the stone piece” (ICOMOS, 2008) (Figure 14).



(a) (b)

Figure 14. a. b. Fractures seen on the entrance facade of the Lala Mustafa Pasha Mosque (St. Nicholas Cathedral) (Öge, 2022).

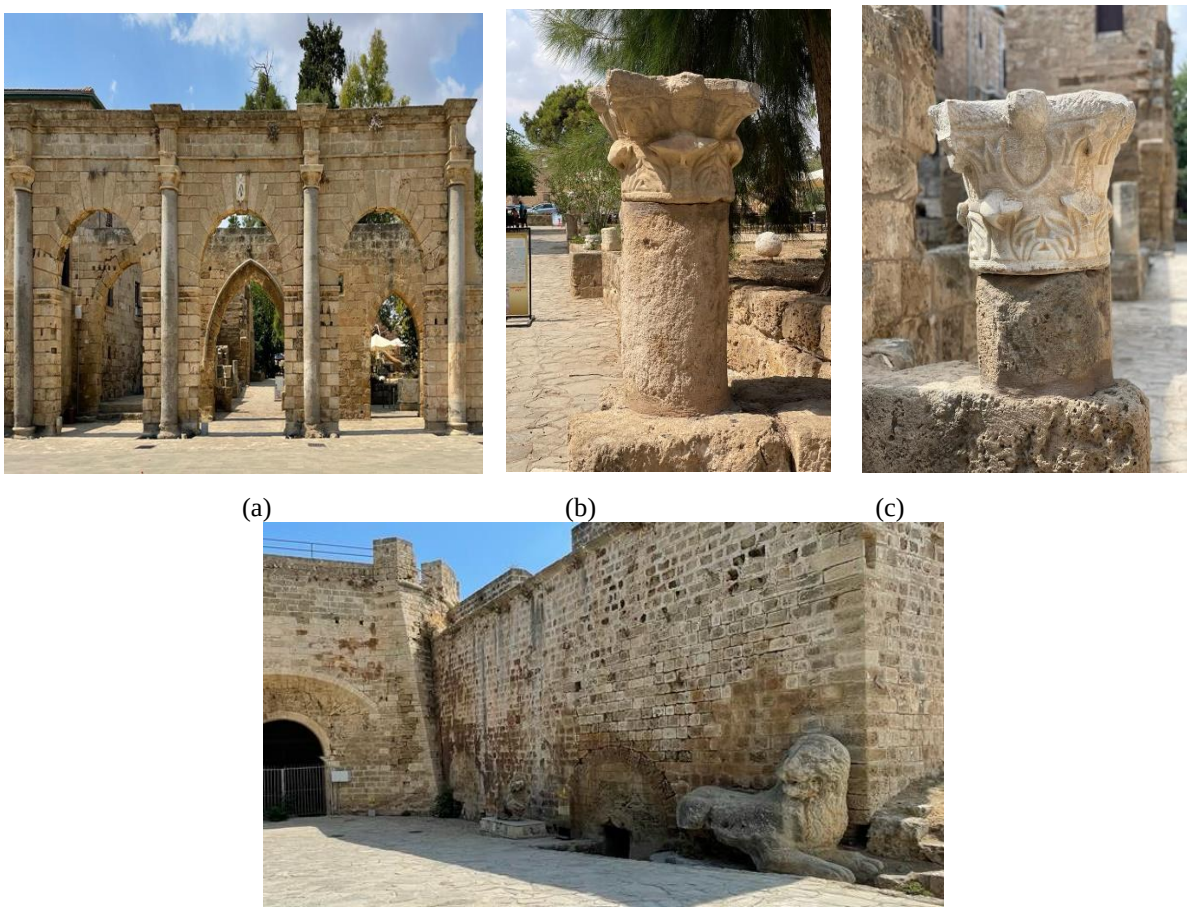
Alveolization: "Formation, on the stone surface, of cavities (alveoles) which may be interconnected and may have variable shapes and sizes (generally centimetric, sometimes metric)" (ICOMOS, 2008) (Figure 15).



(a) (b)

Figure 15. a. Alveolizations seen on the stones on the St. Francis Church facade (Öge, 2021), b. Alveolizations seen on the stones on the Canbulate Gate wall facade (Öge, 2022).

Mechanical damage: "Loss of stone material clearly due to a mechanical action" (ICOMOS, 2008) (Figure 16).



(a) (b) (c)

(d)

Figure 16. a. Loss of materials seen in The Venetian Palace (Öge, 2022), b. c. Broken column pieces due to mechanical actions (Öge, 2022), d. Mechanical damage caused by breaking off the baby lion statue located in the area where the lion statue's hind legs are located (Öge, 2022).

3.2.2. Chemical Deterioration

Chemical deteriorations were examined under three sub-titles: black crust, erosion and salt crust. Black crust forms when the yellow stone is exposed to high humidity and rain. Erosion occurs when the granules of the stone lose their binders and separate from the surface due to climatic conditions or contacts. Salt minerals in the structure of yellow stone dissolve under the influence of moisture or rain. Because of the high temperature in this area, evaporation and crystallization happen immediately. Thus salt crust forms on the surface of the yellow stone.

Black crust: "Kind of crust developing generally on areas protected against direct rainfall or water runoff in urban environment. Black crusts usually adhere firmly to the substrate. They are composed mainly of particles from the atmosphere, trapped into a gypsum (CaSO4.2H2O)" (ICOMOS, 2008) (Figure 17).



(a) (b) (c)

Figure 17. Black crust formation seen on the stones of St. Peter and Paul Church (Sinan Pasha Mosque) facade (Öge, 2022).

Erosion: "Loss of original surface, leading to smoothed shapes" (ICOMOS, 2008) (Figure 18).



(a) (b)

Figure 18. a. b. Erosion and surface loss from frequent human touches on the stones of the St. Nicholas Cathedral (Lala Mustafa Pasha Mosque) facade (Öge, 2022).

Salt crust: "Crust composed of soluble salts, which develop in the presence of high salt levels, and form from wetting and drying cycles" (ICOMOS, 2008) (Figure 19).



(a) (b)

Figure 19. a. Abrasions caused by the effect of salt crust on the stones of St. Peter and Paul Church (Sinan Pasha Mosque) facade (Öge, 2022), b. Partial erosions seen on the stones of the city walls, which are caused by salt crusts. (Öge, 2022).

3.2.3 Biological Deterioration

Organisms can cause damage to structures. The seeds carried by the winds settle in the joint gaps or micro-cavities in the yellow stone. The roots and leaves of the plants growing there damage the stone. Animals and insects can cause damage to historic structures by scraping, climbing, or the acids they produce. Birds and animals such as worms (climbers) can create holes/cavities in the stones and the organic materials they carry can cause the formation of bacteria which causes faster deterioration of the structure.

Biological Colonization: "Colonization of the stone by plants and micro-organisms such as bacteria, cyanobacteria, algae, fungi and lichen (symbioses of the latter three). Biological colonization also includes influences by other organisms such as animals nesting on and in stone" (ICOMOS, 2008) (Figure 20).



(a) (b) (c)

Figure 20**.** a. Damages caused by plants on the stones of the Old Town Cafe and Bar facade (Öge, 2022), b. Damages caused by plants on the stones of St. Peter and Paul Church (Sinan Pasha Mosque) (Öge, 2022), c. The nesting area formed by the birds causes damage to the castle walls (Öge, 2020).

4. Conclusion and Recommendations

This preliminary study used various sources to evaluate the research results on preserving stone structures and artifacts. After literature research on yellow stone material, quarries were examined. Turkish architectural works from the Ottoman period to the present day are studied and classified.

The last part evaluates the stone deterioration in the Famagusta Walled City. Famagusta walled city has been a candidate for UNESCO World Cultural Heritage with 360 churches and many historical structures built using yellow stone. This region is close to the seaside, which has high temperature and humidity. Users, other organisms, location, and this type of

climate in the region cause deterioration of the stone structures. The rate and extent of deterioration in stone structures depend primarily on climate and time.

One of the most critical steps in this study is to investigate the properties of the yellow stone. The deterioration of the yellow stone and the causes of this deterioration should be determined. The repair and restoration method required for each type of deterioration is different. For this reason, the deterioration in the regional structures has been clearly and accurately classified and examined. During deterioration classification, observations were made in the region, research was made, and internationally accepted terms were used. The results obtained from the study should be used to determine the methods of stone protection. People and users should be informed about this manner. This research can be used as a first step while preventing the problems of historical structures in the region. Thus, the protection of historical structures can be adequately achieved. In addition, problems such as wrong material selection, urbanization pressure, and reconstruction method will be avoided. In conclusion, it will be ensured that the works are safely transferred to the future, and their structural integrity will be preserved. While doing this, it is essential to try to protect the value without spoiling the original qualities of the historical work.

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The Impact of Historical Constructions Found in Archaeological Excavations in Recent Years on the Lessons of the History of Architecture

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Abstract

The history of architecture dates back when the humankind put two pieces of stones onto each other. In this respect, architecture isn't the element of a civilized life, however it built sacred ones more. Since the pre-historic period up till now numerous constructions have been built on various purposes. Among these the most popular and the one that is considered the beginning of architecture by the Western World is Egyptian pyramids. In further years the lessons of the history of architecture were enriched even more with scientific books and sources covering ziggurats and ancient cities (Ur, Uruk, Lagash etc.) in Mesopotamia lands and Anatolian cultures. Gobekli Tepe, that is known to be 12 thousand years old as a result of investigations found in Sanliurfa in Turkey, which was found in 1960 and whose archaeological excavations began in 1995 and is open for visits nowadays, as well as Karahan Tepe and alike constructions which date back to the ancient times are studied in the lessons of the history of architecture. Also we have to see how the influence and impact of the data about White pyramids in China, pyramids in Bosnia, pyramids in Brazil, lost pyramids found recently in Egypt (except the known 3 pyramids) and other architectural constructions reached today from pre-historic times have to be on the history of architecture and the lessons. In this article taking the importance of internet and social platforms in speedy spreading of such news and images in the new world into account the question of reviewing the lessons of history of architecture and how they have to be has been analyzed. Thus, considering that students are also aware of such information in social media in a faster way, studying the history of architecture in two directions (with the known history and with the constructions that are newly found) is of importance. The article has covered the data about these constructions found in archaeological excavations in terms of rendering these to the students of architecture and to the world of architecture. The article has been prospered with images and pictures.

Keywords: Pre-historic architecture, the history of architecture

Introduction

The history of architecture dates back when the humankind put two pieces of stones onto each other. In this respect, architecture isn't the element of a civilized life, however it built military, religious or sacred ones more. Since the pre-historic period up till now numerous constructions have been built on various purposes. Among these the most popular and the one that is considered the beginning of architecture by the Western World is Egyptian pyramids (Picture 1).

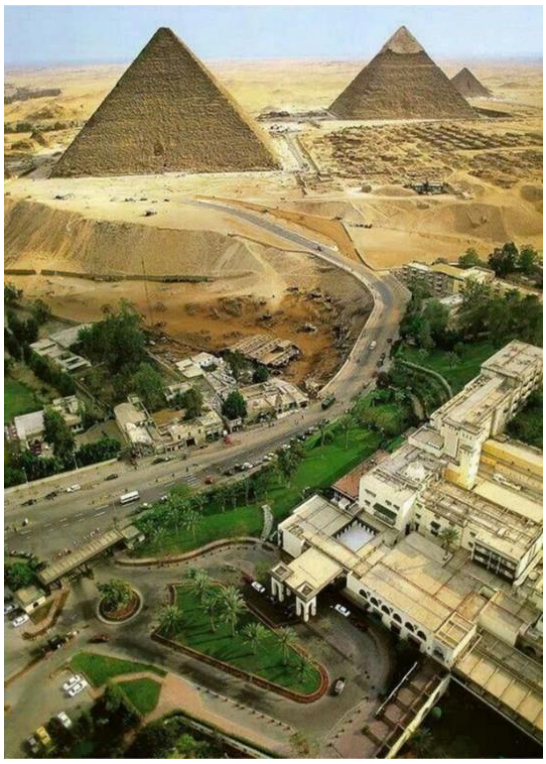


Figure 1. Egyptian pyramids. Giza, Egypt

A pyramid has triangle outer surfaces, and combined in a single point on the top (it is called pyramis in Greek) and it has been built by various cultures in different places of the world. A pyramid's base can be in triangle, quadrangle or any polygonal form.

The Pyramid of Cheops (nearly at 148 m high) which is the biggest of the pyramids that were showed in archaeological sources as they were designed as a pharaoh tomb in Egypt is the only construction reached modern era among the world's seven wonders. Alongside with the Cheops that is in Giza Plateau in Cairo, the capital of Egypt, Khafre and Menkaure Pyramids that are pyramid type are known as important antique constructions (Picture 2).



Figure 2. Egyptian pyramids

Materials and Methods

Pyramids existing in different parts of the world were built by different civilizations. In this respect, historical places, pyramids in the lessons of the history of architecture, recent important archaeological findings that can change the history of mankind contain the material and method of our topic. The Pyramid of Cheops that is the biggest among the pyramids that are said to have been designed as a pharaoh tomb in Egypt was built in between 2580 and 2560 B.C. as a memorial tomb and it was named after Egypt pharaoh Khufu. (Picture 3 ; 4). Cheops is 146,7 m high. In the construction of Cheops materials such as granite and limestone were used. Original Cheops pyramid is known to be covered with stone tiles outside.



Figure 3



Figure 4

Though it is mentioned in archaeological sources that there are many pyramids remained from antique periods in Egypt, only 3 pyramids Cheops, Khafre and Menkaure were highlighted.

The biggest pyramid in volume is Great Pyramid of Cholula in Puebla, Mexico, it is approximately 4 times bigger than Cheops. (**Figure** 5).



Figure 5. Great Pyramid of Cholula in Puebla, Mexico

Great Pyramid of Cholula is a construction that was inherited from Aztecs and it is in the form hidden inside a mountain in Mexico. According to Aztec mythology, a pyramid whose peak can reach Heaven is claimed to have been built by a giant. But archaeologists claim that thousands of workers worked to build this pyramid for hundreds of years.

Though Teotihuacan is also remembered as an Aztec city, it is said that it is the city they lived, not they built. They went on their lives here till the Spanish came. [1]

According to an article published in the website Science Alert, the world's biggest pyramids are in the capital city Mexico in Mexico.

The pyramid that is known as Cholula or Tlachihualtepetl is made of seven pyramids put onto one another (Figure 6).



Figure 6.

Its dimensions are 450 by 450 meters at its base and at 66 meters high.[2]

No written document has been found about the pyramid's construction or beginning of its construction.

Temple I – that is also known as Great Jaguar Temple – This pyramid which is 44 m high is called Great Jaguar because of the carved jaguar figure on the main door's bow (it is an architectural block put on vertical spaces such as door and window in a horizontal form and enables the wall to go on in constructions) (Figure 7).

[1] http://gezginyuzlersitesi.com/gidilen/teotihuacan-piramitleri-meksika-emel-firatli-video-destekli/ TEOTIHUACAN PYRAMIDS (MEXICO) – EMEL FIRATLI (VIDEO SUPPORTED); access date 04.09.2022 13:00

[2] https://www.irfankaygisiz.com/2018/11/06/dunyanin-en-buyuk-piramidi-cholulanin-sirlari/



Figure 7. Great Jaguar Temple

Temple II or in another name Mask Temple located in Grand Plaza in Tikal archaeological sphere, Guatemala. (Figure 8).



Figure 8. Mask Temple located in Grand Plaza in Tikal, Guatemala.

Antique Maya city near Guatemala's Flores city, Tikal's (in another name Yax Mutal) North Acropolis. Professor in Architecture Herbert Stanley Loten in Carleton University writes "North Acropolis appeared in between 350 B.C. and 200 B.C. and it seems like it was reconstructed for several times in the history of the city." in a study published in the work "Tikal: Dynasties, Foreigners & Affairs of State". Acropolis covers a field bigger than 1 hectare. (Figure 9).



Figure 9.

Bosnia Pyramids and Ravne tunnel

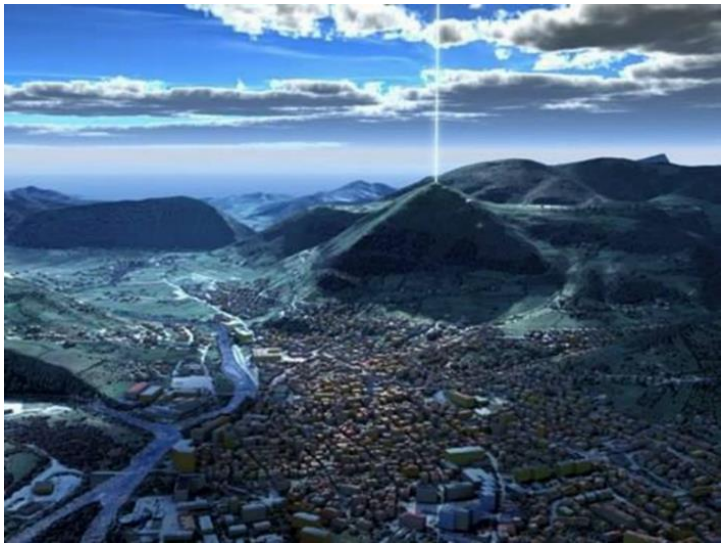


Figure 10.

Semir Sam Osmanagich discovered the first pyramids of Europe near Visoko city in Bosnia and Herzegovina in 2005 (Picture 10; 11).



Figure 11. Sun pyramid in Bosnia.

Bosnia Pyramids are in Visoko 20 km away from Sarajevo. There are 5 pyramids in the pyramids chain. The biggest pyramid (in the picture) Sun pyramid and the world's highest pyramid with 220 m height. Other pyramids; Moon, Dragon, Earth and Love (Picture 12).

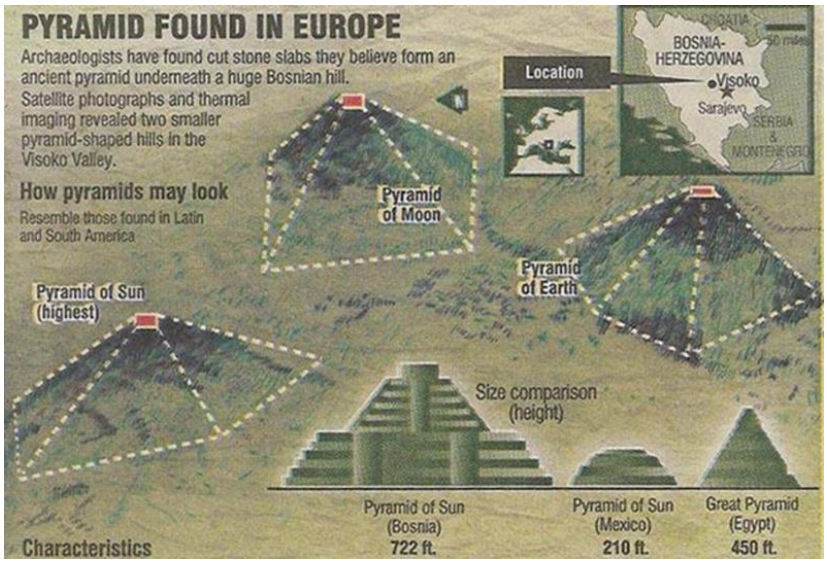


Figure 12

Ravne tunnel found in 2005 was cleaned 1500 m as a result of 6-year cleaning work inside the tunnel beginning from 2010 and a tunnel labyrinth was revealed (Figure 13: 14).



Figure 13



Figure 14

Labyrinths going 200 m deep under the land.. It is unclear by which cultures these were made..

White pyramids in China.

The biggest and the highest pyramid in the world is White Pyramid and it is 300 m high. It is located 100 km near Shiyan city, capital of Shaanxi province in China's middle class. White

Pyramid isn't the only one in the area. It is known to exist nearly 100 big or small pyramids around it (Figure 15).

These pyramids have a straight hill form such as Central America pyramids. White Pyramid is the biggest in central complex consisting of sixteen pyramids.



Figure 15. White pyramid in China

White pyramid was the first observed by American pilot James Gaussman who was carrying equipment in C-54 plane from India to Chungking during the World War II and reported to his administration. The photo he took from the plane was first published in 1957 in Life magazine. After 1994 photos of other pyramids including White pyramid were published for many times by several publishing companies (Figure 16).

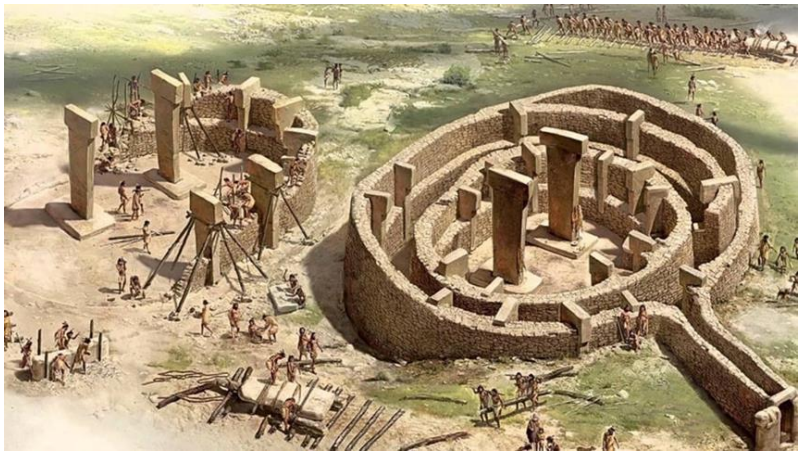
China declared the whole place a forbidden area, planted trees and tried to show pyramids like hills to impede pyramids to be seen from satellite photos. Today from satellite photos the existence of pyramids are clearly seen.



Figure 16

Finding that changed the history of mankind: Göbeklitepe

Gobeklitepe whose history dates back to 12 thousand years ago is considered to be built in 10.000 B.C. Gobeklitepe which is older than megalitical temples from 3600 B.C. in Malta, Stonehenge and Egypt pyramids is the oldest temple in the world with this feature (Picture 17; 18).



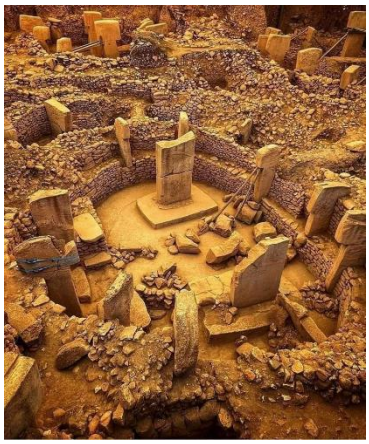


Figure 17 & 18. Gobekli Tepe, Turkey's Remarkable Archaeological Area.

On which purpose has the construction built 12 thousand years before Egypt pyramids been used and then why has it been closed knowingly?



Figure 19. Detail of animal figure reliefs

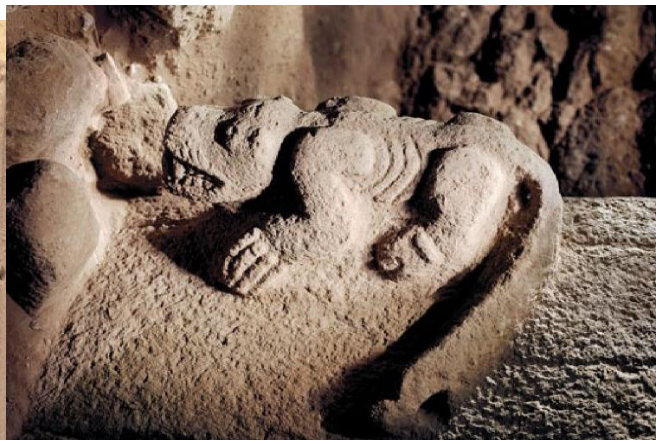


Figure 19a



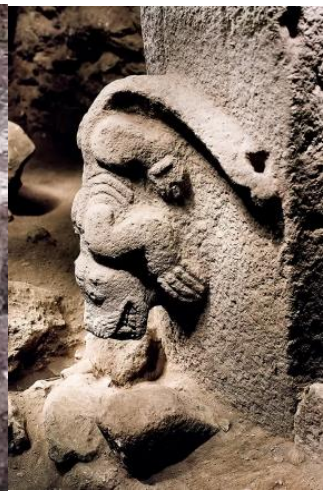


Figure 19 b Detail of animal figure reliefs Figure 19c

UNESCO included Gobekli Tepe in the tentative list of World Heritage in 2011





Figure 20 Detail of animal figure reliefs Figure 21





Figure 22 Detail of animal figure reliefs Figure 23

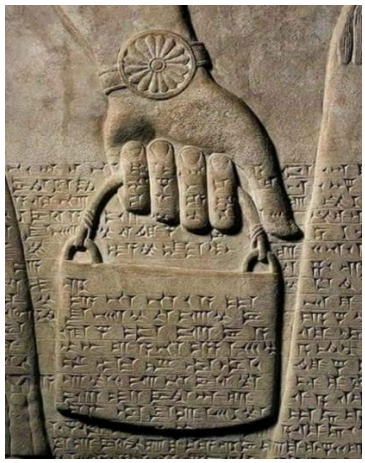


Figure 24. A handbag that is seen in Sumers' God images who ruled Southern Mesopotamia between 4000-2000 B.C. and who was accepted as the oldest civilizations of the world



Figure 25. A handbag seen in the image on T-formed column in Gobeklitepe.

Gobeklitepe or Gobekli Tepe is the collection of the oldest cult constructions known in the world located in Orencik village joint to Haliliye district, 18 km in the northeast from Shanliurfa district center of Turkey. In some popular sources it is remembered as "zero point of the history" too.

Karahantepe

Karahantepe is located 55 km from the city center of Shanliurfa, whose separate mountains are in National Park, it was found in 1997.



Figure 26



Figure 27.

AB construction

AB construction is thought to be built for special purposes which was carved in main rock in 8×6 m. In the middle of long wall of the construction there is a human head (Picture 28; 29). In the head whose neck reminds of a snake and goes out of the rock a man is characterized. In front of this head four fallus form obeliks in the front line and six in the back line were located. You go down to the construction from its side with stairs, and from its other edge you can go up with other stairs. Taking all these into account the construction is believed to have ritualistic action.



Figure 28. Sculpture of a man carrying a leopard on his back.

In excavations conducted in Karahantepe under the leadership of expedition leader Prof. Dr. Necmi Karul four different constructions and sculptures such as a man carrying a leopard on his back were revealed. Findings were moved to Shanliurfa Archaeological Muesum and made open for public.



Figure 29. The sculpture of a sitting man

Mithras Temple in Diyarbakir



Figure 30**.** Zerzevan Castle, view from air. F: Zerzevan Castle Excavation Archive

Zerzevan Castle Mithraeum.



Figure 31. Zerzevan Castle Excavation Archive[3]



Figure 32. Zerzevan Castle Mithraeum. F: Zerzevan Castle Excavation Archive[4]

Kortik Tepe

Location place of tell that is located in Pinarbashi hamlet of Agil village joint to Bismil district of Diyarbakir and known as "Kortik Tepe" in archaeological literature cover 100 x 150 m2' area (Figure 33).

[3] https://arkeofili.com/diyarbakirdaki-zerzevan-kalesi-unesco-gecici-listesine-girdi/
[4] https://arkeofili.com/diyarbakirdaki-zerzevan-kalesi-unesco-gecici-listesine-girdi/

As it is in the intersection point of Botan River and the Tigris (Dicle) River it is of importance in terms of economy and ecology.



Figure 33.

Ziggurat

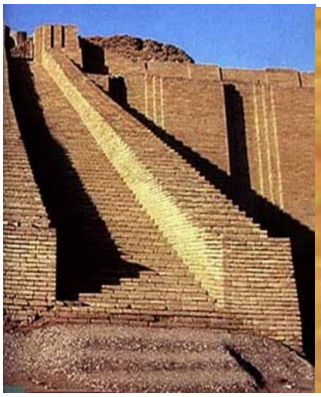


Figure 34

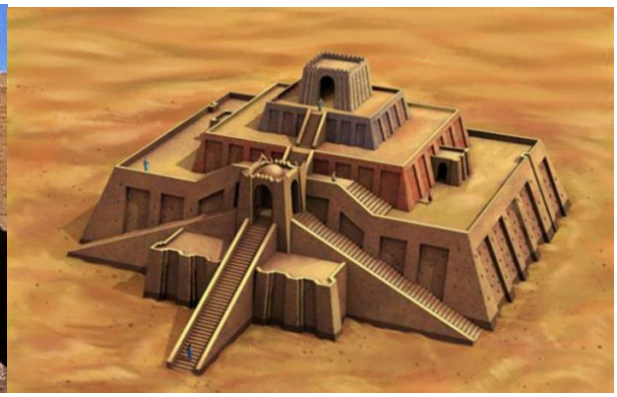


Figure 35

Though ziggurats used by cultures of Babylon, Sumer and Assur look like pyramids at first sight, they have architectural construction such as its surface is flat unlike pyramids (Picture 34; 35).

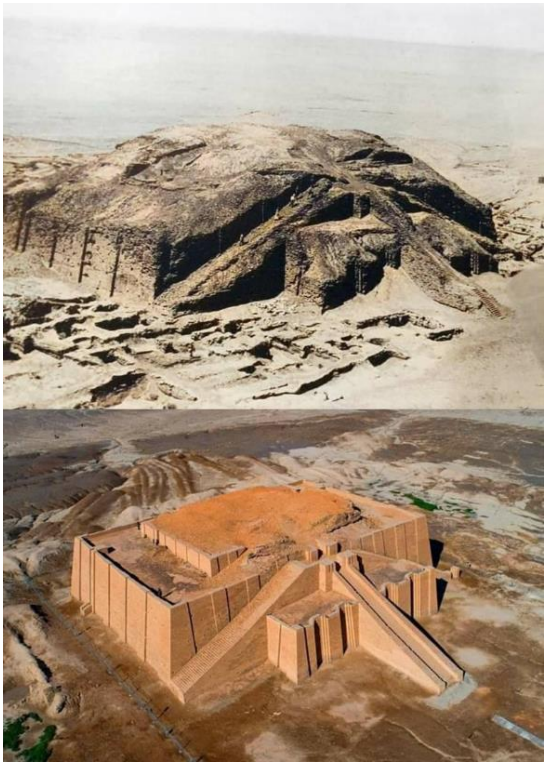


Figure 36. Ur's Great Ziggurat. Before And After Excavation And Restoration



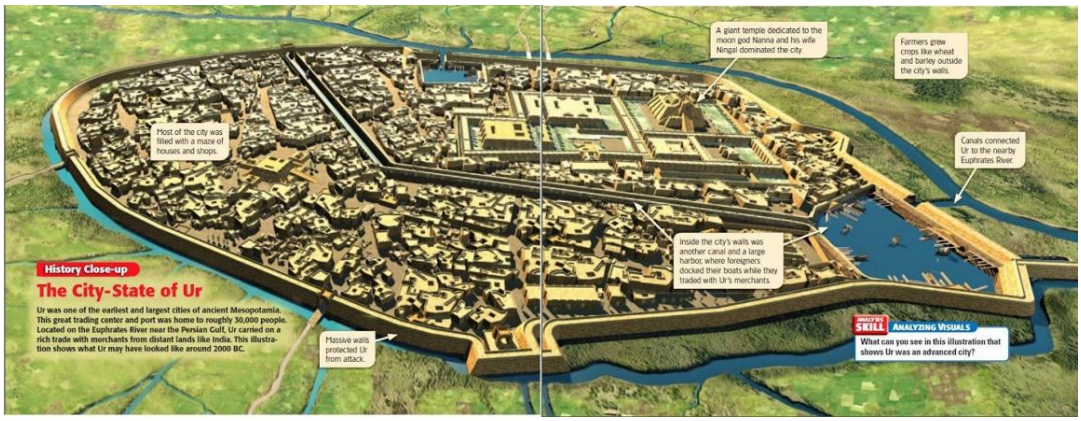
Figure 37



Figure 38

And the number of the ziggurats known in the world is 28 in Iraq (Picture 37; 38) and 4 in Iran which make 32.

Ziggurat castles which make the foundation of the story of Babylon castle that is talked about in Bible too which is sacred book of Christians, the name of temple castles located in today's Iran and old Mesopotamia valley and look like pyramids that have terrace.



Picture 39. It was like this in early 3000 B.C. In 2000s B.C. Babylon, Assur dominated all Iraq. Erbil / Iraq

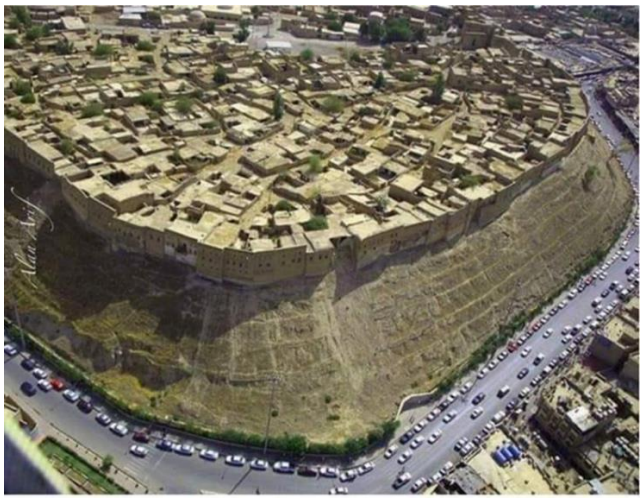


Figure 40. Erbil Castle Which İs Also Known As Hawler Castle, Erbil Which İs One Of The Oldest Cities Of The World.

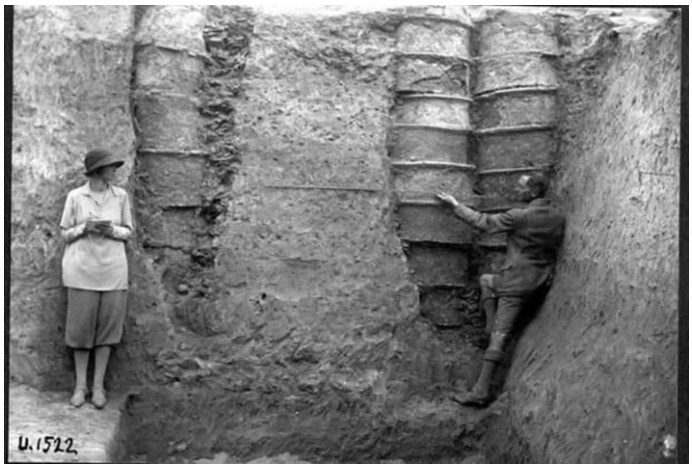


Figure 41. Sir Leonard Woolley and His Wife While Analysing Sewerage System şn Iraq.

Leonard Wooley started excavations in order to find history of Mesopotamia and to discover Sumers in 1922. He found tombs of Sumer kings in the city Ur. Also he revealed the list of Sumer kings who lived before "Great Storm". The excavations lasted till 1929. Archaeologist published his results in his book Mesopotamia when he finished excavations.

First irrigation and waste water channels were found in Mesopotamia.

The scope of the study

It is addressing some of historical constructions built in prehistoric period in the world: pyramids, ziggurats and new archaelogical findings of recent times like Gobekli tepe, Karahan tepe, Kortik tepe etc. that changed the flow of the history via visual media and through articles and books written by scientists in a systematic way in the lessons of the history of architecture, and visual photos and videos have been included from internet links too.

In the lessons and research assignments of the history of architecture being systematic of the B.C. constructions have been covered.

Results and Offers

Images are among main teaching resources. As much as writing, images are explanatory, pragmatic and full of data.

Hence, students should be directed to use the opportunities of internet to the maximum in order to learn about exact main constructions related to main antique cultures and historical periods and new historical architectural constructions found as a result of archaelogoical excavations in recent years.

Gradually various data can be obtained. In this respect, considering syllabus students will be given information in the light of new findings, images or videos are demonstrated if there are any, and in research topics some can be added.

In alternative TV programs (tv 100; ezberbozan tv and youtube) scientists' views about architecture of antique period can be used too.

Students will be able to get information about distinct features and resulting products of different architectural styles as well as know them and be informed about approaches and works of antique periods.

The East is the other face of the West, so it is very essential to know constructions of antique period in the East as much as we know Western culture.

Students will be able to know and get information about architectural constructions' (which were revealed in archaeological excavations) distinct features in which art, architecture and engineering were used altogether.

They will get information about the history of their field and more useful knowledge that will help today's youth to be more informed in the light of new findings being crucial in historical period.

And teachers should also brighten and improve themselves constantly in the light of these innovations so that they can both renew their knowledge and make the lessons more useful for students with the innovations in their field benefitting from the opportunities provided by developing technology. Recently museums' being open to online trip plays an important role in this topic.

Success of an educational institution is directly proportional to the scientific success of teachers who work hard, who love their motherland and job in today's conditions. Such kind of historical places mustn't be limited to social platforms, TV or youtube for teachers and students, trips should be organized as much as it is possible.

It would be suitable to summarize our research with Semir Sam Osmanagich's idea 'If beginning has changed, all the following will change too'.

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A Hybrid Study Module Between Architecture Schools and Architecture Offices

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Abstract

Contemporary educative processes of architectural design studios in universities often aim to develop conceptual links to creativity. Despite the evolution of creativity, the link between reality and creativity can be weakened in some circumstances of architectural practice. Architects who are working in architectural practice mostly have to deal with problems and requests of the employer. This vicious cycle sometimes limits them in decision-making about architectural issues even though the specialization difference between architects and employers. Additionally, architects demand to be aware of regulations and limitations but these are not taught in a detailed way at architecture schools and they need to learn within their professional life. It can be claimed that a disconnection between universities and professional life is shaped by today's rapid production environment. Although most educative processes encourage students to relate abstract and concrete and to look critically, that may cause weakness in technical parts and contribute to setting a boundary between the practice and education. For this condition, can a transitional phase be questioned with a hybrid system that benefits from the creativity and conceptual connection of architectural education and interprets the reality of architectural practice at the same time? A hybrid study module named "Pratikte Mimarlık Atölyesi" was implemented on a group of architecture students to gain a deeper understanding of this topic and recognize its shortcomings more holistically. As a system of this hybrid study module, a 5-day workshop was organized for constituting a transitional stage between architectural firms and education. Students worked on architectural studies with architect mentors in many steps of the concept development process, from fieldwork to plan implementation. Summarily, the hybrid study module and its interrogative workshop have the intention to strengthen the ties between academia and professional life and build a bridge between students and mentors.

Keywords: Architectural education, architecture student, architectural practice, hybrid study, design studio.

Introduction

Pedagogical approaches and methodological preferences on architectural education vary in each university. The evolution and transformation of education systems are mainly based on socio-political conditions and significant movements that universities or academic atmospheres affect. In Turkey, formalized architectural education began in Istanbul in 1883 during the Late Ottoman Period, while the Beaux-Arts style predominated the institution's early years (Demir, 2008). Several undergraduate programs using the American Education model were launched with the founding of the Turkish Higher Education Council in 1957 (Cordan, Gorgul, Numan, & Cincik, 2014). Considering all these occurrences and their

reflections on pedagogy, it can be said that various models influence architectural education in Turkey during different periods regarding the determination of education content. ITU claims that the emphasis of general education at the ITU Department of Architecture is 15% vocational, 25% artistic, 35% academic, and 25% technique-focused (Guney, 2015).

Since architectural education, especially the design studio, is principally based on imagination, contextualism, and abstract thinking, the current architectural design studio pedagogy at Istanbul Technical University also focuses more on critical-creative thinking and imaginative, cutting-edge approaches than processes that practical necessities or technical requirements are prioritized. The content of architectural education can be defined as providing the student with an informed experience of what is happening so that this practice is not accidental in future experiences (Uluoglu, 2000). In project studios, tutors predominantly concentrate on the concept, scenario, and visual-textual narrative of the project established through abstract thinking. On the other hand, professional practices in architectural offices keep a differentiated process for developing projects, such as achieving special requests from employers. These requests sometimes limit them in decision-making about architectural issues even though there is a specialization difference between architects and employers. At the preliminary project stage, the architect must create the exact requirements program of the architectural work he has taken. This program is developed according to the function of the building, the employer's wishes, and legal restrictions, and the cost ceiling is determined in line with the information received from the employer (Yazıoglu, 2007). Additionally, architects demand to be aware of current regulations and limitations. However, these are not taught straightforwardly in architectural education in universities, and they need to learn within their professional life.

The lack of preparation for professional life can be evaluated as a shortcoming of architectural education. This may occur due to an excessive focus on the goals of education and the weakness of some links with reality. While architectural education is well-structured in terms of an abstract sense of design, a lack of concrete sense may cause architecture students to be weak in architectural practices' design process. When the course hour percentages of the courses in the curriculum of the Department of Architecture are examined, it is seen that the majority of the curriculum consists of design courses (39.3%) and structural system and material courses (18.3%), and in this system, the courses that will prepare students for professional life are offered with the lowest percentage (1.3%) (Topraklı & Bengi, 2020). It is seen that newly graduated architects come out with works that lack the context of

fundamental ideas such as analysis in the design process, placement, entrances, and public and private spaces. Together with these design processes, the assumption that the addressed audience is continuously educated academics causes the project to be expressed in a complex way in terms of graphics and verbal explanations.

The expected weakness raised the question of strengthening the weak points between architectural education and practice. These points to be mentioned in the workshop will shape the whole event. While many architectural workshops examine the relationship of architecture with other fields and abstract concepts of architecture, the points addressed in this study make a distinction from others. The workshop "Pratikte Mimarlık" was organized by Aslı Architecture, which may be a transitional phase, strengthening the context between the university and professional life and developing a hybrid approach between education and architectural practices. That hybrid study module named "Pratikte Mimarlık Atölyesi" was implemented on a group of architecture students to gain a deeper understanding of this topic and holistically recognize its shortcomings. It was possible to make a concrete comparison with the outputs of this study. In this context, this paper discusses whether a transitional phase is questioned with a hybrid system that benefits from the critical-creative and conceptual connection of architectural education and interprets the reality of architectural practice simultaneously.

Materials and Methods

"Pratikte Mimarlık" workshop was born with the imagination of how to strengthen the context between school and professional life, creating a hybrid work with education and business life. The workshop has been prepared so the students can preliminarily encounter with the simple methods of design used at office in accelerated way. The workshop revived the actual beginning of the architectural project. This process includes the site seeing, conceptualization, analysis of the site, determination of the needs of the employer, designing with regulations, masterplan organization, and preparation of a comprehensive presentation about previously mentioned steps. These phases are organized by communicating with the Aslı Architecture managers and architects. The workshop is organized for five days for ten students and daily planning can be seen in Table 1. Workshop announcements were made through social media, and people can apply directly in this way. Twenty-five people from different universities studying architecture were applied to the workshop, and ten students were chosen. The participants are studying at the Faculty of Architecture at Istanbul Technical University. The reason that we were choosing participants from Istanbul Technical University is that students

are struggling with similar problems during the education period. In addition, the ITU Faculty of Architecture holds a strong potential to be a fruitful case for designing on conceptual and abstract ideas. The participants were selected, with Aslı Architecture's administrators and architects taking into their portfolios and recommendation letters.

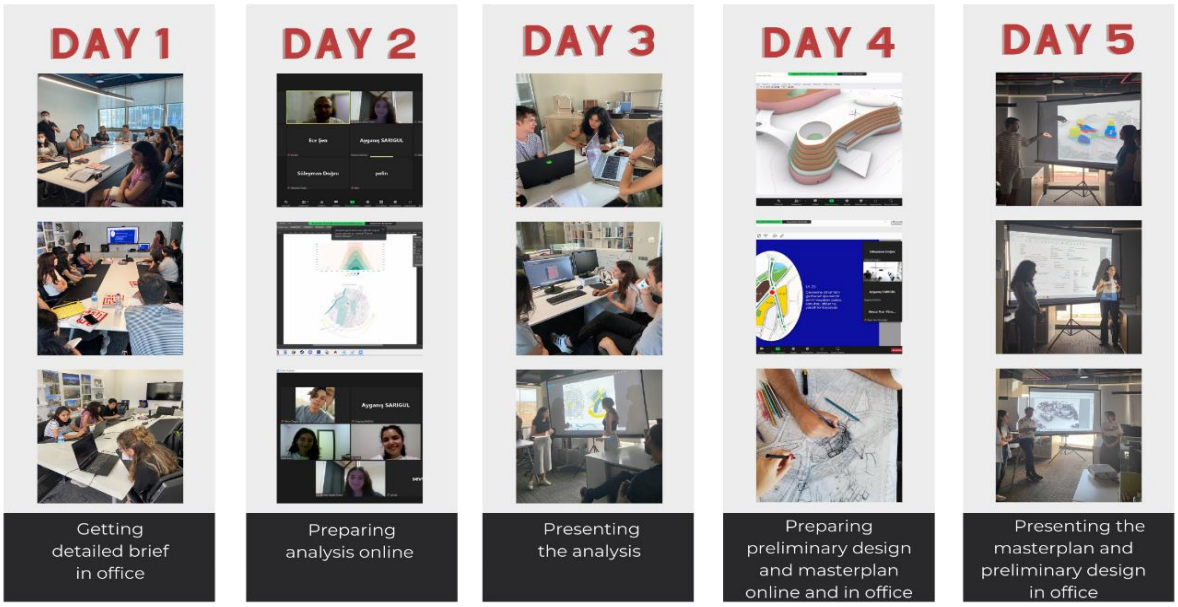


Table 1. Daily workshop program

After the selection process, a meeting was organized, and an introduction to the workshop was given to the participants. In this meeting, firstly, brief information was given to the participants and organized a site visit on the day before the workshop started. The brief information prepared by the office contained the site information and customer needs inside of it. The project area was located in the Yenisahra neighborhood in Ataşehir, Istanbul. Istanbul has received irregular migration to regions such as Yenisahra, and these migrations have also determined the urbanization and settlement of the place (Egüz, 2016). In this context, the project was an urban transformation project covering three parcels according to the new development plan of the Yenisahra. It was requested by the customer that the functions of the to be built here should be mixed-use. Accordingly, it was necessary to use different disciplines throughout the project, such as landscape architecture or city and regional planning. It was a prevailing situation that participants were facing in school. A design studio is seen as an essential part of architectural education, and students should learn by doing while reflecting, thinking, and doing as they work to solve given design issues (Demirbaş & Demirkan, 2003).

Therefore, for many reasons, workshop and educational processes had similar processes while developing a project. Before starting the workshop, a field trip was organized to understand the place better so the participants could understand subjects such as scales more easily. After this day, the first day of the workshop started in the Aslı Architecture office with brief detailed information and learning about the group members and the mentors of the groups. They are working as architects in the Aslı Architecture Office. Afterward, the second day was an online day group working on on-site analysis with their mentors. Groups got to know the field better today with this study. The third day was jury day, where groups presented their work to the office workers. Before it, groups prepared presentations that contained analyses and diagrams of the site. After the presentation, office workers gave critics about the group's presentation methods, analysis, and outcomes. Also, the most striking part of this was creating an atmosphere of the actual customer and office relationship. At the same time, the participants had the opportunity to make presentations in the professional office.

The fourth day started with the groups gathering and evaluating their received critiques. Then, they started preparing preliminary designs and master plans. On the other hand, as design decisions began to become apparent, mass models also start to emerge. Additionally, the fourth day was organized as an online day, but one of the groups came to the office because they said they could be more effective in this way, but the other two groups continued their study online. The fifth day was the busiest day of the workshop because groups needed to finalize their works and be much more careful about their presentation after the critics they got. As a result, groups made their presentations and discussed the missing points of their projects. The workshop ended with everyone thanking each other. Participants and the architects discussed the experiences they got from this workshop and the learnings from it.

After that, we sent two different forms to the participants to collect the results of this study. The first form consisted of direct questions about experiences that participants got from the workshop. For instance, some questions were: Can you tell us about your experiences expressing yourself when considering the work and school environments? How do you evaluate the project perspective as an academic approach and a professional approach? What kind of deficiencies or contributions of the academic education you received during the workshop did you notice? Etc. The second form was a comparative survey in which participants could evaluate the situations by giving numbers to them. They scored similar statuses separately, so comparing professional and academic life was very helpful. For instance, some situations were: How much do you think the critics you received at the

workshop improved you? How much do you think the critics you received from the project tutors at the design studio improved you? Etc. This form made the outputs much more visible because of the numerical assessment.

Findings and Discussion

The results of the "Pratikte Mimarlık" were analyzed together with the observations and feedback from the subject group. Methods for observing and evaluating results are also described above. While the open-ended questions showed us the participants' evaluations of the process, the numerical questions enabled us to evaluate them with comparison and statistical values. When the results were evaluated numerically, they showed some differences between the workshop and design studio courses, which can be seen in Table 2. The results of the university and workshop in the evaluations out of 10 in the determined criteria are as follows; personal productivity 6.1 and 9.1, creativity 8.3 and 6.6, focusing 6.6 and 9.4, time management 5.7 and 7.4, group working productivity 5.5 and 7.9, motivation 7.5 and 8.5, feedback quality 8.3 and 7.6, presentation performance 7.7 and 6.5, stress level 5.6 and 5.6.

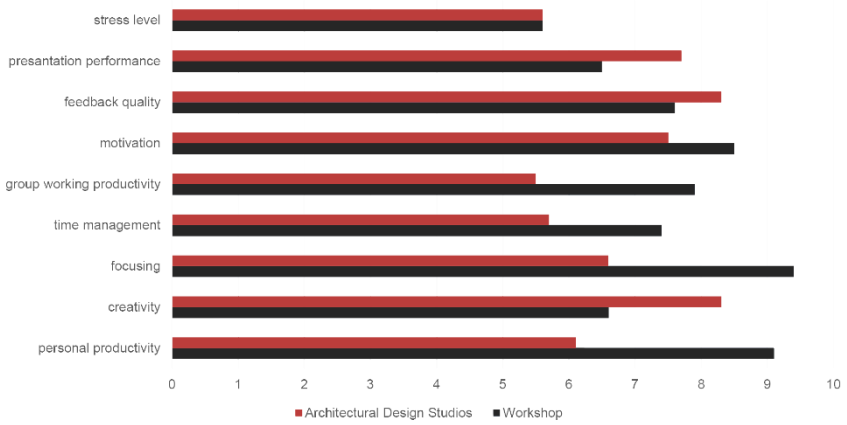


Table 2. Comparative values out of 10

When looking at the table and at the same time observing the feedback of the subject group, it is seen that the workshop has more practical aspects than the design studios in some subjects. Some criteria, such as time management, group, and individual work efficiency, motivation, and productivity, are some of the issues caused by the environment and process management. It was seen that the office environment increased productivity due to the silence, order, and work of architects. At the same time, the efficiency of group work increased with the working architects' mentorship in the office. The clarity of the given times and job descriptions helped the workshop to achieve positive results in time management and production. The fact that the participants knew that the subject studied would be applied in the future caused their

motivation to be higher. In general, it can be thought that the working environment, the work atmosphere, and process management provide these positive effects.

However, the table also shows that architecture schools are more efficient in terms of creativity and apply abstract concepts more efficiently. Giving all the details of the subject of study in the workshop shows that it causes the workshop to be weaker in terms of creativity. In general, it can be thought that the working environment, the work atmosphere, and process management provide these positive effects. It has been shown that the workshop is less efficient in terms of presentation stress and efficiency, as it was held at the end of a busy day, and many architects criticized it. The crowded office and the lack of a familiar environment in the school also caused stress for the students.

When looking at open-ended questions, many different answers appear. One of the most common answers is that it refers to group work and working efficiency. Group working is one of the most important issues in architecture. Teaching to student groups is the most typical and established method, and his approach is primarily centered on teamwork and is applied in existing school spaces and resources (Legény, Špaček, & Morgenstein, 2018). Some of the answers of the participants are as follows;

-"I think I have improved in expressing my ideas and making decisions with the group."

-"I produce more slowly myself. However, I can say that my productivity has increased with the criticism we made between the division of labor and us."

These answers are the sentences that show the efficiency and process of the workshop were positive. The answers also convert the ratios shown in the numerical table into words. In addition, the office's projects in different areas have shown the efficiency of its interdisciplinary work to the students together with the mentors. In addition, the office's projects in different areas have shown the efficiency of its interdisciplinary work to the students together with the mentors. On a national and international level, Aslı Mimarlık offers projects and consulting services in architecture, urbanism, and interior architecture (Aslı Architecture, 2022).

Conclusion and Recommendations

The process, discussions, and outputs of this workshop showed that there are weak points in the transition period between each other due to the differences in education and business life. "Pratikte Mimarlık" workshop, the positive results mentioned in this paper, has shown that it can be a solution to this problem. This hybrid study module and its interrogative workshop intend to strengthen the ties between academia and professional life and build a bridge

between students and architectural companies. As a last words, by learning from the feedback and enriching it, it is determined that it will guide future studies as a study module.

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The Visual Evolution of Baku

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Abstract

Baku, the capital of Azerbaijan, has been one of the emerging and developing cities in the world over the last decade. The rise in the population along with the newly-built large infrastructure and construction projects which represents the economic prosperity of the city had a remarkable impact over the general image of Baku. However, there are also negative consequences of large-scale, unregulated construction projects implemented both in central and remote sites which over time harmed the artistic view of the city. This problem still remains relevant and requires appropriate solutions.

Keywords: Baku, Inner city, visuality.

Introduction

Since the medieval ages, travelers who visited Baku had written historical records about the city, its unique nature, appearance, and architectural monuments. Baku, as a city, was initially formed within the fortress walls of the "Inner City" (also known as Icherisheher) during the medieval ages. Thereafter, when Azerbaijan was part of Tsarist Russia, the city began to develop and extend beyond the walls of the "Inner City". The historical development of Baku during the capitalist era is reflected in the books of the well-known scientist Shamil Fatullayev. The development stage of Baku during the Soviet era had attracted the attention of numerous scientists, but the most detailed information about that era was written by Rena Efendizadeh in her book named "Azerbaijani architecture of the Soviet era".

Materials and Methods

There are a number of photographic materials reflecting the general artistic image of Baku from all the historical periods mentioned above. These photographic materials belonging to the different historical periods reflect the characteristics of the developing artistic view of the city. It is possible to clearly observe the characteristic features of its development until the 70s and 80s of the last century. As might be expected, the overall visual context of the city as a whole is possible due to these valuable panoramic images. If these panoramic examples from different historical periods are examined separately, it is observed that, in each period, the visual content of the panoramic view of the city is dominated by different dominants and accents respectively.

Findings and Discussion

Examining the panoramas of the inner city in the middle ages, it can easily be observed that the Shirvanshah Palace complex, the Maiden Tower, the domes and minarets of the

neighborhood mosques and the walls of the city play a major role in the panaromic view of the city (Figure 1).

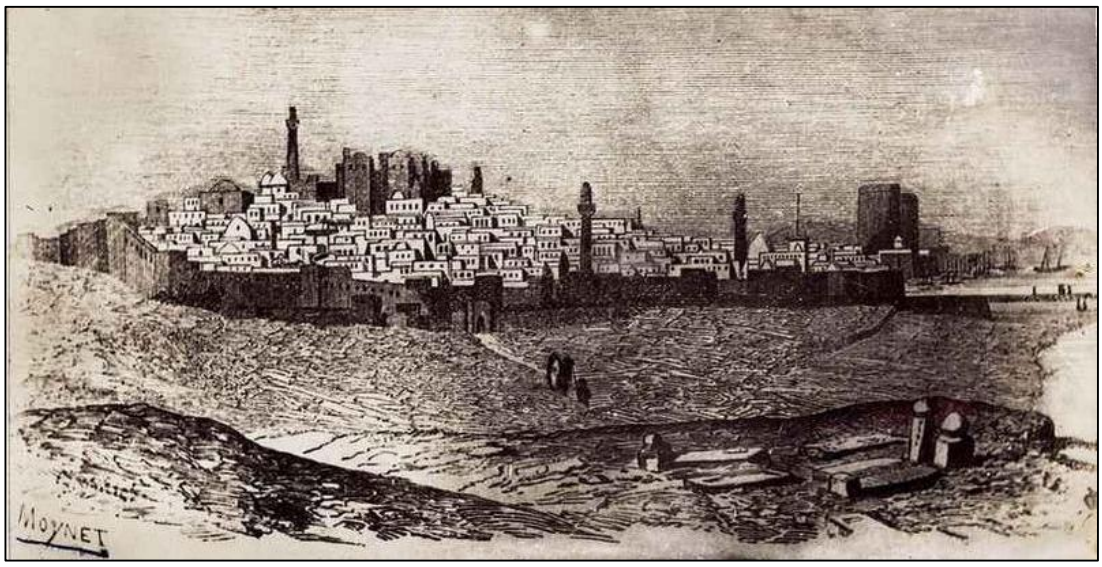


Figure 1. Baku during the middle ages – 1825. Artist: Jan Pyer Mone

Meanwhile, during the capitalistic period, the inner city as a whole plays a dominant role in the general view. The finding of huge oil resources following the emergance of the crude oil extraction industry caused a significant change in the city's main structure and general architecture. In addition, a number of prominent buildings built during the same era stood out as visual accents in the panorama (Figure 2).



Figure 2. Baku During The Capitalist Era – 1900.

In the Soviet period, the emergence of larger buildings and complexes are observed in the general content of the city which, in turn, played a key role in the formation of the current image of the city. This is largely due to the massive urbanization taking place in Baku and the

constant industralization of the local economy during that period of time which in turn led to the implementation of the large construction and infrastructure projects. (Figure 3).



Figure 3. Baku During The Soviet Era – 1970.

The main question is that: what is currently happening in the changing artistic image of Baku? What positive and negative tendencies are being manifested in the image of the city which had been formed over the centuries. In fact, today the city faces the threatening problems which had been created by the negative effects of the last 20-30 years. The development history of the city until recent times, including the architecture of the Soviet era, clearly shows that the city has an evolving but uniquely recognizable image (Figure 4).



Figure 4.

It should also be noted that the appearance and artistic image of any city depends laregely on its geographical conditions and dominants on which it is located. In general, the visual content of a city does not solely depend on its main infrastructure and architectural construction projects. In many cases, natural elements - rocks, hills, rivers, lakes, seas - form and shape the main line of the image. In this perspective, we cannot imagine Baku without the Caspian Sea as we cannot imagine St. Petersburg without the Neva river or Tbilis without the

Kura river. From this point of view, if the Caspian Sea is visible in any panoramic image of Baku, its uniqueness is clearly noticeable (Figure 5).



Figure 5. Modern Baku

Another example to this can be shown by the continuous influence of the mountainous park hill over the pararomic view of the city when seen from the sea side. The main problem is that these geographical elements which have a considerable place in the city's general image, are gradually disappearing due to the negative effects of the recent development. Since the beginning of the 21st century, unfortunately, a few counterproductive measures have been taken in this direction. This can be observed not only in the 3rd and 4th grade, but also even in the 1st and 2nd degree panaromic views which are the central parts. The negative effects caused by the large-scale buildings built on the coastal boulevard of the city can be taken as an example to this issue. Not only the buildings built on the coastal boulevard, but also the buildings built on the historic front panoramic line of the city along Neftchilar Avenue can be mentioned as part of the issue (Figure 6).



Figure 6.

These mentioned buildings cannot be evaluated positively due to their stylistic images, scale, and artistic aesthetic features as a whole. It appears that the necessary legislative acts and

normative administrative regulations on these affairs have not been developed at the required level. For instance, there are many admirable examples of these kind of regulations in the world experience. In a number of countries, this regulations protect the general frameworks and structures of cities. For example, no building that could harm the artistic and historical image of Florence can be built in the city thanks to these kind of restrictions in Italy. There exist countless examples of this type of regulations in the world. Unfortunately, this positive approach are not being observed in Baku. On the contrary, across the center of the city, chaotic image, strangely-scaled buildings have been built in many places that do not match the functional structure of the city. This kind of approach can be observed even in the historical structure of the medieval Inner City.

Conclusion and Recommendations

Apparently, there is an urgent need to develop serious scientific concepts regarding the issue, theoretical principles and conceptual projects in this direction. At the basis of such concepts, in the first place, the determination of viewing angles that express the general, characteristic panoramic images of the city must be prioritized. This includes the entrance sections to the city, characteristic geographical accents (sea and hills), full views of the sea along the coast. It is no coincidence that during the 20th century, even in the last decades, the shots taken to describe the whole artistic image of Baku were usually taken from the same angles such as the one from the mountainous park. Another interesting fact is that newly-built architectural examples in the city structure attract attention in the artistic image of the city, and show themselves as dominant, effective accents in the panorama. One and probably most outstanding of these buildings is the Flame Towers that have recently become the new symbol of the city and particularly fascinated people with its spectacular animated night vision (Illustration 7). These new towers have profoundly changed the city's artistic image and turned to the main dominant in the recent view.



Figure 7. Flame Towers – Night Vision.

Regrettably, such towers located on the coastline, cannot be seen by all sides of the city due to its location, even causing an unaesthetic view from various sites of the city and thus, do not have a full aesthetic essence in this regard (Figure 8). There are plenty of such kind of examples that can be mentioned.

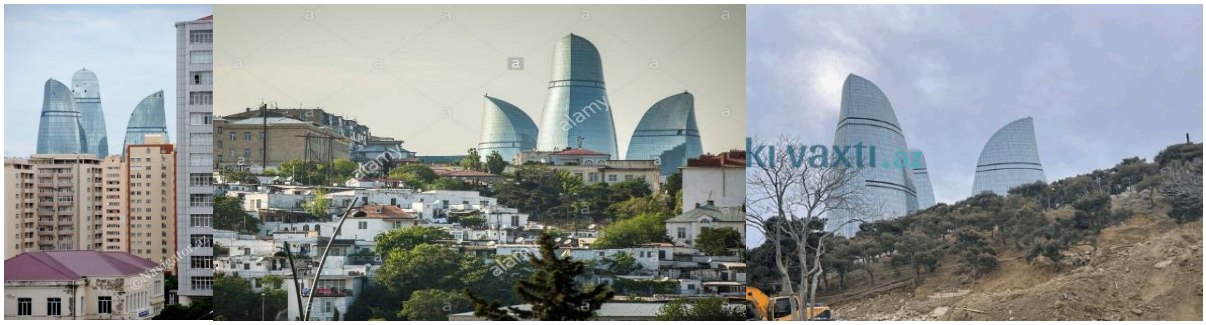


Figure 8. The view of Flame Towers from different sites of Baku

However, the solution of the problem still remains relevant and unsolved. Appropriate measures must be taken accordingly to address the issue and eliminate its negative consequences and return the city to its original artistic view.

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Fatih Camii Külliyesi'nin Okunabilirliğinde Mimari Eğitimin Rolü

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Özet

Birlikteliğin simgesi olan toplum, insanların paylaşım yapacağı mekânların ortaya çıkmasına fırsat tanımaktadır. Bu mekânlar, toplumu bir arada tutan değerlerin etkisiyle şekillenmektedir ve bu değerlerin başında kültür gelmektedir. Kültür insanların ürettiği maddi ve manevi değerlerin tümünü ifade etmektedir. Bu bağlamda, kültürün etkilediği ve toplumu bir arada tutan din kavramı karşımıza çıkmaktadır. Din insanların hem ortak paylaşım yapmasında hem de ortak paylaşım yapılan mekânların şekillenmesinde oldukça etkilidir. Ortaya çıkan mekânın mimari üslubu ise, kullanıcısının davranışlarına yön vermektedir. Bu şekilde yapı ve kullanıcı arasında iletişim kurulmuş olacaktır. İletişim, yapının sahip olduğu üslubun kazandırdığı mimari dil sayesinde meydana gelmektedir. İletişimin niteliği ise, kullanıcının yapıyı algılamasını sağlayan kişisel boyutlarına göre değişmektedir. Bu çalışma kapsamında, Osmanlı Mimari üslubuna sahip Türkiye'nin ilk külliyesi olan Fatih Külliyesi incelenmiştir. Külliyenin iç ve dış mekânına ait görsellerden oluşan bir anket çalışması mimarlık öğrencileriyle gerçekleştirilmiştir. Mimarlık öğrencilerine uygulanmasının sebebi, yapının algılanmasında kişisel boyut faktörü olarak eğitim seviyesinin algılamayı nasıl etkilediğini görebilmektir.

Anahtar kelimeler: Din, algı, mimari iletişim, Osmanlı Mimarisi, Fatih Külliyesi.

The Role of Architectural Education in the Legibility of Fatih Mosque Complex

Abstract

Society, which is the symbol of togetherness, provides an opportunity for people to share places. These spaces are shaped by the effects of the values that keep the society together and culture is at the top of these values. Culture expresses all the material and moral values produced by people. In this context, the concept of religion affecting culture and keeping the society together appears before us. Religion is very effective both in sharing people and shaping shared spaces. The architectural style of the resulting space directs the behavior of its user. In this way, communication will be established between the building and the user. Communication takes place thanks to the architectural language gained by the style of the building. The quality of communication changes according to the personal dimensions that enable the user to perceive the structure. In this study, Turkey's first Fatih Mosque complex, which has been investigated in the Ottoman architectural style. A questionnaire consisting of visuals of the interior and exterior of the complex was carried out with architecture students. The reason for applying it to architecture students is to see how the level of education affects perception as a personal dimension factor in the perception of the building.

Keywords: Religion, perception, architectural communication, Ottoman Architecture, Fatih Complex.

Giriş

Toplumsal bir varlık olan insan, toplum içerisinde varlığını sürdürmek için birçok faaliyet göstermekte ve bir yandan da çevresini anlamaya ve anlamlandırmaya çalışmaktadır. Toplum insanları bir arada tutan ortak yaşam biçimidir. İnsanların bir arada olmasını sağlayan değerlerin başında kültür gelmektedir. Çünkü kültür, insanların kendi alışkanlıkları ve yaşam şekilleri sonucunda ortaya çıkmaktadır. Bu sebeple her toplumun kendine ait bir kültürü olduğu söylenebilir. Kültürü etkileyen büyük güçlerden birisi de dindir. Din, toplumun ortak paylaşımda bulunduğu mekânları etkiler. Ortaya çıkan etkinin boyutu iletişim ile meydana gelmektedir. Çevresini anlamlandıran insan için iletişim oldukça önemlidir. Anlamlandırılan

çevreyi ise mimarlık oluşturmaktadır. Mimarlığın işlevsel amacının yanı sıra iletişimsel işlevi de bulunmaktadır. Mesajların iletilmesi için bir bağlama ihtiyaç duyulur. İnsanların çevresiyle kurduğu iletişim de mimarlık sayesinde gerçekleşir. Bu doğrultuda; gönderilen mesajların içeriği nedir ve her kullanıcı mesajı aynı şekilde mi anlar soruları karşımıza çıkmaktadır. Bu sorulara cevap bulabilmek için, toplumun için önemli olan din olgusunun içinde bulunduğu sosyal ve kültürel yapı olan Fatih Külliyesi'nin okunması hedeflenmiştir.

Çalışma kapsamındaki amaç: Belirli bir üsluba sahip (Osmanlı Mimarisi) yapının çevresine verdiği mesajları saptamak; mimarlık öğrencilerinin bu mesajları nasıl algıladığı ve mimari eğitimin bu algılamaya etkisinin ne olduğunu görmektir.

Problem: Kişisel bir faktör olarak, mimari eğitim seviyesin artması algılamayı etkiler mi?

Araştırma soruları:

- Mimarlık ve iletişim arasında nasıl bir ilişki vardır?
- Mimari iletişim nasıl kurulur ve mimari iletişimin bir dili var mıdır?
- Mimari iletişimdeki mesajların içeriği nedir ve nasıl oluşmaktadır?
- Mesajlar kullanıcı tipine göre farklı şekilde mi algılanır?
- Mimarlık öğrencilerinin mesajı algılamasında eğitim düzeyi etkili midir?

Hipotez: Mimari iletişim için mimarlığa ait bir dil varsa, eğitim seviyesi arttıkça mimari dili bilmek artacaktır. Mimari eğitim seviyesi arttıkça, mimari iletişimde mesajlara verilen cevaplar ve algılamalar ortak olmaya mı başlayacaktır?

Bu sorulara cevap bulabilmek ve hiptezin gerçerliliğini doğrulamak için literatür taramasından yararlanılmıştır. Bu bağlamda, Bell ve Dourish kentin birçok katmandan oluştuğunu söyleyerek bu katmanları üç kategori altında toplamıştır. Birincide fiziksel bir katman olarak kentin farklı topoğrafyaları olduğunu ifade etmiştir. İkinci katmanda ise tarihsel katmanın mevcudiyetinin fiziksel olarak yansıdığını belirtmiştir. Üçüncü katmanda ise birçok kültürel deneyimin yaşandığı dini, siyasi, ailevi yani ortak bir paylaşımın bulunduğu katmanı belirtmiştir (Bell & Dourish, -). İnsanlara farklı olanı tanıma, onunla etkileşim içinde olma imkânı sağlayan kent bunu birçok şekilde sağlayabilmektedir. Yöntemlerinden birisi ve belki de en etkili olanı kamusal alan ve mekânlardır. Kamusal mekân, topluma ait olup herkesin kullanımına açık mekân olarak tanımlanmaktadır (Uzgören & Erdönmez, 2017, s. 42-43). Dolayısıyla farklı katmanlara sahip olan kent, kullanıcısına ortak paylaşım alanı sunarak etkileşim imkânı sağlamaktadır. Etkileşim de durağan olmayan bir süreçtir. Bu süreç içerisinde mekânları deneyimleyen insanlar değişmektedir. Bu sebeple kent ve kentin sahip olduğu mekânlar da kullanıcıyla birlikte yaşamaktadır. Bu yaşam

içerisinde birçok yaşanmışlığa ev sahipliği yapan mekân, izlerini kullanıcısına aktarmaktadır. İnsanlar, bu yaşanmışlıklar sayesinde var olan izlerle kendisini ve çevresini anlamlandırmaktadır.

Çevrenin okunmasını mekânsal bilginin elde edildikten sonra zihinde toparlanıp kullanılmasıyla oluşan bir süreç olarak tanımlayan Köseoğlu ve Önder, mekânsal bilginin elde edilmesini iki faktöre bağlamaktadır. Bunlar; mekânın ve mekânı deneyimleyen gözlemcinin özellikleridir. Mekânsal kurgulanma ve mekândaki mimari ögelerin fark edilebilmesi bir binanın okunabilmesinde önemli değişkenler olmaktadır (Köseoğlu & Önder, 2010, s. 53,56). Dolayısıyla birçok katmanlaşmaya ev sahipliği yapan ve ortak paylaşımların yaşandığı Osmanlı mimari üsluba sahip Fatih Camii ve Külliyesi'nin okunabilirlik çalışması, bahsedilenleri örnekler nitelikte bir çalışma olmuştur. Okuma kapsamında bahsedildiği üzere gözlemcinin özellikleri önemli olmaktadır.

Çalışma Yöntemi

Bu çalışmada, aynı eğitimi alan ortak özelliğe sahip kriter olarak mimarlık alanından katılımcılarla bir okuma gerçekleştirilmiştir. Çalışmayı ortaya çıkarmak için lisans döneminden farklı seviyelere ait mimarlık öğrencileri ve mezun mimarlarla gerçekleştirilen bir anket çalışması yapılmıştır. Bu anket çalışması, yapının iç ve dış mekânına ait görsellerden oluşan yönlendirici soruları kapsamaktadır. Mekânın büyüklüğünün anlaşılması için yapıya ait görsellerde 170 cm. insan ölçeği bulunmaktadır. Öğrencilerden gördükleri görseller karşısında hissettikleri duyguları verilen kavramlar arasından seçmeleri istenmiştir. Bu kavramlar, daha önce yapılan pilot çalışma sonucu elde edilmiştir.[5] Böylece yapının mimari karakteri sonucunda ortaya koyduğu mesaj gözlemlenmek istemiştir. Çünkü mimari üslup sahip olduğu mimari tasarım özellikleriyle kullanıcısında bazı duygular uyandırarak, kullanıcının tavırlarında etkilere sebep olur. Bu etkiler yapının verdiği mesaj sonucunda kendisini gösterir. Mesajın algılanması mesajda verilen iletinin anlaşılmasıyla mümkündür. Bu ileti de mimari üslup sayesinde oluşmaktadır. Çalışma sürecinde incelenen yapı Osmanlı mimari üslubuna sahiptir. Bu süreçte öne sürülen hipotezde; mimarlık eğitimi alan kişilerin bu dili daha iyi bildiği için mesajı anlamasının daha kolay olacağı beklenmektedir. Dolayısıyla mimari eğitim seviyesinin artmasıyla ortak bir dilin oluşup oluşmadığı, böylece sorulara ortak cevap verilip verilmediği gözlemlenmek istenmiştir. Anket kapsamında

[5]https://www.researchgate.net/publication/344712405_KILISE_YAPILARININ_ILETISIMINDE_GOSTERGEBILIMIN_YERI_ST_ANTUAN_KATOLIK_KILISESI_ST_JOHN_ANGLIKAN_KILISESI_BUCA_PROTESTAN_BAPTIST_KILISESI_AZIZ_PAVLUS_KATOLIK_KILISESI_ST_HELEN_KATOLIK_KILISESI

toplanan veriler, SPSS (Statistical Package for the Social Sciences) yöntemi ile değerlendirilmiştir.

Osmanlı Mimari Üslubu (Ottoman Architectural Style)

Selçuklulardan sonra kurulan Osmanlı Devleti hem Selçuklu hem de Bizans kültüründen etkilenmiştir (Dinçeli, 1989, s. 6). Başka bir ifadeye göre Osmanlı mimarisi Erken Dönem Anadolu Türk mimarisi, Selçuklu mimarisi, Bizans mimarisi, İran mimarisi ve Memlük mimarisinden etkilenmiştir (Kınıklı, -). Cami mimarisinde yapılan değişiklikler bu dönemin ana özelliğidir (Cantay, s. 53). Osmanlı mimarisinde küre, piramit ve koni formları dikkat çekmektedir. Bu formların bir ritim oluşturarak bir bütünlük oluşturduğu görülür (Aksoy, 1975, s. 117). Merkezinde kubbeli kare birimin bulunduğu yapılara oldukça sık rastlanılır. Bürokrasinin mimari üzerindeki etkisinden dolayı yapılarda kare formlara sahip birimler bulunur. İslam sanatından oldukça etkilenen Osmanlı mimarisinin merkezinde cami bulunmaktadır. Cami ölçeği de zaman içerisinde daha da büyümüştür. Bu büyümeyle birlikte pencere sayısı artarken duvar işçiliği, payanda sistemi ve yarım kubbeler geliştirilmiştir. Bizans'a karşı üstünlük kuran Osmanlı'nın etkisi mimari alanda oldukça etkileyicidir. Bizans'ın en büyük yapısı olan ve devamında da kiliselerin yapımına ilham veren Ayasofya'nın güçlü duruşuna karşılık Osmanlı cami inşasına başlamıştır. 1470'te inşa edilen Fatih Cami Ayasofya'ya benzerliğinin yanı sıra belirgin farklılıklar da göstermektedir (Hillenbrand, 2005, s. 265-272). Fatih Külliyesi yeni bir dönemin bir güç gösterisi olarak öne çıkmasıyla da tarihimizde yerinin önemli olduğu söylenebilir.

Fatih Camii ve Külliyesi'nin Okunabilirliği (Legibility of Fatih Mosque and Complex)

İstanbul'da bir cami etrafında gelişerek kente hizmet veren toplumsal ve kültürel yapılanma Fatih Külliyesi ile başlamıştır (Papila, 2011, s. 67). Fatih'in kendi adına yaptırdığı külliyenin inşasına başlaması bir dönüm noktası olarak kabul görülmektedir. Fatih, yaptığı fetihleri Allah'ın bir lütfu olarak görmüş ve karşılığında da şükür amaçlı, insanlığa hizmet edecek olan bu külliyeyi yaptırmıştır. Külliye 120 bin metrekarelik bir alana yayılmaktadır. Burada daha önceden Bizans kilisesi bulunduğu söylenmektedir; ancak bu kilise fetihten önce harabe haline gelmiştir. Külliyenin yapımının tamamlanması sekiz yıl sürmüştür. Yapının mimarı, Sinan-ı Atik olarak bilinmektedir (Unan, 2003, s. 51-52). Fatih Külliyesi, kendisini oluşturan yapı birimleriyle Osmanlı yönetim ve siyasetine hizmet etmiştir (Unan, 1999, s. 91).

Külliye; cami, iki yanında yüksek sekiz medrese, tetimme medreseleri, mektep, kütüphane, darüşşifa, misafirhane, ahır ve muvakkithaneden oluşmaktadır. Bu birimlere bazen hamam da eklenmektedir. Külliyenin merkezinde büyük ölçeğiyle cami dikkat çekmektedir (Unan, 2003,

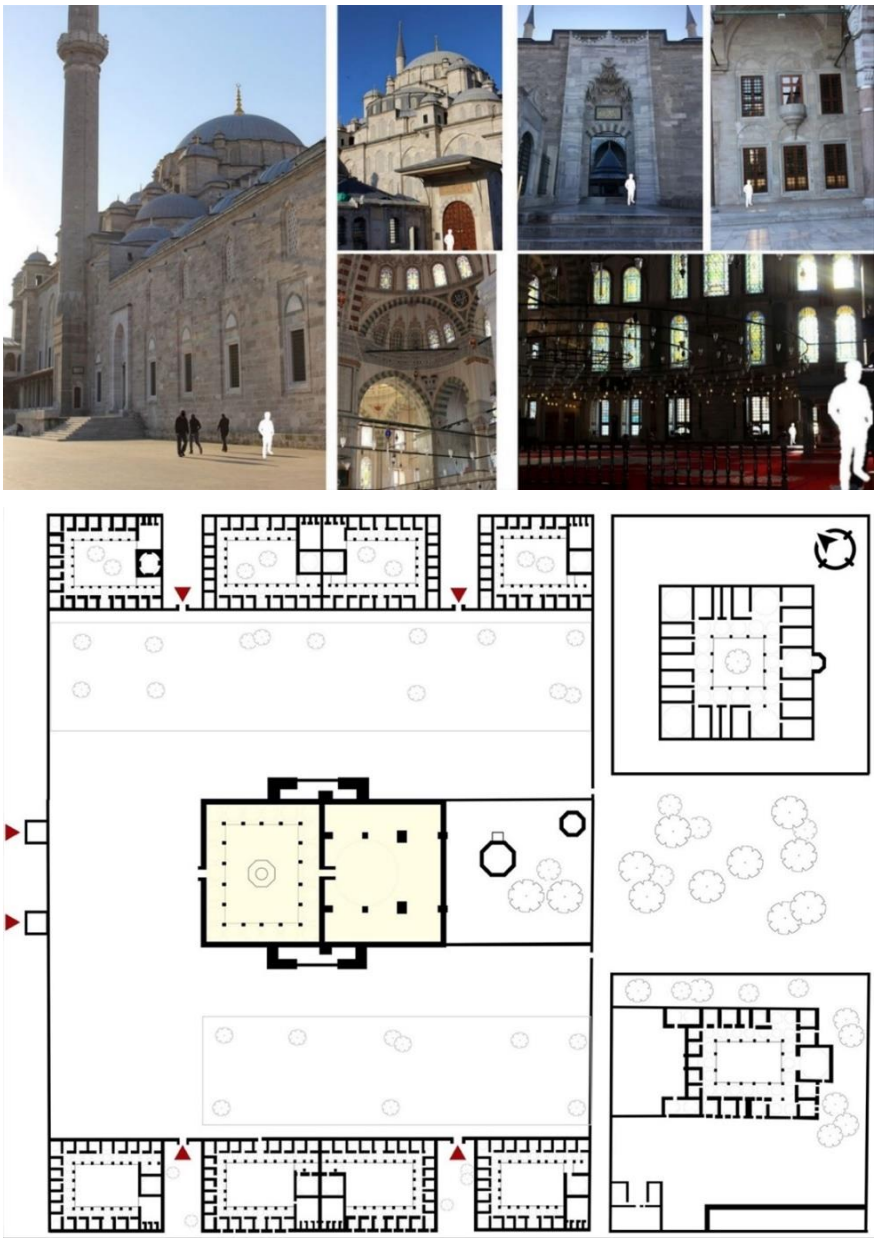
s. 53). İlk inşa edildiği zamandan biraz daha farklı olan caminin planı kareye yakındır (Fatih, 2018). Caminin ağaç ve çiçeklerle süslü revaklı avlu ile çevrili olması, iç mekânın ilahi gücü simgelemesiyle birlikte ortaya cennet bahçesi imgesi çıkmıştır. Avluda şadırvanın bulunması da cennet ırmaklarıyla ilişkilendirildiği için bu imge güçlenmiştir (Papila, 2011, s. 68). Merkezinde cami ve mezarların bulunduğu külliye simetrik bir plana sahiptir ve kuzeydoğu, güneydoğu yönlerinde medreseler bulunmaktadır. Fatih külliyesinde temel ilim, eğitim ve öğretim için yer kaplayan medreseler, Osmanlı Devleti'nin de bu yöndeki ihtiyaçlarını karşılamakta oldukça önem arz etmektedir (Unan, 2006). Cami mekânında yarım kubbe kullanımı, Fatih Külliyesi'nin Osmanlı mimarisine getirdiği bir yeniliktir. Merkezi kubbenin oluşturduğu ana mekânı üç yönde saran yan mekânların önündeki açıklığı örtmek için iki küçük kubbe yerine yarım kubbe kullanılmıştır. Bu tavrın merkezi tasarımın göstergesi olduğu düşünülmektedir (Tuluk, 2006, s. 276).

Toplumu oluşturan insanlar yaşadıkları çevreyi kendi yaşamları doğrultusunda değiştirirken aynı zamanda ortaya çıkan değişimden de etkilenmektedir. Yapının genel özellikleri kişinin davranışları üzerinde etkide bulunarak, tutum ve tavırlarını şekillendirmektedir. Ayrıca yapılar, yol bulma davranışları üzerinde de oldukça etkilidir (Weisman, 1981, s. 192). Yapının yol bulma kaynağı olarak görülmesiyle mimari okunabilirlik kavramı ortaya çıkmıştır. Yapının sahip olduğu temel mimari karakteristik özelikler yön bulmanın yanı sıra yapıların algılanmasında ve temasa geçilmesinde de oldukça etkilidir (Werner & Schindler, 2004, s. 465). Temas ise karşılıklı yapılan bir eylem olarak düşünüldüğünde bir iletişim gerçekleşecektir.

İletişim, insanın çevresini kuşatan her şeyle ister istemez temasa geçmesi sonucu oluşur. İnsanlar yapının işlevine göre hareket ederken aynı zaman da yapının mimari üslubu sayesinde tavırlarında da değişiklikler meydana gelmektedir. Bu değişiklik mimari üslubun ilettiği mesajların alınması sonucu gerçekleşmektedir. Mesajların anlaşılması için de mesajı oluşturan kod veya dil bilinmelidir. Mimari yapının mesajlarını oluşturan dil ise, yapının karakterine yön veren mimari üslubudur. Basit bir örnekle açıklamak gerekirse; işlevi yeme-içme olan her mekânda aynı şekilde davranılmadığı görülebilir. Büyük ölçekli bir restoranla daha küçük ölçekli bir esnaf lokantası karşılaştırıldığında her ikisinin de işlevi yeme ve içmedir. Ancak mekân içerisindeki tavır ve tutumlar yapının mimari üslubuyla şekillenmektedir. Kullanıcı bu dili bildiği için ona göre davranır. Dolayısıyla yapıların işlevleri dışında ilettiği mesajların bulunduğu görülmektedir. Bu sebeple kişisel özelliklerin

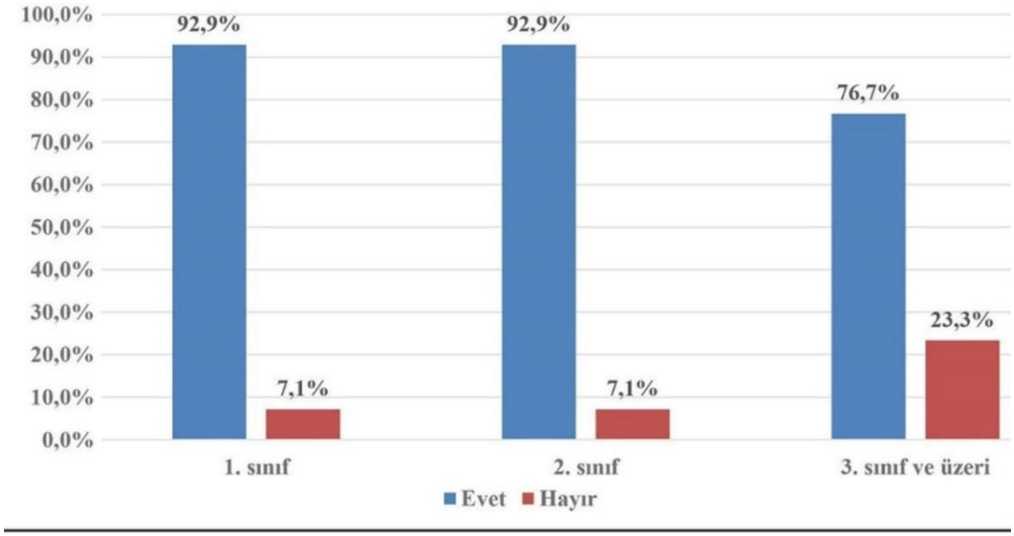
algılamada etkili olduğu düşünülerek Fatih Külliyesi'nin okunabilirliğinde mimari eğitimin rolü sorgulanmıştır.

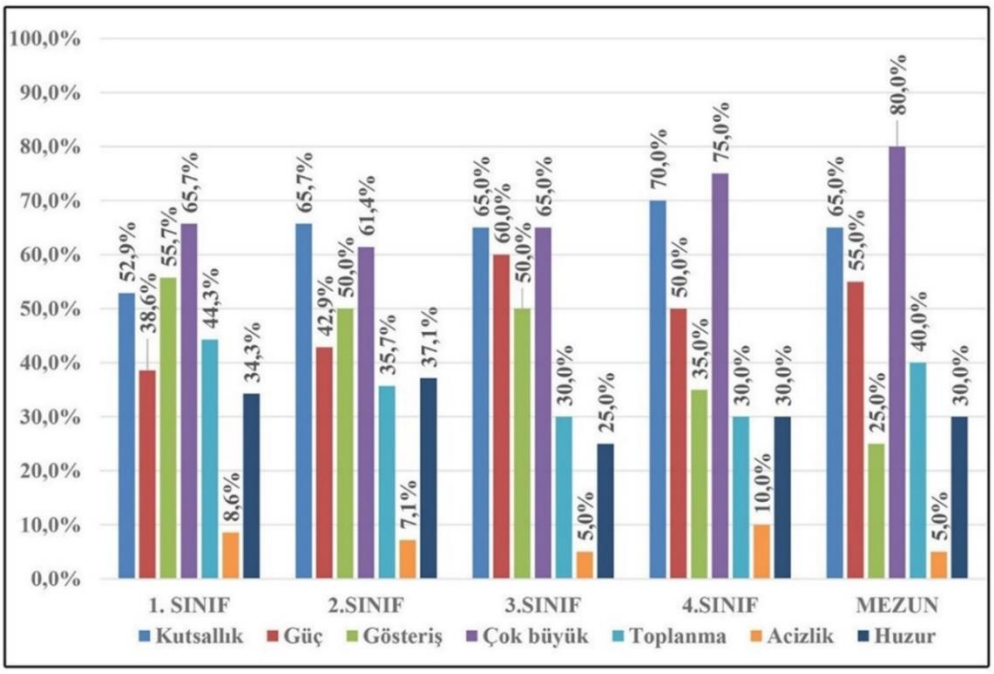
Yapının iç ve dış mekânına ait fotoğraflar ve yapının planı ise Şekil'1 de ifade edilmiştir. Görsel 1'de yapının fotoğraflarında 170 cm'lik beyaz bir insan figürü kullanılmıştır. Bu kullanımın amacı, yapının insan ölçeğine oranla büyüklüğünün anlaşılmasını sağlamaktır. Yapılan anket çalışmasında öğrencilere yapı karşısında hissettikleri, düşündükleri duyguları, belirlenen 7 kavram içerisinden seçmeleri istenmiştir. Bu seçim sonucunda mimari eğitim seviyesine göre cevaplardaki benzerlik durumu Şekil 1'de ifade edilmiştir.



Şekil 1. Fatih Camii ve Külliyesi Planı - Üslup: Osmanlı Mimarisi [6]

[6] Fatih Camii ve Külliyesi Planı, (http-1)'den yararlanılarak çizilmiştir.





ki-kare testi

	değer	Serbestlik derecesi	asimptotik anlamlılık (2 taraflı)
Pearson ki-kare testi	10,426[a]	2	,005
Olabilirlikoranı testi	9,528	2	,009
Satır ve sütun değişkenleri arasında lineer ilişki testi	7,570	1	,006
Geçerli verilerin durumları	200		

a:1 hücre (% 0,0) 5'ten az beklenen sayıya sahiptir. Beklenen minimum sayı 7,20'dir.

Şekil 2. Fatih Camii ve Külliyesi analiz-1

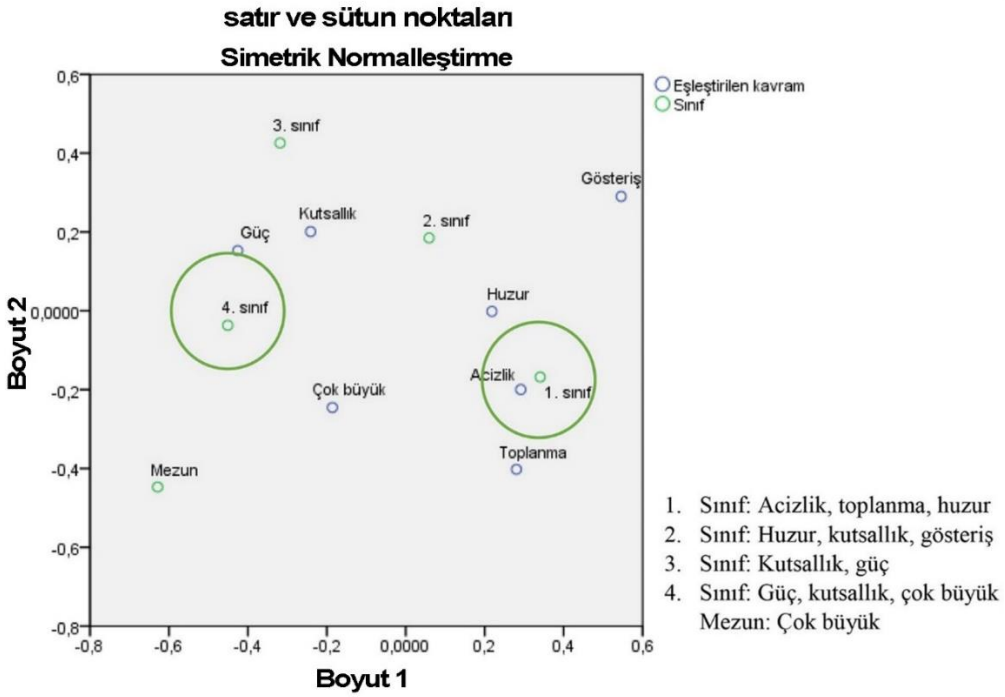
Anket sorusu iki aşamalıdır. Birinci soru yapının tek renk olarak algılanıp algılanmamasının durumunu belirlemek içindir. İkinci soru ise yapı karşısında hissedilenlerin, belirlenen 7 kavram içerisinden seçilmesiyle oluşmaktadır.

Grafik 1'e göre; yapı grupların katılımcılarının büyük çoğunluğu tarafından tek renk olarak algılanmaktadır. Tek renk algısı %99 güven düzeyinde sınıfa bağımlıdır (kikare=10.426, df=2, p=0.005). Tek renk algısı olmayan bireylerin oranı 3. sınıf ve üzeri olan katılımcılarda %23,3 ile diğer sınıflardan farklılaşmaktadır. Dolayısıyla mimari eğitimin başında olan kişiler yapıyı tek renk olarak algılarken, eğitim seviyesi artan kişilerin detayları daha çok fark ettiği anlaşılmaktadır.

Fatih Külliyesi için düşünülen ve öne çıkan kavram çok büyük kavramıdır. Geniş bir yayılım gösteren külliyenin öğrenciler tarafından da algılandığının göstergesidir. Cevaplar detaylı bir şekilde incelendiğimde sınıfların cevapları için; birinci sınıf, dördüncü sınıf ve mezunlar için çok büyük kavramı birinci sırada gelmemiştir. Üçüncü sınıflarda birinci sırada olmakla birlikte kutsallık kavramı ile eş seviyededir. İkinci sınıflarda ise kutsallık kavramı daha baskın olup çok büyük kavramı ikinci sıradadır. Yapı için ortaya çıkan ikinci kavram kutsallık kavramı olmuştur. Mezunlar ve dördüncü sınıflar bu şekilde cevap verirken üçüncü sınıflar için kutsallık üçüncü sırada gelmiştir. Gösteriş kavramı yapı için üçüncü sıradadır. Birinci sınıf ve ikinci sınıflar için gösteriş kavramı üçüncü sıradayken üçüncü ve dördüncü sınıflarda dördüncü sırada, mezunlarda ise beşinci sırada yer almıştır. Güç kavramı dördüncü sırada olan kavramdır. Bu durum sadece ikinci sınıflarda bu şekilde olmuştur. Birinci sınıflarda beşinci sırada, üçüncü sınıflarda, dördüncü sınıflarda ve mezunlarda ise üçüncü sırada yer almıştır. Beşinci kavram ise toplanma kavramıdır. Birinci sınıf ve mezunlarda dördüncü sırada olup, ikinci sınıflarda altıncı, diğer grupların sıralamasında beşinci sıradadır. Huzur kavramı yapı için altıncı sıradadır. Bu kavram ikinci sınıf ve mezunlarda beşinci sıradadır. Dördüncü sınıflarda ise toplanma ile eş seviyededir. Son kavram acizlik kavramı olup, katılımcılar tarafından az seçilen bu kavram hem yapı için hem de katılımcı grupların çoğunluğu için son sıradadır.

Yapı için verilen cevaplar incelendiğinde genel kavram sıralaması; çok büyük, kutsallık, gösteriş, güç, toplanma, huzur, acizlik şeklinde olmuştur. Çok büyük ve kutsallık kavramları birbirlerine yakın oranda çıkmıştır. Dolayısıyla büyük mekânın, yapıların kutsal kılınmasında etkin bir değeri olduğu anlaşılmaktadır. Gösteriş ve güç kavramları da birbirlerine yakın çıkan iki kavramdır. Dolayısıyla bu yapıda, gösterişin gücü doğurduğu söylenebilir.

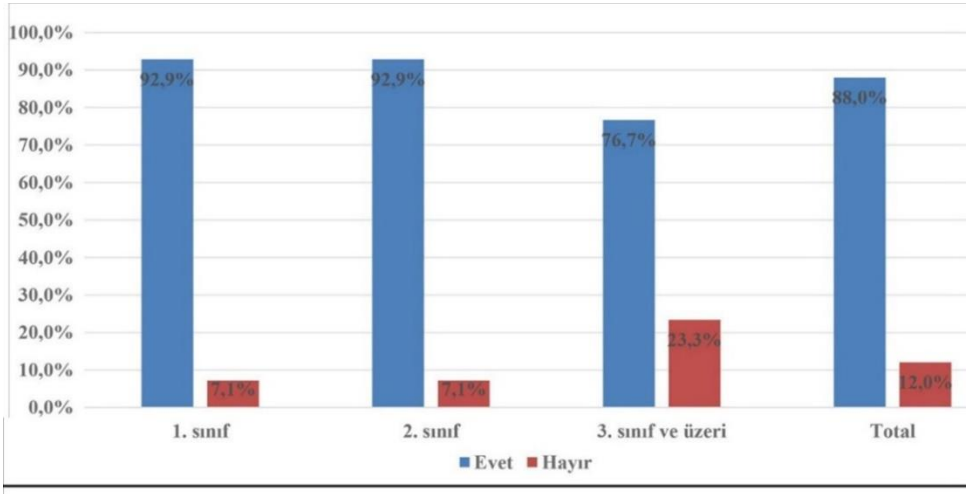
Verilen cevapların sınıflara göre değişimi Şekil 2'de ifade edilmiştir.

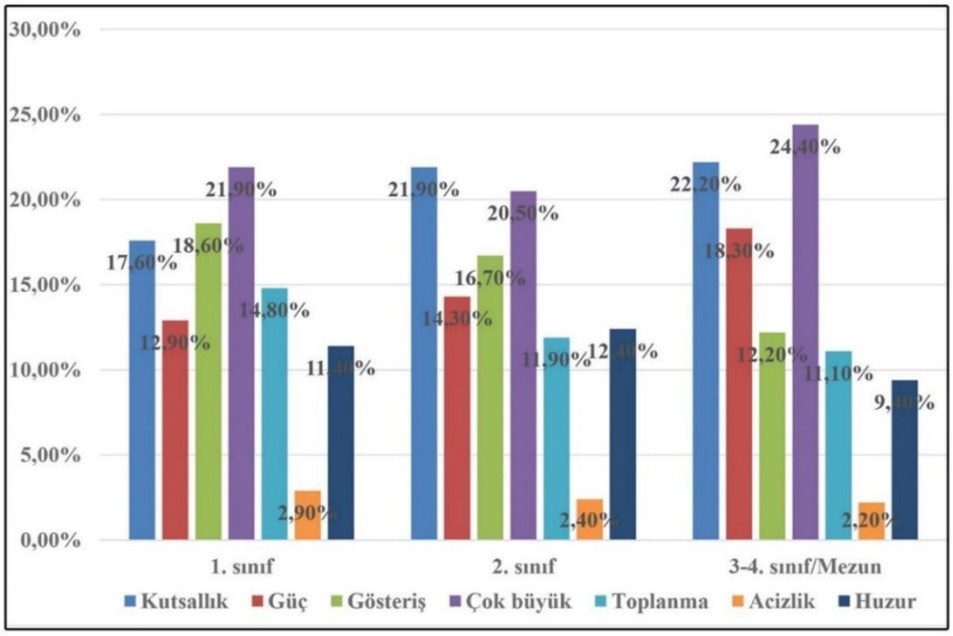


Şekil 2. Fatih Camii ve Külliyesi analiz-2

Şekil 2'ye göre; Fatih Camii ve Külliyesi için seçilen kavramların sınıflara göre değişiminin birbirleriyle olan ilişkisi ifade edilmektedir. Ortaya çıkan genel sonuçta; Her grubun birbirlerinden farklı cevaplar verdiği, birinci ve dördüncü sınıfların bazı kavramlara diğer gruplardan daha çok yakınlaştığı görülmüştür.

Mimarlık eğitiminin, Fatih Camii ve Külliyesi için yapılan anket çalışmasında verilen cevapları etkileyip etkilemediğini anlamak amacıyla ikinci bir analiz çalışması yapılmıştır. Analiz çalışmasında birinci sınıf ve ikinci sınıflar eğitimin temel seviyesi olarak kabul edilmiştir. Üçüncü sınıf, dördüncü sınıf ve mezunların ise mimarlık bağlamında daha bilinçli bir hal aldıkları düşünülmektedir. Bu farklılığın, Fatih Camii ve Külliyesi'nin tek renk olarak algılanıp, algılanmama durumu üzerindeki etkisini saptayabilmek amacıyla ki-kare test uygulaması (Chi-Square Tests) yapılmıştır. Analiz sonuçları ve değerlendirmeler Şekil 3'te ifade edilmiştir. Ortaya çıkan sonuçların birinci analiz çalışmasındaki grupların cevapları arasındaki oran farkının yapılan ikinci analiz çalışmasıyla oldukça benzerlik gösterdiği ortaya çıkmıştır. Bu durum mimarlık eğitiminin her ne kadar algıda etkili olsa da Fatih Camii ve Külliyesi'nin cephesindeki hâkim sadelik tavrının genel olarak ortak bir algı oluşturduğunu ortaya koymuştur.





ki-kare testi

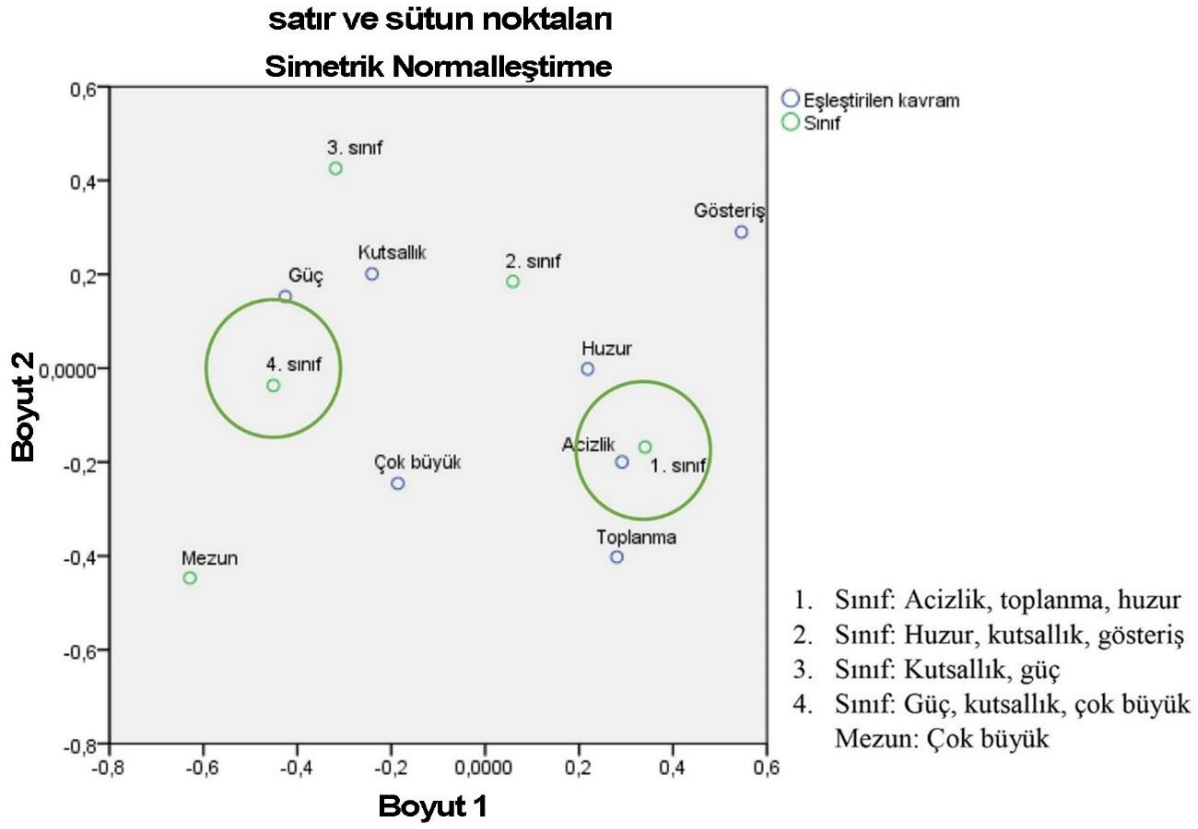
	değer	Serbestlik derecesi
Pearson ki-kare testi	10,426[a]	2
Olabilirlikoranı testi	9,528	2
Satır ve sütun değişkenleri arasında lineer ilişki testi	7,570	1
Geçerli verilerin durumları	200	

a: 0 hücre (% 0,0) 5'ten az beklenen sayıya sahiptir. Beklenen minimum sayı 7,20'dir.

Şekil 3. Fatih Camii ve Külliyesi analiz-3

Şekil 3'e göre, Tek renk algısı %99 güven düzeyinde sınıfa bağımlıdır (kikare=10.426, df=2, p=0.005). Tek renk algısı olmayan bireylerin oranı sınıflar içinde farklılaşmaktadır. Birinci sınıf, ikinci sınıf ve diğerleri şeklinde gruplandırıldığında, Fatih Camii ve Külliyesi için ortaya çıkan kavramların sıralamasının gruplar arasında benzerliğin her kavramda benzerlik

göstermediği ortaya çıkmıştır. Yapılan ikinci analiz çalışmasında birinci sınıf ve ikinci sınıflar mimarlık eğitiminin temel seviyesi olarak kabul edilmiştir. Üçüncü sınıf, dördüncü sınıf ve mezunlar ise artık teknik eğitimine daha hâkim ve bilinçli oldukları için bir grup olarak değerlendirilmiştir. İkinci analiz çalışmasında mimari eğitim seviyesinin, seçilen kavramları etkileyip, kavramlara ortak bir şekilde yaklaşıp yaklaşılmadığını saptamak amacıyla yapılmıştır. Böylece hipotezle ortaya konulan savın ispatı sağlanacaktır. Bunun için Corresponder (Uygunluk) Analizi yapılmıştır. Elde edilen veriler Şekil 4' te ifade edilmiştir.



Şekil 4. Fatih Camii ve Külliyesi analiz-4

Grafik 4' e göre, Fatih Camii ve Külliyesi için seçilen kavramların birinci sınıf, ikinci sınıf ve üçüncü, dördüncü sınıf ile mezunlardan oluşan üç gruplu katılımcılara göre değişiminin birbirleriyle olan ilişkisi ifade edilmektedir. Bu üç grubunda bazı kavramlara daha çok yaklaştığı görülmüştür. Dolayısıyla mimari eğitimin, algılamayı etkilediği ve eğitim seviyesine göre ayrıların grupların kendi içerisinde ortak bir karara vardığı görülmüştür.

Bulgular ve Tartışma

Fatih Külliyesi için yapılan anket çalışması sonucunda külliye için kavramların sıralaması; çok büyük, kutsallık, gösteriş, güç, toplanma, huzur, acizlik şeklinde olmuştur. Külliyenin hem plan düzleminde hem de kesit olarak ölçeğinin insan ölçeğine oranla oldukça büyük

olması katılımcılarda öncelikle yapının çok büyük olarak algılanmasına sebep olmuştur. Dini ve manevi mekânları bünyesinde bulundurması ve ölçeğinin büyük olmasıyla çok büyük kavramından sonra kutsallık kavramının öne çıkması kaçınılmaz olmuştur. Bu sebeple büyüklük ve kutsallık birbiriyle ilişkilendirilen iki kavram olarak düşünülebilir. Yapının iç mekânındaki bezemeler ise, yapının gösterişli olmasını sağlamaktadır. Bir araya gelen çok büyük, kutsallık ve gösteriş kavramlarının katılımcılarda güç hissini uyandığı söylenebilir. Devamında gelen toplanma kavramı ise, yapının tek kubbe formuyla insanları bir araya toplamasıyla ilişkilendirilebilir. Yapının aydınlık ve geniş mekâna sahip olması huzur hissini uyandırırken; insanın bu ölçekteki bir yapı içerisinde oldukça küçük ölçekte kalmasının acizlik hissini öne çıkardığı düşünülebilir. Dolayısıyla bir yapıya karşı oluşan hislerin meydana gelmesinde yapının mimari üslubunun oldukça önemli olduğu söylenebilir. Sahip olunan mimari üslup, yapının karakterine yön vererek, kullanıcısının tutum ve tavırlarını etkileyerek iletişime geçmektedir. Kişinin tavırlarında meydana gelen değişiklikler ise yapıyla iletişim kurduğunun bir göstergesi olmaktadır.

Sonuçlar

Yapılan çalışma algılamanın belirli bir zamana ve mekâna ihtiyaç duyduğunu gösteren bir çalışma olmuştur. Çünkü algılamanın gerçekleşmesi, kişinin onu hissetmesiyle gerçekleşmektedir. Hissetme eylemi ise fiziksel olan duyularla mümkün hale gelmektedir. Bu sebeple algılamada görsel duyunun oldukça etkili olduğu söylenebilir. Ayrıca görme duyusu, insanın çevresini kuşatan yapılı çevreyi anlamlandırma sürecinde başta gelen faktördür. Bu süreç, kişinin bilişsel süreciyle oldukça yakından ilişkilidir. Çünkü bir kişinin özellikleri bir durumun veya olayın algılamamasını etkileyecektir. Bu çalışmada da kişiye ait özellik olan eğitimin algılamadaki rolü incelenmiştir. Belirli bir üsluba sahip yapının algılanmasında mimarlık eğitiminin seviyesiyle de çalışma alanı sınırlandırılarak somut bir veri oluşturulmaya çalışılmıştır.

Yapılan çalışma sonucunda, mimarlık eğitiminde yeni başlayanların birbirinden bağımız ve farklı cevaplar verdiği görülmüştür. Eğitim seviyesinin artmasıyla cevapların birbirine benzerlik gösterdiği görülmüştür. Bu durum bir dil öğrenmeye benzetilebilir. Dili bilmeyen kişiler, o dilde konuşulanları anlamakta güçlük çekmektedir. Mimari üslup, mimari bir dildir ve bu dil mimari eğitim sayesinde kazanılmaktadır. Bu sebeple mimari eğitim altında toplanan kişilerin cevaplarının da birbirine benzemesi çalışmanın hipotezini destekler hale gelmiştir.

Yapılan bu çalışmayla, ülkemizin ilk külliyesi olan Fatih Külliyesi adına bir farkındalık kazandırılmıştır. Mimari üslubun mimari bir dil olduğu ve bu dili bilenlerin yapıyı algılamasında ortak bir payda da buluşulduğu ortaya konulmuştur. Bu yöntem belirli bir mimari üsluba sahip olan birçok yapı üzerinde denenebilir (bakınız [7]). Bu şekilde, tarihimizde önemli yere sahip olan yapılar içinde farkındalık oluşturulabilir.

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Türkiye'de Neoliberalizm Etkisiyle Değişen Mahalle: Kamusal Mekânın Değişimi

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Öz

Neoliberalizm insanların yaşam standartlarının yükseleceğini iddia eden ekonomik tabanlı bir teoridir. Bu teori, gelişmiş bir refah düzeyinin sağlanması için serbest piyasanın etkin olmasını, özel mülkiyet haklarının artması gerektiğini öne sürmektedir. Bu teorinin etki alanlarından biri ise kentsel mekânlardır. Bu kentsel mekânlara mahalleler örnek verilebilir. Sokak, cadde, kahvehane, park gibi çeşitli kamusal mekânları içerisinde barındıran mahalleler, birey-mekân kavramının birleşmesi ile ortaya çıkmış ve inanç, sosyal statü vb. ayırt etmeksizin her kesimi içerisine alan kentsel mekânlardır. Uygulanan politikalar sonucunda tüketim toplumu; güvenlik, sosyal statü gibi kaygılarla mahalleleri kullanmayı bırakarak; sınırlandırılmış bir alan üzerinde kullanıcılarına en iyi imkanları sunduğunu iddia eden kapalı sitelerde yaşamaya başlamıştır. Kapalı siteler, sınırlı bir alan içerisinde, etrafı çevrili, belirli bir kitleye hitap eden, içerisinde çeşitli mekânları bulunduran yaşam alanlarıdır. Kapalı sitelerin ortaya çıkmasıyla beraber kentlerin oluşum çekirdeği olan mahallelerin ve içerisinde yer alan kamusal mekânların kullanımı azalmış ve bundan dolayı kentte atıl durumda olan, niteliği azalmış boşluklar ortaya çıkmaya başlamıştır. Bu durum, kentin bütüncül, çeşitlilik içeren yapısına hem fiziksel hem sosyal açıdan olumsuz bir etki yaratmıştır. Bu çalışmada kentin hem fiziki hem sosyal açıdan önemli bir değeri olan mahallenin, neoliberalizmden nasıl etkilendiği ele alınmaktadır. Çalışma sonucunda bireylerin kolay bir şekilde erişebildiği, toplumun her kesimindeki bireylerine hitap eden kamusal mekânların, uygulanan politikalar ve değişimler sonucunda bu özelliklerinden arınarak, tüketim toplumuna hizmet veren, sınırlandırılmış kamusal mekânlara dönüşmeye başladığı görülmektedir.

Anahtar Kelimeler: Kamusal Mekân, Neoliberalleşme, Mahalle, Kapalı Siteler

Public Places Changed by Neoliberalism in Turkey: Converting From Neighborhood to Gated Communities

Abstract

Neoliberalism is an economic-based theory that claims that people's living standards will rise. This theory suggests that in order to ensure an improved level of prosperity, the free market should be effective and private property rights should increase. One of the areas of influence of this theory is urban spaces. One of the areas of influence of this theory is urban spaces. Neighborhoods can be given as examples of these urban spaces. Neighborhoods, which contain various public spaces such as streets, avenues, coffee houses and parks, have emerged with the unification of the concept of individual-space and urban spaces that include all segments that beliefs, social status, etc. without distinction. As a result of the policies implemented, the consumer society; by stopping using neighborhoods with concerns such as security and social status; It has started to live on gated community that claim to offer the best facilities to their users on a restricted area. Gated community are living spaces that are surrounded by a limited area, appeal to a certain audience, and contain various spaces in them. With the emergence of gated community, the use of neighborhoods, which are the core of the formation of cities, and the public spaces in them, have decreased, and therefore inert and decreasing spaces have appeared in the city. This has had a negative impact on the holistic, diverse structure of the city, both physically and socially. In this study, it is discussed how the neighborhood, which has an important value of the city both physically and socially, is affected by neoliberalism. As a result of the study, it is seen that public spaces that individuals can easily access and that appeal to individuals in all segments of society have transformed into restricted public spaces that serve the consumer society by vanishingly these features as a result of the policies and changes implemented.

Keywords: Public Space, Neoliberalization, Neighborhood, Gated Community

Giriş

''...önce biz mekanlara şekil veririz; sonra da onlar bizlere...'' (Eren, 2017)

Neoliberalizm, literatürde serbest piyasanın önemli olduğunu vurgulayan, ekonomik ve hukuki alanlarda, bireysel girişime dayanan ekonomik bir kuram olarak tanımlanmaktadır (Axis, 2000). Neoliberalizm, 1970'lerin sonlarında, kitle üretimin azalan karlılığına stratejik bir siyasi tepki olarak ortaya çıkmıştır. İlerleyen dönemlerde ise kapitalist küreselleşmenin baskın siyasi ve ideolojik biçimi olarak etkisini sürdürmüştür (Theodore vd, 2013). Neoliberalizm, kapitalizmin devam eden sorunlarına bir çözüm olarak düşünülen ve insan refahını arttırmak için özel mülkiyet hakları, serbest piyasalar ile serbest ticaretin temel alınmasını ve bireysellik kavramının serbest bırakılması gerektiğini savunmuştur. Böylece, yoksulluğun ortadan kalkacağını ve yaşam standartlarının yükseleceğini iddia etmektedir (Harvey, 2015). Kuramın amaçlarını gerçekleştirebilmesi için ''ideolojik bir yazılım'' ortaya çıkartılarak; devletin yeniden yapılanması ve yeniden canlanması için birçok uygulama yapılmıştır (Peck & Tickell, 2002). Kurum vergilerinin azaltılması, kamu hizmet ve varlıklarının özelleşmesi, sosyal yardım programlarının dağıtılması, mevkiler arası rekabetin artırılması, yabancı sermaye hareketinin geliştirilmesi bu uygulamalara örnek verilebilir (Theodore vd., 2013). Devlet, ekonomi ve kamuya bağlı kurumlar arasındaki ilişkiyi yeniden inşa etmiştir. Yeniden kurulan ilişki içerisinde devlet; piyasaya en az düzeyde müdahale etmesi ve gruplar arasındaki çıkarlarda güçlü olanın yanında olması gerekmektedir (Harvey, 2015). Neoliberalizm bu noktada; rekabet gücü, kamu politikası, para değeri, kar, hissedar değeri gibi sosyal üretkenliğin ölçütlerini şekillendirerek; gruplar arası rekabetin ''kurallarını'' oluşturmada belirleyici bir rol oynamaktadır (Peck, Tickell, 2002). Görüldüğü üzere, neoliberalizmin amaçlarını gerçekleştirebilmesi için tek başına değil; devlet, otoriterlik, para, sosyal demokrasi gibi birçok kavramla ilişki içinde olması gerektiğini söylemek mümkündür (Peck vd, 2009). Birçok kavramla ilişkisi olması neoliberalizmin ekonomi dışında kent, kamusal mekân gibi diğer alanlara da etki ettiği söylenebilir.

Neoliberalizmin amaçları doğrultusunda refah hizmetleri, teknolojik işlemler, yaşam ve düşünce sistemi, sosyal ilişkiler vb. unsurlar yeni bir sisteme entegre edilerek, yeniden kurulmaktadır. Yeniden kurulan ilişkiler, yaşamın değişmesine; yaşamın değişmesi ise kentin değişmesini kaçınılmaz kılmaktadır (Bumin, 1998). Bu kaçınılmaz durum, toplumsal üretim ilişkilerinin, bir mekâna yansıyarak; mekânı yeniden üretmesi ve bu mekâna dahil olarak somutlaşmasından kaynaklanmaktadır (Lefebvre, 2015). Neoliberalizmin etkisiyle değişen toplumsal ilişkiler, beraberinde kentsel mekânlarda da somut birtakım değişiklikler

oluşmasına neden olmuştur. Kent; bu süreçte kimileri için refah çağının habercisi olarak, kimileri içinse kalıcı bir yeniden yapılanmanın, sosyal kutuplaşmanın, marjinalleşmenin bir kaynağı olarak görülerek, politik-ekonomik ve sosyal değişimlerin yasalaştığı kilit bir alan haline gelmiştir (Swyngedouw vd., 2002).

Yapılı çevreye yapılan yatırımlar, kapitalist ekonominin devamlılığı için bir çözüm aracı olarak düşünülmüş ve kar oranlarının yükselmesi için sermaye, gelişmiş bir alandan gelişmemiş bir alana çekilmiştir. Böylece kentlerde yeni alanlar oluşmuştur. Bu durum, kapitalizmin yapılı bir çevreyi yok ederken, diğer bir taraftan yeni çevrelerin oluşmasına neden olmuştur. Sonuç olarak, kentsel mekânların özgünlüğü ekonomi ile ilişkilendirilmiştir (Şengül, 2009). Serbest piyasanın önünü açmaya yönelik kentsel politikalar ve yönetimler oluşturulmuş; politika ve yönetimlerin kendini gösterebileceği kentsel pratikler gerçekleştirilmiştir (Mutlu, 2017). Kentsel pratikler ile kentsel dönüşüm projelerinin, dışa kapalı konut tiplerinin ve alışveriş merkezlerinin sayısı artmıştır. Böylece kentsel mekanlar, sermayenin fırsata çevrildiği mekânlar olarak işlev görmeye başlamıştır. Buna ek olarak, kentlerde arazi kullanımı gündelik yaşama dönüşmeye başlamıştır. Bu değişimler, sermayenin dolaşımını desteklerken; diğer taraftan sosyal açıdan toplumun yaşayış biçiminin değişmesine sebep olmuştur (Kırbaş, 2017).

Neoliberalizm, bireyleri ''alışveriş yapıyorum, öyleyse varım'' anlayışı ile tüketici toplumuna dönüştürmeye çalışmaktadır. Bu şekilde toplumun kültürel açıdan yeniden yapılandırılmasına da neden olmuştur (Munck, 2005). Tüketiciler, dikkatleri çekilmesi ve sürekli olarak hareket halinde olması gereken kişilerdir. Piyasa, bu bireyleri en başından tüketici olarak kabul ederek, onlara ilgi çekici, albenisi olan, tüketim toplumuna hitap eden ürünler sunmuştur. Tüketim toplumunun oluşmasındaki dikkat çekici nokta, tüketicinin bu ürünleri arzulaması; arzulanan ürüne yaklaşmak için umut taşımasıdır. Bundan dolayı, her bireye; bir tüketim tarzı modeli biçilmiştir. Tüketim toplumunun bir diğer özelliği katmanlı (yukarı-aşağı) ilişkisinin bulunmasıdır. Tüketim toplumundaki katmanlı ilişki kentlerde de gözlemlenebilmektedir. Kentlerde tüketim toplumunun yukarısında yer alanlar, atıl durumda olan bölgeleri terk edebilmekte; gönüllerince gezebilmektedir (Bauman, 2012). Bu durum, neoliberalizmin yaratmış olduğu sosyal eşitsizlik kavramından da kaynaklandığını söylemek mümkündür. Neoliberalizmin sonucu ortaya çıkan kavramlardan bir diğeri ise bireyselliktir. Bireysel özgürlük ve girişimleri toplum ile sınırlandırmıştır. Bu sınırlandırma ile bireyler, özel sektörün tasarladığı mekânlarda, bu ideolojinin getirdiği kültür ile yaşamaya başlamıştır (Eren, 2017).

Neoliberalizm, davranış biçimleri arasındaki farklılıkların azalmasına, farklı geleneklerin kaybolmasına, yaşam yerlerinin birbirine benzemesine neden olmaktadır. Uygulanan politikalar, farklılaşmayı kabul etmesine rağmen, bu farklılığın belirli sınırlar dışına çıkmasını kabul etmemektedir (Bauman, 2012). Çünkü, kentsel mekân yeniden üretilirken; kapitalist sistemde yer almasını istemediği 'öteki' grupları dışarda tutma istemektedir. Bu durum, aslında kent mekânının, neoliberalizm sonucunda gerek duyulduğunda yeniden üretilen, satılan, takas edilen; devletin kendi iktidarını yeniden inşa ettiği bir meta haline geldiğinin de göstergesidir (Uğurlu, 2013).

Tektipleşme, tüketim kültürünün oluşması, kentsel ayrışma, sosyal eşitsizlik gibi kavramlarla kendini gösteren neoliberalizm, süreç içerisinde kentlerde 'yaratıcı yıkım' (Harvey, 2005) olarak etkisini göstermektedir. Yaratıcı yıkım, kentin, kar kazanmak, piyasanın canlı tutulması, üretim-tüketim zincirinde yer alabilmesi için durmadan yıkılıp, yeniden yapılması olarak tanımlanmaktadır (Harvey, 2015). Yaratıcı yıkım etkisinden dolayı kentte var olan toplumsal gruplar arasındaki gelir farklılığı, yaşam kalitesi farkı giderek daha da artmıştır.

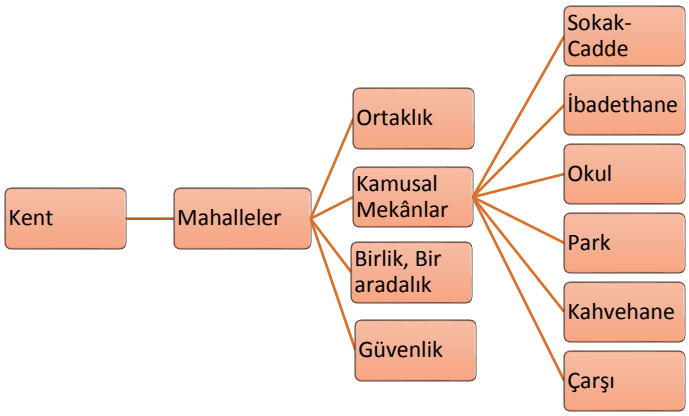
Neoliberalizm teorisinin etkilerinin görüldüğü ülkelerde metropolitan bölgelere ilgi artmıştır. Bu bölgelerde uygulanan projeler ile serbest ticaret sağlanmıştır (Kırbaş, 2017). Tüketim toplumunu da etkileyen, yeni yaşam tarzı, büyük mağazalar, yeni konut tipleri, alışveriş merkezleri, temalı parklar, oteller, tatil merkezi gibi hayranlık uyandırıcı, hazza dayalı 'simülasyon' çevreler ortaya çıkmıştır (Altun, 2010). Böylece, kentler neoliberal politika faaliyetlerin stratejik hedefi haline gelmişlerdir. Neoliberal kentleşme olarak tanımlanan bu süreçte teori, kentsel kamusal ve sosyal hizmetlerin özelleşmesini, kentsel mekânların biçimlendirilmesinde yüksek gelir gruplarının rolünü artırılmasını hedeflemektedir (Geniş, 2009).

Türkiye'de Neoliberalizmin Mahalleye Etkisi

Kentler, mahallelerin bir araya gelmesiyle kendini inşa etmektedir. Bundan dolayı mikro kent (Madanipour, 2003) olarak da tanımlanan mahalleler, kentin çekirdeği olarak işlev görmektedir. Kamusal hizmetler, kamusal mekânın paylaşımı, mahallenin aynı zamanda kamusal bir yaşam nüvesi olarak tanımlanmasını da mümkün kılmaktadır. Yaşam nüvesindeki kamusallık; tanıdık olma, karşılıklı toplumsal denetim, dayanışma, birlik gibi eylemlerin bu kentsel mekanlarda ortaya çıkmasını sağlamaktadır (Akbulut, 2006).

Sokak, bina, yollar gibi ögeler mahallenin yerini belirler ve fiziksel sınırlarını çizer. Mahalleler, aynı zamanda kültürel ve toplumsal sınırlara da sahiptir. Kültürel ve toplumsal

sınırlar, bir mahalleden, bir mahalleye geçerken hissedilir. İnsan yüzleri, binalar, sokak düzeni, hayat tarzındaki değişiklikler bu sınırları destekleyen unsurlardır (Alver, 2010).



Şekil 1. Kent, Mahalle, Kamusal Mekân İlişkisi

Mahalle, Türkiye'de kavramsal olarak coğrafi alanı teslim eden bir terim olmasının yanında; yaşam merkezinde yer alan, yönetsel ve fiziksel bir birimdir. Osmanlı dönemindeki mahalle, herkesin birbirini tanıdığı ve komşuluk bağlarının güçlü tutulduğu mekân olarak tanımlanmaktadır. Osmanlı mahallesi, sınıf ve statü farkının yer almadığı, sosyal dayanışmanın ve fiziksel güvenliğin var olduğu kentsel mekânlardır. (Ürküt, 1998). Aynı zamanda mahallede geniş bir birey profili yer almaktadır. Esnek bir yapılanmaya sahip olmasından dolayı çeşitliliğe yer verirken; tek tipleşmeye izin vermemektedir (Alver, 2010). Bu durum, mahallenin her ne kadar dışa dönük, esnek bir yapıda olduğunu gösterse de mahalle aynı zamanda içe dönük bir yapıya da sahiptir. Bu içe dönüklük, mahalledeki bireyleri birbirine bağlayan güvenlik ve dayanışma ilişkisini yaratır (Eren, 2017).

Osmanlı döneminde mahalle kavramı kendi kendini yöneten en küçük idari birimdir. Osmanlı mahallerine genel ölçekte bakıldığında, mahallerin kentten yalıtılmış bir birim olarak gelişmesine izin verilmemiştir (Bek, 2013). Dönem içerisinde bu idari birim, dini inançlara göre şekil alarak biçimlenmiştir. Müslüman mahalleleri cami ya da mescitlerin, gayrimüslimlerin mahalleleri ise kilise ve havraların etrafında gelişmişlerdir. Komşuluk bağlarının güçlü olmasının yanında Osmanlı mahallelerinde içe dönük bir yapı söz konusudur. Bu sayede mahalleyi birbirine bağlayan güvenlik ve dayanışma algısı ortaya çıkmaktadır. Güvenliğin, dayanışmanın, kültürel özelliklerin yer aldığı bu mahalleler aynı zamanda deneyim ve belleğin mekânı olarak kabul edilir (Eren, 2017).

Tanzimat dönemi ile kentlerde de değişiklikler görülmektedir. 19. yüzyıl sonlarına doğru Osmanlı kentlerinde ticari ve idari değişiklikler meydana gelmiştir. Tekerlekli araçların kullanımının artması, ulaşım, su gibi temel ihtiyaçların daha kolay bir şekilde karşılanması için mahallelerde yapısal bir değişim gerçekleştirilmiştir (Ürküt, 1998). Tanzimat Fermanı'nın ilan edilmesi, Osmanlı pazarının Batılı tacirlere açılması ve bu duruma bağlı olarak ithalatın artması ile Osmanlı sanayisi ve zanaatı gerilemiş ve bunların sonucunda liman kentlerinin önemi artarak, toplum bu kentlere göç etmiştir. Göç sonucunda, yeni iş merkezileri kurularak bedesten içinde yürütülen ticari faaliyetler geri planda kalmıştır. Ayrıca kentlerde nüfus artışı ve gecekondu yerleşmelerinin ortaya çıktığı görülmüştür (Aydoğdu & Tuncer, 2018).

Cumhuriyet döneminde ise kentte yenileştirme çabaları, yıkımlar, yeni kent planları gibi değişimler meydana gelmiştir. Bu değişimler, mahalle kavramını doğrudan etkilemiştir. Cumhuriyet dönemi ile kentteki yaşam koşulları değişmiş, müstakil evden apartmanlaşmaya doğru bir değişim yaşanmıştır. Osmanlı döneminde daha dini merkezli bir cemaat mahalle anlayışı hâkim iken, Cumhuriyet döneminde ise halk merkezli bir cemaat mahallesi hâkim olmaya başlamıştır (Oruç, 2019). Cumhuriyet'in kurulmasıyla beraber değişen kent kurgusunda mahalle birimindeki en önemli değişim, geleneksel konut yaşamının yerine yeni konut tiplerinin ortaya çıkması olmuştur. Sanayileşme sonucunda, kırdan kente doğru göçün yaşanmasıyla kentlerde gecekondu mahalleleri ortaya çıkmıştır (Bek, 2013).

1980'li yıllardan günümüze kadarki süreçte, ülkemizde görülen ekonomik değişimler sonucunda, mahalle kavramı, daha çok yerel yönetim ile sınırlandırılmıştır (Eren, 2012). Bu dönemde alınan ekonomik kararlar ile kamu bünyesinde olan temel hizmetler özel sektöre bırakılmaya başlanmış, İMKB açılmış, ithalat ve ihracatın serbest bırakılmasıyla ekonomi alanında yeniden yapılanma gerçekleştirilmiş ve dünyaya açılma politikaları uygulanmaya başlanmıştır. Bu politikalar sonucunda Türkiye'de kültürel ve sosyal anlamda değişiklikler gözlemlenmiş; tüketim kültürü, üst ve alt sınıf grubu, ithal ürün gibi kavramlarla ortaya çıkmıştır (Özgür, 2006). 1980'li dönemde ülkede ekonomik alanda yaşanan değişimler sonucunda yeni tüketim alışkanlıkları ortaya çıkmıştır. Bu tüketim alışkanlıklarının gerçekleşmesi için yeni hizmet mekânları oluşturulmuştur. Bu mekânsal değişiklik, sosyal sınıf farklılıklarını daha da belirgin hale getirmiştir. Daha önce kent içerisinde var olan mekânlar, ihtiyaçlara cevap vermemeye başlamış, ihtiyaçların karşılanması adına özel sektör tarafından yeni konut tipleri gibi mekânlar üretilmiştir. Özel sektörün sermaye odaklı olarak ele aldığı mekânlar ise üst düzey gelire sahip olan bireyler için tasarlanmıştır (Polat & Martal,

2018). Sanayileşme ve kentin sağladığı iş imkanlarından dolayı kente doğru bir göç başlamıştır. Bu göç sonucunda ise gecekonduların artmasına sebep olmuş; aşırı kalabalıklaşma ve suç oranlarının artmasıyla, sağlıksız yaşamın ortaya çıkmasıyla gelişmiş kentlerde kapalı sitelere yönelim daha da artmaya başlamıştır (Madanipour, 2003). Ekonomik tabanlı bu değişimler kent içerisinde kentsel ayrışma, tek tipleşme, tüketim toplumu olma gibi kavramların çıkmasına sebep olmaktadır.

Özetle, Türkiye'deki geleneksel mahalle kavramı içerisinde yer alan pazar, kahvehane, meydan, cami, çarşı, manav, kasap gibi kamusal mekanları ile toplumsal bir bütündür. Bu bütünlük, 1980'li yıllardan itibaren etkin olan neoliberalizmin etkisiyle değişmeye başlamıştır. Geleneksel konut tiplerinin, özelleşmenin etkisi mahallelere alternatif olarak kapalı konut, sosyal konut gibi birimler ortaya çıkmaya başlamıştır.

Neoliberalizm Sonucunda Değişen Kamusal Mekânlar

Küresel ortamda, büyüyen kentin bütünselliği bozularak dağılmaktadır. Bu dağılım da kent algısının fragmanlaşmasına neden olmaktadır (Yıldırım, 2010). Bu fragmanlara kapalı siteler örnek verilebilir. Kapalı siteleri kent içerisinde kapalı kültür adacıkları (Ürküt, 1998) olarak yer aldıkları düşünülebilir. Kapalı konutların sitelerinin artışı literatürde genellikle üç ana unsurla ilişkilendirilmiştir.

1. Sosyo-ekonomik tabakalaşma: Kentlerde artan gelir eşitsizliği, üst gelir gruplarının ayrıcalıklı, prestijli konut talebi;

2. Güvenlik ve suç endişesi: Suç, kalabalık gibi kentte 'güvenli' yaşamı sarsan durumlardan dolayı bireylerin kendini güvende hissetmemesi;

3. Doğa ile iç içe olma: Kentsel problemlerden uzaklaşarak doğa ile iç içe yaşama isteğidir (Akalın, 2016).

Bu üç ana unsur aynı zamanda neoliberalizm sonucu kentlerde görülen sonuçlardır. Tüketim odaklı olan bireyler, konutları barınma işlevinin yanı sıra sosyal bir rol olarak görmektedir. Yeni hayat vaat eden, her türlü imkânı içinde barındırdığı, kısacası kaliteli yaşamı imkân sağladığını iddia eden bu konut tipleri sosyal statü olarak bireylere sunulmaktadır. Geleneksel mahalle kültürüyle ilgisi olmayan, kentle ilişkisiz olan kapalı konut tipleri içe dönük yapısıyla kapalı şehirler (Atkinson vd, 2005) gibi davranmaktadır. Erişebilirliğin sınırlı olduğu kapalı konut tiplerinde, belirli bir gruba hizmet vermesi, kentte gettolaşmaya yol açmakta ve kentsel mekanlara ve kamusallığa zarar vermektedir (Altun, 2008). Kapalı siteleri, mahallelerden ayıran bir özellik ise kapalı sitelerin belirli bir kitleye hitap etmesidir. Bu belirli kişiler dışındakiler hariç tutulmaktadır. Bu açıdan bir kentte bütünlük sağlamadığını da

göstermektedir. Bu özelliği ile kapalı sitelerin aksine mahalle, içe dönük bir kurgu olmasına rağmen kentin bütünsel bir parçası olup giriş çıkışlarda kendiliğinden bir denetim oluşturmaktadır (Eren, 2017). Bu konseptlerde hazırlanan projeler ise tüketim toplumuna 'ideal yaşam tarzı, sizin mahalleniz' olarak sunulmaktadır.

'' İstanbul'un en eski yerleşim yerlerinden Eyüp'te hayata geçirilen New Eyüp projesi, konumu ve doğaya yakın yaşantısıyla ***premium bir yaşam sunmayı*** *hedefliyor.* ***Şehir merkezine birkaç adım*** *ötede olan New Eyüp projesi metronun hemen yanında yer alıyor.* ***Sağlıklı yaşam konsepti*** *sunulan projede Kaliteli yaşam tarzınıza uyacak şekilde değiştirilen geniş tesisleri ile harika yaşam seçenekleri mevcut…''* (URL-1).



Şekil 2. Kapalı Konut Sitelerine Bir Örnek (URL-1)

'' Acıbadem Konakları ile ***yeni nesil konak yaşamı!*** *Acıbadem Konakları'nın* ***muhteşem peyzajı ve yemyeşil avlusu****, bahçe katı sakinlerine aradığı tüm huzuru evlerinin içine kadar getiriyor. Acıbadem Caddesi'ne 150 metre ve Koşuyolu caddesine 200 metre mesafesiyle İstanbul'un* ***en iyi kafe restoranları sizin mahallenizde*** *olacak...''* (Kaynak: URL-2).

'' Yeni Fikirtepe projesi için ön talep toplanıyor. ***"Fikirtepe güzelleşiyor"*** *sloganıyla yola çıkan Emlak Konut'un Yeni Fikirtepe projesi* ***güvenli ve konforlu evleri, sosyal alanları, parkları, bahçeleri, caddeleri, geniş bulvarlarıyla*** *İstanbul'a değer katacak.* ***Güvensiz yapılar, sağlıksız yaşam alanları*** *ile çevrili olan Fikirtepe,* ***güvenli yapıları, sosyal donatıları, yeşil alanları****, 7/24 yaşayan prestij caddesi ve ticari ünitelerin yer aldığı yeni hali ile dönüşüyor.* ***Eğitim, sağlık, sosyal ve kültürel alanlarıyla*** *tüm detaylarının yeniden tasarlandığı, insanların huzur ve güven içinde yaşayacağı, tamamlandığında İstanbul'un yeni çekim merkezi olması beklenen Yeni Fikirtepe, hak ettiği değerine ulaşıyor…''* (URL-3).

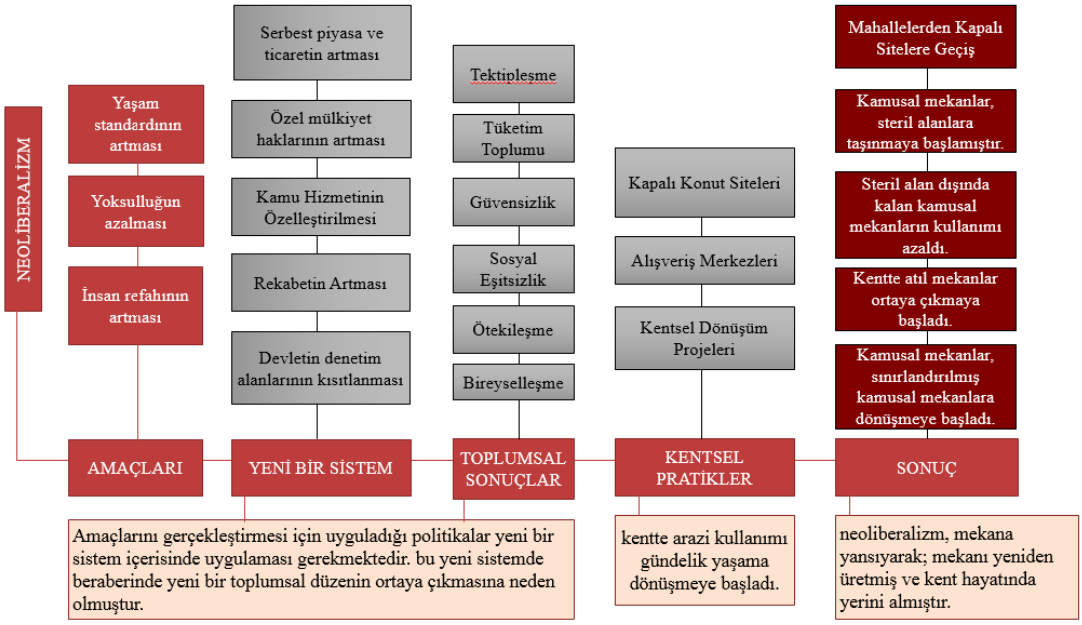
Belirtilen örneklere de bakıldığında, kapalı siteler kendi içerisinde küçük bir kent gibi davranmaktadır. İçerisinde bulunan donatı elemanları, caddeler, çeşitli yapılar kapalı sayesinde sınırlı bir alan içerisinde küçük bir kent görevi görmektedir. Kent içerisinde özel ve kamusal kavramları arasındaki denge bozularak, kamusal mekanlar giderek küçülmeye,

zayıflamaya başlamış, buna karşılık özel olan mekanlar/ alanlar ise sınırsızca büyümeye, talepkâr olmaya başlamıştır (Yıldırım, 2010).

Kamusal mekânlar, ortak varlığı kolaylaştıran, kişilerarası ilişkileri düzenleyen, bu ilişkiler sonucunda elde edilen deneyimlerle nesiller arasında bağlantı kurulmasını sağlayan mekânlar olarak tanımlanmaktadır (Madanipour, 2003). Değişen toplum ve mekân yapısıyla birlikte kamusal mekânlarda erişim ve iletişim de değişmeye başlamıştır. Bu durum, kentte yabancılaşmaya, kutuplaşmaya neden olmaktadır. Kapalı sitede yaşayan bireyler, benzer yaşam standartlarına, gelir düzeyine sahip bireylerle yaşamayı tercih ederek, farklı özelliklere sahip bireylerle bir arada olmayı reddetmektedir. Bir aradalık, kapalı sitelerde mahalle de olduğu gibi değil, güvenliği olan; steril bir alan içerisinde meydana gelmektedir. Steril alan dışında kalan kamusal mekanların kullanımı azalmakta ve bundan dolayı atıl boşluklar ortaya çıkmaktadır. Kullanımı azalan kamusal mekanlarda güvensizlik ortaya çıkmaktadır. Böylece kapalı sitelere yönelimin daha da artmasına neden olmaktadır (Özdemir ve Doğrusoy, 2016).

Sonuç

Çalışmada, kentsel bir mekân olan mahallenin neoliberalizm üzerindeki değişimler ele alınmıştır. Ekonomik tabanlı bir teori olan neoliberalizm; statü, sosyal demokrasi, devlet gibi kavramlarla birlikte çalışarak, hayatın hemen hemen her noktasında etkisini göstermektedir. Sosyal ve toplumsal ilişkilerin yeniden şekillenmesine neden olan neoliberalizm, bu şekillenmenin somutlaşmasını sağlamak için kentsel mekanlarda da etkisini göstermektedir. Kentsel bir mekân olan mahallede görülen bu etkilerin, kamusal mekân açısından değişimine sebep olduğunu söylemek mümkündür. Bu durumu Şekil 3'de yer aldığı gibi özetlenebilir.



Şekil 3. Neoliberalizm Politikalarının Kentsel Açıdan Sonuçları

Mahallede; statü, din, gelir grubu gibi özelliklerin geride kalarak, bireylerin kolay bir şekilde erişebildiği, içerisinde kahvehane, ibadet yapıları, sokak, park gibi çeşitli kamusal mekanları barındıran, kamusallığın yoğun olarak yaşandığı bir mekân olarak karşımıza çıkmaktadır. Kapalı siteler ise, her ne kadar görünürde içerisinde çeşitli mekanları bulundursa da bu mekanları sadece site içerisinde yaşayan bireyler kullanabilmektedir. Bu durum sokakların, alışveriş birimleri, parkların sınırlandırılmış bir kamusal mekân olma özelliğini taşımasına neden olmaktadır. Çünkü bu mekâna her bireyin erişemediği gibi, erişen bireylerinde düşüncelerini özgürce dile getirebildiği ya da bireylerin kimlik kazanabildiği bir mekân olma özelliği taşımamaktadır. Madanipour'un kamusal mekânın kalıcılığını hakkındaki tanımlamasında kullanılmış olduğu 'nesiller arasındaki köprü' kavramı; uygulanan politikalar sonucunda olumsuz etkilenmekte ve kamusal mekânın kalıcılığının azalmasına yol açmaktadır.

Kapalı konut tiplerinde kültür, değer gibi olguların bütünlüğü dışında, finansal durumlar daha önemli bir noktadadır. Finansal değerleri temel alan toplum, geleneksel bağlarından uzaklaşmıştır. Geleneksel bağların koparılması, kimileri için sosyal etkileşimin daha sakin ve sağlıklı olduğunu kabul görmesine rağmen, geleneksel bağlardan kopma bir yabancılaşmadır. Bu yabancılaşma ise eşitsizliğe ve adaletsizliğe sebep olmaktır (Madanipour, 2003). Özetle, ekonomi tabanlı bir uygulama sonucunda sadece ekonomik alanda değil; aynı zamanda toplumsal ve kentsel açıdan da önemli değişimler yaşanmış olması söz konusudur.

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Investigation of Structural Problems of Huseynik Historical Buildings

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Abstract

Since the middle of the 19th century, changes in the social order in Harput, innovations in transportation vehicles and various weapons caused the castle walls to be insufficient for city defense. With the changes experienced, the city center and administrative buildings were transferred from Harput to the Elazig plain. Hüseynik, which was an important and large settlement area in Harput in the past, has transformed into a neighborhood of Elazig depending on these developments in the city. Although Hüseynik migrated over time due to the social and economic changes in the region, it preserved its identity and history better than other settlements. Today, people in the region have difficulties in meeting the maintenance and repair needs of historical and cultural values. Accordingly, structural problems have arisen in the buildings in the region depending on the physical and environmental conditions. In this study, the characteristics and structural problems of the historical buildings in the region were examined. Structural elements such as walls, joinery, flooring, roof, and foundation were particularly considered in terms of maintenance, repair, and restoration works of the historical buildings in the Hüseynik district. A comprehensive literature survey and technical and observational site investigations were carried out to determine the structural features and problems. Depending on the data obtained, structural and geotechnical suggestions were done in order to preserve the architectural texture, and improve the structural performance of the building.

Keywords: Hüseynik, historical buildings, structural problems, structural and geotechnical solutions.

Introduction

Harput, which has been home to many civilizations, has lost its centrality over time due to the political, cultural and social changes it has undergone. In the past, Hüseynik (Ulukent), a settlement area of Harput, was affected by these changes. This situation has caused the historical and cultural buildings in Hüseynik to be extensively damaged and some of them to be destroyed over time. The historical buildings in Hüseynik, which are decreasing day by day, need to be preserved and transferred to future generations. For this purpose, the current status and structural problems of these buildings should be identified quickly and accurately. Depending on the identification studies to be carried out, the most appropriate intervention decisions (ie. maintenance, repair, dismantling, renovation, etc.) should be made for these buildings. Because, interventions to be applied to buildings without understanding their structural problems may be far from serving the purpose. Therefore, structural problems should be thoroughly understood before determining an environmental or structural intervention type for a building or group of buildings (Zakar, 2013). Structural problems can arise due to climatic, natural, biological and man-made causes. Regardless of the cause of

their occurrence, a comprehensive and rigorous research and investigation process should be carried out to properly understand the existing problems of a building.

In this context, this article has been prepared to serve as an example of the identification of structural problems, which is one of the necessary implementation stages for the protection of the few historical and cultural values of Hüseynik. Structural and geotechnical recommendations are presented for the elimination of the structural problems identified as a result of the investigations. It is aimed that the structural problems and solution suggestions obtained in the study will help the future intervention decisions to be taken for Hüseynik historical buildings.

Materials and Methods

In the study, a technical and observational field study was carried out in Hüseynik on June 12, 2022 to determine the structural characteristics and problems of the historical buildings in Hüseynik. In addition, a comprehensive literature review was conducted to support the conceptual background of the study. Since the types of materials they contain, the conditions they are exposed to and their location within the building vary, the building elements were analyzed separately within the scope of the study. Accordingly, in the article, the structural problems of the elements such as foundations, walls, joinery, floors and roofs of the historical buildings in Hüseynik were examined and identified separately.

Findings and Discussion

In the past, Hüseynik, where caravans coming from Diyarbakır used to stay and known as "a place where guests are accepted, a place with many guests" among the people, is located in the northern region of Elazig Ulukent Neighborhood today. Hüseynik is approximately 5 km from the city center, and the historical Harput Quarter lies to the northwest. The area is bordered by Tunceli to the north, Bingöl to the east, Malatya to the west and Diyarbakır to the south.

In the early 20th century, Hüseynik, which experienced its most glorious days, became a production center with many business lines such as carpentry, leatherworking, jewelry making, sugar-helva manufacturing, coppersmithing, saddlery, silversmithing and weaving (Bican, 2007) (Akyel, 2013). At this time, Elazig was only an administrative center, while Harput continued to be a city (Karakaş, 1999). In 1833, Mehmet Reşit Pasha's construction of the munitions and barracks buildings started an important transformation process for the province of Harput. As a result of the technological, social, cultural and economic changes, people started to create new settlements on the plain. Over time, this loss of value transformed

Harput and Hüseynik into a neighborhood of Elazig. Nevertheless, the social, cultural and economic connections between Hüseynik and Harput continued for many years.

In the Hüseynik settlement, 22 registered buildings have survived from the past to the present. These buildings are mainly located on Sefer Street and Çarşı Street. These historical buildings, which were built from local materials using great skill and craftsmanship, have a unique appearance with their fertile gardens surrounding them. Most of the buildings have an interior and exterior sofa plan type. The plan elements of these buildings consist of rooms, sofas, service spaces, şahnişin, courtyards, iwan and flat roofs. It was determined that the historical buildings were built using adobe and/or stone materials. Stone material was used intensively on the foundation and ground floors. Wooden beams were used in the flooring system of the buildings. Wooden boards were placed on the upper part of these beams and wooden sawdust was placed on the boards for insulation. The insulation layer was covered with a wooden floor covering to provide a clean finish.

Within the scope of the study, the structural problems identified in Hüseynik historical buildings, where the best examples of Elazig traditional architecture are located, are as follows.

- *Walls*

Stone and adobe materials used in the masonry walls of historical buildings have ruptured and lost their texture. In addition, the wall coverings (paint coverings on plaster) of many of the buildings are peeling and discolored in places. In addition, metal sheet claddings were placed on the exterior wall surfaces to solve the insulation problem in the walls. Insulation problems were detected at the bottom of the walls in contact with the floor slabs of the buildings (Figure 1).



Figure 1. Example of structural problems in walls

- *Joinery*

Swelling and shrinkage occurred in wooden joinery in historical buildings due to temperature differences, rain and snow water. Accordingly, openings were formed at the joints of walls and joinery (Figure 2). Through these openings, it was determined that heat, sound, rain and snow water from the outdoor environment reached the interior spaces. Discoloration, insect infestation and moisture problems occurred at the joints and joinery surfaces of the joinery exposed to outdoor conditions. Therefore, some of the wooden joineries were replaced.



Figure 2. Example of structural problems in joinery

- *Floors and Roofs*

Due to the effects of environmental conditions (**ie.** rain, snow, insects, frost...), deflections, spills, material losses and insect infestation were observed (Figure 3) on the floors and flat roofs. It was determined that metal roofs were applied to the wooden beam roofs of historical buildings. These metal roofs over the flat roofs transferred the extra structural load to the building walls. This situation negatively affected the bearing capacity of the walls.

Soil-covered flat roofs are a building component that we frequently encounter in hot climate regions in the world and in our country, especially in traditional rural residences. In our country, it is applied to traditional adobe houses in the Eastern and Southeastern Anatolia regions. It is generally applied by placing it on thick wooden beams with round cross-sections, covering the beams with short pieces of plank, and compacting it by laying 30-40 cm of clay soil on it. Soil with high clay content is used in the earth roof system. Nylon is sometimes spread over the layer of wood chips called the "Cross" of the roof. On the soil in the region, mud, which is formed by the mixture of soil with higher clay content, water and

straw, and called "combirik", is laid. This mud mixture is more solid than the mud plaster applied to the wall. Gravel can be laid on the mud. Finally, the soil is compacted by moving a cylindrical stone called "yuvak stone" or "log stone" (İner & Çağlarer, 2013).



Figure 3. Example of structural problems in joinery

- *Foundations*

As in many traditional houses in Anatolia, stone foundation systems were used in Hüseynik' s historical buildings. The two main elements that make up this foundation system are the stone and the binding material between the stones. Stone foundation systems, which are constructed directly on the natural ground or on a kind of stabilization layer, should be selected as robust, frost resistant and with qualities that will provide adherence.

While the foundation systems of the buildings in the study area vary according to the contour lines of the upper walls, in some houses the foundations were built in regular forms. In general, the defects in the foundation system of the structures examined are due to the deterioration of the bonding mortar elements. These elements have lost their strength under repeated seasonal effects, and material losses have also occurred in the system. These mortar material losses demonstrate themselves as cracks or cavities in places.

Conclusion and Recommendations

The historical buildings of Hüseynik, which are the subject of the study, represent the traditional architecture of Elazig in the best way with their garden walls, courtyards, carnichons, door and window ratios, and the materials used in their construction. In the study, the current situation was analyzed and structural problems were identified in order to preserve these buildings and transfer them to future generations. In the study, it was understood that

the structural problems in the building are climatic, biological and human-induced. Suggestions have been developed to eliminate the structural problems of the mansion. These recommendations are as follows:

- Static and mechanical analyzes should be made for the structural performance of buildings. According to the results of the analysis, projects that will increase the structural performance of the buildings should be created. For this purpose, first of all, the additional structural loads brought by the roofs added to the buildings should be determined. Accordingly, damages to walls, floors and foundations should be determined. According to the damage conditions, dismantling, strengthening, maintenance and repair decisions should be made. In addition, thermal calculations should be made to increase the indoor comfort of the buildings. Special details should be developed for building elements such as windows, walls, floors, roofs and foundations to increase the thermal performance of buildings. The support of experts in the field of structural physics and engineering should be obtained for static and mechanical analysis.

- It was determined that damage to structural elements occurred as a result of biological causes (**ie.** insect infestation, material breakage and spillage). In the studies, it was determined that the areas covered by the damages to the structural elements differ from each other. The damaged part on the less damaged structural elements should be cut and replaced with the same material. On the other hand, building elements with a high amount of damage (especially roof and floor elements) should be completely dismantled and replaced with new materials. In the interventions to be made, materials suitable for the texture of the building should be selected.

- Wooden joinery of the buildings should be dismantled and these elements should be maintained and repaired. Wooden joinery used in the past should be reproduced in accordance with the original.

- The local people often cover the roofs with simple sheet covers, since the maintenance and preservation of the roof cover are considered difficult, as is the case with many traditional roof covers in the region. Especially in the winter season, the leakage of rain and snow water from the uncompressed cover layer can lead to the development of dampness and different structural damages. Polymer-based materials such as geomembrane, which are widely used in geotechnical engineering, can be used to collect and drain water from the top cover. While this type of drainage material prevents the penetration of water into the lower layers, it can be collected by natural stone or cast-in-situ gutters and discharged through gargoyles.

- Geotechnical engineering applications have very satisfactory solutions in terms of strength to meet heavy superstructure loads. However, in residential areas that come to the fore with such unique architectural features, solutions suitable for the characteristics of the building and the texture of the settlement should be developed. Therefore, filling the stone joints in foundations with high-strength concrete and workmanship is the most reasonable option. Stone elements that have been thawed and broken under repeated thermal effects should be replaced with the most suitable for the general texture. General or regional settlements were not generally encountered in the sub-foundation soil. No deformation or cracks were observed on the pavement walls due to these settlements. However, it should be kept in mind that the light superstructure loads due to such traditional structures are not expected to cause serious settlements under their own weight apart from strong ground motions. Again, it is expected that the structure will behave flexibly due to the beams used on the exterior and interior walls against possible sub-foundation settlements.

A qualified conservation approach to historic buildings involves a comprehensive and systematic project and implementation process. For this reason, all relevant work items in the project and construction process should be accurately defined and a team of experts should be worked with. This study will help to accurately identify structural problems in the conservation of historical and cultural buildings in Huseynik. At the same time, it will contribute to academic circles and local administrations to comprehensively address the current situation analysis, project and implementation studies of historical buildings and settlements in Elazig. In this way, it will be ensured that the few historical and cultural structures of Elazig will be preserved and transferred to future generations.

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Büyükada Greek Orphanage Architectural Features and Periodic Changes

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Abstract

Built between 1898 and 1899 by the French company Compagnie Internationale des Wagons-Lits et des Grand Express Européens (International Sleeping Wagons and the Great European Express Enterprise) as a hotel on Büyükada İsa (Hristo) Hill, the building was moved to the Balıklı Greek Orphanage in Yedikule in 1902 and started to serve as an orphanage building. The architect of the hotel, named 'Prinkipo Palas', inspired by the 'Prince Island', which is the first name of Büyükada, is Alexandre Vallaury of French origin. The building, which served as an orphanage from 1902 to 1960, has been standing empty (dysfunctional) for approximately 58 years. The building, which was used as a shelter for Greek orphans when the orphanage function was active, is also known as the "Red Palace" as well as being the largest wooden building in the Europe. It also served at Kuleli Military High School during the First World War. The building, which contains information about the cultural and architectural identity of the period in which it was built, still sees the quality of a resource today. For this reason, it is necessary to carry out all the necessary studies to document the material, construction techniques, historical construction processes of the building, especially the structural system, and to transfer it to future generations by preserving it. The transformation of the orphanage, which was a home for orphaned Greek children in Istanbul, from its first construction in 1898 (with hotel function) to the present day, in its function and architectural space, has been discussed with pre-restoration and post-restoration studies in different periods, and a critique of the present state of the building has been presented. The proposal to re-function as an effective way of keeping this building, which was left to disappear without a function, was put forward within the scope of the study. In the study, qualitative data analysis method was used, which includes analysis of the building as a result of on-site observation in addition to scanning the national and international literature, old and new news, interviews, travel writings and notes about the building. As a result of the data obtained, the re-functioning proposal of the region and the building was presented as a study output. This analysis process and the outcome will contribute to the historical classification of the orphanage's transformation process, reveal the criticism and function proposal brought to the current state of the building, and form a basis for further studies on the subject.

Keywords: Büyükada Greek Orphanage, Prinkipo Palace, architectural transformation, refunctioning.

Büyükada Rum Yetimhanesi Mimari Özellikleri ve Dönemsel Değişimler

Öz

1898 – 1899 yılları arasında, Compagnie Internationale des Wagons-Lits et des Grand Express Européens (Uluslararası Yataklı Vagonlar ve Büyük Avrupa Ekspres İşletmesi) isimli Fransız şirketi tarafından Büyükada İsa (Hristo) Tepesi'nde otel olarak inşa edilen yapı, 1902 yılında Yedikule'deki Balıklı Rum Yetimhanesi'ne taşınarak yetimhane binası olarak hizmet vermeye başlamıştır. Büyükada'nın ilk adı olan 'Prens Adası' ndan esinlenerek 'Prinkipo Palas' adı verilen otelin mimarı Fransız kökenli Alexandre Vallaury'dir. 1902 yılından 1960 yılına kadar yetimhane işlevini sürdüren yapı, yaklaşık olarak 58 yıldır boş (işlevsiz) durmaktadır. Yetimhane işlevinin aktif olduğu dönemde Rum yetimlerine barınak olarak kullanılan bina, Avrupa'nın en büyük ahşap binası olmasının yanı sıra "Kırmızı Palas" adıyla da anılmaktadır. Birinci Dünya Savaşı sırasında Kuleli Askeri Lisesi'ne de hizmet vermiştir. Yapıldığı dönemin kültürel ve mimari kimliğine dair bilgiler barındıran yapı, bugün bile bir kaynak niteliği görmektedir. Bu sebeple yapının başta strüktür sistemi olmak üzere malzeme, yapım teknikleri, tarihsel yapım süreçleri konularının belgelenmesi ve gelecek kuşaklara korunarak aktarılması için gerekli tüm çalışmaların yapılması gerekmektedir. İstanbullu kimsesiz Rum çocuklarına yuva olmuş yetimhanenin 1898 yılı ilk yapımından (otel işlevli) günümüze kadar işlevinde ve mimari mekanında meydana gelen dönüşümleri, farklı dönemlerde restorasyon öncesi ve sonrası çalışmalarla ele alınarak yapının günümüz durumuna bir eleştiri sunulmuştur. İşlevsiz olarak yok olmaya terk edilen bu yapıyı yaşatmanın etkin bir yolu olarak yeniden işlevlendirilmesi önerisi çalışma kapsamında ortaya konulmuştur. Çalışmada, yapıya ait ulusal

ve uluslararası literatürün taranması, yapıya ait eski ve yeni haberler, söyleşileri gezi yazıları ve notların incelenmesine ek olarak yapının yerinde gözlemlenmesi sonucu analizleri içeren nitel veri analizi yöntemi kullanılmıştır. Elde edilen veriler sonucunda bölgeye ve yapıya ait yeniden işlevlendirme önerisi de çalışma çıktısı olarak sunulmuştur. Bu analiz süreci ve sonuç çıktısı, yetimhanenin dönüşüm sürecinin tarihsel olarak sınıflandırılması konusunda katkı sunacak, yapının güncel durumuna getirilen eleştiri ve işlev önerisini ortaya koyacak ve konuya dair yapılacak sonraki çalışmalar için altlık oluşturacaktır.

Anahtar Kelimeler: Büyükada Rum Yetimhanesi, Prinkipo Palas, mimari dönüşüm, yeniden işlevlendirme.

Introduction

The orphanage building on Büyükada, which was a warm home for orphan Greek children many years ago, has been the subject of different discussions today. There are many question marks, including the cost, about the intervention and restoration processes that need to be applied due to the choice of the wood frame system as the construction technique and material use of the building, and the lack of maintenance and repair for a long time. Within the scope of this study, the functional and spatial transformations of the orphanage from its first construction as a hotel to the present day will be discussed and the repairs it has undergone will be revealed. In this way, awareness will be raised to this structure, which is the subject of current debates and the opinions of many experts on the subject are included in order to do what is necessary as soon as possible. It is expected that the work will have a catalytic effect towards the acceleration of the restoration works planned to start and the steps to be taken to solve the cost problem.

In the 1920 study of Anna Welles Brown, one of the researches on orphanages in Istanbul, it was revealed that there were four Greek orphanages in Istanbul. Three orphanages located far from the city center are located in Büyükada, Pendik and Heybeliada, while the fourth orphanage is located in Ayaspaşa within the city (Şenyurt, 2021). It is also obtained from the information given in this source that the boys stay in the Büyükada orphanage. In the classification made by Bakal (2021), it is mentioned that the orphanage accommodates 733 children. Except for the four orphanages mentioned in Brown's (1920) study, the name of the building that was converted from Hıristos Monastery at the beginning of the 20th century[1] and used as an orphanage on Kınalıada is not mentioned. It is stated about the Hristos Monastery, which is also known as the Upper Monastery, that it was repaired with the payments made by a Greek wealthy named Simon Sinyosoğlu at the beginning of the 20th century, and that it continued to be used as an orphanage (Şevki, 2004).

Short Information About Büyükada Greek Orphanage (Prinkipo Palas)

In order to make sense of the building and to better understand the historical and structural change process, first of all, it is necessary to have information about the geographical,

historical, physical, architectural and registration status of the building. In this section, the general features of the Büyükada Greek Orphanage are mentioned.

The former name of Büyükada, which is frequently used today, is Prinkipos (Bey Island). (Alper, 1994). The orphanage is located on Manastır Hill (ancient Hristos (Isa) Hill) of Büyükada, the largest and central island of the Prince Islands in the Sea of Marmara (Figure 1). Different names were used, such as Kırmızı Palas, Prinkipo Palas, which varied depending on the function and the period. Although the building has a floor area of 11000 square meters, it is a construction built with a 124-year-old wooden frame system as of 2022. The construction of Prinkipo Palace was started in 1898 by the French Wagon-Li (Wagons-Lits)[2] company under the direction of Maurice de Bochard and lasted approximately two years until 1900 (Somer, 2009). The building was originally built as a hotel[3] and its architect was Alexandre Vallaury,

[1] According to Türker (2000), the children in the Büyükada Greek Orphanage were moved to the aforementioned Kınalıada Orphanage after 1916. For this reason, it can be thought that the building was used actively at the beginning of the 20th century.

[2] The investment company is the owner of the Pera Palas hotel, which connects Istanbul to Europe by rail, and the owner of the Orient Express line.

[3] In some sources, the hotel and casino functions are mentioned together (Söylemez, 2022; Özlü, 2018). one of the famous Levantine architects of the period.

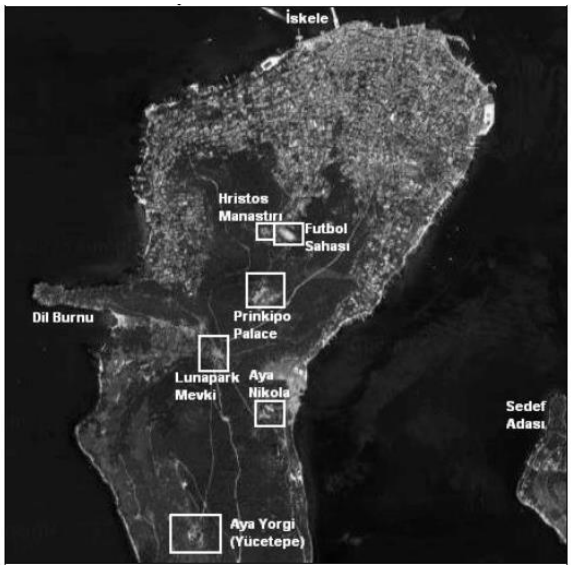


Figure 1. Buyukada Satellite View, Prinkipo Palace, Google Earth, 2005

Prinkipo Palace is designed to be used as a hotel - casino function, consisting of 206 rooms, concert halls, ballrooms and dining halls. The structure is 100 meters long, 32 meters wide

and 24 meters high (Somer, 2016). Ceiling heights vary between 2.60 and 7.30 meters depending on the floor and place they are located. The building spans are between 3.5 and 9.0 meters. The building has 5 floors and its wings are 6 floors. The facade of the building has the window features and proportions of traditional Turkish houses. The main building axis, which is located horizontally in the planning of the building, vertically intersects with 3 different vertical axes, namely the head, middle and end. The division that occurs as a result of this intersection breaks the perception of long corridors and enables the use of the service. The building is located in the northeast-southwest direction.

Architectural Planning and Construction Features

The building, which is known as the Greek Orphanage today, is positioned to cover an area of 26,000 square meters on the Isa Hill of Büyükada. There is a monastery, which is said to have been built in 1597, where the orphanage was previously located (Göktürk, 1963).

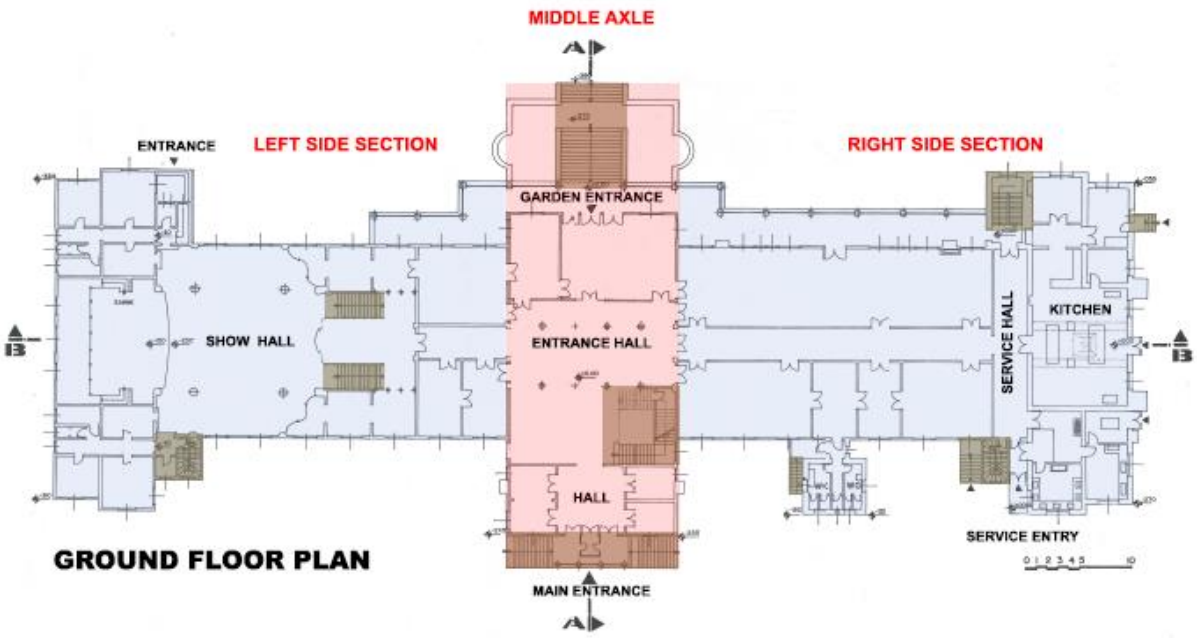


Figure 2. Ground Floor Plan of Büyükada Greek Orphanage (Arkitekt, 1994)

The main entrance axis in the plan in Figure 2 also defines the middle axis to meet the square planned entrance hall. While 4 double-row columns placed on the middle axis form the stair hall in the south part, it is a middle space that provides access to the corridors of the two side branches of the building in the northern part. All columns in this area and on the floor serve as carriers for the upper floor floors and walls. The 3 doors used in the transition from the area located directly across (south) of the entrance hall to the garden lead the middle axis back to the exterior (garden facade).

On the ground floor, there are the side branches (east - west axis) positioned perpendicular to the middle axis, the corridor opening to the entrance hall in the middle, and rooms whose size and location change according to their function. Although the function of all these rooms cannot be determined, there is a service entrance in the plan scheme in the easternmost part of the right side. As understood from the furnishings in the plan, it is revealed that there is a kitchen and that it may include additional service areas such as laundry and cleaning. The narrow edges of the corridors are limited by the stairs (vertical circulation) reaching the upper floors. On the left side, there is a performance hall with a separate entrance from the garden facade, apart from a few rooms whose function is not clearly known (it is presumed that they are places serving the performance hall). The hall space, which includes the height of the basement and the ground floor, can be defined as the basement floor, and the upper floor of the hall (ground floor of the building (2.30 elevation)) is accessed by two symmetrically located stairs from both sides of the middle box. In the hall, there is a stage 80 cm elevated from the ground and two separate entrances from the outside, two-storey backstage rooms and side rooms serving the stage. Another staircase on the entrance façade provides access to the upper floor loggias of the hall. This staircase also performs vertical circulation on all other floors. It is stated that this hall, which is an important place of this building, which was built as a hotel, preserved its function and importance even when it was used as an orphanage (Alper, 1994).

The first 3 floors, where vertical circulation is provided by the 3-armed staircase in the ground floor entrance hall, have a similar plan scheme. The corridor on the right and left sides merged on the upper floors and turned into a horizontal, east-west axis through which the rooms were opened. This axis is designed as a luminous area, starting from the 1st floor and continuing through 4 floors, in the area equal to the upper part of the entrance hall. Thanks to this space, it is seen that all spaces of the corridor with a long axis can benefit from natural light.

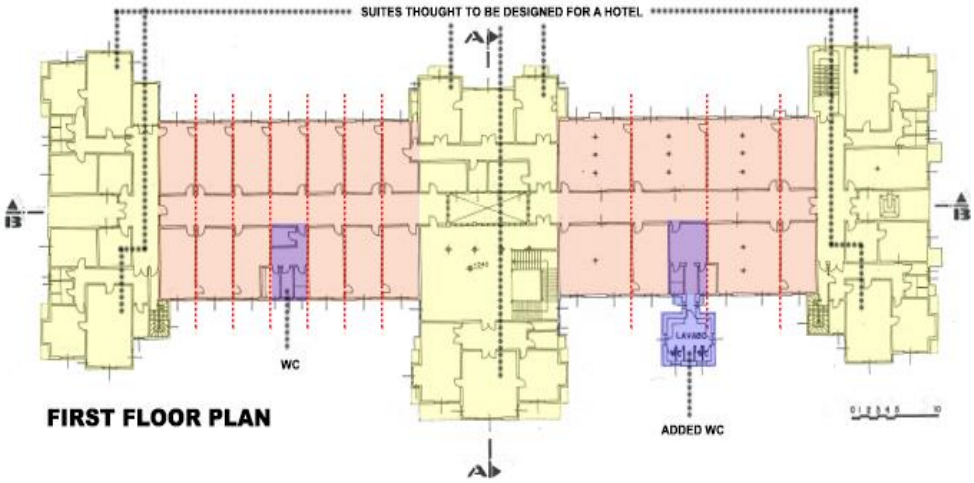


Figure 3. Buyukada Greek Orphanage 1st Floor Plan (Arkitekt, 1994)

In the 1st floor plan in Figure 3, the main corridor axis is divided into 7 axes on the left side arm, and between the axes is divided into different rooms. On the right side arm, this situation was differentiated and the spaces were combined and the columns were left in the middle of the space. While wooden columns leave a visual effect in the space, more than one module is combined to create larger spaces. A module on the rear façade on both arms is reserved for washbasins, and the space has been expanded with a legible masonry addition on the right arm. Apart from the rooms located on the east-west axis and opening to the middle circulation area, which maintains its continuity on each floor, the apartments designed in the ends and middle parts of the front and rear facades stand out. Considering the building, which was originally designed as a hotel, it is estimated that these apartments may be suite hotel rooms. Although the sizes of the rooms are similar, the sizes of the overhangs used on the exteriors differ. Apart from the main staircase in the middle axis, there are stairs that provide circulation at the east and west ends.

After 3 floors with the same plan, a fourth floor with a lower floor height than the other floors was created by being raised from the east-west ends and the middle axis. Although the space planning on the other lower floors is the same, some of the apartments have been reduced and some rooms have been canceled (Figure 4). Although the reason for this is not known, it is estimated that it was made as a result of requesting a difference in the last floor in order to create mobility on the facade.

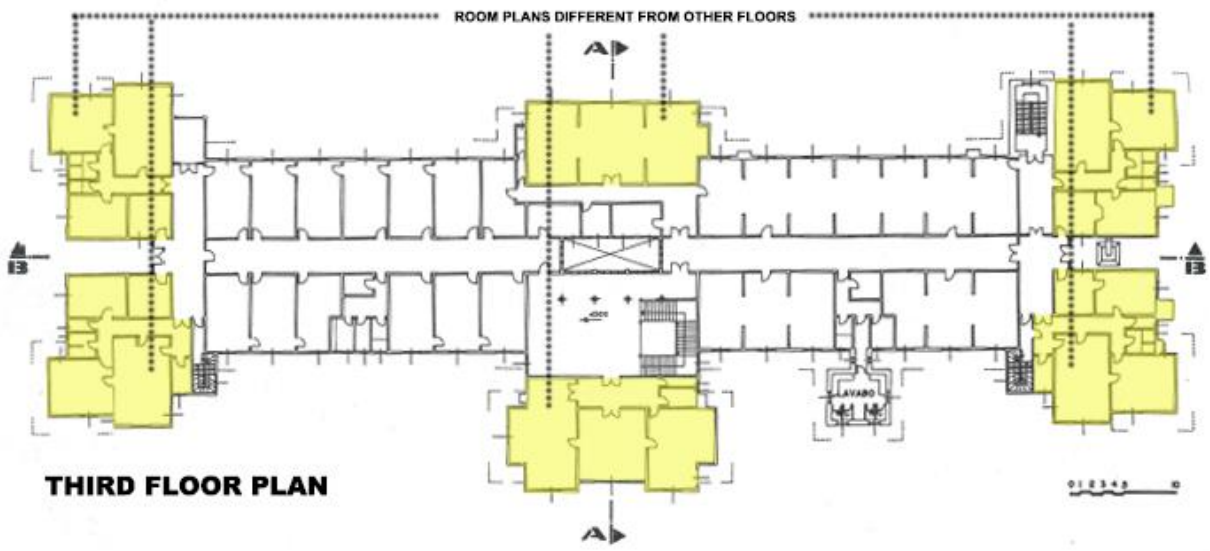


Figure 4. Büyükada Greek Orphanage 3rd Floor Plan (Arkitekt, 1994)

The symmetrical layout in the plan scheme of the building is also reflected on the facades. However, the differences that can be seen in some parts are noteworthy. It is anticipated that the reason for these differentiations may be due to the renovations that took place after the functional change (conversion from a hotel function to an orphanage). In order to break the rectangular horizontal mass appearance on the façade, vertical masses were created at the ends and middle parts. These vertical axes are supported by overhangs on different floors and in different sizes, thereby enlivening the facades (Figure 5).

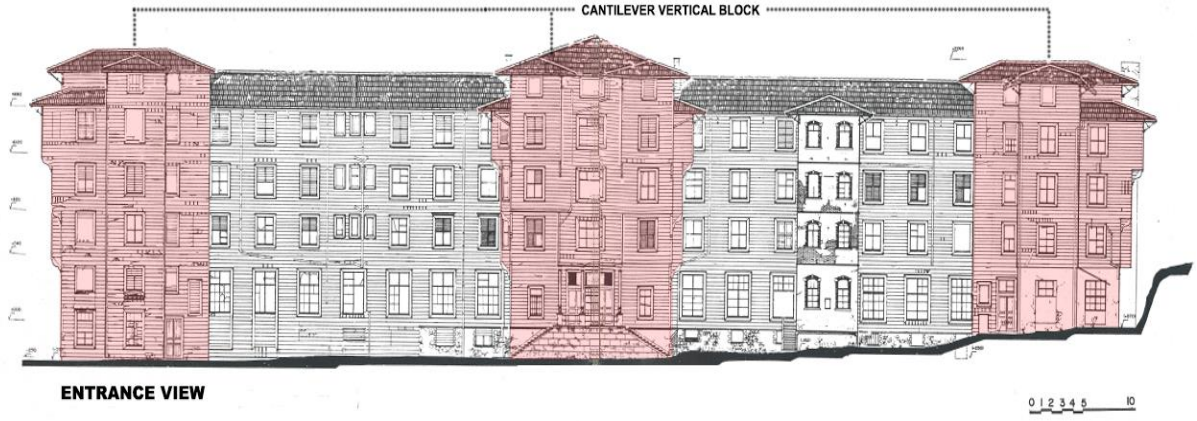


Figure 5. Büyükada Greek Orphanage Entrance View (Arkitekt, 1994)

The continuity of the movable façades is ensured by the fragmented appearance of the hipped roof covering the building, welded from different elevations. The walls of the service areas in the basement and ground floors are considered as masonry. Apart from this, the entire structure was built with a wooden frame system. The construction of a structure of this size

using wood as a structural system and material has made it the largest wooden structure in Europe (Cumhuriyet, 1996; Somer, 2016; Öztürk, 2019 - internet; Germirli, 2018-internet; Kültür Servisi, 2018-internet). In some sources, it is the world's largest multi-storey wooden structure (Kartal, 2015; Milliyet, 1995; Ökten, 2022-internet). Elsewhere, there is a situation different from the two ideas advocated. The 'Buyukada Greek Orphanage Restoration Project', which was introduced in October 2021, was carried out under the coordination of Yeniköy Panayia Greek Orthodox Church Foundation President Laki Vingas. In the article of Mari Minasyan dated November 1, 2021, it is stated that the structure is the first largest wooden structure in Europe and the second largest in the world (Minasyan, 2021-internet). While this structural system is covered with stucco in the interior, it is covered with horizontal woods on the exterior (Alper, 1994). The floors of the service areas of the building are covered with mosaic tiles, while the other areas are covered with wooden boards (20-30 cm wide). The carrier wooden beams on the ceilings are covered with wooden ceilings. The transition between the beams and the ceiling is provided with profiled cornices.

When looking at the window spaces, double wing windows are used in the rooms, while wooden shutters are used on the outer side of the windows. The large rectangular windows of the ground floors due to their function are the parts where fixed and openable glass are used together.

Contrary to its large scale, the building has a simple character. It has a simple facade, away from ornaments and details. Mobility is provided by the partial construction system made at different elevations.

The building does not have an elevator, unlike other buildings built to function as a hotel. In addition, each room does not have its own wc-shower unit. In addition, it consists of flat sections consisting of many rooms and differing according to their location.

Periodic Architectural Changes of the Building

The Büyükada Greek Orphanage, which is defined as Europe's first and the world's second largest multi-storey wooden structure according to different sources, has hosted many changes and transformations over the years as it turns 124 today. Since their first construction, these have brought primarily functional and structural transformations over time. In this part of the study, the periodical changes that the building has undergone, starting from 1898, when it was first built, will be discussed.

First Production – Hotel (Casino) Structure

Between 1898 and 1899, Compagnie Internationale des Grand Hotels, managed by Count Maurice de Bochard, built Prinkipo Palace as a luxury casino hotel, costing 50,000 gold coins (Dinçer & Demiroğlu & İzgi, 2008). However, Sultan II. As a result of Abdülhamid's veto of the building because of its casino function, the company had to abandon the investment, thinking that it would make a loss. Subsequently, the structure was built as a hotel by the French company Compagnie Internationale des Wagons-Lits et des Grand Express Européens (International Sleeping Wagons and Large European Express Enterprise). The sultan of the period did not allow this magnificent wooden building to be used as a hotel under the name of 'Prinkipo Palace'.

At this point, it is necessary to mention the Balıklı Greek Orphanage, which will be included in the process later on. The inconvenience of the environment of the orphanage located in the garden of Yedikule Balıklı Greek Hospital was noticed by the patriarch of the time, Germain, and the construction of a new section was started in 1850. However, upon the death of the patriarch before the building could not be completed, the orphanage building was completed between 1851 and 1853 (Türker, 2000). At the end of this process, the first Greek Orphanage in Istanbul was established by Patriarch Yermanos IV in 1853 in the garden of Balıklı Greek Hospital (Göktürk, 1963). However, as time progressed, the need for space, which developed due to the increase in the number of children, led to the search for a new place. In Şenyurt's (2021) article on the subject, although it is stated in the information obtained from many sources that the search for a place for an orphanage emerged after the great earthquake in Istanbul in 1894, there were documents indicating that there were some attempts before this date. In one of them (document dated July 24, 1886), the search for a new building is mentioned due to reasons such as the patients in Yedikule Balıklı Greek Hospital wanting to use the orphanage building, the increase in the number of children and the lack of adequate places for the industrial training they received. Land was sought for the construction of the new building requested by the Greek Patriarch. It is understood that the land (Figure 6), located around Şişli Police Station[4], close to the Greek cemetery, is an empty mud-covered area where construction will not be possible. The upper floor of the orphanage, which was damaged in the aftermath of the great Istanbul earthquake (year 1894), was demolished beyond repair. While the search for a place continues, the orphans staying in the elderly ward of Balıklı Greek Hospital are moved to the guesthouse of Balıklı Monastery located in the same area (Türker, 2000) and it was thought that orphans could stay here for a while (until a

new land was found and a new building was built).and it was thought that orphans could stay here for a while (until a new land was found and a new building was built).

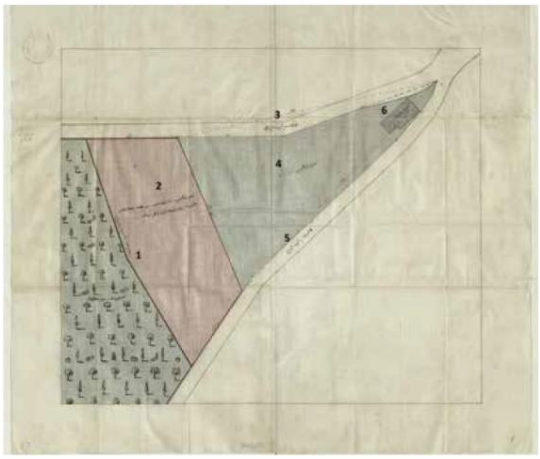


Figure 6. The Land Chosen For The Orphanage and its Immediate Surroundings

Since the land in Picture 1 was not suitable for construction, the Greek patriarch and the community started to search for land again. The place deemed suitable for the building this time is a 12-decare plot called Küçükbalıklı, located in front of the existing orphanage. On October 10, 1898, the Patriarchate requested the construction of a new building on the selected land for the Yedikule Greek Orphanage, which was damaged and destroyed by the earthquake, for the necessary letters and permissions. However, it is reported that the land belongs to Sultan Bayezid Han-ı Veli foundations and was left as a cemetery by him (Şenyurt, 2021). However, it is stated in the same source that the documents regarding this endowment process could not be found. As a result, it turns out that the area where permission was requested to build an orphanage was used as a cemetery for the burial of the dead in the neighborhood.

[4] (1) It is the wall of the Greek Cemetery, (2) It is from the field of Emlak-i Hümayun and is used to be annexed to the Greek Cemetery, (3) the land going to Büyükdere, (4) the field of Emlak-i Hümayun, (5) Tarik who went to Kağıthane, (6) Şişli Police Station (Source: BOA., ŞD., 2509/12).

Although permission was granted for the construction of the land in Küçükbalıklı, for some reasons, permission was requested from the sultan to move to Prinkipo Palas, which is located near the Büyükada Hristos Monastery, which was considered a more suitable area (BOA., DH.MKT., 490/19).

Opening as an Orphanage

Yedikule Balıklı Greek Orphanage, which started and continued before the sultan of the period did not allow the use of the hotel-casino, which was the first construction function of the orphanage, was approved to be moved to the hotel structure as a result of the demolitions (1894 earthquake). In order for the hotel building to be used as an orphanage, Eleni Zarifi, the widow of banker Yorgo Zarifi, bought the building from a French company for 3,700 gold coins (Milliyet, 1995). Zarifi donated the building to the Patriarchate on the condition that it only be used as an orphanage (Behar, 1996; Alper, 1994; Gülersoy, 2001). On March 19, 1902, there was no harm in using Prinkipo Palas Hotel (Figure 7) as an orphanage, on the grounds that there was no private property area and no state structure around it. II. Abdülhamid gave the building to the auspices of the Greek Patriarchate on the condition that it be used as an orphanage for children belonging to the Greek Orthodox community in regions such as Istanbul, Gökçeada and Bozcaada. The orphanage was opened on 21 May 1903 (Fendoğlu, 2010).



Figure 7. Büyükada Greek Orphanage on an old postcard (Source: İBB. Atatürk Library, Krt_004581)

World War I – Allotment to Kuleli Military School

Due to the turmoil in the country with the start of the First World War, the orphaned children were moved to another orphanage in Heybeliada. The building was allocated to Kuleli High School (Kuleli Military High School) students and then to German soldiers (Özlü, 2018). In

this process, the orphanage functions as a military barracks. Then it became a shelter for Greek immigrants sent to the island by the occupation forces. Meanwhile, Russian refugees fleeing from the Bolshevik Revolution that took place in Russia also used the Büyükada Greek Orphanage as a shelter. In order to prevent the cold caused by the conditions when the Russians were in use, the building was equipped with wooden flooring, etc. they tried to warm up by removing their materials. Therefore, the structure was damaged in this process as well.

Seizure of Building – Cyprus Events

During the Cyprus Events in the 1960s, the Büyükada Greek Orphanage was confiscated and its service was stopped and transferred to the General Directorate of Foundations. The building, which has not been used since 1964 and the functional uses suggested by different segments, were not considered warmly, was left to rot.

Return to the Fener Greek Patriarchate

In this process, Fener Greek Patriarchate requested the return of the structure from the General Directorate of Foundations, together with the edict from the Ottoman Empire and the documents donated by the Zafiris and Sygnoss families to the patriarchate. As a result of the rejection of this request, the Fener Greek Patriarchate filed a lawsuit through the ECtHR (European Court of Human Rights) in 2005 to take back the orphanage. The case was concluded on 29 November 2010 and the title deed of the Büyükada Greek Orphanage was officially transferred to the Fener Greek Patriarchate.

The State of the Building Today – The Problem of Negligence and Dysfunction

The building, which is 124 years old as of 2022, has suffered a lot of damage due to the strength of its material during this period. In the 58-year period from 1964 onwards, the damage occurred in the building due to the fact that it had no function and was left empty. Thereupon, the notables of the sector, the islanders, representatives of non-governmental organizations came together and started working to find a solution to the issue. The Büyükada Greek Orphanage, which is known as the largest wooden structure in Europe and the second largest in the world, was opened to some preparations and discussions on ideas and suggestions before the restoration works were started. In this context, the Büyükada Greek Orphanage's designation as one of the '7 World Heritage in Danger' by Europa-Nostra within the scope of the '2018 Year of Cultural Heritage' is seen as a turning point in terms of preserving the heritage and transferring it to future generations.

In 2021, an information meeting was held in the garden of the orphanage as part of the studies. Fener Greek Patriarch Bartholomew, Deputy Minister of Culture and Tourism Ahmet Misbah Demircan, representing the Istanbul Metropolitan Municipality, the municipality's subsidiary Bimtaş I.C. General Manager Özcan Biçer, Islands Mayor Erdem Gül, Europa Nostra Turkey President Burçin Altınsay Özgüner, Islands Foundation President Halim Bulutoğlu and project coordinator Laki Vingas participated. In his speech at the meeting, Fener Greek Patriarch Bartholomew said, *"This building, which is known to the whole world for its architectural features, is also a monument of social solidarity, progressive education, self-sacrifice and compassion. It is the tangible and historical form of these spiritual values, which we desperately need today."*

Digital Documentation, Relief (Rölöve) Studies

After this meeting, which guided the beginning of the works, the digital documentation and survey works of the building were completed. Some digital documents obtained as a result of these studies will be included in order to understand the process and see the change.

The first steps were taken in August 2020 to return the orphanage building, which is currently in danger of collapsing, to its former glory (NTV, 2021 – Haber). The digital documentation and survey works of the building have been started by BİMTAŞ, a subsidiary of IMM (Istanbul Metropolitan Municipality). As a result of the work of a team of 70 experts with their special equipment, the survey of the building was made in a period of 4 months (https://bimtas.istanbul/projelerimiz/buyukada-rum-yetimhanesi-rolove-ve-dijital-belgeleme-calismasi). Related examinations and reports have been submitted to the Supreme Council of Monuments. In the light of the information obtained from the images, it is seen that serious collapse and damage occurred on the roof and floor of the building (Figure 8).



Figure 8. The survey study section of the Büyükada Greek Orphanage (Bimtaş, 2021)

The executive of the preliminary restoration project, IMM affiliate BİMTAŞ I.C. Deputy General Manager Akkoyunlu emphasized that 50 percent of the roof of the orphanage was destroyed and all of it was damaged, and shared the following information:

60 percent of the fourth floor has collapsed, and 40 percent of the third and fourth floor floors are damaged. Floor beams have lost 60 percent of their load-bearing capacity throughout the building. A protective cover system and support elements should be placed so that the structure does not enter a demolition process (Figure 9). The building was examined by the KUDEB Conservation and Restoration Laboratory and 43 wood, one brick, one stone, three paint, four plaster and 18 mortar samples were taken.

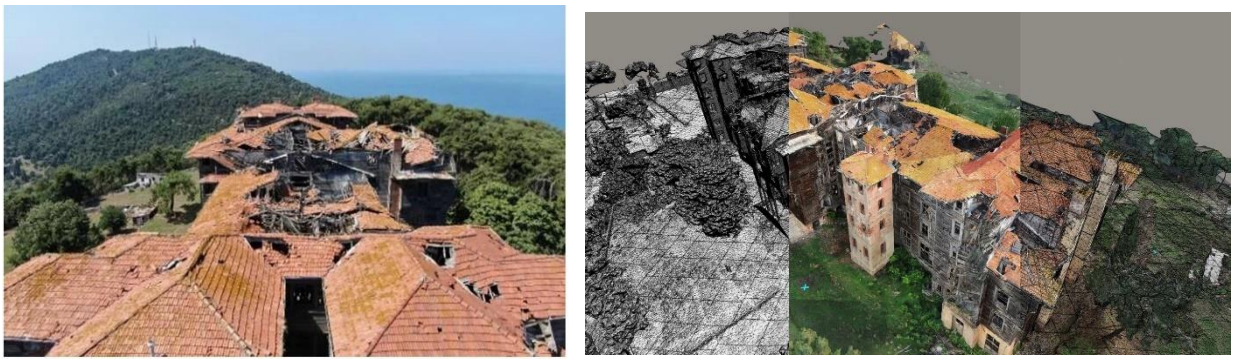


Figure 9. Digital documentation studies showing the damage on the roof of the Büyükada Greek Orphanage (Bimtaş, 2021)

Büyükada Orphanage Restoration Project Coordinator Laki Vingas, where digital documentation and survey works have been completed, states that considering the physical condition of the building (Figure 10, Figure 11) not all of it is suitable for restoration, and some of it can be demolished and rebuilt (Anadolu Ajansı, 2022).



Figure 10. Büyükada Greek Orphanage Entrance Facade Digital Documentation Image (Bimtaş, 2021)

While emphasizing the importance of starting the restoration works as soon as possible, it is stated that a cost of 20 million Euros (according to the calculations of 2021) is needed in order to complete the restoration works of the building as a result of the studies (Bimtaş, 2021).



Figure 11. Büyükada Greek Orphanage Plan Digital Documentation Image (Bimtaş, 2021)

Conclusion and Recommendations

Prinkipo Palace, which was originally built as a hotel and casino structure and allowed to be used by converting its function to meet the need for an orphanage in different parts of the island, is now under the control of the Fener Patriarchate (Ceylan, 1994, 354). Restoration works of the building, which is the subject of discussion in different media, which includes

ideas, about which exhibitions are held, and where ideas about its preservation are produced with new proposals, should be started without any further delay.

It remains a matter of curiosity how the restoration of such a large building will be carried out without 'losing or spoiling' the structural and architectural originality of the wooden frame building. However, it was seen within the scope of the study that by using the digital documents obtained as a result of the restitution studies;

- The parts of the structure and material to be protected should be protected,
- Parts that are too bad to be preserved should be rebuilt with today's suitable materials in a way that preserves the difference of the period they were made,
- Although it is subject to different discussions as a function, a new function should be defined by considering the conditions and needs of the island,
- Being open to mixed functions that can contain mixed functions,
- Include flexible spaces that may differ according to seasonal uses depending on density,
- Considering the storey heights of the building, taking into account the difficulties in the period of the orphanage function, giving it a different function,
- Reaching a conclusion by making the necessary grounds and multi-disciplinary discussions against the ideas of functioning as a hotel,

specified items are required.

Based on all these inferences, it is important not to ignore the real structure of the building, especially the sensitive situation caused by the material. Starting every step to be taken as soon as possible means that at least the remaining parts of the building are preserved and kept alive.

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Yüksek Yapılarda Dış Destek Sistemlerin Kullanımına Yönelik Bir Değerlendirme

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Öz

Yapı ve yapım teknolojileri ülke ekonomilerinde önemli bir yere sahiptir. Bu duruma bağlı olarak kentlerde yapılaşma alanları azaldıkça küçük arazi kullanımına sahip yüksek yapılar her geçen gün önem kazanmaktadır. Yapılarda, yükseklere ulaşmak; güç, itibar göstergesi olarak karşımıza çıktığı için her geçen gün daha yükseklere ulaşmak için gösterilen bu çaba sonucunda malzeme ve yapı mühendisliği alanlarında önemli gelişmeler gözlemlenmektedir. Belirli yüksekliklerden sonra geleneksel taşıyıcı sistemler deprem, rüzgar gibi yanal yüklere karşı yeterli dayanıma sahip olmadıkları için farklı taşıyıcı sistem alternatifleri uygulanmıştır. Bu taşıyıcı sistemler içerisinde dış destek sistemler (outrigger) şu anda dünyanın en yüksek yapılarında hatta Türkiye'nin en yüksek yapılarında uygulanan bir taşıyıcı sistem çeşididir. Bu çalışmada yüksek yapılarda taşıyıcı sistem bağlamında dış destek sistemlerin kullanımı odak noktası alınmıştır. Çalışmanın amacı; bina üretiminde en hakim role sahip olan mimarlarda yüksek yapı taşıyıcı sistem türü olan dış destek sistemlerin kullanımına yönelik bilinç oluşturmaktır. Bu doğrultuda, nitel araştırma yöntemlerinden veri toplama ve iz sürme metotları kullanılarak dünyadan ve ülkemizden 10 adet dış destek sistem ile tasarlanmış yüksek bina örneği incelenmiştir. İnceleme sonucunda, dış destek sistemlerin kullanımı ile tasarım aşamasında projeye nasıl dahil edildiğine yönelik değerlendirmeler yapılmıştır. Yapının göreli kat ötelenmeleri ve tepe noktası deformasyonları azalarak daha konforlu kullanım sağlayan bu sistemler; kolon ve perde boyutlarının küçülmesine yardımcı olarak mimari kullanılabilir alanın artmasına imkan vermektedir. Ayrıca cephelerde daha özgür tasarım imkanı tanıyarak yüksek yapı tasarımlarının kısıtlayıcı faktörü olan taşıyıcı sistemin etkisini nispeten azaltmaktadır. Sonuç olarak bu çalışma ile mimarların yüksek yapı taşıyıcı sistemlerinden dış destek sistemler konusuna vakıf olmaları için bir kaynak oluşturulmuştur.

Anahtar Kelimeler: Yüksek Yapılar, Dış Destek Sistemler, Deprem, Mimari tasarım.

An Evaluation of the Use of Outrigger Frame Systems in High-Rise Buildings

Abstract

Building and construction technologies important in national economies. Depending on this situation, as decrease the building areas in the cities, high-rise buildings using small land importance day by day. Reaching heights in buildings; As a result of this effort to reach higher and higher every passing day, important developments are observed in the fields of materials and structural engineering. Since conventional structural systems do not enough strength against lateral loads such as earthquake and wind load after certain heights, different structural system alternatives have been applied. Among these structural systems, outriggers are currently used in the tallest buildings in the world, even in Turkey's tallest buildings. In this study, the focus is on the use of outrigger systems in the context of structural systems in high-rise buildings. The aim of the study; It is to create awareness for the use of outrigger systems, which are the type of high building structural system, in architects who have the most dominant role in building design. In this direction, 10 examples of high-rise buildings designed with outrigger systems from the world and our country were examined by using data collection and tracing methods from qualitative research methods. As a result of the study, evaluations were made on the use of outrigger systems and how they were included in the project at the design stage. These systems, which provide more comfortable use by reducing the story drifts and top deformations of the building;

It allows to increase the architectural usable area by helping to reduce the size of columns and shear walls. In addition, it provides a free design opportunity on the facades and relatively reduces the effect of the structural system, which is the limiting factor of high-rise designs. As a result, with this study, a resource has been created for architects to have information about outrigger systems, which are among the high-rise structural systems.

Keywords: High-rise Buildings, Outriggers, Earthquake, Architectural Design.

Giriş

Yapı ve yapım teknolojileri ülke ekonomilerinde önemli bir yere sahiptir. Bu duruma bağlı olarak kentlerde yapılaşma alanları azaldıkça küçük arazi kullanımına sahip yüksek yapılar her geçen gün önem kazanmıştır. Yapılarda, yükseklere ulaşmak; güç, itibar göstergesi olarak karşımıza çıktığı için her geçen gün daha yükseklere ulaşmak için gösterilen bu çaba sonucunda malzeme ve yapı mühendisliği alanlarında önemli gelişmeler gözlemlenmektedir. Bu gelişmelerin doğal bir sonucu olarak da 5-6 katlı tipik çerçeve sistemlerden oluşan yapısal taşıyıcı sistemlerden, günümüzün farklı mimarilere sahip yüksek yapılarına ulaşılmıştır (Gözütok, 2011). Taşıyıcı sistem tasarımı yıllar içerisinde birçok değişime uğramış, malzemenin de gelişmesiyle bazı yeni taşıyıcı sistemler ortaya çıkmıştır.

Yüksek yapıların tasarımda deprem ve rüzgar tasarımı kısıtlayıcı önemli faktörlerdendir. Bu nedenle yüksek yapı tasarımında depreme karşı dayanıklılık ve rüzgar faktörü ilk olarak yapıların taşıyıcı sistemi belirlenirken göz önünde bulundurulur. Yüksek yapılar geleneksel yapılara göre daha fazla deprem ve rüzgar etkisine maruz kaldıkları için taşıyıcı sistem daha önemli hale gelmektedir. Bu nedenle yapıda yükseklik arttıkça geleneksel taşıyıcı sistemler iş göremez hale gelmekte ve bunun sonucunda yeni taşıyıcı sistemlerin geliştirilmesi kaçınılmaz olmaktadır. Bu sistemler içerisinde ise dış destek sistemler (outrigger) şu anda dünyanın en yüksek yapılarında (Şekil 1a-b), hatta Türkiye'nin en yüksek yapılarında (Şekil 1c) uygulanan bir taşıyıcı sistem çeşididir.



(a) (b) (c)

Şekil 1. a) Shanghai Tower, Şangay, Çin,2015 b) Lotte Tower, Seul, G. Kore,2017, c) Folkart Towers, İzmir, Türkiye, 2014

Prensip olarak açık denizlerde seyahat için kullanılan kano ya da sandalların dalgalara karşı yatay stabilitesini arttırmak amacıyla geliştirilen bu prensip, yüksek yapılarda da kolay tercih edilebilir bir uygulamadır. Dış destek (outrigger) sistemlerin çalışma mantığı yapının yüksekliği boyunca bazı noktalarda rijit katlar oluşturulmasıdır (Şekil 2a-b).



(a) (b)

Şekil 2. a) Kanolarda Dış Destek Sistem Benzeşmesi b) Yüksek Yapıda Dış Destek Sistem

Dış destek sistemler çekirdeği çevredeki kolonlara bağlayan yatay perdelerden oluşmaktadır. Dış destek sistemleri genellikle yapıların tesisat katlarında yer alır. Bu sistemin yeterli etkinliğinin sağlanabilmesi için en az bir kat yüksekliğinde olmalı ve eğilme rijitliği yüksek olan yatay perdeler, normal katlarda kullanımına engel teşkil etmemek amacıyla, genellikle yapı yüksekliği boyunca bir veya daha çok seviyede yer alan mekanik katlara yerleştirilir (Günel & Ilgın, 2014).

Dış destek sistemler süper yüksek yapılarda yaygınlaşmadan önce tüp sistemler 1980'li yıllara kadar en çok tercih edilen taşıyıcı sistem türüydü. Dış destek sistemlerin tüp sistemlere göre hızla yaygınlaşmasının en önemli sebepleri sağladığı mimari esneklik ve yapısal verimliliktir. Tüp sistemlerde derin kirişler ve sık kolon aralığı mimari esnekliği kısıtlayan en önemli nedenlerdendir.

Materyal ve Yöntem

Bu çalışmada yüksek yapılarda taşıyıcı sistem bağlamında dış destek sistemlerin kullanımı odak noktası alınmıştır. Çalışmanın amacı; bina üretiminde en hakim role sahip olan mimarlarda taşıyıcı sistem türü olan dış destek sistemlerin kullanımına yönelik bilinç oluşturmaktır. Çalışma kapsamında nitel araştırma yöntemlerinden veri toplama ve iz sürme metotları kullanılarak dünyadan ve ülkemizden 10 adet yüksek bina örneği incelenmiştir. İnceleme sonucunda, yapıların yanal kuvvetlere karşı daha stabil davranmasına imkan veren dış destek sistemlerin kullanımı ile bu tip yapı tasarımlarının ve mimari kararların ne yönde eğilim gösterdiği değerlendirilmiştir. Ortaya konacak çıkarımlar ile mimarların dış destek sistemleri kullanmalarına katkı sağlamak ve tasarım süreçlerine ışık tutmak hedeflenmektedir.

Dış Destek Sistemler ve Mimari Tasarım ile İlişkisi

Çalışma kapsamında ele alınan taşıyıcı sistemlerden biri olan dış destek sistemler, ilk olarak 1967 yılında Kanada'da Tour de la Bourse (Alanazi, 2019) yapısında kullanılmış, yıllar içerisinde de yaygınlaşarak 150 kata kadar olan yapılarda sıkça tercih edilmiştir. Çekirdeği ve çevre kolonları birbirine bağlayarak yüksek katlı yapıların sorunlarına çözümler sunan dış destek sistemlerin yapılara kazandırdığı başlıca avantajlar;

i- bir binada devrilme momenti %40 oranına kadar azaltabilmesi

ii- Yanal yük etkisi sırasında yapının genel deplasmanlarını azaltması, çekirdek ve yatay perdenin dayanıklılığına bağlıdır.

iii. Devrilme yüklerinin temele etkin bir şekilde dağıtılmasına yardımcı olması.

iv-Yapının tepe deplasmanlarını ve göreli kat ötelenmelerini azaltması

Şeklinde özetlenebilir (İnternet-1). Bu sistemin tasarlanması, yapının bulunduğu bölge, yapı geometrisi, deprem hareketliliği, rüzgar, yapı yüksekliği gibi etmenlerden etkilenmektedir. Bu noktada boyutlandırma, üretim, konum ve uygulama aşamasında yapıların mimarlarına önemli görevler düşmektedir.

Gün geçtikçe sayıları çoğalmakla birlikte ulaştıkları yükseklik seviyesi artan yüksek yapılarda mimari olarak farklılaşma isteği göz ardı edilememekte olup strüktürel performansın arttırılması en çok ihtiyaç duyulan konudur. Mimarların yapı üretiminde tasarım ve uygulama etkileşimini göz önünde tutarak yapım sistemlere hakim olmaları gerekmektedir. Bu doğrultuda taşıyıcı sistemlerinin faydaları, etkinliği, uygulanması gibi bilgilere sahip olarak kendi tasarımlarının sınırlarını çizmektedirler. Bu bağlamda sunulan çalışmanın hedefi; çok yönlü bir düşünme biçimi ve bilgiye dayalı etkili bir yorum yeteneği kazandırmak amacıyla yüksek yapılarda kullanılan dış destek sistemleri incelemek, analiz etmek, değerlendirmek ve nihayetinde hem tasarım hem uygulamalar açısından farklılaşan noktaları ortaya koymaktır.

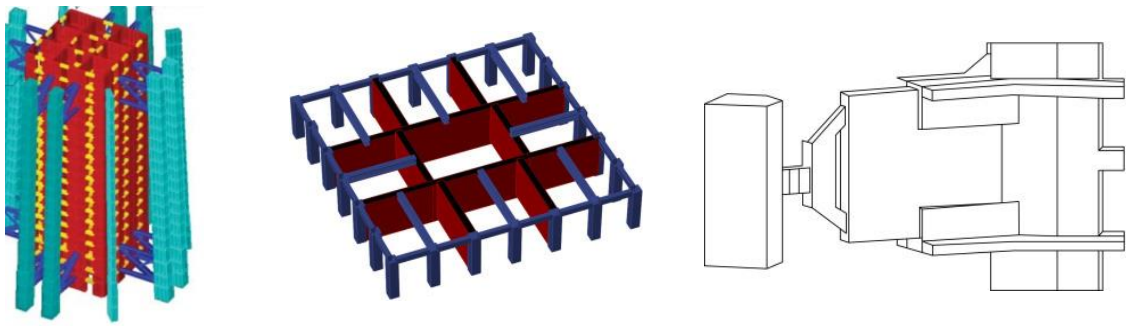
Mimari tasarım kriterleri ile strüktürel performanslarına dönük etkin olan kriterler belirlenerek literatür özeti sunan bu bölümde dış destek sistemlerin boyutu, dış destek sistemlerde malzeme, dış destek sistemlerin yapıdaki sayısı ve konumu, dış destek sistemlerin tipi gibi temel başlıklardan bahsedilmiştir.

Dış Destek Sistemin Boyutu

Dış destek sistemleri genellikle yapıların tesisat katlarında yer alır. Yapının yüksekliğine, taşıyıcı sistem malzemesine, taşıyıcı sistem boyutlarına, yapının bulunduğu bölge ve yapıya etki eden yanal yüklere göre optimum boyutta olacak şekilde tek kat veya iki kat yüksekliğinde yapılabilir.

Dış Destek Sistemlerde Malzeme

Çelik, betonarme ve hibrit (hem beton hem çelik kullanılan) olmak üzere birçok farklı malzeme kullanılmaktadır. Geleneksel tasarımda, dış destek sistem, kat yüksekliğinde bir kafes kiriş olacak şekilde tasarlanır. Betonarme destek sistemlerin çeliğe göre en önemli avantajı yüksek rijitlik ve düşük maliyetidir (Szołomicki ve Szołomicka, 2020). Yapım teknolojisinin gelişmesiyle birlikte projelerde hibrit sistemler gibi yeni türler ortaya çıkmıştır. Çelik, beton kadar rijit değildir. Ancak, saf beton destek sistemi çok kırılgandır. Raffles City Chongqing'deki 370 metre yüksekliğindeki kulede, çelik kirişin Şekil 3'de gösterildiği gibi betonarme dış destek duvarına gömülü olduğu yenilikçi bir çelik-beton hibrit destek kirişi ARUP tarafından geliştirildiği görülmektedir. Hem çelik kafes hem de beton dış destek duvarı, aşırı yükler altında kule yapılarının genel yapısal performansını artırmak için kompozit olarak çalışır.



(a) (b) (c)

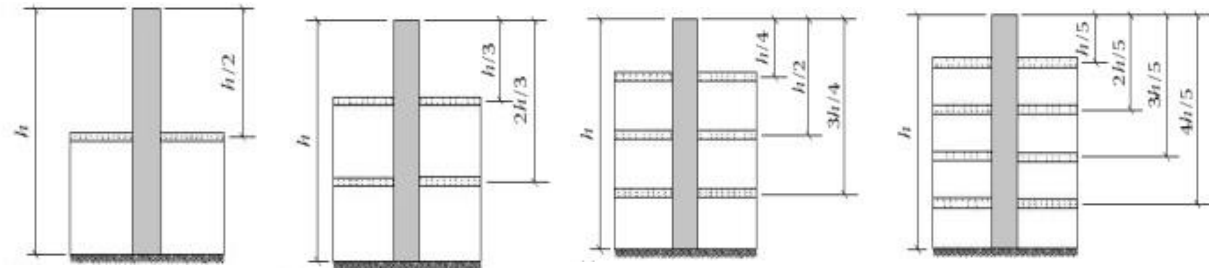
Şekil 3. a) Çelik Sistem, b) Betonarme Sistem, c) Hibrit Sistem (Fu, 2018).

Dış Destek Sistemlerin Yapıdaki Sayısı ve Konumu

Dış destek sistemlerin sayısı ve yapıdaki konumunu belirleyen en önemli faktör yapının yüksekliğidir. Belirli yüksekliğe kadar tek seviye dış destek sistem yeterli olurken, daha yüksek seviyelerde birden çok seviyede dış destek sistem yapıya eklenmektedir. Dış destek sistemlerin yapıdaki optimum konumu belirlenirken rijitliğin maksimum, yer değiştirmenin ise minimum olacağı konuma yerleştirilmelidir. Yüksek yapılarda genellikle, yapının tepe noktası, 2h/3 yükseklikte, h/3 yükseklikte, h/2 yükseklikte olmak üzere belirli seviyelerde dış destek sistem kullanılır (Şekil 4). Yapılan incelemeler neticesinde tek seviye kullanılan dış destekte, en verimli çözümler h/2 ve 2h/3, h/3 yükseklikte kullanılanlar olurken, en verimsiz çözüm tepe noktasında kullanılan olmaktadır (Nanduri & Hussain, 2013).

Bir yapı tasarımında yapı mühendisi önce iki durumdan hangisinin geçerli olduğunu belirlemelidir. Bunlar; yer değiştirme ve perde devrilme momentidir. Yapıda perde devrilme momentinin azaltılması gerekiyorsa, mühendis dış destek sistemi optimal çözümden daha

yüksek bir seviyeye yerleştirebilir. Yer değiştirme hakimse, mühendis dış destek sistemi optimal çözümden daha aşağıya yerleştirebilir (Nanduri & Hussain, 2013).



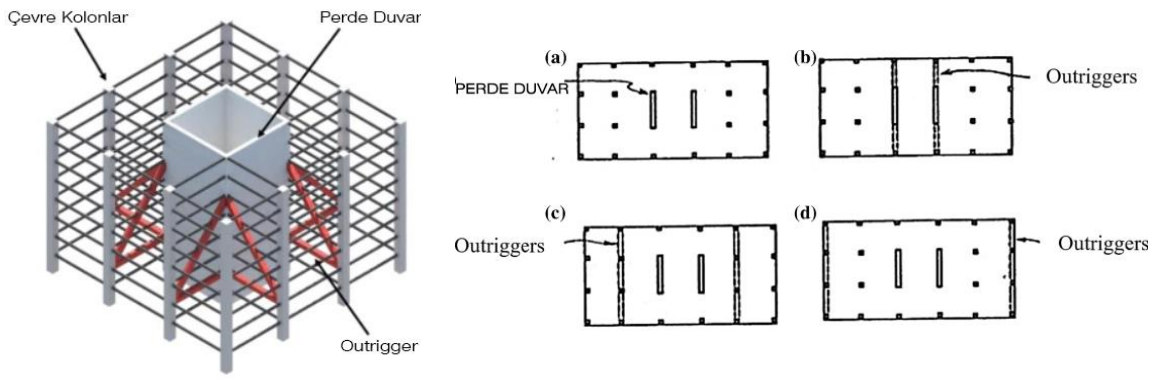
(a) (b) (c) (d)

Şekil 4. Dış Destek Sistemlerin Yapıda Bulunduğu Seviyeler (Taranath, 2010).

Dış Destek Sistemlerin Tipi

Yüksek yapılarda kullanılan dış destek sistemler mesnetlenme ve sistem davranışına etkisi bakımından literatürde üç ayrı tipte sınıflandırılır. Bunlar aşağıda maddeler halinde açıklanmıştır.

- **Konvansiyonel dış destek sistemi**: Bu sistemde, çekirdekteki perde duvarlar veya çaprazlı çelik çerçeveler, makaslar veya betonarme kirişler yardımı ile yapının çevresinde bulunan kolonlara doğrudan bağlanır (Gore & Mhatre, 2018).
- **Offset Dış destek sistemi**: Bu sistemde, dış destek sistemler geleneksel sistemler gibi çekirdekteki perde duvarları ile yapının çevresinden bulunan kolonları birbirine bağlamaz (Şekil 5a). Çekirdek duvarlarının düzlemleri dışındaki kolonları birbirine bağlar (Resim-5b). Bu sistemde geleneksel sistemin sağladığı bütün avantajlar korunurken, yanal yer değiştirmelerin azaldığı gözlemlenmektedir (Gore &Mhatre, 2018).

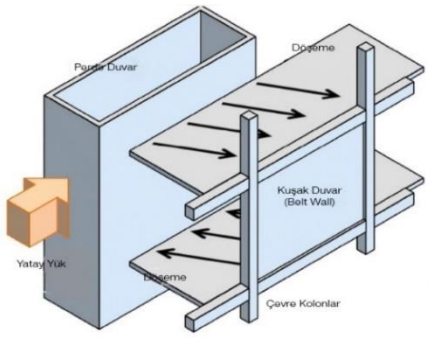


(a) (b)

Şekil 5. a) Geleneksel Dış Destek Sistem, b) Offset Dış Destek Sistem (Internet-2)

- **Sanal Dış destek sistemi**: Bu sistemde, çekirdek ve çevresel kolonlar arasında doğrudan bir bağlantı yoktur. Ancak devrilme momenti çekirdekten çevresel kolonlara

aktırılır. Bu sistemde çekirdek ile çevresel kolonlar arasına tesisat katlarında iki çift döşeme eklenir. Bu döşemeler sayesinde çekirdek ile çevresel kolonlar arasında yük aktarımı gerçekleşir (Şekil 6) Bulunduğu katı olduğu gibi çevreleyen bir kuşakta (belt truss) genellikle eklenir. Bu sistem geleneksel sistemde meydana gelen bağlantılardaki problemleri doğrudan ortadan kaldırır (Gore & Mhatre, 2018).



Şekil 6. Sanal Dış Destek Sistem (Eom, Murmu, Yi, 2019).

Dış Destek Sistemlerin Kullanılması Durumunda Dikkat Edilecek Hususlar

Dış destek sistemler yapısal sistem olarak tercih edildiğinde belirli kriterlere dikkat edilmesi gerekmektedir. Bu kriterler şunlardır;

i-Dış destek sistemlerin bağlandığı kolonlar, diğer kolonlara oranla daha fazla eksenel kuvvet almaktadır. Bu durum kolon ve perde arasında farklı eksenel kısalmalara sebebiyet vermektedir; bunun sonucunda ikincil kesit tesirleri oluşmakta ve büyük kesitler ortaya çıkmaktadır.

ii-Belirli katlarda kullanılan bu sistem daha rijit davranacağından katlar arası farklı rijitlik düzensizliği oluşmaktadır.

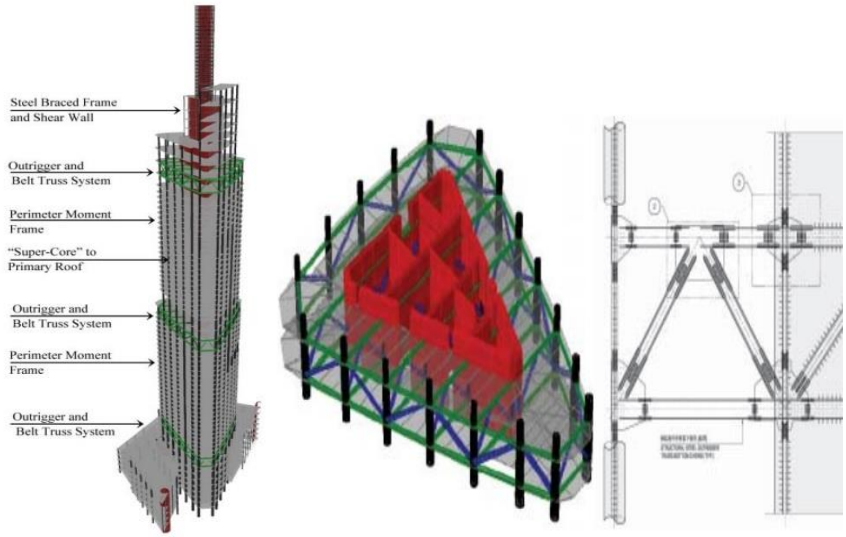
iii- Oluşacak ani ve düzensiz yüklerin, güvenli bir şekilde transfer edilebilmesi için yapı özelliklerine göre özel birleşim detayları üretilmesi önem kazanacaktır (Internet-1).

Dünyadan ve Türkiye'den Dış Destek Sistemli Yüksek Yapı Örnekleri

Bu bölümde öncelikle mevcut yüksek yapıların fonksiyonu, cephe malzemeleri, plan tipleri, çekirdek konumları gibi mimari yaklaşımları ele alınmış ve sonrasında yüksek yapılarda kullanılan dış destek sistemlerin; boyutu, malzemesi, yapıdaki sayısı ve konumu, dış destek sistemin tipi gibi başlıklar altında dünyada ve Türkiye'den örnekler üzerinden incelenmiştir. Bu hedefte ilk adım olarak incelenen örnek yapılar hakkında kısaca bilgi verilmiştir. Veri toplama ve iz sürme metotları kullanılarak dış destek sistemine sahip örnek yüksek yapılardan bahsedilmiştir.

Nanjing Greenland Financial Centre, Nanjing

197 bin metrekare toplam inşaat alanına sahip yapı, 2010 yılında tamamlanmıştır (internet-3). 450 metre yüksekliğinde ve 89 katlı karma kullanımlı olarak tasarlanmıştır. Üçgen bir plana sahiptir ve merkezi çekirdek kullanılmıştır. Kompozit taşıyıcı sistem olarak tasarlanmıştır (Şekil 7) ve geleneksel dış destek sistem kullanılmıştır. Normal kat yüksekliği 4.2 metredir. Tesisat katları 2 kat yüksekliğinde tasarlanmıştır. Üçgen şeklinde betonarme perde duvar bulunmaktadır. Üçgenin dayanıklılığı ve dönmeye karşı olan rijitliği sebebiyle perde duvar kalınlıkları optimal seviyede kullanılmıştır. Çevredeki kompozit kolonlar merkezdeki süper çekirdeğe çelik outrigger makaslar ile 8,4 metre ve 2 kat yüksekliğinde bağlanmıştır. 10,35 ve 60.kat seviyelerinde olmak üzere üç seviye de outrigger kullanılmıştır. Ayrıca tesisat katlarında binayı çevreleyecek şekilde kuşaklama (belt truss) bulunmaktadır (Besjak, McElhatten & Biswas, 2009). Dış cephede cam paneller kullanılmıştır.

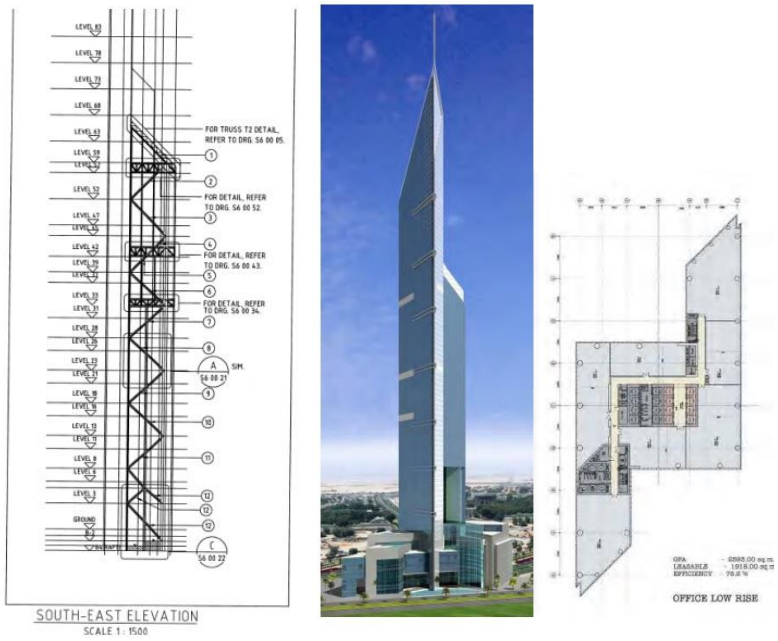


Şekil 7. Nanjing Greenland Financial Centre (Besjak, McElhatten, Biswas,2009).

Dubai Tower, Doha

110 bin metrekare toplam inşaat alanına sahip yapı, 438 metre yüksekliğinde ve 90 katlı karma kullanımlı olarak tasarlanmıştır. İnşaatı 2007 yılında başlamış ve halen devam etmektedir. Z şeklinde bir plana sahiptir. Dikdörtgen bir plan etrafında iki ayrı kol ile bağlanmıştır. Merkezi dikdörtgen bir çekirdek vardır. Kompozit taşıyıcı sistem olarak tasarlanmıştır (internet-4). 1 adet geleneksel dış destek sistem ve 2 adet offset dış destek sistem kullanılmıştır ve merkezi betonarme çekirdek bulunmaktadır (Şekil 8). Çevredeki kompozit kolonlar merkezdeki çekirdeğe betonarme kompozit outrigger ile tesisat katlarında bağlanmıştır. Üç seviye de outrigger kullanılmıştır. Ayrıca tesisat katlarında binayı

çevreleyecek şekilde çelik kuşaklama (belt truss) bulunmaktadır. Prekast döşeme kullanılmıştır. C80 beton sınıfı kullanılmıştır. Geleneksel dış destek ve çevresel kuşaklama, 2 ayrı dış cephede betonarme ve çelik bağlantı (bracing) ile güçlendirilmiştir (Davids, Wongso, Popovic & McFarlane,2008). Dış cephede cam paneller kullanılmıştır.



Şekil 8. Dubai Tower (Davids, Wongso, Popovic & McFarlane, 2008).

Aston Apartments, Sydney

90 metre yüksekliğinde ve 1998 yılında tamamlanan 30 katlı yapı konut kullanımı için tasarlanmıştır. Betonarme çerçeve olarak tasarlanmış, 13 metre cephe genişliği vardır bu sayede ince uzun bir forma sahiptir (Dean, Martin, Emery, Chancellor). 7:1 narinlik oranına sahiptir. Dikdörtgen plan ve merkezi çekirdeğe sahiptir. H/2 ve tepe noktasında yüksekliğinde iki adet offset dış destek sistemi vardır. Binanın dış çeperinde konumlandırılan offset dış destek sistem (Resim-9'a), geleneksel dış destek sistemin bazı dezavantajlarını azaltır. Geleneksel sistemde çekirdek ve çevre kolonlar doğrudan birleştirilir.20 cm kalınlığında iki kat yüksekliğinde cephede kesme kuvveti duvarından oluşan offset destek sistemi vardır. Bu yenilikçi yanal yük dayanımı sisteminin avantajlarından biri, binanın kat planında üzerinde neredeyse hiçbir olumsuz etkisi olmamıştır. Bu sayede mimarın işlevsel ve estetik tasarım gereksinimlerini karşılaması için daha fazla esneklik sağlamıştır. Offset dış destek sistemi son derece ekonomik ve verimlidir; çünkü sistem çevre kolonlara etkiyen eksenel yüke karşı maksimum kuvvet kolunu kullanır. Offset dış destek sistemi binanın deplasmanlarını sınırlar ve çekirdekteki bükülme eylemlerini azaltarak duvar kalınlıklarını ve donatı tonajını minimize eder (Gore & Mhatre, 2018). Cam ve kompozit panel dış cephede kullanılmıştır.

Torre KOI, Monterrey

31 bin 530 metrekare toplam inşaat alanına sahip yapı, 279 metre yüksekliğinde ve 69 katlı yapı karma kullanımlı olarak tasarlanmıştır. İnşaatı 2013 yılında başlamış ve 2017 yılında tamamlanmıştır. Dikdörtgen plana sahiptir (Internet-5). Aşağıdan yukarı katlara doğru plan boyutları küçülerek devam eder. Merkezi çekirdek vardır. Dış cephesi cam panel ile kaplıdır. Yapıda 8.7:1 narinlik oranı vardır. Sanal dış destek sistem vardır. Betonarme çekirdek, betonarme kuşak duvarı ve kompozit kirişler bulunmaktadır. İki seviyede 21. ve 62.katlarda sanal outrigger kullanılmıştır (Şekil 9b). Ayrıca bu seviyelerde dışarda betonarme duvarlar (belt Wall) kullanılmıştır. Belt Wall yatay yük altında, merkezi çekirdekteki dönme kuvvetine ters yönde bir güç uygular. Merkezi çekirdekteki yük, tesisat katlarındaki çelik diyafram döşeme levhaları ile çevredeki kolon ve betonarme duvarlara yük aktarımı sağlanır. Çekirdeğin kalınlığı alt katlarda 105 cm'den başlayıp yukarı doğru 45 cm'ye kadar düşmektedir. Çevredeki kuşak betonarme duvarların kalınlığı ise 60 cm ile 160 cm arasında değişerek, diyafram döşeme levhaları tarafından taşınan yatay kesme kuvvetine karşı direnç gösterir. Betonarme kuşak duvarlarından C50, C60 ve C70 beton sınıfı kullanılmıştır. 21. ve 22. Kat seviyelerindeki diyafram döşeme levhaları 30 cm kalınlığındayken, 62. ve 63. Kat seviyelerindeki diyafram döşeme levhaları ise 40 cm kalınlığındadır (Crilly, Tamaro & Stark, 2018).



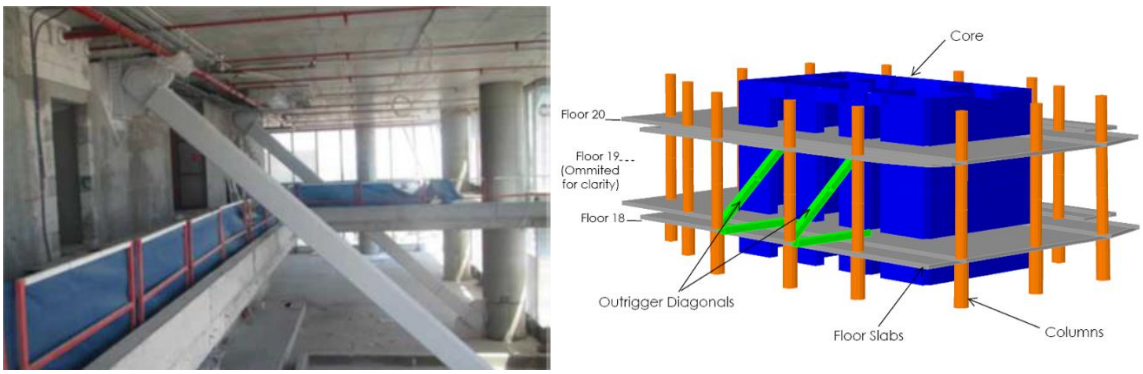
(a) (b)

Şekil 9. a) Aston Apartments (Gore & Mhatre ,2018), b) Torre KOI (Crilly, Tamaro & Stark, 2018).

Rönesans Tower, İstanbul

185,5 metre yükseklikteki 2014 yılında tamamlanan yapı karma kullanım olarak tasarlanmış ve 40 kat yüksekliğindedir. Yamuk şeklinde plana sahiptir ve merkezi çekirdeğe sahiptir.

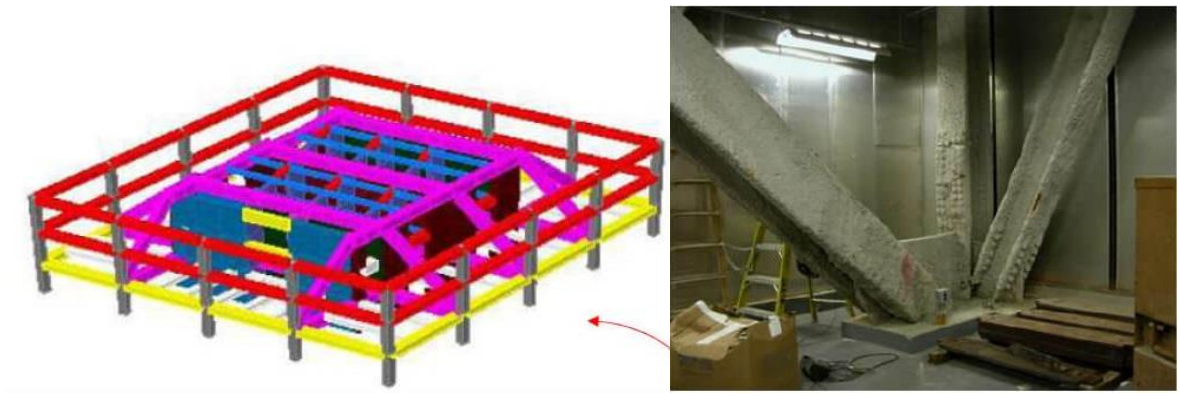
Dış cephesinde cam kullanılmıştır (internet-6). Kompozit taşıyıcı sistem kullanılmıştır. Yapıda 30 cm kalınlığında betonarme döşeme kullanılmıştır (Kaplan, DeSimone & Anlar, 2015). Tek seviyede yapının yarı yüksekliğinde 18. ve 19. katta 2 kat yüksekliğinde geleneksel dış destek sistem kullanılmıştır. Merkezi betonarme çekirdek bulunmaktadır. Dış destek sistem çelik olarak tasarlanmıştır. Çevredeki kolonlar merkezdeki çekirdeğe kompozit çelik çubuklar ile tesisat katlarında bağlanmıştır. Dış destek sistem tek yönde betonarme perdenin kuzey-güney aksı boyunca çevredeki 4 adet kompozit kolonlara bağlanmıştır (Şekil 10). Bu yapıda kullanılan dış destek sistemi, çelik bağlantı elemanları, Burulma Kısıtlı Destek (Buckling Restrained Brace, BRB) olarak adlandırılmaktadır. Sismik yükler için önemli miktarda enerji kaybı sağlarken, rüzgar yüklerine karşıda önemli statik rijitlik sağlayarak iki duruma da optimum düzeyde fayda sağlar. BRB sistemleri, çeliğin saf eksenel gerilim ve sıkıştırmada histeretik davranışı yoluyla enerji dağılımı sağlar.



Şekil 10. Rönesans Tower (Kaplan, DeSimone & Anlar, 2015)

İstanbul 205 Tower, İstanbul

220 metre yükseklikte 2019 yılında tamamlanan yapı ofis yapısı olarak tasarlanmıştır ve 54 kat yüksekliğindedir. Kare plana sahiptir ve merkezi çekirdek vardır. Dış cephede cam panel kullanılmıştır (Internet-7). Betonarme perde kullanılmış olup, kompozit taşıyıcı sistem kullanılmıştır. Tek seviyede, yapının yaklaşık yarı yüksekliğinde 29. ve 30. katta 2 kat yüksekliğinde geleneksel dış destek sistem kullanılmıştır. Dış destek sistem çelik makaslar olarak tasarlanmıştır. Merkezi betonarme çekirdek dört yönde 10 adet çelik makaslarla çevre kompozit kolonlara bağlanmıştır (Şekil 11). Yapıya eklenen çelik makaslar sayesinde, rüzgar ve deprem yüklerine karşı dirençli hale gelmiştir (Internet-8).



Şekil 11. Istanbul 205 Tower (Internet-8).

Folkart Tower, İzmir

200 metre yükseklikte, 2014 yılında tamamlanan yapı ofis ve konut kullanım olarak tasarlanmış ve 40 kat yüksekliğindedir. Dikdörtgen şeklinde plana sahiptir ve merkezi çekirdeğe sahiptir. Dış cephesinde cam kullanılmıştır. Yapıda kompozit taşıyıcı sistem kullanılmıştır (internet-9). 18. ve 29. katta tek kat yüksekliğinde geleneksel dış destek sistem kullanılmıştır. Çevresel betonarme çekirdek bulunmaktadır. Dış destek sistem çelik olarak tasarlanmıştır. Çevredeki kolonlar merkezdeki çekirdeğe kompozit çelik çubuklar ile tesisat katlarında bağlanmıştır. Dış destek sistem iki yönde betonarme perde çevredeki kolonlara bağlanmıştır (Şekil 12). 8 adet dış destek sistem kullanılmıştır. Outrigger sönümleme sistemi, dıştan çelik kaplamalı beton dolgusu olan, içinde ise sönümlemeyi sağlayan çelik özü olan bir sistemdir. Dolgu ile çelik öz arasında ayırıcı bir kat da bulunmaktadır (Fidan & Güven, 2019).

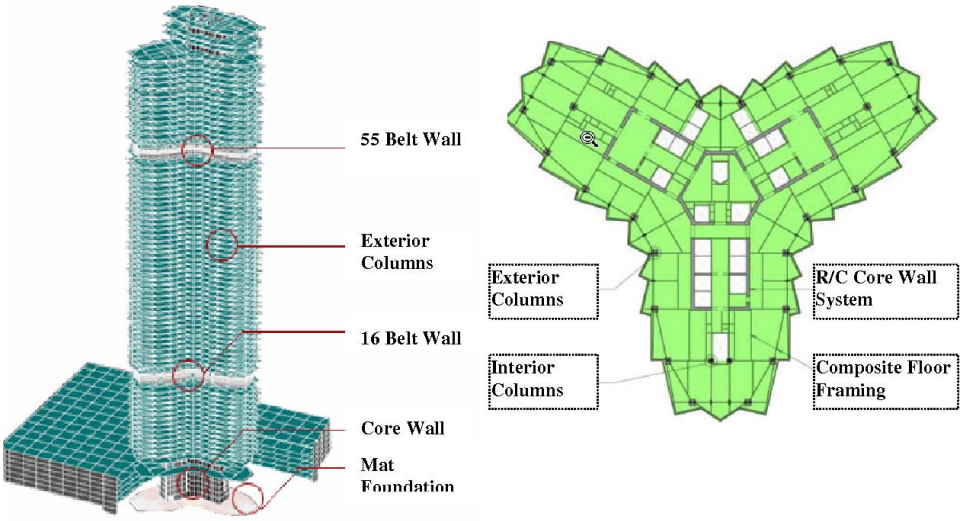


Şekil 12. Folkart Tower (Fidan & Güven,2019).

Tower Palace Three, Tower G, Seul

263,7 metre yükseklikte, 2004 yılında tamamlanan yapı konut kullanım olarak tasarlanmış ve 73 kat yüksekliğindedir. 3 yapraklı yonca şeklinde planda ve merkezi betonarme üçgen çekirdeğe sahiptir. Dış cephesinde cam kullanılmıştır. Kompozit taşıyıcı sistem kullanılmıştır

(Internet-10). 16. ve 55. katta tek kat yüksekliğinde sanal dış destek sistem kullanılmıştır (Şekil 13). Dış destek sistem betonarme olarak tasarlanmıştır. Sanal dış destek (belt Wall) 80 cm kalınlıktadır ve döşeme kalınlığı 30 cm dir. Bu sistem sayesinde çelik makaslar ile oluşacak zor bağlantı detaylarının önüne geçilmiştir. Bu yapıda kullanılan sistem daha sonraki yıllarda yapı yüksekliklerinin artması ile "Buttressed core" sistemine dönüşecektir (Abdelrazaq vd., 2005).



Şekil 13. Tower Palace Three (Abdelrazaq ve diğerleri, 2005).

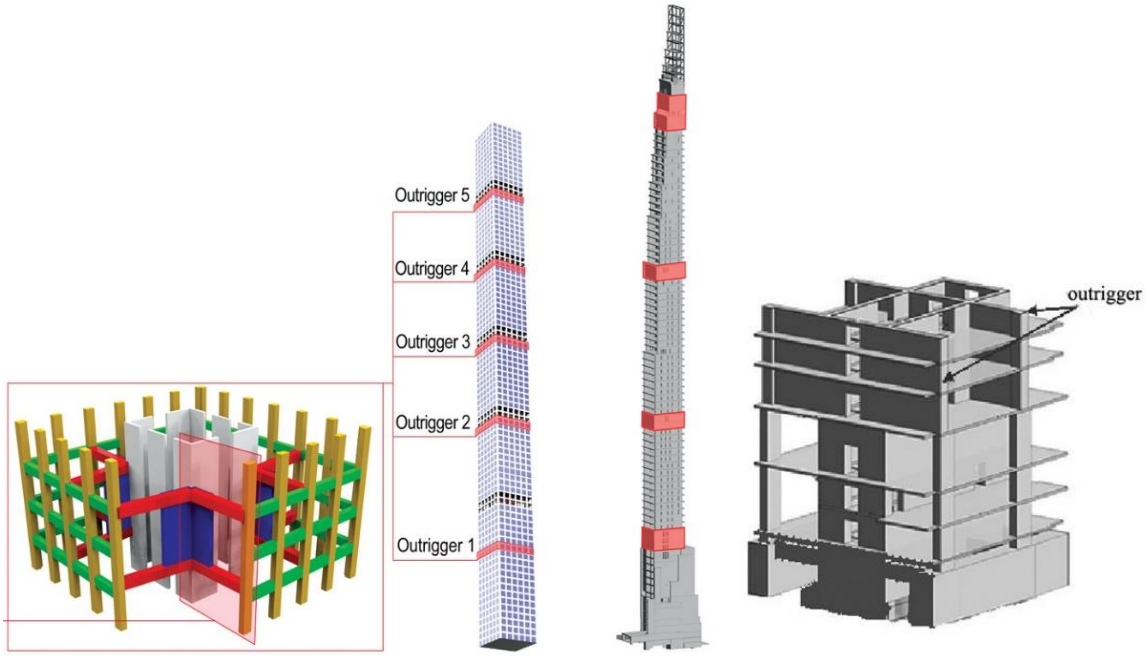
432 Park Avenue, New York

425,7 metre yükseklikte, 2015 yılında tamamlanan yapı konut kullanım olarak tasarlanmış ve 85 kat yüksekliğindedir. Kare şeklinde plana sahiptir ve merkezi çekirdeğe sahiptir. Yapının dış cephesinde cam ve beton kullanılmıştır (Internet-11). Betonarme taşıyıcı sistem kullanılmıştır. 1:15 narinlik oranına sahiptir. Merkezi betonarme çekirdek bulunmaktadır. Dış destek sistem betonarme olarak tasarlanmıştır. Geleneksel dış destek sistemi bulunmaktadır.18,32,46,60 ve 74.katlarda 2 kat yüksekliğinde 5 seviyede dış destek sistem bulunmaktadır (Şekil 14a.). Çevredeki kolonlar merkezdeki çekirdeğe betonarme dış destek sistemler ile merkezi çekirdeğe bağlanmıştır (Szołomicki &Szołomicka, 2020).

111 West 57th Street

435,3 metre yükseklikte ,2021 yılında tamamlanan yapı konut kullanım olarak tasarlanmış ve 84 kattan oluşmaktadır. Dikdörtgen planlı ve üst katlara doğru küçülmektedir. Dış cephede cam kullanılmıştır. Kompozit taşıyıcı sistem kullanılmıştır ve son 48 metresi tamamen çelik taşıyıcı sistem olarak tasarlanmıştır. (Internet-12). Çevresel çekirdekli olup, çekirdek cepheye yaslanmış şekildedir (Şekil 14b). 1:24 narinlik oranına sahiptir. 6,19,32,36. kat

yüksekliklerinde, 4 ayrı seviyede betonarme geleneksel dış destek sistemi bulunmaktadır. Döşeme kalınlığı 30.5 cm'dir (Yalnız, 2020).



(a) (b)

Şekil 14. a) 432 Park Avenue (Szołomicki & Szołomicka, 2020), b) 111 West 57th Street (Yalnız, 2020).

Bulgular ve Tartışma

Dış destek sistemler yapıların devrilme momentini azaltıp, yapısal rijitliğini arttıran sistemlerdir. Yatay yüklere karşı dayanıklı yapı tasarımında kullanılan bu teknolojinin temel çalışma prensibi yapı yanal yüke maruz kaldığında, çekirdek yapının yanal kuvveti, yatay perdeler aracılığıyla çevre kolonlarına ve ardından zemine aktarılır (Internet-1). Bahsedilen bu prensip doğrultusunda değişen tasarım imkanı da sunmaktadır.

Farklı bölgelerde uygulanan 10 farklı yüksek yapının incelenmesi ile dünyadaki ve ülkemizdeki dış destek sistem(outriggers) uygulamalarındaki tutum ortaya konmuştur. Yapılar plan tipi, cephe malzemesi, çekirdek konumu, taşıyıcı sistem malzemesi, dış destek sistemin boyutu, malzemesi, tipi ve kaç adet kullanıldığı şeklindeki kriterler ışığında değerlendirilmiştir (Tablo 1).

Tablo.1 Dış Destek Sistemlerin Örneklerde Kullanımı

	Kullanım	Plan Tipi	Çekirdek Konumu	Taşıyıcı Sistem Malzemesi	Cephe Malzemesi	Dış Destek Tipi	Dış Destek Malzemesi	Dış Destek Boyutu	Dış Destek Sayısı	Dış Destek Konumu
1	Karma	Üçgensel	Merkezi	Kompozit	Cam	Geleneksel	Çelik	2 Kat	3	10,35 60.Kat
2	Karma	Z Formu	Merkezi	Kompozit	Cam	Geleneksel Offset	Çelik Betonarme	2 Kat	3	34,43,52.Kat
3	Konut	Dikdörtgen	Merkezi	Betonarme	Cam Kompozit	Offset	Betonarme	2 Kat	2	15 ve 30.Kat
4	Karma	Dikdörtgen	Merkezi	Betonarme Kompozit	Cam	Sanal	Betonarme Kompozit	2 Kat	2	21 ve 62.Kat
5	Karma	Yamuk	Merkezi	Betonarme Kompozit	Cam Kompozit	Geleneksel	Çelik	2 Kat	1	18.Kat
6	Ofis	Kare	Merkezi	Betonarme Kompozit	Cam	Geleneksel	Çelik	2 Kat	1	29.Kat
7	Karma	Dikdörtgen	Çevresel	Betonarme Kompozit	Cam	Geleneksel	Çelik	1 Kat	2	18,29.Kat
8	Konut	Yonca	Merkezi	Betonarme Kompozit	Cam	Sanal	Betonarme	1 Kat	2	16,55.Kat
9	Konut	Kare	Merkezi	Betonarme	Cam Beton	Geleneksel	Betonarme	2 Kat	5	18,32,46,60 74.Kat
10	Konut	Dikdörtgen	Çevresel	Kompozit Çelik	Cam	Geleneksel	Betonarme	2 Kat	4	6,19,32, 46.Kat

Dış destek sistemleri kullanıldığı yüksek binalar genel olarak karma ve konut kullanım sınıfında hizmet vermektedir. Dış destek sistemlerin çeşitli plan tiplerinde kullanım durumu olabilmektedir. Dış destek sistemler mimarların özgür tasarımlar üretebilmesini sağlamaktadır. Yapılan analizler ışığında oluşturulan tablo incelendiğinde, çekirdek konumu olarak merkezi ve çevresel çekirdek konumu tercih edilmiştir. Bu durumun en önemli sebebi de yüksek yapılarda şeffaflık ve özgür cephe ön planda olduğu için merkezi çekirdek bu durumu oluşturmaktadır. Taşıyıcı sistem malzemesi olarak betonarme ve kompozit kullanım ön plandadır. Dış destek sistemleri kullanılan ve yapılan çalışmada incelenen 10 bina özelinde cephe malzemesi olarak genel olarak şeffaflık ön planda olup cam malzeme kullanılmıştır. Dış destek tipi olarak geleneksel tip kullanımı ön planda olup, incelenen iki yapıda sanal ve offset dış destek sistem kullanılmıştır. Dış destek sistem malzeme olarak betonarme, çelik ve kompozit destekler tercih edilmektedir. Ancak çelik ve betonarme ön plana çıkmaktadır. Yapı yüksekliği ile orantılı olarak, dış destek sistemlerin kullanım sayısı artmaktadır. Dünyadaki örneklerde birkaç farklı seviyede dış destek sistem tercih edilirken, Türkiye'deki örneklerde tek seviyede tercih edilmiştir. İncelemeler neticesinde dış desteklerin konumu, yapının yüksekliğine bağlı olarak değişmek ile birlikte genellikle yapının tepe noktalarına ve yarı

yüksekliklerine daha yakın olarak konumlandırıldığı gözlemlenmiştir. Yapının tepe noktasına daha yakın olmasının en önemli nedeni tepe deplasmanlarının önüne geçmektir. Türkiye'de incelenen örneklerde ise h/2 yüksekliğe daha yakın olacak şekilde konumlandırılmıştır. Dış destek sistemler incelenen iki yapı dışında 2 kat yüksekliği olarak tasarlanmıştır. Dış destek sistemler yapıların tesisat katlarında yer aldığı için mimari tasarıma herhangi bir olumsuz etkisi bulunmamaktadır. Ayrıca taşıyıcı sistem boyutlarında küçültme sağlayarak cephede daha özgürlük ve daha az taşıyıcı sistem yansıması sağlamaktadır.

Sonuç ve Öneriler

Yüksek yapılarda dış destek sistemlerin uygulanması ve geliştirilmesinde önemli noktalar ve kilometre taşları bulunmaktadır. İncelemeler neticesinde ilk olarak yüksek yapılarda kullanılan dış destek sistemlerin boyutu en az bir kat yüksekliğinde olması gerekirken incelenen örneklerden sekizinde iki kat yüksekliğinde tasarlanmıştır (Tablo-1). Bu durumda dış destek sistemler tasarlanırken "minimum iki kat yüksekliğinde tasarlanması daha optimal bir çözüm olacaktır" sonucu çıkartılabilir. İncelemeler neticesinde dış destek sistemlerin malzeme kullanımı yapılarda çelik makaslar ve çelik bağlantılar ile betonarme eşit olarak tercih edilmiştir. Yüksek yapılarda kullanılan dış destek sistemler yapı yüksekliği arttıkça kullanım sayısı artmaktadır. Dünyadaki örneklerde birkaç farklı seviyede dış destek sistem tercih edilirken, Türkiye'deki örneklerde tek seviyede tercih edilmiştir. Bunun en önemli nedeni Türkiye'deki yapıların çok yüksek olmamasıdır. İncelemeler neticesinde incelenen örneklerde dış destek sistemlerde genellikle geleneksel dış destek sistem tercih edilmiştir. Bunun en önemli sebebi çekirdek konumunun merkezi olması, geleneksel sistem ile ilgili daha fazla bilgi ve tecrübeye sahip olunması, diğer sistemlerin yeni ve yaygın olmaması gösterilebilir. Bununla birlikte sanal dış destek sistemin maliyet ve kolay kullanımı bu sistemin yıllar içerisinde daha yaygın kullanımı ile ilgili bilgiler vermektedir. Tüm bu bulgular ışığında bu sistemlerin kullanımı ile; yapı rüzgar ve depreme karşı daha stabil hale gelmektedir. Bu sistem her ne kadar dünyada yaygın olarak kullanılsa da ülkemizde daha çok yeni yeni kullanılmaktadır. Ülkemizde de yapı yükseklikleri her geçen yıl arttığı göz önünde bulundurulduğunda, mimarlar ve mühendisler bu sistem ile ilgili bilgi ve tecrübeleri arttıkça bu sistem ülkemizde de daha yaygın hale gelecektir.

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Production of Erzurum City Thermal Comfort Map for Climate Oriented Design

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Abstract

According to the United Nations data, it is stated that the rate of urbanization in the world is increasing rapidly and the urban population in the global area increased from 751 million in 1950 to 4.2 billion in 2018 an increase of 4.6 times. In this context, micromarque climate data will be transferred to the plans to ensure sustainable urbanization and will be used effectively in decision processes. Within the scope of this research, data from 10 meteorology stations established with projects in Erzurum city center and 3 state-owned meteorology stations were used. The established meteorology stations were placed at the points determined by the grid technique to represent every point of the city. The area where the stations are established covers an area of approximately 400 hectares in the city center. Data for the last six years (2016-2021) were used for temperature (Ta=°C), humidity (RH=%), wind (W/m²), cloudiness (N= Oktas), and solar radiation (W/m²) and analyzed with the hourly RayMan Pro 2.1 model. With the analyzes made, the thermal comfort graphics of the city center were produced according to the months and years. Sky View Factor (SVF) was determined with a fish-eye lens on the streets and streets in the city center. A Thermal Comfort Map was produced by using the obtained thermal comfort values and the data prepared in the Geographic Information System (GIS) for the city.Sustainable efficient planning in cities works when climate analyzes are made on a micro-scale and are used as a base for plan decisions. For this reason, the Thermal Comfort Map produced for Erzurum using micro-meteorological data can be used effectively in the physical plan decisions to be made by local governments. Considering the urban transformation areas, it is clear that local governments, planners, and landscape architects should produce site-specific urban design proposals using nature-based data.

Keywords: Thermal Comfort, SVF, Thermal Comfort Map, Erzurum.

İklim Odaklı Tasarım İçin Erzurum Şehri Termal Konfor Haritası Üretimi

Öz

Birleşmiş Milletler verilerine göre dünyada kentleşme hızının hızla arttığı ve küresel alanda kentsel nüfusun 1950'de 751 milyondan 2018'de 4,6 kat artarak 4,2 milyara çıktığı belirtilmektedir. Bu kapsamda, sürdürülebilir kentleşmenin sağlanması için mikro iklim verileri planlara aktarılarak, plan karar süreçlerinde etkin bir şekilde kullanılmalıdır. Bu araştırma kapsamında Erzurum kent merkezinde projelerle kurulan 10 meteoroloji istasyonu ve devlete ait 3 meteoroloji istasyonunun verileri kullanılmıştır. Kurulan meteoroloji istasyonları şehrin her noktasını temsil edecek şekilde grid tekniği ile belirlenen noktalara yerleştirilmiştir. İstasyonların kurulduğu alan kent merkezinde yaklaşık 400 hektarlık bir alanı kapsamaktadır. Çalışma kapsamında mikro-iklim verileri saatlik olarak sıcaklık (Ta=°C), nem (RH=%), rüzgar (W/m²), bulutluluk (N= Oktaş), güneş radyasyonu (W/m²) kullanılmış ve RayMan Pro 2.1 modeliyle analiz edilmiştir. Yapılan analizler ile istasyonların termal konfor grafikleri üretilmiştir. Şehir merkezindeki cadde ve sokaklarda balık gözü lens ile Gökyüzü Görünüş Oranı (GGO) belirlenmiştir. Mikro meteorolojik veriler kullanılarak Erzurum için üretilen Termal Konfor grafikleri yerel yönetimlerin alacağı fiziki plan kararlarında etkin bir şekilde kullanılabilecektir. Kentsel dönüşüm alanları

dikkate alındığında, yerel yönetimlerin, planlamacıların ve peyzaj mimarlarının doğa temelli verileri kullanarak sahaya özel kentsel tasarım önerileri üretmesi gerektiği açıkça ortaya çıkmaktadır.

Anahtar Kelimeler: Termal Komfor, Gökyüzü Görünürlük Oranı (GGO), Termal Komfor Haritası, Erzurum.

1. Giriş

Günümüzde ekonomi, sağlık gibi çeşitli başlıklar altında hızla değişen gündem krizleri arasında yer alan iklim kavramı, çeşitli meslek disiplinleri çatısında farklı bakış açıları ile ele alınmaktadır. Mimarlık, coğrafya başta olmak üzere iklim kavramı ele alındığı meslek çerçevesinde çeşitlilik göstermektedir. İklim krizinin beraberinde getirdiği taşkınlar, aşırı yağış, uzun süreli kuraklık vb. olumsuzluklar kentleri doğrudan etkilemektedir (Yılmaz, 2020). Yer aldıkları coğrafyaya göre kentlerin taşıdıkları iklim temelli riskler farklılık gösterse de kullanıcısı olan canlıları etkilemektedir. İklim krizinin önüne geçebilmek adına çeşitli çalışmalar ve planlar yürütülmektedir. Ülkemizde T.C Çevre, Şehircilik ve İklim Değişikliği Bakanlığı tarafından İklim Değişikliği Eylem Planı (İDEP) ve İklim Değişikliği Uyum Stratejisi ve Eylem Planı olmak üzere ulusal ölçekli planlar ile iklim krizi üzerinde çalışmalar yürütülmektedir. Hükümetler arası İklim Değişikliği Paneli (The Intergovernmental Panel on Climate Change- IPCC) tarafından 9 Ağustos 2021 tarihinde açıklanan basın bülteninde dünyamızın 1850-1900'lü yıllardan günümüze uzanan süreçte yaklaşık 1.1 °C ısındığı, bu ısınmanın önümüzdeki 20 yıllık süreçte ortalama 1.5 °C'ye yaklaştığı ifade edilmiştir. Raporda sera gazı emisyonlarında ani, hızlı ve büyük ölçekli azalmalar olmadıkça yakın gelecekte 2.0 °C'lik artışların söz konusu olacağı ve bu seviyelerin özellikle tarım ve sağlık sektörlerinde kritik eşiklere varmamıza neden olacağı belirtilmektedir.

Sürdürülebilir kentleşmenin sağlanabilmesi için mikro ölçekteki iklim verilerinin imar planlarına aktarılması ve karar alma süreçlerinde etkin bir biçimde kullanılması gerekmektedir. Türkiye'de yapılan bilimsel çalışmalarda ve günümüzde İmar Planlarında kullanılan iklim verileri Devlet Meteoroloji Müdürlüğünden alınan veriler olup, bu değerler de genellikle kırsal mekânı sembolize etmektedir. Meteorolojik veriler veya mikro iklim verileri kullanılarak yapılan termal konfor çalışmaları farklı kentler için uyarlanmıştır (Topay, 2013; Sun vd., 2017; Zölch vd., 2016; Yilmaz vd., 2018; Çetin vd., 2010; Yavaş &Yılmaz 2020; Yılmaz vd., 2022). Oysa insan yaşamını etkileyen iklim parametreleri, kırsal alanlara göre kentsel mekânda farklılıklar göstermekte, kırsala göre kentlerde daha fazla sıcaklık artışı görülmektedir (Oke, 1987- 2002; Rizwan vd., 2008; Sharmin vd. 2015). İklim verilerinin potansiyel etkilerinin kent bazında halk ile birlikte değerlendirilmesi kent ve mikroiklim değişikliği ilişkisinin ele alınması, plan kararlarına aktarılması gerektirmektedir.

Bu çalışmada temel amaç Erzurum Kentinde; mikro-iklim verileri ölçülerek termal konforu belirlemek ve kent için alternatif senaryolar üretmektir. Kent için yaklaşık 400 hektarlık alanda kentsel yenileme ve dönüşüm çalışmaları devam etmektedir. Araştırma sonucunda elde edilen verilere dayanılarak, sağlıklı, güvenilir ve güncel planlamalar için altlıklar oluşturulacaktır. Erzurum sert, soğuk ve uzun kış şartlarına sahip, bulunduğu rakım itibarı ile de dünyanın sayılı yerleşim yerleri arasındadır. Erzurum kış sehirleri arasında kış turizmi açısından önemli bir yer tutmaktadır. Bu çalışma sonucunda elde edilecek veriler, sağlıklı kentleşme, dönüşüm alanları veya yeni yerleşim yerlerinin belirlenmesinde, daha doğru kararların alınmasına katkıda bulunulmasını sağlayacaktır. Kentlerin konforlu alanlara konumlandırılması, bu alanlara doğru geliştirilmesi veya düşük konforlu alanlarda müdahalelerle konforun artırılması, kentlerde yaşanabilirlik standartlarını yükseltecektir. Erzurum için yön gösterici olan bu çalışma yöntemi, ayrıca diğer soğuk kentler için de örnek teşkil edecektir.

2. Materyal ve Metod

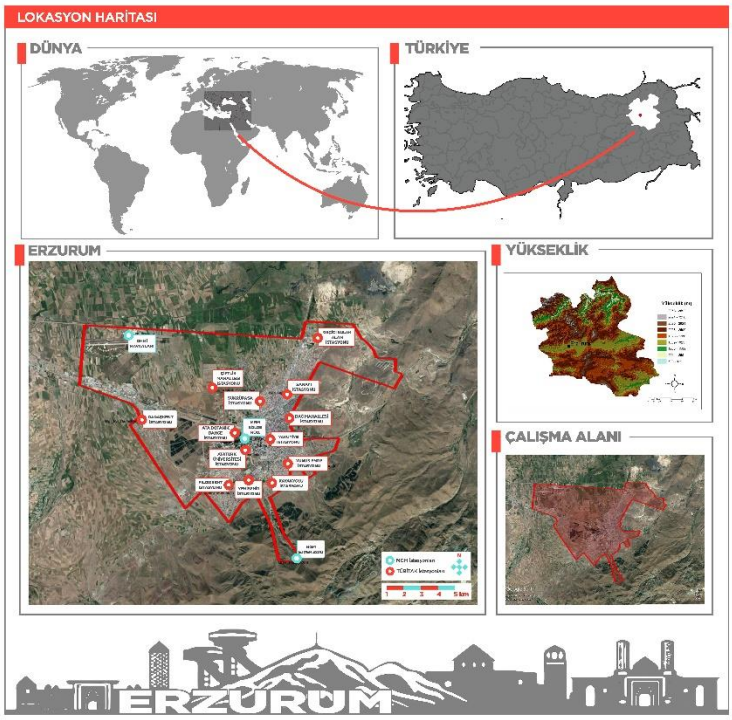
Bu çalışma, Dünya'da ve Türkiye'de soğuk iklim bölgelerindeki kentler için bir ilk olmuştur. Pilot bölge olarak ise yaklaşık 400 hektar kentsel dönüşüm-yenileme alanına sahip, önemli bir marka kış kenti olma yolunda bulunan Erzurum seçilmiştir. Kent, Doğu Anadolu Bölgesinin kuzeydoğusunda 25.066 km^2 büyüklüğü ile 40°15' ve 42° 35' doğu boylamlarıyla 40° 57' ve 39° 10' kuzey enlemleri arasında yer almaktadır. Kentin etrafı yüksek dağlarla çevrili ve çanak şeklindedir. Uzun yıllar meteoroloji sonuçlarına göre, ilde en soğuk ay ortalaması, -13.9 °C, en sıcak ay ortalaması 27.1 ºC, en düşük sıcaklık Aralık ayında -37.2 ºC ve en yüksek sıcaklık ise, Ağustos ayında 36.5 ºC olarak ölçülmüştür. Yıllık yağış miktarı 431 mm olup, kar yağışlı gün sayısı 50 ve kar örtüsünün yerde kalış süresi ise 114 gün olarak belirlenmiştir (MGM, 2020).

Bu çalışma kapsamında kent merkezinde 10 adet meteoroloji istasyonu kurulmuştur. Bu istasyonların kurulumunda kafes tekniği ile cihazlar koruma altına alınmıştır (Şekil 1). Meteorolojik verilerin ölçülmesi ve saatlik olarak kaydedilmesinde "Davis Vantage Pro 2 plus" aleti kullanılmıştır.



Şekil 1. Kent Merkezinde Kurulan İstasyonlardan Birinin Kurulumu ve Kabini

Kent merkezini sembolize edecek şekilde kurulan istasyonların konum haritası Şekil 2'de verilmiştir.



Şekil 2. Çalışma Alanı Kapsamında Kurulan 10 İstasyon ve Devlete Ait 3 İstasyonun Konum Haritası

3. Araştırma Bulguları ve Tartışma

Erzurum'daki farklı kentsel alan ve konut dokusu kullanımlarını sembolize eden ve 10 istasyon için uygun alanların özellikleri aşağıda sırası ile verilmiştir (Şekil 3).

İstasyon 1- Dadaşkent İstasyonu: Bu istasyon Dadaşkent semtinde Şehit Yunus Arda Bilgi Evi Bahçesine kurulmuştur. TÜBİTAK 1001 projesi kapsamında kurulan ve sıcaklık, rüzgâr, yağış ve nem sensörleri bulunan Otomatik Meteoroloji Gözlem İstasyonu (Vantage Pro2

Meteoroloji istasyonu, EU versiyon, alıcı üniteli), 24 saat boyunca ölçüm almaktadırŞehir merkezine uzaklığı ise, 7,9 km'dir.

İstasyon 2-Yıldızkent İstasyonu: Proje kapsamında kurulan, Otomatik Meteoroloji Gözlem İstasyonu (Vantage Pro2 Meteoroloji istasyonu, EU versiyon, alıcı üniteli) 39°52'48.61"N enlem, 41°14'46.57"E boylam koordinatlarında 1983 m rakımda Erzurum ilinin Palandöken merkez ilçesine bağlı Yıldızkent semtinde bulunan, Palandöken Belediyesi Yıldızkent Zabıta Amirliği'nin bahçesine kurulmuştur. İstasyon şehir merkezine 4,5 km uzaklıktadır.

İstasyon 3-Yenişehir İstasyonu: Bu istasyon 39°53'0.33"N enlem, 41°15'33.43"E boylam koordinatlarında 2030m rakımda Erzurum Palandöken merkez ilçesine bağlı Yenişehir semtinde, Palandöken Belediyesi Nikah Sarayı'nın arka bahçesine kurulmuştur. Şehir merkezine uzaklığı yaklaşık olarak 3 km'dir.

İstasyon 4- Kayakyolu İstasyonu: Kayakyolu istasyonu 39°52'56.32"N enlem, 41°16'30.26"E boylam koordinatlarında 2026 m rakımda Erzurum ilinin güneyinde Palandöken merkez ilçesinde kurulmuştur. İstasyon Palandöken Belediyesi'ne bağlı Kayakyolu semtinde yer alan Şehitler Parkı'nın içerisinde konumlanmaktadır. Ayrıca istasyon Palandöken Kayak Merkezi ve Dağ otellerine yaklaşık 3,5 km, kent merkezine ise yaklaşık olarak 3,3 km uzaklıktadır.

İstasyon 5- Yunus Emre İstasyonu: İstasyon; 39°53'32.67" N enlem, 41°17'7.99"E boylam koordinatlarında 1990 m rakımda, Sultan Alparslan Caddesi üzerinde bulunan Abdurrahman Gazi Mahallesi Muhtarlığı hizmet binası yanında kurulmuştur. Bu istasyon çevresinde 3 ve 5 katlı binalar bulunmaktadır. Kent merkezine 3,5 km uzaklıktadır.

İstasyon 6- Yakutiye İstasyonu: Bu istasyon; 39°54'18.00" N enlem, 41°16'23.63" E boylam koordinatlarında 1917 m rakımda, Ali Ravi Caddesi üzerinde bulunan Güneş Koleji binası bahçesinde kurulmuştur. Kent merkezine yaklaşık 1,2 km uzaklıktadır.

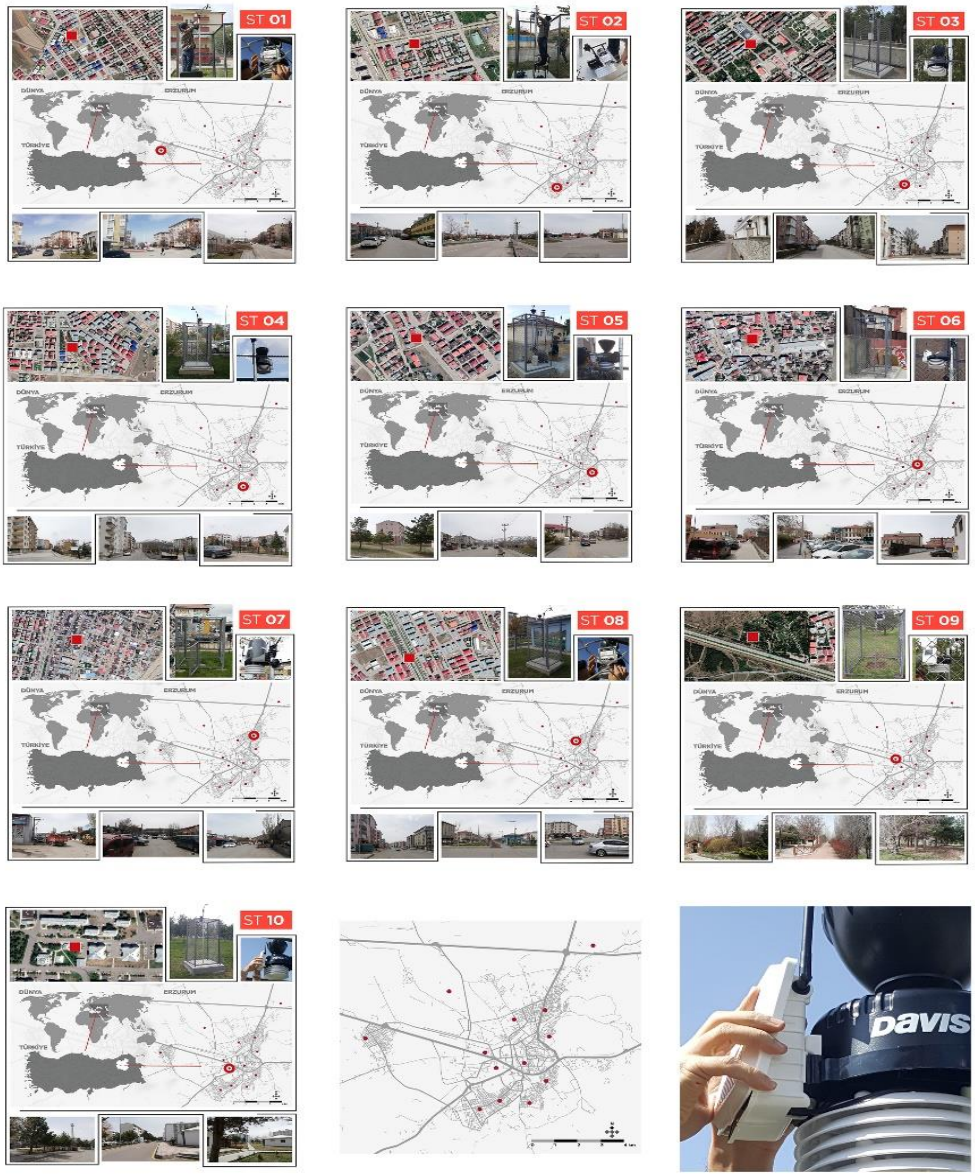
İstasyon 7-Sanayi İstasyonu: Eski sanayi sitesinin olduğu alanda kurulan bu istasyon; 39°55'44.63" N enlem, 41°17'3.20" E boylam koordinatlarında 1830 m rakımda, Endüstri Caddesi ile Keresteciler 9. Sokak kesişimde sanayi sitesi içerisindedir. Yakınında D950 (Erzurum-Tortum) karayolu bulunmaktadır. Kent merkezine yaklaşık 3,6 km uzaklıktadır.

İstasyon 8- Şükrüpaşa İstasyonu: Yerleşim yönünün hızla ilerlediği ve lüks konutların yapıldığı bu istasyon; 39°55'29.26" N enlem, 41°16'2.65" E boylam koordinatlarında 1830 m rakımdadır. Kent merkezine yaklaşık 2,8 km uzaklıktadır.

İstasyon 9- ATA Botanik Bahçesi İstasyonu: Yapımına 2005 yılında başlanan ve günümüzde kentin akciğerleri olarak tanımlanan Ata Botanik Bahçesi istasyonu: 39° 54'

26.7516"N enlem, 41° 14' 59.9064"E boylam koordinatlarında 1882 m rakımda Erzurum şehir merkezi ile Dadaşkent arasında konumlanmıştır. Kent merkezine 1,1 km uzaklıktadır.

İstasyon 10: Atatürk Üniversitesi İstasyonu: Atatürk Üniversitesi Lojmanları içinde kurulmuş olan bu istasyon; 39° 54' 1.5264" N enlem, 41° 15' 24.7068"E boylam koordinatlarında 1915 m rakımda bulunmaktadır. Kent merkezine 1,5 km uzaklıktadır.



Şekil 3. Kent Merkezinde Kurulan 10 İstasyonun Konum ve Durum Analizi

Termal konfor; genel olarak insanın en az miktarda enerji harcayarak çevresine uyum sağladığı ve kendisini son derece sağlıklı ve dinamik hissettiği iklim koşullarıdır (Fanger 1970). Physiological equivalent temperature (PET) indeksi insan ısı enerjisi denkliğinden türetilen bir indekstir. Bu nedenle PET indeksi farklı iklim tiplerindeki insan biyoklimatik konforunun hesaplanması için ideal bir araçtır (Fanger, 1970; Blazejczyk, 1994; Matzarakis

vd., 1999; Höppe, 2002; Matzarakis vd., 2000; 2007; Matzarakis, 2014; Yilmaz vd., 2021a; 2021b; 2021c Yılmaz vd., 2022).

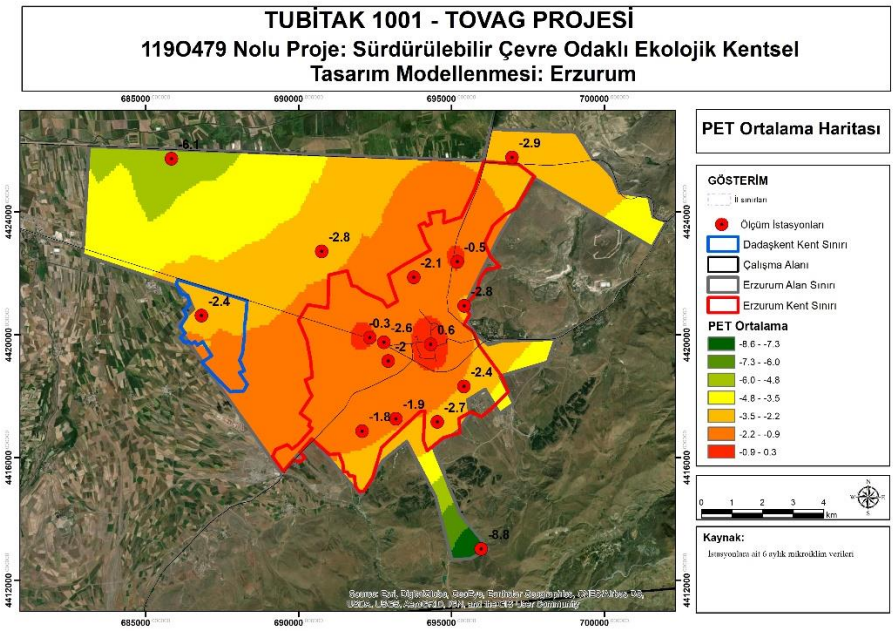
Elde edilen veri kayıtları ile Termal konfor analizi için RayMan pro 2.1 modeli kullanılarak, Fizyolojik eşdeğer sıcaklık (FES) hesaplaması yapılmıştır. Fizyolojik Eşdeğer Sıcaklık olarak bilinen (FES= PET (Physiologically Equivalent Temperature) MEMI (Munich Energy Model for Individuals) modeline dayalı olarak özellikle dış mekanlar için geliştirilmiştir (Fanger 1970; Höppe 1999). Bu modelde insan vücuduna ait sıcaklık giysili ve giysisiz alanların sıcaklığı olarak ele alınmıştır. PET ayrıca elbisenin ısı geçirim direncini ve metabolik ısı üretimini de hesaba katmaktadır. Konfor değerlerinin hesaplandığı mekanın çevresel özellikleri;

Tmrt = Ta, v = 0,1 m/s, Clo = Bulutluluk, VP =12,0 hPa şeklindedir. Tmrt, ortalama yansıma radyasyon sıcaklığı; Ta, havanın sıcaklığı; v, rüzgar hızı ve VP, buhar basıncını ifade etmektedir (Unger 1999-2004; Gulyas and Matzarakis 2009). Bu konudaki detaylı formüller Höppe (1999) ve ASHRAE (1992 ve 2004)'de bulunmaktadır. Araştırma sonucu elde edilen veriler Tablo 1' e göre yorumlanmıştır.

Tablo **1.** PET İndeksinin Termal Stres Kategorileri (Matzarakis et al., 1999)

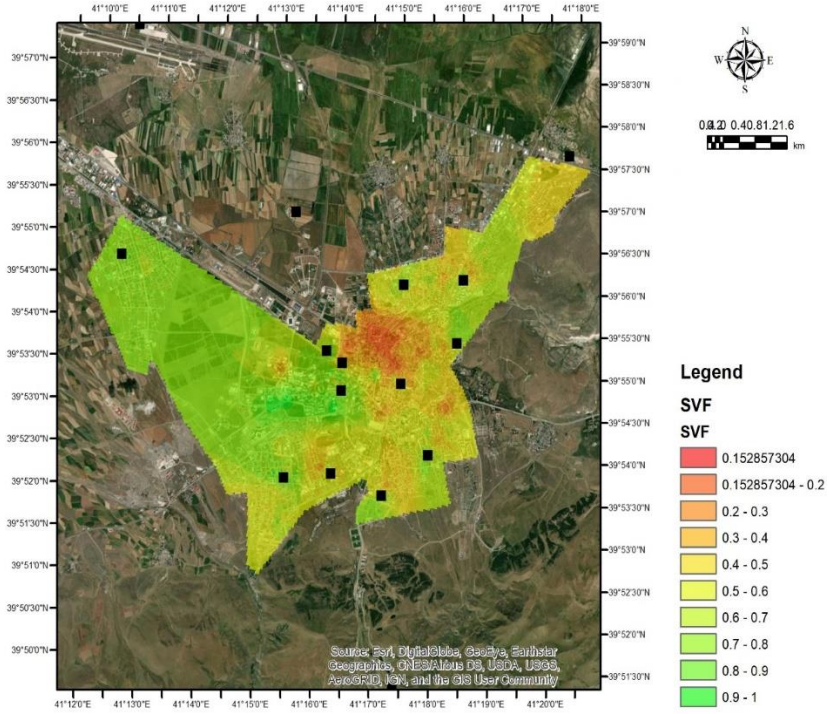
PET (°C)	İnsan hissi	Termal stres seviyesi
< 4	Çok soğuk	Aşırı soğuk stresi
4.1 – 8.0	Soğuk	Güçlü soğuk stresi
8.1 – 13.0	Serin	Orta soğuk stresi
13.1 – 18.0	Hafif serin	Hafif soğuk stresi
18.1 – 23.0	Konforlu	Termal stres yok
23.1 – 29.0	Hafif ılıman	Hafif sıcak stresi
29.1 – 35.0	Ilıman	Orta sıcak stresi
35.1 – 41.0	Sıcak	Güçlü sıcak stresi
> 41.0	Çok sıcak	Aşırı sıcak stresi

Elde edilen altı aylık (Ekim-Kasım- Aralık 2020- Ocak-Şubat-Mart 2021 verilere göre hazırlanan PET dağılım haritası Şekil 4'de verilmiştir.



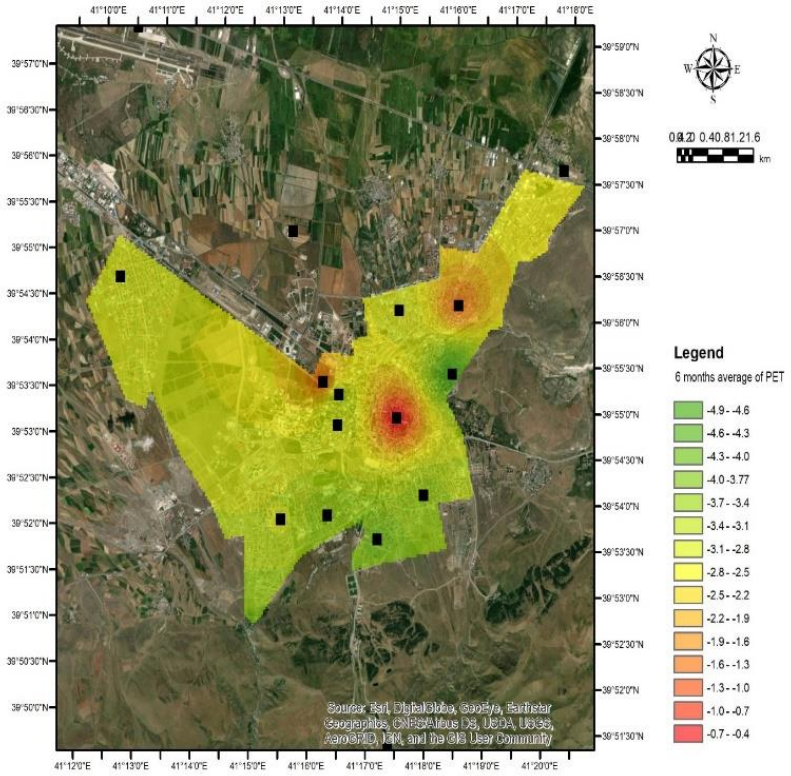
Şekil 4. Altı aylık (Ekim-Kasım- Aralık 2020- Ocak-Şubat-Mart 2021 Verilere Göre Hazırlanan PET Dağılım Haritası

Gökyüzü Görünürlük Oranı- Sky View Factor (SVF): Gökyüzü görünüş oranı (SVF), gökyüzünün belirli bir noktadan görülebilen kısmını gösteren bir parametredir (Oke, 1988). SVF, bir yarım küredeki görünür gökyüzünün fraksiyonu olarak tanımlanmakta ve sıfır ile bir arasında değer ile ifade edilmektedir. SVF değeri ise Rayman program ile hesaplanmakta ve gökyüzü görünürlük oranını ifade etmektedir. Bu değer 1'e yaklaştıkça gökyüzü görünürlüğünün açık olduğunu, 0'a yaklaştıkca gökyüzü görünürlüğünün azaldığını göstermektedir (Algeciras et al., 2016; Middel vd., 2017; Li et al., 2020; Yilmaz vd., 2021b). Balık gözü lens ile kent merkezinde 500'den fazla noktadan ölçümler alınmış ve RayMan Pro 2.1 modeli ile analiz edilerek şekil 5'de verilmiştir. Analizi yapılan 500 nokta verisi ile ArcGIS 10.3 programı kullanılarak kent için SVF haritası hazırlanmıştır.



Şekil 5. İstasyon ve Yakın Çevrelerinden Alınan Gökyüzü Görünürlük Oranı Değerleri (SVF analizi)

Ölçüm yapılan altı aylık veriler RayMan Pro 2.1 modelinde işlenerek elde edilen PET değerlerine göre hazırlanan harita, SVF değerleri ile hazırlanan harita ile çakıştırılmıştır (Şekil 6). Yapılan enterpolasyon analizi sonucu kış aylarına göre PET değerleri kadar tüm makroform da belirgin bir fark olmadığı ancak yine de kent merkezinin yüksek PET değerine sahip olduğu belirlenmiştir. Makro formdaki farklı yerleşim alanları arasında belirgin fark olmayışının nedeni farklı dönemlerde farklı kentsel mekanların birbirilerine göre değişik tepkiler vermesiyle açıklanabilir. SVF değerinin yanı sıra, rakım, yeşil alan varlığı, rüzgâr vb. birçok değişkenin etkili olduğu görülmektedir.



Şekil 6. İstasyonlara Göre 6 Aylık Veri Analizinden Elde Dilen PET Değerleri Haritası

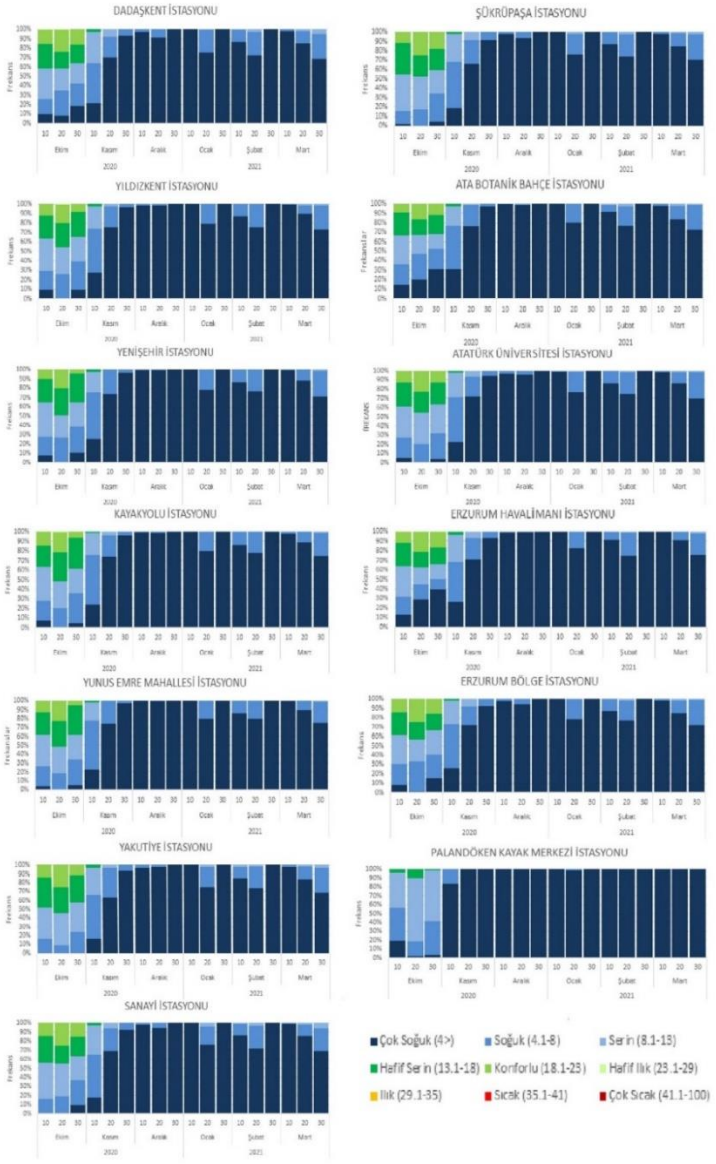
Saatlik olarak elde edilen ortalama sıcaklık, rüzgâr, nem ve bulutluluk verilerinin RayMan Pro 2.1 programına girilerek elde edilen ve hissedilen sıcaklığı oluşturan PET değerlerinin, ilk 6 aylık dönemdeki değerleri Tablo 2'de verilmiştir. Elde edilen frekans grafiği şekil 7'de verilmiştir.

Tablo 2 . PET (Physiologically Equivalent Temperature) Ortalamaları (1 Ekim 2020- 1 Nisan 2021 Arası)

	2020			2021		
	Ekim	Kasım	Aralık	Ocak	Şubat	Mart
DADAŞKENT İSTASYONU	9,7	0,2	-6,5	-8,6	-6,1	-2,9
YILDIZKENT İSTASYONU	10,5	-0,2	-5,5	-7,0	-5,2	-3,1
YENİŞEHİR İSTASYONU	10,0	-0,2	-5,5	-7,0	-5,2	-3,8
KAYAKYOLU İSTASYONU	10,0	-1,1	-6,7	-8,0	-6,0	-4,2
YUNUS EMRE MAHALLESİ İST.	9,6	-0,9	-6,2	-7,8	-5,8	-3,6
YAKUTİYE İSTASYONU	11,9	2,0	-3,1	-4,6	-2,4	-0,4
SANAYİ İSTASYONU	10,7	1,4	-4,4	-5,5	-3,6	-1,5
ŞÜKRÜPAŞA İSTASYONU	10,1	-0,3	-6,4	-7,7	-5,3	-3,1
ATA BOTANİK BAHÇE İSTASYONU	11,7	1,2	-5,1	-5,4	-3,1	-1,3
ATATÜRK ÜNİVERSİTESİ İSTASYONU	10,0	-0,4	-5,8	-7,2	-5,5	-3,2
ERZURUM BÖLGE İSTASYONU	8,8	-0,9	-7,4	-7,5	-5,2	-3,4
ERZURUM HAVALİMANI İSTASYONU	5,3	-3,2	-8,3	-13,0	-10,3	-7,4
PALANDÖKEN KAYAK MERKEZİ	2,5	-8,0	-11,3	-12,1	-11,9	-11,8

Tablo 2 incelendiğinde en yüksek değerlerin sırası ile Yakutiye İstasyonu (0,6 ^{o}C), Ata Botanik Bahçesi İstasyonu (-0,3 ^{o}C), Sanayi İstasyonu (-0,5 ^{o}C), Yıldızkent İstasyonu (-1,8 ^{o}C), Yenişehir İstasyonu (-1,9) ve Atatürk Üniversitesi İstasyonu (-2,0 ^{o}C) olarak sıralanmıştır. En düşük değerler ise Palandöken Kayak Merkezi (-8,8 ^{o}C), Erzurum

Havalimanı İstasyonu (-6,1 ºC), Kayakyolu İstasyonu (-2,7 ºC), Erzurum Bölge İstasyonu (-2,6 ºC), Yunus Emre Mahallesi İstasyonu (-2,4 ºC) ve Dadaşkent İstasyonu (-2,4 ºC) olarak sıralanmıştır. Bu istasyonlarda elde edilen PET ortalamalarının Tablo 1'de verilen PET indeksinin termal stres kategorileri (Matzarakis et al., 1999) açısından değerlendirmesi yapıldığında ilk 6 aylık veriler 'Çok soğuk' hissi ile 'Aşırı soğuk stresi' olarak ifade edilen (< 4 ºC) değerlerin termal seviye olarak hakim olduğu görülmektedir. Kent – kır arasındaki sıcaklık farkı, çalışma yapılan alanın özelliklerine göre değişmekle birlikte 4-6 ^{0}C arasında değişmektedir. Kırsal alanlar her zaman kentlere göre daha serindir (Oke, 1987; Toy and Yılmaz, 2010; Connor et al. 2013; Yılmaz et al., 2021a).



Şekil 7. İstasyonlardan Elde Edilen Sıcaklık Verilerinin Aylara Göre Frekans Dağılımları (1 Ekim 2020- 1 Nisan 2021 Arası)

Şekil 7'de verilen PET değerlerinin aylara göre dağılımlarına bakıldığında Ekim ayı içerisinde sadece Palandöken Kayak Merkezi İstasyonunun 4 ºC' nin altında olan, çok soğuk hissi ve aşırı soğuk stresi sınıfında olduğu görülmektedir. Ekim ayı PET ortalaması 2,5 ºC olan bu istasyon, yüksek rakım ve rüzgâr etkisi ile düşük PET değerlerini kış aylarında da sürdürmektedir. Erzurum Havalimanı İstasyonu da benzer şekilde düşük PET değerleri sunarken, bu istasyonda elde edilen Ekim ayı ortalaması 5,3 ºC ile güçlü soğuk stresi aralığında (4,1-8,0 ºC) yer almaktadır. İlk 6 aylık ortalamada ise diğer tüm istasyonlarda olduğu gibi aşırı soğuk stresi (< 4 ºC) hakim olmaktadır. Bu istasyon ise daha önce de ifade edildiği gibi kentin en düşük rakımlı ve açık arazide olması nedeniyle soğuk çökelmesi ve şiddetli rüzgârın etkisi ile düşük PET değerlerinin oluşmasına neden olmaktadır. Yeşil alanların yoğun olduğu yerler termal konforu olumlu etkilemektedir (Irmak vd., 2013;2018;2020). Tüm aylarda en yüksek değerlerin görüldüğü Yakutiye İstasyonu bizlere tipik bir kentsel ısı adası örneği sunmaktadır. Kentsel alanların en yoğun olarak yer aldığı bu istasyonda ilk 6 aylık dönemde 0,6 ºC' lik PET ortalaması görülmesine karşın Ekim ayında 11,9 ºC 'lik değer ile Orta soğuk stresi (8,1-13,0 ºC) aralığında yer almıştır. Düşük rüzgâr ve yüksek sıcaklık verileri kent merkezinde bulunan bu istasyonu termal konfor açısından ilk 6 aylık dönemde en avantajlı PET değerlerine ulaşmasını sağlamakla birlikte, yaz dönemlerinde sıcak stresinin bu istasyonda etkili olması beklenmektedir.

4. Sonuç

PET verilerinin bu istasyonlar arasında sağlıklı yorumlanabilmesi için en az 1 yıllık verilerin değerlendirilmesi gerekmekle beraber kış dönemini içeren ilk 6 aylık veriler değerlendirildiğinde istasyonların bulunduğu yerleşim birimleri arasında farklılıklar dikkat çekmektedir. Özellikle kentsel ısı adası özelliği gösteren Yakutiye İstasyonu, açık alanda kurulu olan ve rüzgâr etki altına bulunan Erzurum Havalimanı İstasyonu, yüksek rakımda kurulu Palandöken Kayak Merkezi istasyonu, Erzurum'un yeni yerleşim alanlarından olan Kayakyolu istasyonu ve yeşil alanların yoğunlukta olduğu Ata Botanik Bahçesi İstasyonu farklı veriler sunarak farklılıklar göstermişlerdir. İlk 6 aylık dönemde elde edilen bu farklılıkların, verilerin 1 yıla tamamlanması ile daha artarak belirginleşeceği tahmin edilmektedir.

Kente gelmesi gereken rüzgârın yanlış yapılaşmalar ile engellenmesi, yeni imar planı ile yerleşimin tarım toprakları içeren ovaya doğru yayılım göstermesi ve binaların enerji verimliliği açısından son derece düşük bir performansa sahip olması bu sorunun boyutlarını

daha da artırmaktadır. Kentsel planlamalarda kullanılacak mikroiklim verilerinin kent içerisinden farklı konum ve kent ölçeğinde alınması büyük önem arz etmektedir.

Günümüzde birbirinden çok farklı iklim verilerine sahip kentlerimizde, yapı karakteri ve diğer dış mekân alan kullanımları ile uyumlu yapılaşma modelleri tasarlanmasına önem verilmelidir. Çünkü; mekâna ait bu kaynak değerleri doğru kullanıldığında sonuca olumlu etki ettiğini gösteren çok sayıda araştırma bulunmaktadır. Multidisipliner ekiple her bölgenin kendine has doğal ve sosyo-kültürel kaynak değerlerini iyi analiz ederek ve etkin kaynak kullanımıyla planlandığında ve uygulandığında daha sağlıklı sonuçlar elde edilebilmektedir.

Sonuç olarak, Türkiye'de neredeyse hemen hemen her ilimizde yaşanan kentsel dönüşüm/yenileme çalışmalarında doğaya kulak verilerek yapılan, iklim ve mikroiklim odaklı planlarla avantaja dönüştürmek mümkündür. İnsanoğlunun doğayla barışık yaşamaktan başka şansının olmadığı artık görülmelidir.

Teşekkür

Ölçümler için kullanılan yazılımlar ve cihazlar, TÜBİTAK (Türkiye Bilimsel ve Teknolojik Araştırma Kurumu) destekli 119O479 numaralı bilimsel proje kapsamında satın alınmıştır. Bu bildiri için TÜBİTAK tarafından sağlanan araştırma fonuna ve desteklerine teşekkür ederiz. Ayrıca Devlet Meteoroloji İşleri Genel Müdürlüğünede ücretsiz olarak paylaştığı veriler için teşekkür ederiz.

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Political Developments and Media Reflections Caused by Earthquakes in Turkey After the Republic

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Abstract

In our country, which is located in one of the important active earthquake belts, destructive earthquakes have continued from the past to the present. Destructive earthquakes have always brought loss of life and property. The authorities of the period put disaster regulations into force in order to take precautions after disasters. After the earthquakes, the regulations were updated by making additions to the regulations or new regulations were introduced and measures were tried to be increased. There have been ten major earthquakes that have shaken the country deeply since the Republican period until today. After these earthquakes, regulations have continued to be issued or updated. Of course, there were no problems with the content of the regulations. However, the inability to make the regulations applicable, the inadequacy of the control mechanism of the regulations, and the fact that political figures were at the forefront of the decisions taken after the earthquake more than the competent names on earthquakes caused the repetition of the suffering experienced after the earthquake.

In this study, it is examined how the earthquakes in Turkey were followed, what kind of decisions were taken by the politicians and what kind of perception the press presented the earthquake disasters to the public. Firstly, the theoretical studies under the headings of Earthquake, Politics and Earthquake in Turkey are analyzed according to general researches and narrower specific researches. Then, the data on the reflections of the disasters in the press after the earthquake were supported by the newspapers of the period. The results of the decisions taken by the administrations of the period, the sustainability of the decisions until today, and whether the regulations were effective or not were obtained.

Keywords: Earthquake, Disaster Regulation, Politics, Press.

Introduction

Natural disasters are an undeniable reality in the world. Turkey is one of the countries where the risk of natural disasters requires the highest level of attention due to its location in the Alpine-Himalayan Earthquake Zone. In our country, where disasters are frequently seen, many earthquakes have occurred from past to present. If we list the major and destructive earthquake disasters historically; May 7, 1930 Hakkâri Earthquake, December 27, 1939 Erzincan Earthquake, November 24, 1976 Van/ Çaldıran Earthquake, August 17, 1999 Marmara, November 12, 1999 Düzce, May 1, 2003 Bingöl Earthquake, October 23, 2011 and November 9, 2011 Van Earthquake, January 24, 2020 Elâzığ and October 30, 2020 İzmir Earthquakes. The importance of scientific researches, predictions and determinations in order to identify the risks in settlement areas and to minimize the damage of the disasters to be realized is revealed in every disaster with the loss of life and property in disasters. Disaster management, on the other hand, is to minimize possible losses by taking precautions against hazards that will cause loss of life and property before natural disasters occur.

Developed countries take precautions before disasters occur because they produce knowledge, use technology at a good level and blend these accumulations.

Thus, the loss of life and property is at the lowest level compared to undeveloped countries that cannot produce information and use technology well. For this reason, effective and applicable regulations are needed in order for the administrations to get fast and effective results before and after disasters in undeveloped or developing countries. Only regulations may not be effective with unqualified staff in disaster management. This effect can also be facilitated by utilizing mass media in disaster management. It is of utmost importance especially for press organizations to inform the citizens with the facts and to convey the information to the citizens in a timely manner.

In this study; how the earthquake disasters that took place at different times since the establishment of the Republic of Turkey have been covered in the press, how the governments of the period took a course after the disasters, the disaster regulations that emerged after the earthquakes and how the media presented the disasters to the public under the conditions of the period are included.

Materials and Methods

Material

Turkey is located on the Alpine-Himalayan earthquake belt, one of the major active earthquake belts. For this reason, there have been many large and destructive earthquakes in the territory of the Republic of Turkey throughout history. So much so that after the Istanbul Earthquake in 1509, which was recorded in the literature as a 7-base earthquake, people referred to the disaster as the Little Apocalypse. Large and destructive earthquakes can be analyzed in two periods: before and after the Republic [Url- 11].

If we list the major and destructive earthquakes after the establishment of the Republic in historical order;

The first large and destructive earthquake was the Hakkâri Earthquake of May 7, 1930. The earthquake was measured as 7.2. 2,514 people are known to have lost their lives.

December 27, 1939, Erzincan Earthquake; In the literature, it is referred to as the Great Erzincan Earthquake. The magnitude of the Erzincan Earthquake was measured as 7.9. It is stated that approximately 33 thousand people lost their lives. Today, it still maintains its place as the largest and most destructive earthquake experienced within the borders of Turkey.

November 24, 1976, Van/ Çaldıran Earthquake; It took place in Çaldıran Sub-district of Muradiye District of Van. It is included in the literature as an earthquake with a magnitude of

7.5, in which 9,232 buildings were damaged and 80 percent of the houses in an area of 2,000 kilometers were destroyed.

The August 17, 1999, Gölcük (Kocaeli) Earthquake is known as the longest lasting earthquake in Turkey's earthquake chronology, lasting 45 seconds. The 2010 Parliamentary Research Report on the 7.4 magnitude earthquake states that 18,373 people lost their lives.

November 12, 1999, Düzce Earthquake; It is mentioned as the earthquake that lasted the longest with 30 seconds after Gölcük (Kocaeli) Earthquake. The magnitude of the earthquake was measured as 7.2 and 894 people lost their lives.

According to the information announced by Düzce Disaster and Emergency Directorate, 16 thousand 666 houses and 3 thousand 837 workplaces were heavily damaged, 10 thousand 968 houses and 2 thousand 573 workplaces were moderately damaged, 13 thousand 70 houses and 1606 workplaces were slightly damaged in Düzce Province.

May 1, 2003, Bingöl Earthquake; 176 people lost their lives and 625 buildings collapsed or were heavily damaged in the earthquake with a magnitude of 6.4.

October 23, 2011 and November 9, 2011 Van Earthquake; On October 23, an earthquake measuring 7.2 magnitude with the epicenter in the village of Tabanlı in central Van, was followed days later by another earthquake measuring 5.6 magnitude on November 9, 2011 in Edremit District of Van, killing 601 people in both earthquakes.

January 24, 2020 Elâzığ Earthquake; It is an earthquake measuring 6.8 magnitude in Sivrice District of Elâzığ. 41 people lost their lives.

On October 30, 2020, an earthquake with a magnitude of 6.6 occurred off the coast of Seferihisar district of Izmir. It is reported that 116 people lost their lives in the earthquake.

When the earthquakes that have occurred in the Republic of Turkey since the proclamation of the Republic are examined, it is seen that earthquakes have caused a lot of loss of life and property. As it is known that the loss of life will not come back, people and other living things lose their homes, workplaces, in short, their established order.

Since Turkey is located in a region with high seismicity, it is impossible to prevent earthquakes by predicting them in advance with the current level of development. However, not to seek solutions to the disasters that may occur, and for the government officials and politicians of the time to forget the people who elected them is to create another disaster.

Method

During the first phase of the study, the balance sheets of major and destructive earthquakes in Turkey were investigated in theoretical studies, and then, regardless of political views, what

the government officials of the period did before and after the earthquakes, what kind of activities they carried out before and after the disasters, and how the earthquakes were reflected in the press were included. Turkey was chosen as the study boundary due to the fact that Turkey is located in one of the most important active earthquake zones, as well as the fact that the expectations of politicians are prioritized over the welfare of the people and political decisions are more commercial than the health of the society.

During the research, all studies in the literature on earthquakes, politics and earthquake issues in Turkey were taken into consideration.

After the researches, the prominent headlines in the press and the practices and policies of the governments of the period have been taken into consideration and explained in line with the principle of impartiality, without making judgments, by including every opinion. Thus, the sensitivities of the authorities and the press on earthquake since the establishment of the Republic of Turkey will be evaluated.

Table 1. Earthquake, Political Development and Media

Earthquake	Political Development	Media
May 7, 1930 Hakkâri Earthquake	-	The earthquake was not reported on the front pages of the press.
December 27, 1939 Erzincan Earthquake	After the earthquake, the Turkish Grand National Assembly and NGOs worked to provide assistance.	Citizens were asked for help through the press.
November 24, 1976 Van/ Çaldıran Earthquake	The authorities of the period stated that they made every effort for the citizens. and brought them. Relief efforts continued.	The media emphasized that the death toll was very high.
August 17, 1999 Marmara Earthquake	After the earthquake, it was reported that permanent housing would be started in phases. Training tapes to raise public awareness about the earthquake will be prepared.	Newspaper headlines claimed that the government was responsible.
November 12, 1999 Düzce Earthquake	Earthquake evacuation plans of schools were said to be prepared. Provincial emergency plans after disasters will be done.	The headlines emphasized the pain of the disaster and featured people who could not escape from the rubble.
May 1, 2003 Bingöl Earthquake	Housing works started after the earthquake. Afterwards It was declared that it was built in accordance with the urban structure.	The press held the government responsible with headlines such as "Who will be held accountable?" and "State wreckage".
October 23, 2011 and November 9, 2011 Van Earthquake	The state has started work on permanent housing for earthquake victims.	The media targeted contractors as responsible for the earthquake.

January 24, 2020 Earthquake		Elâzığ	School, Mosque, Park projects and new housing projects have been started.	The headlines emphasized that the nightmare had reappeared.
October 30, 2020 Earthquake		Izmir	Housing Development Administration (TOKİ) carried out an earthquake housing project for earthquake victims.	Newspapers mentioned that the earthquake had warned again.

Politics and Earthquakes

The concept of politics is defined by the Turkish Language Association (TDK) as; "A special view or understanding of the art of organizing and conducting state affairs."

As it is known that states are made up of people, assuming that people live under states; Politics can be defined as a discipline that organizes and conducts state affairs that affect all of social life [Url-12]. Although it is not possible to prevent earthquakes in today's conditions, it is possible to prevent the defeats that will arise from earthquakes.

Although earthquakes are natural disasters and take place outside of politics, policies and the failure to implement these policies are responsible for the material and moral damage caused by earthquakes. Government officials and politicians should ensure that necessary measures are taken before disasters occur.

Findings and Discussion

May 7, 1930 Hakkari Earthquake

When the newspapers dated May 7, 8 and 9, 1930 are examined following the earthquake in Hakkâri, it is seen that the earthquake was not covered on the first pages of the newspapers. When the earthquake that took place on May 7, 00.34 is taken into consideration in the newspapers dated May 8, 1930, taking into account the printing conditions at the time;



Figure 1. Hakkari Earthquake in Cumhuriyet and Vakıt Newspapers (URL-1, 14.07.2022.)

December 27, 1939 Erzincan Earthquake, Aftermath

On December 27 and 28, 1939, newspapers published headlines such as "Citizen! It is your first duty to help your fellow disaster victims. Do not forget this", "The disaster is much bigger than imagined".



Figure 2. Erzincan Earthquake in Akşam and Ulus Newspapers (URL-1, 14.07. 2022)

On December 28, Deputy Minister of Internal Affairs B. Faik Öztrak and Deputy Minister of Health Dr. Hulusi Alataş left Ankara by train to go to the earthquake zone (Ulus, December 29, 1939 cited in Haçin, 2014). It is stated in the article that İsmet İnönü, the President of the period, arrived in Erzincan on December 31 and that the Grand National Assembly of Turkey (TBMM) started its work on the morning of the earthquake.

The Grand National Assembly of Turkey (GNAT) started its work on the morning of the earthquake and firstly, it is stated that material and social needs were sent to the earthquake zone through the Red Crescent (Ulus, December 29, 1939 cited in Haçin, 2014).

Haçin, 2014; Gümüşhane Deputy Hasan Fehmi Ataç, who took the floor in the Parliament, states that people in the regions affected by the earthquake could not be contacted by telegraph. In this regard, Deputy Minister of Health Alataş states that this problem will be solved in a short time.

It is stated that Tunceli Deputy Sami Erkman requested that the state pay 40 thousand liras from its budget to the earthquake victims, but this proposal was not approved because the bad consequences of the earthquake were not yet clear, and it is explained that Çanakkale Deputy Ziya Gevher Etili then took the floor and presented a proposal to establish an aid committee for the earthquake victims, which was accepted and the "National Muavenet" committee

started its activities. In the January 10, 1940 parliamentary meeting, the law on prisoners in the earthquake zone is mentioned.

It is stated that this law is both about the demolition of the places where prisoners were staying due to the earthquake and the employment of prisoners to help earthquake victims. In the January 15, 1940 parliamentary meeting, it is stated that a law was proposed for those affected by the earthquake under the title "On the aid to be provided to those who suffered damages in Erzincan and in the region affected by the Erzincan earthquake". According to the proposed law, articles such as helping those affected by the earthquake and improving the salaries of civil servants in the earthquake zone were included in the article (Ulus, December 29, 1939 cited in Haçin, 2014).

The studies and regulations enacted after 1939 do not support the execution of duties to mitigate damages before disasters occur. In 1944, with the "Law on Measures to be Taken Before and After Earthquakes", what should be done before and after disasters was determined by law, and the first building regulations of the Republic of Turkey and the map of earthquake zones were created together with those determined in this law (Anonymous, 2004 cited in Kepenek & Gençel, 2016).

In 1945, with the "Law on Measures to be Taken Before and After Earthquakes" and the first building regulation, it can be said that efforts to reduce the bad consequences of disasters in Turkey have begun because the concept of "earthquake", which was not mentioned in the "Law on Municipal Buildings and Roads and Ebniye Regulation" that came into force in 1933, has been included in the law and issues such as principles related to the structures to be built in earthquake zones and ground survey studies have been made ready (Kepenek & Gençel,2016).

In addition, the law includes rules such as the readiness of emergency aid and rescue plans before disasters occur, and the commitment of those in management and citizens to their responsibilities in their duties (Anonymous, 2004 cited in Kepenek & Gençel, 2016). Earthquake regulations have continued to evolve continuously.

In 1945, there was no mention of reinforced concrete structures, but in 1949, the regulation included an uncomplicated calculation method for calculating the earthquake forces acting on reinforced concrete buildings in the regions located in the first and second degree earthquake zone (Alyamaç &Erdoğan, 2005). The 1949 regulation was replaced by the "Regulation on Structures to be Built in Earthquake Zones" and the method of calculating earthquake forces was made more comprehensive and informative tables were included.

In 1949, an earthquake bureau was established within the Directorate of Building and Zoning Affairs, and in 1955 the bureau was transformed into the "DE-SE-YA (Earthquake, Seiche, Fire)" organization (Kepenek & Gençel, 2016).

After two years, the Zoning Law was enacted in 1957, which was one of the turning points for the planning discipline in Turkey and would be in effect until 1984. With the Zoning Law, for the first time in Turkey, the planning discipline was included in the mitigation of bad consequences arising from disasters together with regulations, planning within municipalities and adjacent areas was tied to certain rules, and it was necessary to take into account the natural disasters that would occur in new settlement areas (Yavaş, 2001) Following the Zoning Law, the Ministry of Zoning and Settlement was established in the same year to put this law into operation.

In this law, which is the first zoning law in Turkey, it can be said that Turkey entered a new era with the definition that planning would be used as a tool to reduce the damages arising from disasters. In 1959, with the establishment of the Ministry of Zoning and Settlement and the entry into force of the "Law on Measures to be Taken and Assistance to be Provided in Case of Disasters Affecting Public Life" or in other words "Disaster Law" in the same year, the laws made until 1959 were gathered together and the institutions to execute these laws were determined (Ministry of Environment and Urbanization, 2015).

In 1962, the "Regulation on Structures to be Built in Disaster Areas" was prepared for the first time in order to solve the technical deficiencies within the scope of the "Law on Measures to be Taken and Assistance to be Provided in Case of Disasters Affecting Public Life" and made it applicable (Anonymous, 1962).

In this regulation, it is mentioned that the structural systems of the buildings should be symmetrical with respect to the axes of the buildings. However, rules and calculations were not given in detail and remained as guidance (Ministry of Environment and Urbanization, 2012) In 1965, with the amendments made in the establishment and duties of the Ministry of Reconstruction, Development and Settlement, the duties and authorities of the Directorate of Disaster Affairs were also amended. According to the changes, the organization was given full authority except for search and rescue, security and health services. In 1965, the name changes in other state institutions also took place in this institution. The general directorate started to be used instead of the directorate (Ministry of Environment and Urbanization, 2015).

In 1968 and 1975, with the increase in reinforced concrete building stock in Turkey, the technical deficiencies in the "Regulation on Structures to be Built in Disaster Areas", which entered into force in 1962, were tried to be solved, construction elements, construction dimension and reinforcement rules were mentioned, and earthquake formulas were tried to be detailed (Anonymous, 1968 &1975).

Since 1968 and 1975, there have not been any name changes or updates on the general functioning, and it has continued to be developed with corrections and details (Kepenek & Gençel, 2016).

November 24, 1976 Van/ Çaldiran Earthquake

On November 25, 1976, Tercüman and Cumhuriyet Newspapers published the following articles: "Great Earthquake in the East, High Number of Dead", "Earthquake in Van, many dead."



Figure 3. Van/Çaldıran Earthquake in Tercüman and Cumhuriyet Newspapers (URL-1, 14.07.2022)

In 1983, the Ministry of Public Works and the Ministry of Reconstruction and Settlement were merged and the Ministry of Public Works and Settlement was established. In 1985, the Zoning Law No. 3194, which is still in force today, entered into force. Construction and execution of Zoning Plans were explained in detail and local administrations were authorized. The foundations of the 2007 earthquake code, which is still in force today, were laid in 1998. In this regulation, each type of building was categorized under sub-headings and earthquake resistant design rules were determined not only for reinforced concrete structures but also for steel, timber and masonry structures.

The concept of irregularities in buildings was mentioned for the first time in this regulation, horizontal and vertical irregularities were defined and it was emphasized that these irregularities should not be present (Kepenek & Gençel, 2016).

August 17, 1999, Gölcük (Kocaeli) Earthquake

After the earthquake disaster, Cumhuriyet Newspaper's main headline reads "Our pain is great" and sub-headlines read "The response to the wreckage was late" and "The state was not where it should have been". In Star Newspaper, this situation was reported as "Here is the Terrible Balance Sheet that the Government Expected but could not Disclose", in Hürriyet Newspaper; in the main headline; "Murderers", and in the sub-headlines; "Rotten construction again. Thieving and unscrupulous contractors again". Sabah Newspaper covers the disaster with the main headline "At least 2500 dead" and the sub-heading "Oh my God."



Figure 4. Gölcük (Kocaeli) Earthquake in Cumhuriyet Newspaper (URL-2, 14.07.2022)



Figure 5. Gölcük (Kocaeli) Earthquake in Star and Hürriyet Newspapers (URL-3, 14.07.2022)

November 12, 1999, Düzce Earthquake

In the press following the disaster, Sabah Newspaper headlined "Pain God". Takvim Newspaper emphasized "Hundreds of Dead" and reported that buildings, bridges and roads were destroyed.



Figure 6.a. 1999 Düzce Earthquake in Sabah Newspaper (URL-4, 11.03.2022)
Figure 6.b. 1999 Düzce Earthquake in Takvim Newspaper (URL-5, 11.03.2022)

After the 1999 Marmara earthquakes, it has once again become evident that Turkey has not taken precautions against natural disasters in the desired quality and in advance. After the Marmara Earthquakes, it was understood that only regulations would not be sufficient and that a project-oriented era should be adopted. The only problem is not the new settlement areas, but the non-resistant building stock in the existing built-up areas.

Following this period, international cooperation efforts were initiated by examining projects abroad and it became necessary to upgrade the suitability of existing buildings for use (Kepenek & Gençel, 2016). The year 2001 was a breaking point for buildings in Turkey. As the public inspection mechanism was insufficient in terms of the quality and soundness of buildings, the "Decree Law on Building Inspection" was issued and the inspection mechanism was authorized by the state and transferred to the private sector. A system was planned for the private sector to be supervised by another private sector (Kepenek & Gençel, 2016).

May 1, 2003, Bingöl Earthquake

In the aftermath of the earthquake disaster; Hürriyet Newspaper dated May 3 carried the headline "Rescue: 10 Management: Zero", and again in Posta dated May 3 with the title "Who Will Give the Account". In Tercüman Newspaper dated May 2; with the title "State Wreckage". In Tercüman Newspaper dated May 6; with the title "Terrible Negligence" and the headline "When Bingöl shook, public buildings in Istanbul were remembered. Files were taken off the shelf. It has been revealed that 21 hospitals damaged on August 17th have not had a single nail hammered for 4 years".



Figure 7. Bingöl Earthquake in Hürriyet, Posta, Tercüman Newspapers (URL-6, 11.03.2022)

October 23, 2011 And November 9, 2011 Van Earthquake

Following the disaster, on October 24, 2011, Akşam Newspaper reported "This time the East collapsed, the scene is the same as Marmara 1999: Killer Rotten Buildings". On October 24, 2011 Cumhuriyet Newspaper covers the disaster with the subtitle "Van shook this time in Turkey, the country of earthquakes".



Figure 8. October 23 Van Earthquake in Akşam and Cumhuriyet Newspapers (URL-7, 13.03.2022)

After the October 23, 2011 earthquake disaster, another earthquake disaster struck Van on November 9, 2011. This time, Star Newspaper dated November 10, 2011 covers the earthquake with the headline "Earthquake returned to Van with 5.6" and Sözcü Newspaper dated November 10, 2011 covers the earthquake with a black humor in which Gazi Mustafa Kemal Atatürk speaks to the people from Van.



Figure 9. November 9 Van Earthquake in Star and Sözcü Newspapers (URL-7, 13.03.2022)

January 24, 2020 Elâzığ Earthquake

On January 25; Sözcü Newspaper, "Elazığ'da Disaster", Sabah Newspaper, "Elazığ'da 6.8'lik Earthquake Disaster", Yeniçağ Newspaper, "Elazığ'da Earthquake", Karar Newspaper, "Nightmare unfolded in Elazığ".



Figure 10. 2020 Elazığ Earthquake in Sözcü, Sabah, Yeniçağ, Karar Newspapers (URL-8, 11.03.2022)

October 30, 2020 Izmir / Seferihisar Earthquake

The earthquake disaster is described with headlines such as "İzmir'den Vurulduk" in Akşam Newspaper, "Deprem warned again" in Diriliş Postası Newspaper, and "Deprem Dehşeti" in Yeni Mesaj Newspaper.



Figure 11. 2020 Izmir Earthquake in Akşam, Diriliş Postası, Yeni Mesaj, Yeni Asya Newspapers (URL-9, 11.03.2022)

Post 2011 Regulation

In Turkey, earthquake regulations have been revised and updated 7 times in total: 1947, 1953, 1961, 1968, 1968, 1975, 1998 and 2007, which is still in force.

When the regulations are examined, the minimum conditions required for earthquake-resistant design and construction of buildings are given, taking into account the earthquake zone and soil characteristics of the buildings. The Earthquake Regulation was updated on March 18, 2018. 2018 Turkey Building Earthquake Regulation is the first comprehensive regulation issued after the 1998 Regulation on Structures to be Built in Disaster Zones [URL-10].

With the Turkey Building Earthquake Regulation 2019, which was published in the Official Gazette in 2018, the Regulation on Buildings to be Built in Earthquake Zones in 2007 was repealed. With the enactment of the 2019 regulation, the Earthquake Zones Map, which was used from 1996 to 2019, was also abolished and the Turkey Earthquake Hazard Maps 2019, which will replace it, came into force (Seyrek, 2020; AFAD, 2021; Özşahin, 2021).

Conclusions and Recommendations

Disasters are an important problem not only in Turkey but also in other countries around the world. Since it is not possible to completely prevent natural disasters under current conditions, it is necessary to take necessary precautions, raise awareness of people, evacuate risky buildings, tighten building inspections and be prepared for disasters by completing legal deficiencies, if any. Our cities do not have strategic plans and scenario-based disaster response and recovery plans on how to proceed in a possible crisis. Following major and devastating disasters, perception management in the press is of great importance. Misdirecting the emotions and motivations of people in the society may cause worse consequences in the society.

In addition, as seen in the print media, after earthquake disasters, most earthquake news did not even make the headlines despite the loss of life and property, or were mentioned in a subheadline. Earthquake is a disaster that greatly affects economic and social welfare. For this reason, the way earthquake news is covered in newspapers is also important. If it is only for people to be informed, yes, the headlines are correct, but if it is desired for people to be aware after the disaster, there are deficiencies. The press should observe the principle of impartiality and cover the wrong or right policies and practices of the governments before and after the disaster in order to raise awareness of its citizens.

The governments of the period when the earthquakes occurred are given below. Since 2002 until today, the AK Party Government has been serving. And unfortunately, since 2002, preearthquake measures have not been adequately provided. Bitter scenarios continue to be repeated.

- May 7, 1930 Hakkari Earthquake - İsmet İnönü - Republican People's Party
- December 27, 1939 Erzincan Earthquake - Celal Bayar - Republican People's Party
- November 24, 1976-Van /Çaldıran Earthquake-Süleyman Demirel-Right Party Coalition
- August 17, 1999- Gölcük Earthquake-Bülent Ecevit-Coalition Government
- November 12, 1999-Duzce Earthquake-Bülent Ecevit-Coalition Government

- May 1, 2003-Bingöl Earthquake-Rep Tayyip Erdoğan- AK Party
- October 23, 2011 Van Earthquake-Rep Tayyip Erdoğan- AK Party
- November 9, 2011- Van Earthquake- Recep Tayyip Erdoğan-AK Party
- 2018- Presidential System
- January 24, 2020- Elazığ Earthquake- Recep Tayyip Erdoğan- AK Party
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Estimation of Future Climate Change in Erzurum City for Urban Design Using UrbClim Model

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Abstract

Climate change, thermal uncomfortable spaces and related energy efficient usage scenarios are being created when the World's common environmental problems such as increase in urban population, intense construction, distorted urbanization, change in urban fabric and decrease in open-green areas are being considered. The potential impacts of climate change, which has emerged as a global problem and examined by many scientists, need to be addressed on an urban basis. For Erzurum city, where the climate has a negative impact on living conditions, microclimate values such as wind movements, frost deposition areas, thermal comfort areas and temperature distributions should be determined for developing compliance strategies and producing climate sceneries for the future. A site usage change map was developed using the Geographic Information System (GIS) for the year of 2020. For this reason, 50 years of climate data of the city are analyzed using ***UrbClim****. Erzurum, the future climate change projections for 2050-2070 will be estimated using the UrbClim model. For this reason, it is aimed to produce climate adaptation strategies at point based on the city macroform by analyzing the sample cities in the world, which have a cold climate, and using the energy efficiently. As a result of the analysis of the climate values with the correct method and the physical plan decisions, it is considered to be very important in terms of achieving the standards that the urban livability conditions, including the cities with extreme climatic conditions, can be improved. The project results have great importance not just for Erzurum but also for the other cities facing urban transformation in Turkey. This project will serve as an example for determining climate change and will support sustainable and livable urbanization.*

Keywords: Future climate change; UrbClim; Cold region; Erzurum.

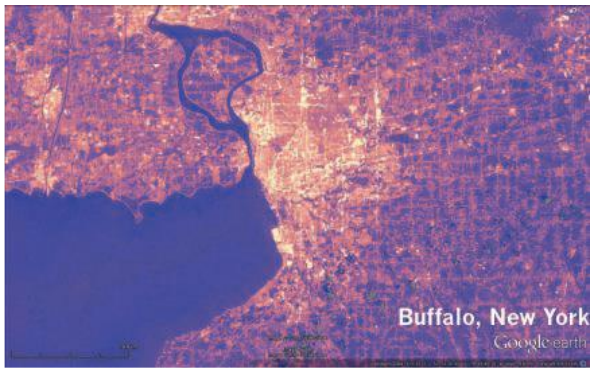
Giriş

IPCC 2007 yılında küresel ısınma ile ilişkili olan iklim değişikliğinin bir gerçek olduğunu belirtmiştir. Bu değişikliğin yani artan sıcaklığın baş rolündeki insanoğlunun, değişime etkisiyle yaşanan sıcaklık artışının varlığını %90 güvenilirlikle ortaya koymuştur. Söz konusu durum ve küresel iklim değişikliği üzerindeki insan etkisi IPCC tarafından da teyit edilerek, 1983-2012 yılları arasındaki 30 yıllık dönemin son 1400 yıldaki en sıcak devre olduğu onaylanmıştır (IPCC Synthesis Report, 2014).

IPCC 2021 Ağustos'ta yayınladığı "İklim Değişikliği 2021: Fiziksel Bilim Temeli" 6. değerlendirme raporuna göre bilim insanlarının dünyanın ısındığına dair şüphelerinin bulunmadığı ve değişen parametrelerin insan kaynaklı olan eylemler olduğuna kesin gözüyle

bakılmaktadır. Çalışılan tüm senaryolara göre dünya sıcaklık artışının 1.5 ˚C üzerinde olacağı öngörülmektedir. Isınma hızında artış, 1970'den bu yana küresel yüzey sıcaklıkları, son 2000 yıllık zaman dilimindeki 50 yıllık dönemlere kıyasla daha hızlı yükseldiği belirtilmektedir (IPCC, 2021).

Kentleşme yoluyla iklim değişikliği, insanın çevre üzerindeki baskısı adına önemli bir gösterge olarak kabul edilmektedir. Kent merkezleri ve şehirler genellikle çevrelerindeki alanlara ve kırsal alanlara göre birkaç derece daha sıcaktır ve değişen iklim şartlarına karşı savunmasız hale gelmektedir (Şekil.1). Kentleşmedeki termal konfor, genellikle kentsel ısı adası olarak adlandırılan yüksek yüzey ve hava sıcaklığı ile ilişkilidir. Kentlerde bulunan, yapı çatıları, asfalt yollar, geniş meydan ve yoğun sert zemin yüzeylerin düşük albedosu (yansıma), radyasyonun kentsel gölgelik içinde hapsolması, kent bileşenlerinin ısı depolaması ve geçirimsiz yüzeyler nedeniyle evapotranspirasyondaki azalma kentlerde ısı adası oluşmasına neden olmaktadır. Ayrıca küçük mekânsal ölçeklerde ulaşım ve enerji gibi kentsel altyapı bileşenlerinin yoğun kullanımı kentsel ısı adalarında 1°C'ye kadar artırabilen yoğun antropojenik ısı salınımlarına yol açmaktadır. Kentsel ısı adası (UHI) artışı nedeniyle, şehirler özellikle ısı dalgalarına karşı savunmasızdır (Oke, 1978; Ohashi et al., 2007; Gabriel & Endlicher, 2011; Tremeac et al., 2012; Zhang et al., 2013).



Şekil 1. New York Buffalo'da NASA uyduları tarafından ölçülen kentsel ısı adası (Rosenzweig et. al., 2018).

Enerji ve sağlık gibi kentin sosyal hizmet sektörleri, UHI etkisinden kolayca etkilenmektedir. Yunanistan'ın batısındaki küçük bir şehirle ilgili bir araştırma, şehir merkezinde yaz/kış aylarında çevredeki kırsal alanlara kıyasla daha fazla/az soğutma/ısıtma ihtiyacı duyduğu belirlenmiştir (Vardoulakis et. al., 2013). Çin'in Şanghay kentinde ise ısı adası üzerinde yapılan bir araştırmada, kentsel bölgelerde yüksek sıcaklıkların sağlık üzerindeki olumsuz etkileriyle birlikte artan ısıya bağlı ölümler tespit edilmiştir (Tan et. al., 2010). İklim değişikliğine bağlı olarak artan ısı dalgalarının birleşik etkileri ve UHI etkisi üzerine yapılan

araştırmalar göz önünde bulundurulduğunda kentsel nüfus için ciddi sağlık riskleri oluşturmaktadır (Li &Bou-zeid, 2013).

Kentsel iklim sisteminin kapsamlı bir şekilde anlaşılması, iklim risk değerlendirme sürecinin başlangıç noktasıdır. Bunun için kritik olan, uzun vadeli, kalite kontrollü, gözlemlenen iklim verilerine duyulan ihtiyaçtır. Uzun vadeli tarihsel kayıtlar olmadan, iklim değişkenliğinin rolü yeterince tanımlanamaz ve iklim değişikliği projeksiyonları güçlü bir tarihsel temel tarafından desteklenemez. Uzun vadeli bir kaydın mevcut olduğu yerlerde bile, şehir içi değişimleri daha iyi anlamak ve iklim risklerine ilişkin farkındalığı artırmak için kentsel iklim izleme ağlarını genişletmek için genellikle bir içerik bulunmaktadır (Blake et. al., 2011; Rosenzweig et al., 2018).

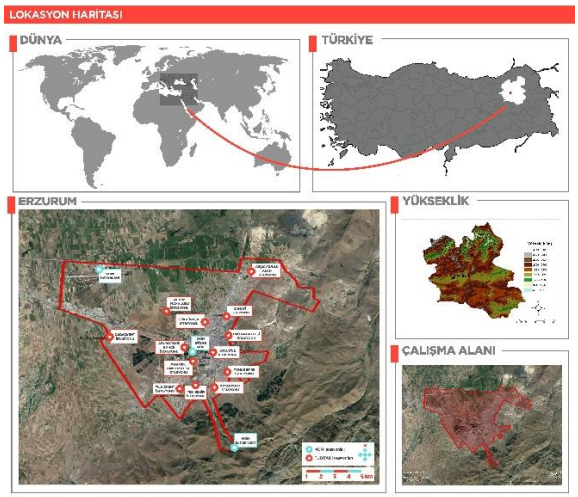
Materyal ve Yöntem

Materyal

Yapılacak bu çalışma Türkiye'deki ekstrem iklim özelliklerine sahip Erzurum kentinde yürütülecektir. Erzurum, Doğu Anadolu Bölgesi'nde, 1959 metre rakımda bulunan tek büyük yerleşim yeri olarak bilinmektedir (Şekil 2). Yüksek bir yaylanın güney batı bölümünde konumlanan yerleşim yerleri 2000 metreye kadar çıkan ova üzerinde bulunmaktadır. Kentin kuzeyinde Dumlu Dağları, güneyinde Palandöken Dağları bulunaktadır. Yüzölçümü 25.355 km^2 olup, Erzurum 2020 nüfusu 758.279 olduğu bilinmektedir. Erzurum kara, hava ve demiryolu ulaşım ağı ile yurdun her tarafına bağlanmaktadır. (Anonymous 2021a; Anonymous 2021b).

Yöntem

Kentsel iklim sisteminin kapsamlı bir şekilde anlaşılması, iklim risk değerlendirme sürecinin başlangıcı olarak kabul edilmektedir. Bu nedenle kritik olan, uzun vadeli, kalite kontrollü, gözlemlenen iklim verilerine duyulan ihtiyaçtır. Uzun vadeli tarihsel kayıtlar olmadan, iklim değişkenliğinin rolü yeterince tanımlanamaz ve iklim değişikliği projeksiyonları güçlü bir tarihsel temel tarafından desteklenemez (Blake et. al., 2011; Rosenzweig et al., 2018).



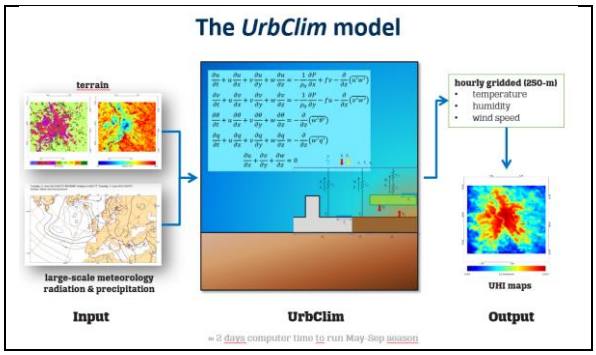
Şekil 2. Erzurum Konum Haritası, Çalışma Alanı ve Meteoroloji İstasyonlarının Konumları

Bu bilgiler ışığında 119O479 Nolu "Sürdürülebilir Çevre Odaklı Ekolojik Kentsel Tasarım Modellenmesi: Erzurum" TÜBİTAK 1001 Projesi kapsamında Erzurum Kentinin 10 ayrı bölgesine "Davis Vantage Pro 2" OMGİ meteoroloji istasyonları (Şekil 3) kurulmuş ve her ay sonu itibariyle veri aktarımı düzenli olarak yapılmaktadır (Şekil 2). Bunun yanı sıra MGM'ye ait 3 adet istasyondan da veriler alınarak toplam 13 istasyon üzerinden klimatik veri temini yapılmaktadır.



Şekil 3. 119O479 Nolu TÜBİTAK 1001 Projesi Kapsamında Kurulan "Davis Vantage Pro 2" İstasyonları

Soğuk iklim kenti olan Erzurum kentinde, kentsel iklim sisteminin kapsamlı bir şekilde anlaşılması ve iklim risk değerlendirme sürecinin başlaması ve geleceğe yönelik tahmin amacıyla kullanılacak olan UrbClim modeli; şehir ölçeğinde sıcaklık ve ısı stresini simüle etmek için tasarlanmıştır. Kentsel ölçekte sıcaklık değişimi ve sürdürülebilir kentleşmenin etkisini de belirlemek üzere 2013 yılında tasarlanmış olan UrbClim modeli Avrupa'nın birçok kentinde uygulanmaktadır. Bu model, üç boyutlu atmosferik sınır katmanı ile basitleştirilmiş kent fiziğinin birleşiminden oluşmaktadır. UrbClim, kentsel yapı bileşenleri *(bitki örtüsü, toprak izolasyonu, tipoloji, arazi kullanımı ve arazi örtüsü)* hakkındaki bilgileri, kentsel ölçeklerle ilgili bir fizik yaklaşımıyla birleştirerek ileriye dönük 100 m'lik ızgaralara bölerek çok yüksek çözünürlükte uzamsal yerel iklim verileri üretmektedir. Her ızgara hücresi kendi enerji dengesine ve karşılık gelen termal davranışa sahip olmaktadır (De Ridder and Schayes, 1997; De Ridder et al. 2005; García-Díez et al., 2016; Martinez et al., Lauwaet et al. 2017; Verdonck et al., 2018; Ingole et al., 2020) (Şekil 4).



Şekil 4. UrbClim Modeli Çalışma Prensibi

Model Barselona (İspanya), Toulouse (Fransa), Brüksel ve Gent (Belçika) kentleri üzerinde yapılan sağlama çalışmaları ile doğruluğu onaylanmıştır.

Bu araştırma ile değişen iklim parametreleri göz önünde bulundurularak, Erzurum ve benzer ekstrem iklim parametrelerine sahip soğuk kentlerde oluşan yoğun popülasyonun fiziksel ve psikolojik stresinin azaltılması, sürdürülebilir ve ekolojik planların yapılması için iklim projeksiyonunun gerekliliği ortaya koymaktır. Bununla beraber kentteki yoğunluğun insan yaşamı üzerindeki olumsuz etkilerinin azaltılması ve yaşam kalitesinin arttırılması gerekliliği benimsenmektedir.

Teşekkür

Ölçümler için kullanılan yazılımlar ve cihazlar, TÜBİTAK (Türkiye Bilimsel ve Teknolojik Araştırma Kurumu) destekli 119O479 numaralı bilimsel proje kapsamında satın alınmıştır. Bu bildiri için TÜBİTAK tarafından sağlanan araştırma fonuna ve desteklerine teşekkür ediyoruz.

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Yağmur Suyu Yönetiminde Düşük Etkili Gelişim Yaklaşımının Malatya Kent Merkezi Örneğinde İrdelenmesi

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Öz

Yeşil alan varlığının sürekli olarak azalarak yerini beton yığınlarına bırakan kentlerimiz, aşırı ve kontrolsüz bir şekilde gelişerek birer geçirimsiz şehirler haline dönüşmektedir. Yeşil alanların azalması ve yağmur sularını geçirmeyen beton vb. geçirimsiz yüzeylerin artması sonucunda yeryüzüne inen yağmur suları bu yüzeyler tarafından emilemeyip yüzeysel akışa neden olmakta ve sonucunda sel vb. gibi çevresel sorunların yaşanmasına neden olmaktadır. Bu sorunlara çözüm bulmak amacıyla son zamanlarda dünya genelinde ekolojik temelli yaklaşımlara doğru bir eğilim olmaktadır. Bu çalışmada ise bu ekolojik temelli yaklaşımlardan biri olan Düşük Etkili Gelişim (DEG) bileşenlerinin etkinliği kent ölçeğinde ele alınmıştır. Bu bağlamda Malatya kent merkezinin mevcut yağmursuyu altyapısı, doğrulanmış bir model olan Storm Water Management Model (SWMM) tarafından gerçek yağış verileriyle simüle edilmiş ve geçirimsiz yüzeylerin %88,70 oranında yüzeysel akışa neden olduğu belirlenmiştir. Daha sonra planlama alanı yağmursuyu drenaj hatlarının konumlarına göre 197 alt havzaya ayrılarak 4 farklı DEG bileşeni (yağmur bahçesi, yeşil çatı, geçirimli kaplama ve yağmur varili) her bir havzaya belirli oranlarda entegre edilmiş ve simülasyon tekrarlanmıştır. Simülasyon sonuçlarına göre DEG bileşenleri mevcut yağmursuyu altyapısıyla entegreli bir şekilde planlandığında yüzeysel akışları %22,20 oranında azalttığı ve yağmursuyu yönetiminde etkin bir şekilde rol oynadığı tespit edilmiştir.

Anahtar Kelimeler: Düşük Etkili Gelişim, Yağmur Suyu Yönetimi, Yüzeysel Akışlar.

Stormwater Management Low Impact Development Analysis: The Case of Malatya City Center

Abstract

Our cities, which reduce the existence of continuous green areas and leave their place to concrete piles, develop excessively and uncontrollably and turn into impermeable cities. As a result of the decrease in green areas and the increase of impermeable surfaces such as concrete that do not absorb rainwater, the rain water descending to the earth cannot be absorbed by these surfaces and causes surface runoff, and as a result, it causes environmental problems such as flooding. In order to find solutions to these problems, there has been a trend towards ecological-based approaches around the world recently. In this study, the effectiveness of Low Impact Development (LID) components, which is one of these ecologically based approaches, is discussed at the urban scale. In this context, the existing stormwater infrastructure of Malatya city center was simulated with real precipitation data by a verified model, the Storm Water Management Model (SWMM), and it was determined that impermeable surfaces cause 88.70% of runoff. Then, the planning area was divided into 197 sub-basins according to the locations of the stormwater drainage lines, and 4 different LID components (rain garden, green roof, permeable coating and rain barrel) were integrated into each basin at certain rates and the simulation was repeated. According to the simulation results, when LID components are planned integrated with the existing stormwater infrastructure, it has been determined that it reduces runoff by 22.20% and plays an active role in stormwater management.

Keywords: Low Impact Development, Storm Water Management, Surface Runoff.

Giriş

Küresel çapta meydana gelen aşırı ve plansız kentleşme, kentsel alanlarda yeşil örtünün kaybolmasına ve bunun yerini beton, asfalt vb. gibi geçirimsiz yüzeylerin almasına yol açmaktadır. Artan geçirimsiz yüzeyler sonucunda yeryüzüne düşen yağmur suları bu yüzeyler

tarafından emilemeyip yüzeysel akışa geçmekte ve sonucunda sel vb. gibi çevresel afetlerin yaşanmasına neden olmaktadır. Şehirlerimizde genellikle yağmur suyunun meydana getirdiği olumsuzlukları ortadan kaldırmak amacıyla geleneksel altyapı veya bir diğer adıyla gri altyapı sistemleri kullanılsa da artan şehirleşmeye paralel olarak bu sistemlerin yetersiz kalması bilim çevresini alternatif ve sürdürülebilir yaklaşımlara doğru yönlendirmede zorunlu kılmaktadır (Cnt, 2010; Qin et al., 2013).

Son zamanlarda yapılan bilimsel çalışmalar dikkate alındığında bu alternatif yaklaşımların daha çok ekolojik temeller üzerine kurulduğu ve bu yaklaşımların başında ise Düşük Etkili Gelişim (DEG) bileşenleri olarak adlandırılan uygulamaların geldiği görülmektedir.

Bu uygulamalar geleneksel altyapı sistemlerine alternatif olarak getirilen ve yağmur suyunun meydana getirdiği olumsuzlukları kaynağında çözmeyi amaçlayan mikro ölçekli kontrol uygulamaları olarak adlandırılmaktadır. Dünyanın birçok kıtasında ve kentinde yağmur suyunu yönetmek, planlamak ve geliştirmek için bu uygulamalar kullanılmaktadır. Yeni Zelanda'da kentsel tasarım ve geliştirme, Avustralya'da suya duyarlı kentsel tasarım ve Avrupa'da sürdürülebilir kentsel drenaj sistemleri gibi farklı isimlerle anılsa da hepsinde amaç yağmur suyunun meydana getirdiği olumsuzluklara noktasal çözümler üretmektir (Ahiablame et al., 2013; Coffman, 2002; Eckart et al., 2017).

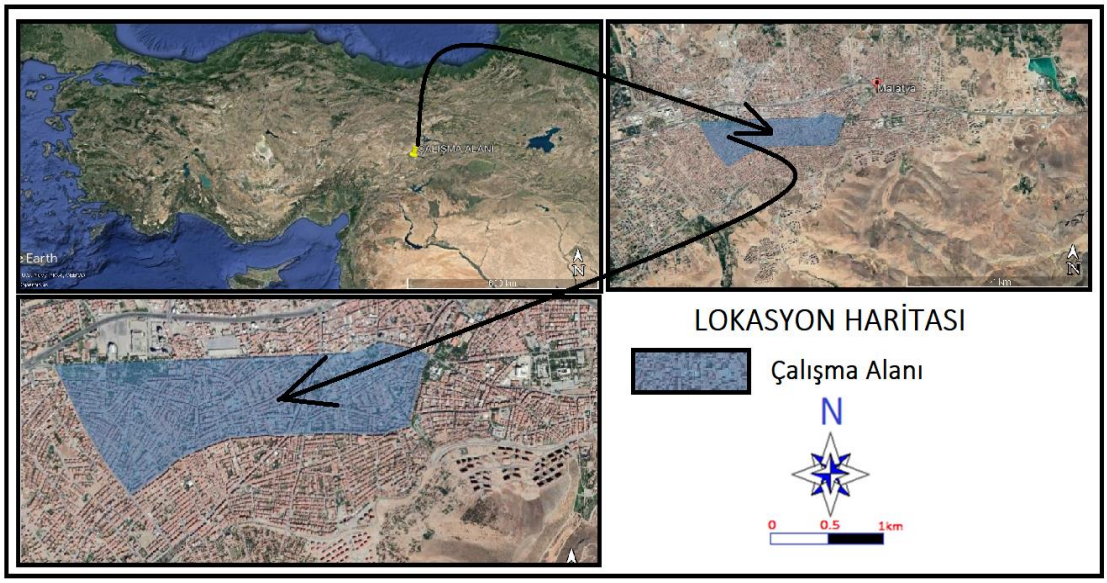
Bu uygulamalar arasında; yağmur bahçeleri, yeşil çatılar, biyolojik filtreleme kanalları, yağmur hendekleri, geçirgen kaldırımlar, yağmur varilleri ve sarnıçlar, sızma siperleri ve çatı bağlantısının kesilerek yeşil alanlara yönlendirilmesi gibi çeşitli uygulamalar gelmektedir(EPA, 2014).

Bu çalışmanın amacı; geleneksel altyapı sistemlerine alternatif olarak düşünülen 4 farklı DEG (yağmur bahçesi, yeşil çatı, geçirimli kaldırım ve yağmur varilleri) bileşeninin kentsel alanlarda yağmur suyu yüzey akışlarını azaltma potansiyeli tespit etmektir. Bu kapsamda Malatya kent merkezi pilot bölge olarak belirlenmiş ve 32 aylık gerçek yağış verileri kullanılarak geleneksel altyapı sistemlerinin yüzey akışlarını önleme kapasitesi doğrulanmış bir model olan SWMM (Storm Water Management Model) aracılığıyla tespit edilmiştir. Daha sonra aynı model kullanılarak belirlenen 4 farklı DEG bileşeni 197 alt havzaya ayrılmış olan alanın belirli kısımlarına entegre edilerek ilk duruma göre yüzey akışlarında meydana gelen azalma simülasyon çalışmalarıyla tespit edilmiştir.

Materyal ve Yöntem

Materyal

Çalışmanın ana materyalini Malatya kent merkezi sınırları içerisinde yer alan kentsel bir havza oluşturmaktadır (Şekil 1). Yoğun yapılaşmaya sahip olan bu alan geçirimsiz yüzeylerin fazla olmasından kaynaklı olarak yoğun yağış olayları sırasında sık sık su birikintilerine maruz kalmaktadır. Toplam 225,20 hektarlık bir bölgeyi kapsayan alan yapılan ölçümler sonucunda %84,61 geçirimsiz yüzeylerden (beton, asfalt ve çatı yüzeyleri) oluşmaktadır.

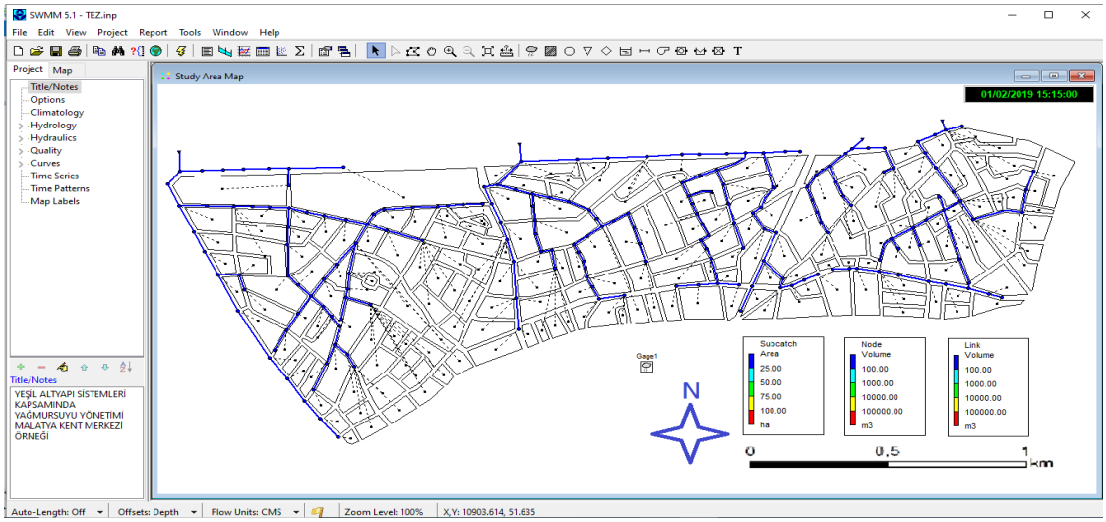


Şekil 1. Çalışma Alanı

Yöntem

Yöntem olarak birbiriyle entegrasyonlu olan çift aşamalı bir yöntem belirlenmiştir. İlk yöntem olan ArcGIS, çalışma verilerinin tespit edilmesi amacıyla kullanılmış olup çalışmanın altlığını oluşturmaktadır. Bu yöntemde alana ait yüksek çözünürlüklü ortofoto görüntüleri kullanılarak alanın geçirimli (Yeşil ve toprak alanlar) ve geçirimsiz (beton, asfalt ve geleneksel çatı alanları) miktarları, alanların eğim ve genişlik gibi verileri tespit edilmiştir. İkinci ve asıl yöntem olan SWMM ise çalışma alanının mevcut altyapı ve yağış verileri ışığında yağmursuyu yüzey akışlarının tespiti için kullanılmıştır. Model sisteme girilen kısa ve uzun süreli gerçek yağış verilerini kullanarak alanın yüzeysel akışlarını simüle etmektedir(Rossman, 2010). Bu model kullanılarak çalışma alanı mevcut yağmursuyu kanalizasyon hatlarının konumlarına göre 197 alt havzaya ayrılmış ve ArcGIS modelinden elde edilen veriler programa manuel olarak girilmiştir (Şekil 2). Daha sonra gerçek altyapı verileri (bağlantı düğümleri yani menhollerin maksimum derinlikleri ve yükseltileri, boru bağlantıların uzunlukları ve çapları, çıkış düğümlerinin yükseltileri) ile 01.01.2019 ila

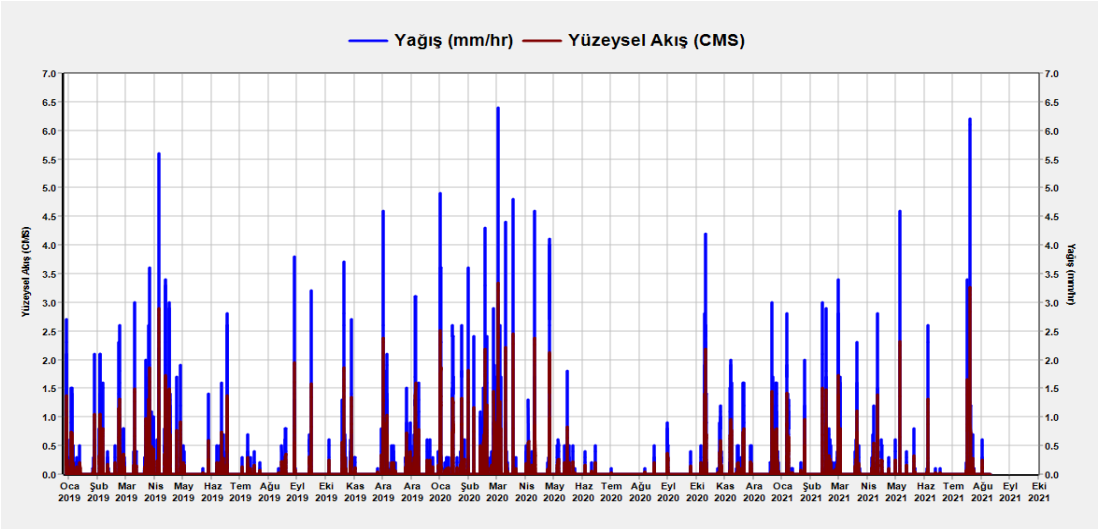
01.09.2021 tarihleri arasını kapsayan 32 aylık saatlik yağış verileri bir dosya haline dönüştürülerek programa yüklenmiş ve çalışma planı oluşturulmuştur. Çalışma planı oluşturulduktan sonra herhangi bir DEG bileşeni alanlara entegre edilmeden simülasyon çalıştırılmış ve mevcut altyapının analizi gerçekleştirilmiştir. Daha sonra model içerisinde yer alan DEG bileşenleri her bir havzaya belirli oranlarda yerleştirilerek simülasyon sonuçları tekrarlanmış ve DEG bileşenlerinin yağmursuyu hacmini azaltma potansiyeli tespit edilmiştir.



Şekil 2. Yağmursuyu Yönetim Modelinde oluşturulmuş alanın planlı gösterimi (Dinçer & Yılmaz., 2022).

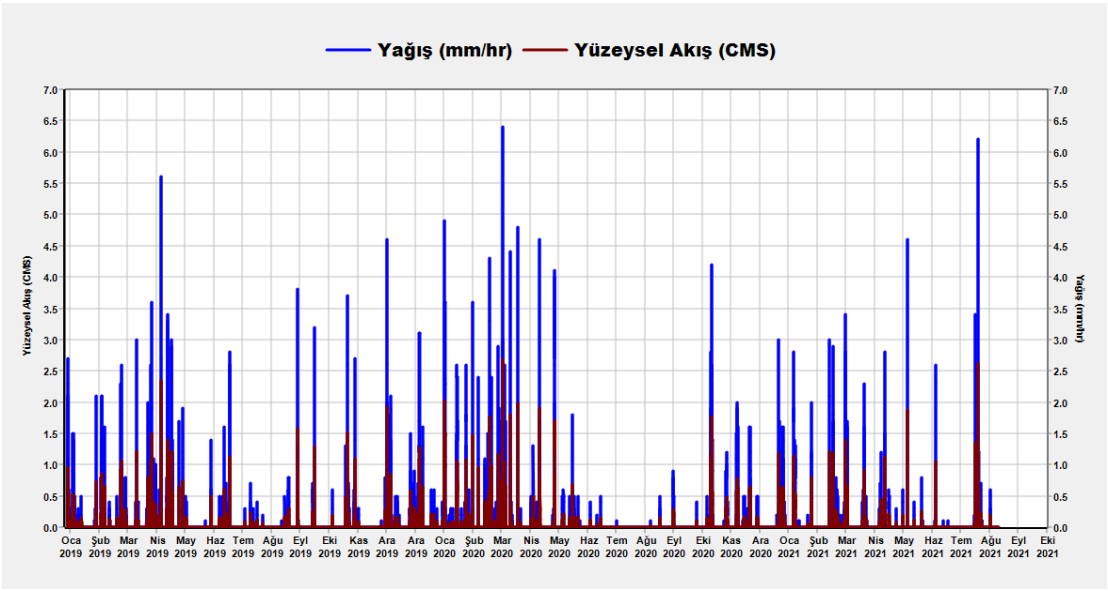
Araştırma Bulguları

Mevcut yağmur suyu drenaj altyapısının işlevinin anlaşılması için öncelikle çalışma alanına herhangi bir Düşük Etkili Gelişim bileşeni entegre edilmeden simüle edilmiş ve simülasyon sonuçlarına göre havzalarda meydana gelen toplam yüzeysel akış değeri %88,70 olarak tespit edilmiştir. Havzalarda meydana gelen yüzeysel akışlar, yağış yoğunluğunun 3mm üzerine çıktığı zaman dilimde 1,5 m^3/s üzerinde olduğu, yağış yoğunluğunun 5 mm'nin üzerine çıktığı zaman diliminde ise 2,5 m^3/s nin altında kaldığı tespit edilmiştir. Havzalarda meydana gelen en fazla yüzeysel akış miktarı yağış yoğunluğunun 6.40 mm olduğu 31.03.2020 tarihinde 3,34 m^3/s olarak ölçülmüştür (Şekil 3).



Şekil 3. Herhangi bir Düşük Etkili Gelişim bileşeni olmadan oluşturulmuş Yüzeysel akış/yağış grafiği (Dinçer &Yılmaz., 2022).

Mevcut altyapı analizi gerçekleştirildikten sonra 197 alt havzaya ayrılmış her bir alandaki toplam çatı alanlarının %20'si yeşil çatı bileşeni, toplam çatı alanlarının %20'sinden akacak olan suyun toplanması üzerine 4 metreküp hacme sahip yağmur varili, çatı alanları dışında kalan diğer geçirimsiz alanların %20'si yağmur bahçesi ve %20'si ise geçirimli kaplama bileşenleriyle kaplanmıştır. Tüm bileşenler alanlara entegre edildikten sonra simülasyon sonuçları tekrarlanmış ve çalışma periyodu içerisinde alana düşen toplam yağışın %69'u yüzeysel akışa geçtiği tespit edilmiştir. Mevcut altyapının meydana getirdiği toplam yüzeysel akış oranı (%88,70) dikkate alındığında DEG bileşenlerinin eklenmesiyle toplam %22,20 oranında bir azalma meydana gelmiştir. Grafiğe göre havzalarda meydana gelen en fazla yüzeysel akış miktarı yağış yoğunluğunun 6,40mm olduğu zaman diliminde 2,69 m^3/s olarak tespit edilmiştir (Şekil 4).



Şekil 4. Düşük Etkili Gelişim bileşenleri entegre edildikten sonra oluşturulmuş Yüzeysel akış/yağış grafiği (Dinçer & Yılmaz, 2022).

Sonuçlar

Yapılan ölçümlerde Düşük Etkili Gelişim (DEG) bileşenlerinin yağmursuyu yüzey akışlarını azaltarak geleneksel altyapı sistemlerine alternatif olarak kullanılabileceği ve yağmursuyu hacimlerini azaltarak yüzey akışlarını önlediği tespit edilmiştir(Dinçer ve Yılmaz, 2022). Simülasyon sonuçlarına göre elde edilen veriler maddeler halinde aşağıda verilmiştir.

- DEG bileşenleri alanların belirli kısımlarına entegre edilmesiyle toplam yüzeysel akış miktarı %88,70 den %69'a düşerek %22,20 oranında azalmıştır.
- Havzalarda meydana gelen yüzeysel akış miktarı genellikle 2 m3 /s altında kalmış olup yağış yoğunluğunun 4mm üzerine çıktığı zaman diliminde artış göstermiştir.
- DEG bileşenleri mevcut altyapı sistemleriyle entegreli olarak uygulandığında geleneksel altyapıda meydana gelebilecek her türlü baskıyı hafifleterek akış miktarlarında düşüş meydana getirmiştir.
- DEG bileşenleri şehirlerimizde kaybolmayla yüz yüze olan yeşil alanların yeniden tahsis edilmesini sağlayarak yeşil alan miktarlarının artmasına ve geçirimsiz yüzeylerin azalmasına olanak tanımıştır.
- DEG bileşenleri çeşitli form ve yapılarıyla şehirlerdeki görsel peyzaj kalitesinin artmasına imkan tanımıştır.
- DEG bileşenleri kendi bünyelerinde yağmur sularını tutup daha sonra bu suların farklı amaçlarda kullanılmasına olanak tanıyarak küresel iklim değişikliğinin meydana getirdiği etkileri hafifletme potansiyeli oluşturmuştur.

Teşekkür

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The Origins of Design in Prehistoric Times

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Introduction

During evolutionary processes, humans have developed certain traits (or skills) required for survival, one of the most important among which is the ability to quickly adapt to changing environments, that is still relevant today. The only difference is that the human has polished this ability, making it more effective. The first objective of every designer is to produce something that may be utilized as effectively as possible.

Design is a contemporary notion, and for the majority of us, this profession is novel, complicated, and not totally clear. The notion of design is contemporary, and for the majority of us, this profession is novel, difficult, and obscure. I'll attempt to shed light on the origins of design activity, its primary position, and centuries-old influencing forces.

Human origins

Prior to comprehending the beginnings of design and human (design) activity, it is important to define a human. At the earliest phases of human development, it is very difficult to determine the genesis of human concepts. People have attempted to answer the issue "Who we are and where we originated from" from prehistoric periods, which are very difficult to trace. Some ancient societies sought to explain their origin by associating themselves with distant predecessors who had both human and animal characteristics. In some cultures, the link between humans and the "primordial progenitor" and the subsequent differentiation of humans from the animal world led to the introduction of creationism or "wonderful" (divine) creation.

The Anthropological Evidence

The creation of the contemporary scientific notion of man's genesis was a lengthy process. Numerous ancient thinkers were prevalent (such as Herodotus (484–425 B.C.), Democritus (470–380 B.C.), Hesiod [31]) and medieval times (Lucilio Vanini [82; 83]) as well as scientists (Lamarck [48; 49; 50; 26], were at the origins of the formation of evolutionary ideas.

Our ancient ancestors had to quit their cozy "wooden cradle" owing to a variety of well-known and well-established circumstances, [92] (while some scientists dispute the arboreal

stage in the history of human evolution and believe man to be an exclusive mountain dweller [91; 93]), replacing it with a vast African savannah. (Thomas Huxley [35] and later Darwin [19] "so far the australopithecines and earliest Homo have been found only in Africa." [65] Our forefathers were incapable of competing with predators. Unless he was pursuing a specific objective, the individual's proximity to them was utterly improper and hazardous. Evolution, or progress in life, is accomplished among animals or plants by killing the weaker-the less favored-and by saving the stronger and more favored. Many must be killed because there are too many, and so only the best is preserved. Those a little above the average are saved, and this is called "natural selection." [61] Raymond Dart found the face bones and endocranial cast [15; 18] (and as restored by Tobias [78; 79]) of a creature (soon he called it *Australopithecus* in the Buxton lime quarry in Taung in the northern Cape Province of South Africa, roughly 320 kilometers southwest of Johannesburg.

Minimal Requirements for Surviving and Evolution

Any action is made possible by energy and is the result of some reason. There is no activity without purpose; otherwise, it would be a waste of energy. Energy is "obtained" in a certain manner and does not "appear" spontaneously. Physiologically speaking, an organism (not just a human) cannot survive without energy, which is continually used to sustain important activities. This need continuous energy replenishment. Ancient philosophers, such as Democritus, who saw need (need) as the primary motor of civilization, observed this: It was the need for food and shelter that compelled humanity to "contrive" new methods of overcoming nature and to advance [81] This trait is shared by all living species, including humans.

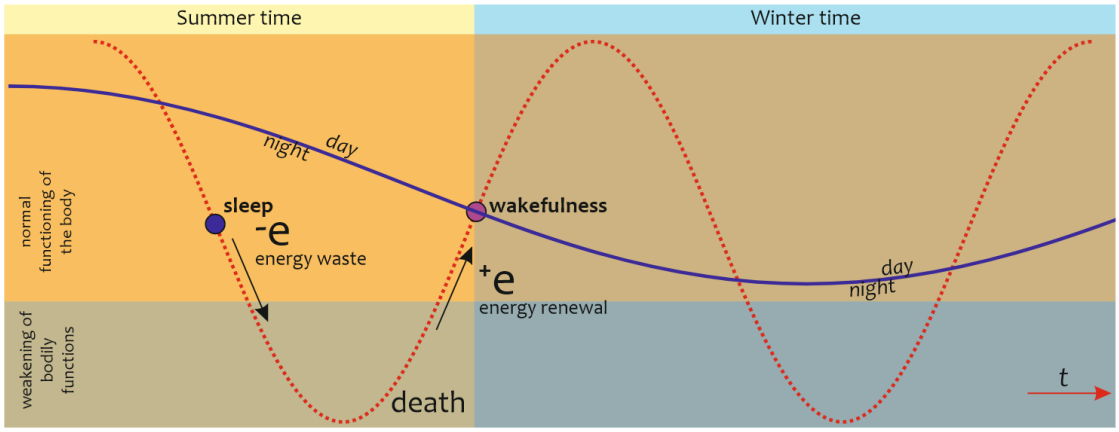
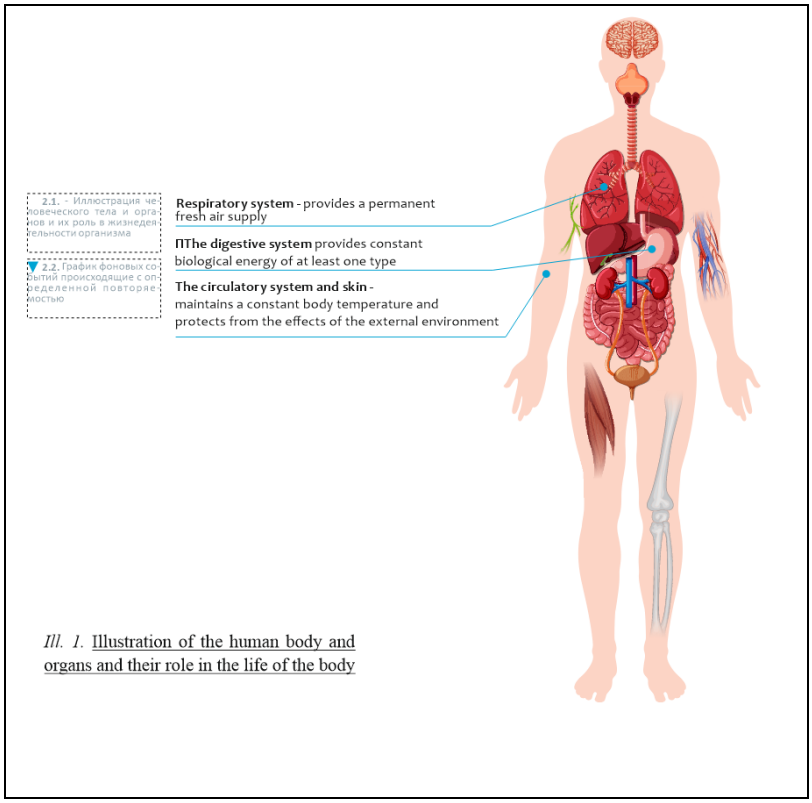


Figure 1. Schedule of Frequency of Sleep And Wakefulness (Not Dependent On The Man)

Energy replenishment is a fundamental need for all living creatures. Even in a state of sleep, the human body expends a great deal of energy - cells are continually updated and internal

organs function nonstop - and the extraction (or generation) of this energy is the highest priority.



Ill. 1. Illustration of the human body and organs and their role in the life of the body

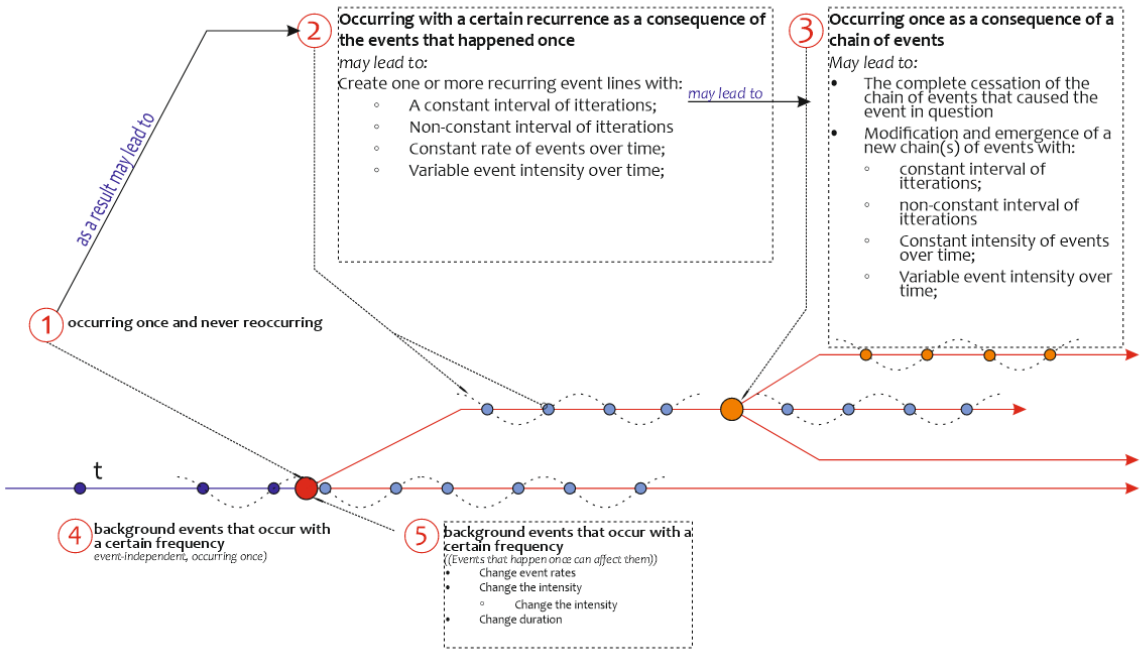
The human body is incapable of preventing a 100% energy depletion, but it may "save" energy by reducing behaviors that contribute to excessive consumptions. Our brains are designed to achieve the greatest possible energy savings. This is precisely why so many of us are prone to minimum physical and mental activity. To "push" ourselves to accomplish anything, we must persuade our brain that this "investment" is worthwhile. The urge to replenish energy is a deeply ingrained instinctual tendency of all lifeforms, including humans. The human body is a complex system that needs certain minimal parameters to operate normally:

- **A constant supply of clean air, abundant in oxygen**
- **At least one kind of constant biological energy:** This is the very first "component" that a newborn infant acquires from his mother via intuitive mother's milk consumption. When he becomes an adult, he will begin to get his own food. Soon after, our ancestors switched to a new kind of food: meat ([28; 60; 80; 21])) and the evidence is found in flaked stones dated to 2.6–2.5 My ([8]) (fixed by 40Ar/39 Ar and paleomagnetism [28; 29;

[8] My – million years

73; 70; 71; 72]) at several localities in Ethiopia (Kada Gona, Hadar [44]) by *Australopithecus garhi.* (3)

- **Maintain a certain range of body temperature:** Since birth, mothers have endeavored to give their infants with a stable and pleasant environment. With age, the human body can tolerate enormous temperature differences and, in certain situations, temperatures that are severe for the body, although for a brief period of time. Temperature can be adjusted and maintained inside, however this is very difficult in open spaces. In addition to everything else, it is important for the correct functioning of the body for a human to frequently shut down his awareness, or sleep. The chance to sleep is as vital as the unavoidable need to eat. During sleep, the body temperature drops by several degrees, numerous processes are inhibited or blocked entirely, and the person becomes very vulnerable.
- **Body defense against environmental impacts** (such as predators and carnivores)



Ill. 2. According to their source, events are classified into numerous categories: Natural phenomena. These are natural occurrences that occur without human interference. Anthropogenic phenomena. An event's anthropogenic origins indicate the existence of human involvement. The image illustrates the diversity and interdependence of occurrences. In addition to the effects that particular occurrences may have.

Consequently, there are various types of hazards:

- **Passive.** Temperature fluctuations are one of these variations. Changes in temperature are caused by weather disturbances (which can be cyclical depending on the season). Even in ancient times, individuals observed seasonal changes and may have learnt to "see" the difference in order to plan their activities beforehand. But the earliest human ancestors lived

in a climate that was temperate and warm (hot), so they did not need to consider how to protect themselves from the elements. The environment in which he resided was uncontrolled, and humans were (constantly) exposed to this kind of "passive" risk, notwithstanding his intentions and goals. Phenomena just occur on their own, and he must merely adapt in order to mitigate the "risks." The temperature regimes of settings vary based on time of day, season, meteorological conditions, and geographical information.

- **Active.** A human's natural adversaries in the wild include a variety of predators, of whom he is only a victim. (There are several indications of this: Australopithecines were mostly brought to caves by predators and raptors (at Taung) [5], by carnivores or natural pitfall trapping (at Kromdraai) (6; 85; 88), by hyenas (at Makapansgat – twenty five hominid of (the oldest known – paleomagnetic dating 3 my ago [52; 58; 86; 62]) Australopithecus africanus fossils [52; 53; 63] and by large cats (at Sterlcfontein (probably formed between 2.5 (the Gauss Normal Polarity Chron) (2.1 ± 0.5 my ago dated using ESR age on enamel from eight bovid teeth [69] and by paleomagnetism [38]) - 1.4 my ago; and 200 ky ago [58; 59; 86; 87] and Swartkrans) [6; 8])) His adversaries are observing him, pursuing him, and have a lot of advantages over humans. The human race has almost fully surpassed his natural foes throughout time. Surprisingly, one of a person's most formidable adversaries is his own kindred - another human. The animosity between humans dates back to ancient times and continues to this day.
- **Invisible.** In addition to animals that hunt and consume humans, there are other species that are invisible or barely visible to humans. These include insects, microbes, bacteria, and viruses. They may be found everywhere, and their proximity to a person is not always visible. All of these events have a mystifying quality due to the fact that they function so efficiently and invisibly that no one can discern what is occurring.

These demands are all time-sensitive. A person has to continually maintain a specified body temperature, and regularly (from time to time) restore lost energy. However, not all occurrences can be detected due to a number of factors. For instance, an event may extend over a very long length of time while being unaltered to a human observer. Nonetheless, without the introduction of time as a particular abstract reality, it would be impossible to organize and control your activities (tactic). The sensation of hunger drove a human to get food, but once he ate (filled his desire), he realized that it would eventually return. In the human intellect, time is an abstract notion connecting events in a certain order that may be specified.

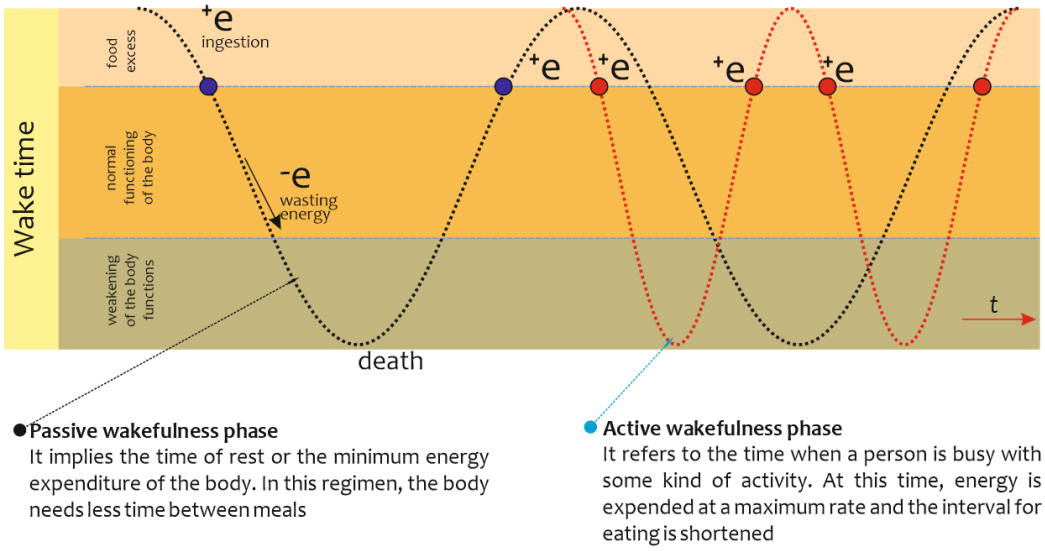


Figure 2. FA Background Occurrence That Happens at A Certain Frequency.

Due to their physical traits, the great apes were unable to compete with predators such as saber-toothed tigers and prehistoric hyenas, whose area they started to progressively occupy. These once-beautiful, now-extinct animals formerly ruled the immense plains of Africa, where venturing out exposed one to enormous peril. He became another prey for huge cats, who lacked natural adversaries and were total overlords of the wastelands. Obviously, man's proximity to big cats was completely inappropriate and reckless, if not for the goal he was trying to pursue: numerous herbivores inhabiting vast savannas, including bison, rhinoceros, deer, prehistoric bulls, and horses, as well as giant animals - elephants and their northern relatives, mammoths. All of them were prey for huge predators, to which a human was added. When confronted with a fearsome creature, he had almost zero chance of survival. To get an advantage over these creatures, humans had to invent weapons. Each object has its own function (or purpose). Man creates weapons for his personal use and to inflict damage to animals or other humans. The basic type of self-defense is attacking with our arms and legs ("crushing blows"). It didn't work. Even evading a predator with superior vision, hearing, and camouflage in thick grass is ineffective if the predator detects you far sooner than you do. The ineffectiveness of the technique of resisting the predatory forced a human to devise other methods of defense, one of which is keeping the opponent at a safe distance. The simplest method is throwing stones.

A long stick is another method for keeping an opponent at bay. The benefit of employing it is that the process is under human control, as opposed to the manner in which stones are thrown. So, man created the spear. To get an edge over these creatures, humans had to build weapons.

Despite this, our ancient predecessors were able to live largely as a result of a unique human skill: observation. [12])

Man and the majority of herbivores lack sufficient "protection" and "weapons" against the multipurpose and efficient armament used by predatory animals against their prey, particularly if some of them choose "team" hunting. Long ago, our ancestors were easy prey for enormous predators, and they had to find a way to defend themselves. The only option that occurred to them was to use a stone as a projectile and a piece of wood as a club. Their characteristics, which include crushing and destruction, are similar to those of human limbs.

Before choosing the material, you must determine what shape the item must have to fulfill the aforementioned purposes. The effectiveness of the human body's motions is determined by the structure of the bones, the muscular system, and the brain. Scientists know a great deal about the activities of the human brain and how it regulates the body; nonetheless, this knowledge cannot "go against anatomy." Our muscles, bones, and joints, among others, have particular mechanical movement restrictions. Unlike owls, we cannot swivel our heads 180 degrees without moving our bodies. In addition to the mechanical limitations of the skeletal system, there are also limitations on the functioning of the muscular system. Since ancient times, several nations throughout the globe have practiced martial arts, where they have theoretically and practically explored numerous facets of the human body, principally as a potent instrument of physical impact.

Additional tools are used to enhance the result. The club, utilized as a defensive or offensive weapon, is in fact a continuation of our limb. The length of the instrument depends on how it is used and for what purpose, such as whether it is wielded with one or two hands, or if it is used to attack an opponent at close range or to keep them at a distance. The length may vary according on the function and manner of application, but the form should be optimized as much as feasible.

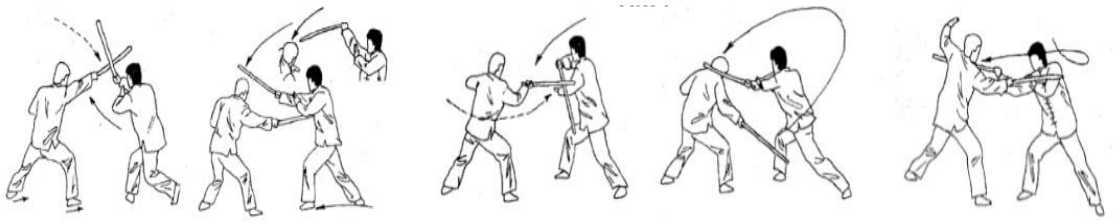


Figure 3. Fighting Technique Used in Wing Chun Martial Art



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When we consider of the property "crash and crushing," we naturally recall the hammer, cudgel (club), and ax. The club is most likely a precursor of the hammer and axe, which are technically more complicated instruments. Possible evidence (Makapansgat Member 3 (the "gray breccia") were in fact tools of an "osteodontolceratic" (bone-tooth-horn)) were used of certain antelope skeletal parts, such as the distal humerus and the mandible which were chosen by the australopithecines as clubs. Numerous animal bones were found at Makapansgat Member 3 (the "gray breccia") (estimated to be between 3 and 2.5 my old) [17] evidence of the use australopithecines of certain antelope skeletal parts (such as the distal humerus) as clubs, although this remains a point of contention, since studies of the surface of the bones [6] point to the activities of predatory animals rather than australopithecines. [53]

The shape of the instrument depends on its intended purpose. To do this, its form must be "minimized" to the greatest extent. Obviously, the simplest form is a straight, long pole. Irregularities (imperfections) in the form will exacerbate issues with control and concentration during hitting. If the Club is heavy, its asymmetrical design will just serve to provide extra centers of mass, which will result in poor weapon control. You must thus choose the original form, a long pole.

On the basis of the original form, you may add more details. This shape is so functional that it has remained mostly unchanged and lasted to the current day.

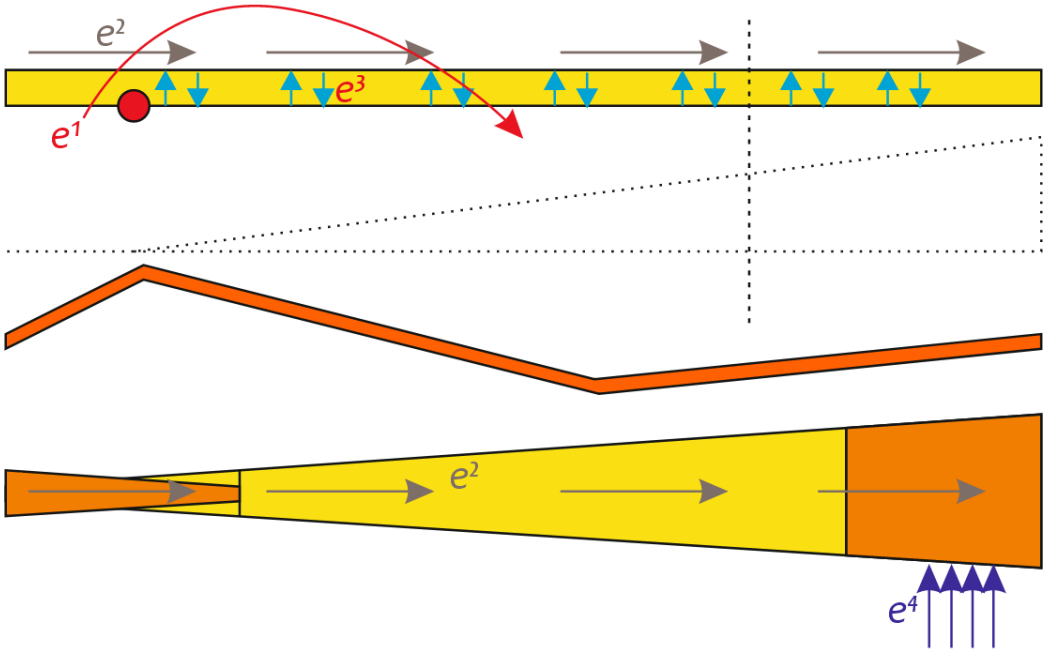


Figure 4. Scheme Of Energy Distribution in The Club And Its Components

Initially, while utilizing the instrument, the user sends his energy toward the pole (e1) in the direction of the blow. The internal structure prevents this energy from leaking into space by redirecting it along (e2) and concentrating it at the pole's tip. In reality, the energy was dispersed around the pole, but owing to acceleration and momentum, it is accumulating more and more. Therefore, the farther away from the fulcrum (a), the greater the energy and, therefore, destructive power.

Thus, the pole may be separated into zones:

Grip zone. Its length relative to the length of the pole depends on the entire length of the pole and whether one or two hands will be employed. If the pole is sufficiently long, controlling it with a single hand will be tough. This zone is mostly employed for defense, since the further it is from the pivot, the more energy it generates when absorbed. In other words, if you successfully protected yourself from a strike with the pole's center, you will be able to grasp the pole and withstand this attack.

Impact zone - here is where the majority of the pole's impact energy is produced. The greater the distance from the pivot, the greater the amount of energy transmitted.

Compound elements

Thus, we determined the object's fundamental form. Based on this form, other features may be added to enhance it.

The handle should not be shaped like a cone toward the target, since it will simply fly out of the user's hands upon impact. The cone-shaped form must face the direction of impact. For a secure handhold, the form of the handle should mirror as closely as possible the inside of the fist in the clamped position. With this fist position, a cylindrical cavity is created inside, and if the item being grasped has a similar shape, and the effectiveness of the grip improves. Additionally, you must consider the measurements, which must not surpass the diameter of the fist. In other words, a cylindrical item of a certain diameter is suitable for prolonged usage.

The central part of the pole is crucial, since its primary function is to transmit an user's energy from his hands to the impact zone while maintaining control. To do this, this region must be sufficiently resistant to substantial energy swings. During the strike, the energy is directed along the pole towards its "end" and develops steadily, despite the "swing" of the pole seeming to be a rapid movement; the quicker the movement, the more energy is produced. As soon as he encounters an impediment, that is, the surface, he will release all of his energy while simultaneously absorbing "repulse energy" (e4) from the object, a portion of which will be sent back down the pole to the fulcrum. The transmission of energy from the "source" to the "target," that is, from the person to the "target," its multiplication, and its controllability, are the primary qualities of the pole and the benefits that regular throwing stones do not possess.

Zone of collision for the pole. This zone is one of the most important, since it is responsible for the item's primary function - crushing. In order to double the impact force, more weight must be added to this zone. When one item collides with another, its destructive force is proportional to its mass and velocity. The great amount of "repulse energy" that happens upon contact with an item might ruin its surface if it is constructed of an inadequately durable material, and the thing may become worthless in a short time.

The transfer of energy from the "source" (from the user to the "target"), its doubling, and the capacity to regulate it are the primary characteristics of the pole and the benefits that throwing stones lacks.

Thus, we determined the essential parts of their responsibilities and functions. These composite parts, their shape and size, and the material of construction satisfy the minimal criteria for the object to execute its intended functions. The designer was able to complete the assignment he was given, which was to build a gadget that improves his life.

Exploitation entails using. For it to serve a person appropriately and successfully, he must know how to utilize it. Let's examine its use. There are points along the handle where the club is fixed in the hand and the ax head spins around those points. Due to the weight of the head, the ax swings in a curve. The strike is more strong the longer the handle and the heavier the tip. This makes the axe heavier and more difficult to handle.

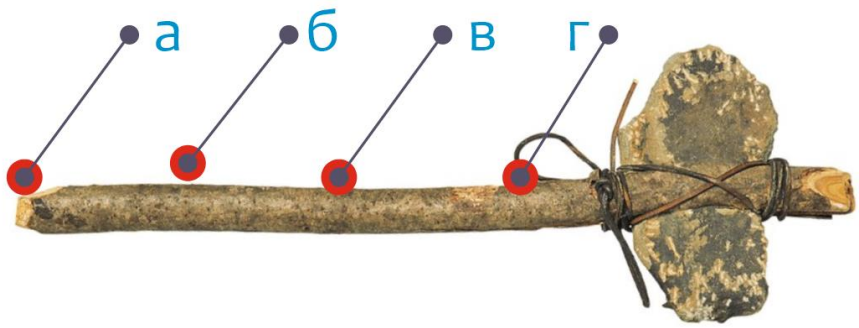


Figure 5. Methods of usage

Point a: the user is not in the optimal position. When this point is grasped with one hand, the ax head becomes less controlled and there is a greater chance of striking mistakes. Due to the largest distance between the head and the fixation point, the ax will hit with maximum power in this circumstance. In this instance, the second hand might be used to adjust the accuracy.

Point b: the most usual handle location. By gripping this spot, the user may effortlessly operate the axe with a single hand.

Point v: in this location, we have an advantage in accuracy, but our hitting force is diminished. In most cases, it is employed when you need to slice tiny items swiftly with one hand.

Point g: By gripping this point with one hand, you may obtain the maximum level of accuracy with the least amount of impact force.

Production

Obviously, the product must be manufactured before it can be used, but in the case of a simple club, which was first selected experimentally from a variety of branches and employed as a weapon, the process was reversed. In actuality, "the hunt for the proper stick is a kind of manufacturing." A person employs specific information about the structure, shape, and size of the stick, searches for it in certain locations, and picks the most suited sample. In the majority of instances, it is probable that the discovered specimen also passed some kind of "test"

before being deemed an acceptable item. Over time, some characteristics on the discovered samples will begin to emerge as the principal components that we had previously considered, namely the handle, shaft, and head of the future item. A basic piece of wood has been transformed into a functioning club, giving birth to a new thing.

Raw Material Availability

As soon as the functional components and their attributes were recognized, the potential materials that may be used to accomplish the desired outcome were also identified. As stated before, wood is a great material for the production of this item; nevertheless, not every kind of tree or branch form may serve as a material. The availability of resources (or raw materials) is a crucial factor in the design process. Recent archaeological study has shown a direct relationship between lithic raw materials, tool manufacture, and core reduction techniques [9; 20] to artifact functional effectiveness [10; 32; 74], to retouch intensity on tools [45; 46], and to aspects of risk management [4; 11] and understood the importance of lithic raw material availability. (22; 23; 24; 57; 89] In the lower Omo River Valley, where small quartz pebbles were the most readily accessible raw material, the range of artifact types is restricted mainly to small sharp-edged quartz splinters produced by smashing [55]. At Koobi Fora and Olduvai, where large pieces of volcanic rock were more abundant, various core forms are much more common [37; 80], at Fejej the large size of Oldowan artifacts is clearly linked to the large size of the available clasts [1].

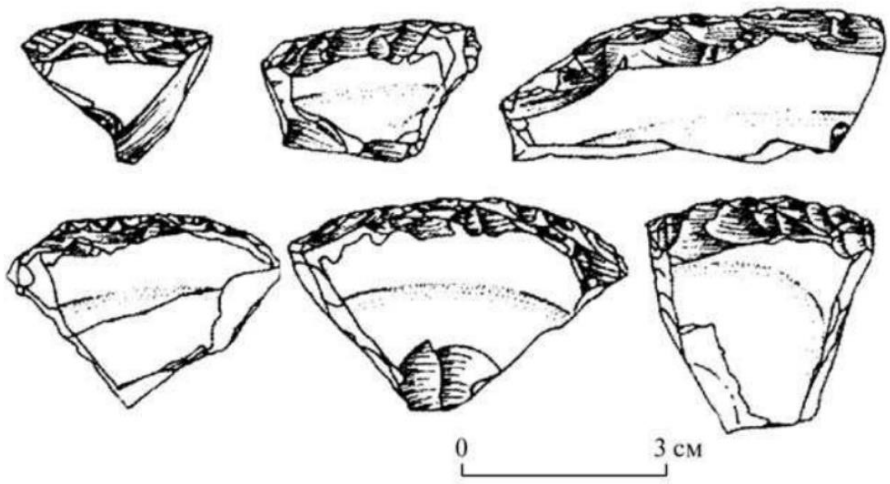


Figure 6. Scrapers From Callista Chione Shell From Moscerini (Spain) [56]

Modifications (of reconfigurations)

The definition of the term modification (Late Latin modificatio establishment of measure, from Latin modus measure, appearance, image, transitory quality and Latin facio to do) is to

modify or gain the original's properties. Changes may be either destructive (from Latin destructivus, "destructive") or functional. The designer's job is to discover elements that need improvement and make modifications - modify.

In the club example, the user determines that the greater the "tip" of the club, the more damaging and destructive it may be to the adversary. It indicates that you must search for the associated stick. It is advantageous to use this tool on "surfaces" that are softer than wood, such as the body (flash) of an animal or a human. However, if the "tip" is to be used against hard surfaces, it becomes useless. It will soon be impossible to use such a tool, (and it was initially difficult to use it), the user had to spend more energy during the strike. This soon exhausted him.

You may pinpoint the source by combining two issues into one: sufficient head weight. How may the head's weight be increased? This is where a stone comes to our aid.

Finding the perfect piece of wood to use as a club is not yet an innovation, but it is already a conscious activity, since one must "choose the proper one." The initiation of design activity is the implementation of (deliberate) alterations to the item.

The hammer is one of the first "designed" implements. We have thoroughly investigated the aims sought by our ancient predecessors, and with the development of the club, we have attained our purpose. But "progress" did not end there; humans continued to add new features to old ones or to replace one feature with another. As a result, axes evolved throughout time.

There is an endless abyss between the invention of the "concept" of an object and its constant and efficient exploitation. People often knew what they wanted from an item, but they didn't always know exactly how to get it to do what it was supposed to. Considering the world around us, we begin to isolate individual objects from it, each of which has a so-called shape - one of the factors that determines the appearance of an object. Over time, we were able to identify the most "fundamental" among the objects of the world around us and successfully apply and develop them to this day. Every designer must learn to "recognize" shapes and patterns among a great variety of different objects.

Borrowing from the predators

Clubs were popular as chopping tools. This property contains both the person himself and many herbivores, but still there is one more weapon. To be precise, it was a weapon of very distant ancestors and genetic relatives to humans. These are teeth that can cause damage. Some primate species, due to the environment, have evolved in such a way that their teeth and jaws have lost their effectiveness and ceased to act as the main weapon, which cannot be said

about predators. Predators use their jaws and teeth as their main weapon. So why shouldn't man learn to use them? But in order to start using something, you first need to get this item, study its properties, and then understand how it works so efficiently and performs its function. The effectiveness of the weaponry of predatory animals depends not only in the sharpness of their teeth. In fact, this weapon consists of interrelated parts and is a kind of "working complex". "The club we considered earlier was also a "working complex". The teeth of a predatory animal are only part of the "complex", but they will be ineffective on their own, that is, they will not fulfill their main functions. For this to happen as efficiently as possible, it is necessary that the "system" work in the right way. And so, we will consider this system in more detail.

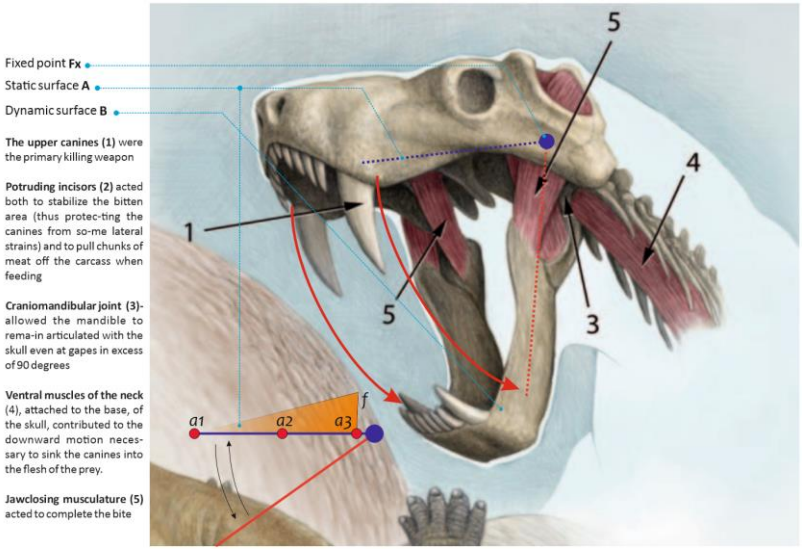


Figure 7. A jaw as a system. (Functional anatomy of the bite in the gorgonopsian Rubidgea, with skull, cervical vertebrae, and selected Muscles (after [54])

What exactly is this system? In fact, these are two planes, one of which is relatively static (**A**), and the other is, dynamic (**B**). This mechanism works great, but still there is one more very important element in the "system" that makes it as effective as possible – the teeth. The system works even without an additional element – teeth, but in this case, its functionality will be quite limited. Before understanding what the role of teeth is in the system, we must understand the structure of the teeth.

Teeth are different depending on their intended use. We do not aim to analyze the variety of teeth in different animals or people, but nevertheless we should formulate an overall overview. Teeth are divided into 4 types according to their functions:

- **Incisors -** are used to grasp and bite flash. The principle of their work is identical with the wedge, and led to the invention of a huge number of things: knives, axes, arrowheads, as well as nails, etc.
- **Fangs -** needed to tear and hold food. The principle of the wedge works the same way, but in a more advanced form. Based on this, such objects as a needle, a harpoon, etc. were invented.
- **Premolars - crush food**
- **Molars –** grind food. The principle of their operation can be compared with a hammer that crushes and grinds.

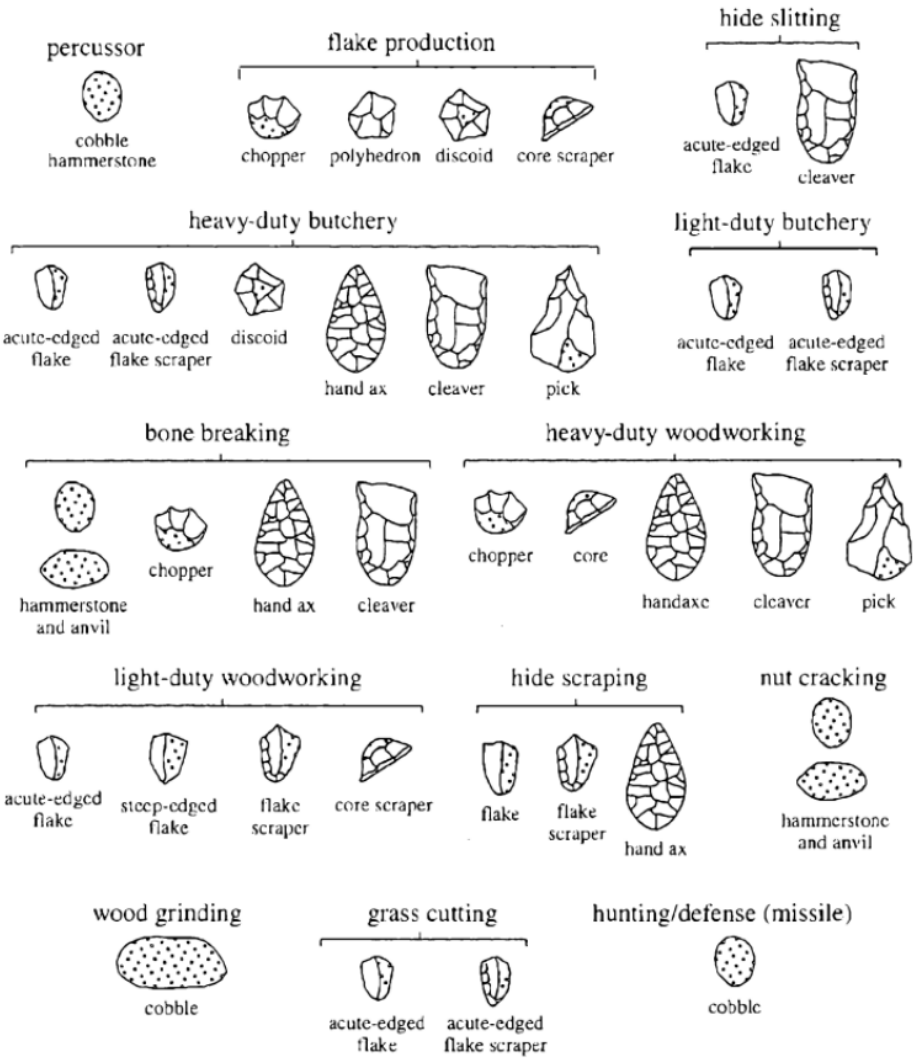
Each type of tooth performs its function due to its shape: the fangs are pointed; the incisors are blade shaped. Fangs became the prototype for making tips, needles, and other objects with piercing properties. The chisels became the prototype for making knives, ax blades, etc. - objects that have the properties of cutting. (Illustrations of Skull of Barbourofelis fricki (by [54]); a range range of typical Oldowan stone tools and their conventional typological designations [[36], fig. 1] redrawn [64] after originals range of typical Oldowan stone tools and their conventional typological designations; some examples of stone tools from Wardaman Country (Australia) [15] Oldowan Core tools was controlled by the shape of the initial blank, not by a template in the maker's head [80]. At first glance, stone tools may seem so primitive that even monkeys can do better. But a number of experiments with chimpanzees and bonobos [68; 77] have shown that they are not able to do this, not only because of their physiological indicators (the difficulty may have been the typical ape structure of his hands, with the thumbs very short relative to the other fingers [76]), and so they cant master the purpose and the general idea of strike useful flakes. "Even the earliest Oldowan people fully understood this principle, and their artifact assemblages reflect an ability to produce useful flakes more or less at will." [66]

Stone and bone tools

There is no doubt that, stone is the most common material, and possibly the very first material used by our distant ancestors for millions of years. Along with stone artifacts, archaeologists find a large number of bone items, although the oldest finds do not indicate the popularity of this material. "Truly formal bone implements, made in advance to a repetitive pattern, appear only much later, in the Eurasian Upper Paleolithic African Later Stone Age, beginning between 60 and 50-40 ky ago. Until that time, people certainly handled bones regularly and

used them occasionally, but they did not recognize bone as a material that could be broken, carved, and ground into a variety of useful artifact types." [66]

A large number of artifacts have been found: The oldest known stone artifacts come from Kada Gona, Hadar, where they are fixed by 40Ar/39 Ar and paleomagnetism at 2.6-2.5 my ago [28; 29; 73], lower Omo River Valley [33; 34]; and at Lolcalalei (Kalochoro Member of the Nachukui Formation) West Turkana [42]; 2.3 my ago [30] at Senga 5A (the Upper Semlilci Valley of eastern Zaire); at Olduvai and Koobi Fora [36; 51] in the Kaitio Member of the Nachukui Formation, West Turkana [27; 42], and at Chemoigut (Chesowanja), Kenya [25], Melka Konture, Ethiopia [13], Fejej, Ethiopia [2], Mwimbi (Chiwondo Beds), Malawi [39], Swartkrans (Member 1) [7; 14], and Sterkfontein (Member 5) [47; 75]



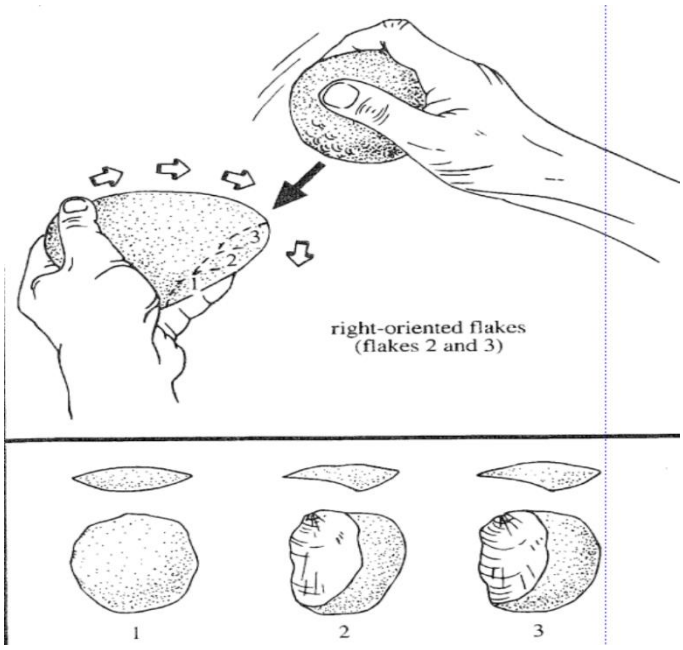
The basic types of stone artifacts found at Oldowan and Acheulean sites in Africa (adapted from [80], fig. 7). The Acheulean is usually distinguished from the preceding Oldowan by the

presence of hand axes, cleavers, and other large bifacial tools. Large bifacial tools do, however, occur in some "Developed Oldowan" assemblages. The suggested uses are based on feasibility experiments with replicas. [64]

It was necessary for the most ancient people to learn how to distinguish stones them from ordinary ones. The stones that the ancient man used for crushing in the first place had to be brit enough so as not to collapse upon impact and fit comfortably in the hand, that is, have certain dimensions. These stones were not supposed to have sharp edges, as they would otherwise cut through the soft tissues of the inside of the hand with which they came into contact. In most cases, these are ordinary pebbles that can be found almost everywhere, and it is very difficult to identify them as a "prehistoric tool", but still there is evidence that they were used as the first tools of labor.

The main goal of the creators of the first (oldowian) tools was, apparently, to obtain functionally significant tool elements - first of all, blades of various types and points, as well as, probably, accommodative elements that ensure a comfortable grip of the tool during operation. The general form of the guns, apparently, did not yet have a significant meaning for their manufacturers at that time. [90]

The process of making stone tools is complex, requiring special dexterity and technical skills. It will take a long time to make a product that will be used over and over again for a long time (microscopic examination from Koobi Fora showing use wear or polish, other pieces were used for scraping or sawing wood, and for cutting meat, and two for cutting grass stems or reeds. [41]). This is evidenced by the large amount of so-called "debitage" found in the caves. The debitage can be tested under the microscope, where unmodified flakes may show wear polishes that formed during use. [40]



A right-handed knapper using the preferred right hand to strike flakes from a pebble held in the left hand. (Oldowanian) (redrawn after [68], p. 141)

Conclusion

We are unique in that we are striving in every way to change the world for ourselves, and consciously. It is much more difficult to do this than just use what we have. Our ancestors had to develop the ability to find a "way out of impossible" situations, which is the main reason that we survived and developed into modern people. At the same time, the desire to increase efficiency is the most important task, since first, this concerns the human body itself. We spend energy on some actions, while it must be constantly replenished. Our brain, like that of many higher mammals, is constantly trying to "optimize" the expenditure of energy. This optimization is essential to survival and is the main reason why we seek our own comfort and avoid discomfort. At its most primitive level, comfort is the absence of pain and additional physical activity. In order to achieve this, we try to optimize the items for ourselves.

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Taşkesan Pirofilitinin Dekoratif Seramik Karoların Üretiminde Düşük Büzülen Seramik Çamur Alınması İçin Kullanılması

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Öz

Hem iç, hem de dış mekan için istikrarlı estetik ve geometrik özelliklere sahip dekoratif kaplama ürünleri için seramik çamurların bileşimlerinin geliştirilmesi, seramik teknolojisinde ve özellikle halı-mozaik seramik kompozisyonlarının üretiminde çok ilgili teorik ve pratik bir görevdir. Düşük büzülme özelliklerine sahip seramik kütleler elde etmek için, pıhtılaşma-yoğunlaşma ve kristalzasyon struktur oluşumu aşamasında parçacıkların en yoğun paketlenmesinin sağlanmasını sağlayan seramik karışımın rasyonel bir fraksiyonel bileşiminin seçilmesinin önemli olduğu bilinmektedir. Sulu alüminosilikatlar olan pirofillitlerin, az miktarda kristalleşme suyu ve yeterince yüksek refrakterlik nedeniyle düşük büzülme özelliklerine sahip oldukları bilinmektedir. Öte yandan, Azerbaycan'ın Tashkesan bölgesinde, M. Qashqai liderliğindeki jeologlar tarafından geçen yüzyılın 50'li yıllarında keşfedilen büyük pirofilit rezervleri olduğu bilinmektedir. Bu çalışmada, pirofilitin kimyasalını ve mineralojik incelenmiş, pirofillit kullanmakla düşük hava ve ateş büzülmesine ve yüksek estetik ve tüketici özelliklere sahip seramik kütlelerin kompozisyonları geliştirilmiştir. Deneyler sırasında, özellikleri optimize etmek için deneyi planlamanın matematiksel yöntemleri uygulandı ve incelenen düzlemdeki süreçleri yeterince açıklayan bir regresyon denklemi elde edildi.

Anahtar kelimeler: seramik karo, büzülme, su emme, pirofilit, diferensial termiki analiz.

Giriş

Hem iç, hem de dış mekan için istikrarlı estetik ve geometrik özelliklere sahip dekoratif kaplama ürünleri için seramik çamurların bileşimlerinin geliştirilmesi, seramik teknolojisinde ve özellikle halı-mozaik seramik kompozisyonlarının üretiminde çok ilgili teorik ve pratik bir görevdir. Düşük büzülme özelliklerine sahip seramik kütleler elde etmek için, pıhtılaşma-yoğunlaşma ve kristalzasyon strüktür oluşumu aşamasında parçacıkların en yoğun paketlenmesinin sağlanmasını sağlayan seramik karışımın rasyonel bir fraksiyonel bileşiminin seçilmesinin önemli olduğu bilinmektedir [Ateş Arcasoy, 1983].

Aynı zamanda, minimum su absorpsiyonunu elde etmek çok zordur ve yalnızca atıl parçacıkların çerçevesini bağlayan önemli miktarda sıvı fazın varlığında mümkündür ve ateşleme sırasında ürünlerin düşük büzülmesi karışımdaki hammadde ve oranlarının seçimine, kurutma pişirme işlemleri için optimal rejim parametrelerinin oluşturulmasına özel bir yaklaşım gerektirir. Son zamanlarda, bölgedeki askeri-politik durum nedeniyle, Ukrayna ve Rus kaolinit-hidroslyuda kilinin ithalatı pratik olarak imkansız hale geldi. Bu nedenle yerel hammaddelere dayalı dekoratif

duvar karolarının geliştirilmesi büyük önem taşımaktadır. Öte yandan, Azerbaycan'ın Taşkesan bölgesinde, M. Qashqai liderliğindeki jeologlar tarafından geçen yüzyılın 50'li yıllarında keşfedilen büyük pirofilit rezervleri olduğu bilinmektedir [Kaşkay, 1955]. Aynı zamanda, seramik teknolojisinde pirofillitin kullanılması olasılığı hakkında çok sayıda literatür verisi bulunmaktadır [Tresvyatsky, 1980, Zaikov, 1989].

Pirofilitin hammadde karışımına eklenmesinin ürünlerin fırınlanma süresini azalttığı, seramik kütlelerin sinterlenmesi ile eritilmesi arasındaki sıcaklık aralığını arttırdığı ve ürünlerin büzülmesini azalttığı bilinmektedir. Kimyasal formül $Al_2O_3 \cdot 4SiO_2 \cdot H_2O$, kristal kimyasal yapısal formül $Al_2[Si_4O_{10}] \cdot [OH]_2$. Mineralin teorik bileşimi, kütle. %: $A1_2O_3$ 28.3, SiO_2 66.7, H_2O 5.0. Hesaplanan erime noktası yaklaşık 1740°C'dir. Isıtıldığında, yapısal su 700-900°C aralığında tamamen uzaklaştırılır. Tam dehidrasyonun ürünü metapirofilit $Al_2O_3 \cdot 4SiO_2$'dir. 1150°C'de metapirofillit, mullit ve kristobalit oluşturmak üzere ayrışır. Isıtma üzerine pirofilitin genel faz dönüşüm sırası şöyledir: $Al_2O_3 \cdot 4SiO_2 \cdot H_2O \rightarrow \rightarrow Al2O3 \cdot 4SiO_2 \rightarrow 3Al_2O_3 \cdot 2SiO_2 + 4SiO_2$. Yüksek sıcaklık dönüşümlerinin son ürünleri, ateşe dayanıklı bileşiklerdir- tüm ateşlenmiş alüminosilikatların tipik özelliği olan mullit ve kristobalit.

Kristal kimyasının özellikleri ile bağlantılı olarak, diğer doğal alüminosilikatlardan farklı olarak, pirofillit, yurtdışında çeşitli endüstrilerde geniş bir uygulama alanı sağlayan bir dizi değerli fiziksel, kimyasal ve teknolojik özelliklere sahiptir: tatmin edici refrakterlik, yüksek termal kararlılık, kolay kırma ve öğütme düşük sertlik nedeniyle doğal ve ateşlenmiş minerallerin çeşitli asitlerin ve tuzların etkisine karşı kimyasal eylemsizliği, nispeten düşük ısı iletkenliği, düşük sürtünme katsayısı, pişirme sırasında büzülme olmaması, sertlikte önemli bir artış (Mohs ölçeğinde 7.5'e kadar) Orta sıcaklıklarda (1300-1400 ° C) sinterleme ürünleri.

1926'da ABD'de pirofilit kullanan seramikler üretilmeye başlandı. Çok çeşitli seramik ürünler üretildi: kaplama fayansları, vitrifiyeler, ev porselenleri, radyo bileşenleri, elektroporselen vb. Japonya'da alüminosilikat refrakterlerin, seramiklerin ve diğer birçok ürün türünün üretimi için çok işlevli bir hammadde olarak pirofillit içeren roseki adı verilen kaya kullanılmıştır.

Araştırmanın amacı, Taşkesan yatağının pirofilitinin özelliklerini belirlemek ve buna dayanarak, kaplama halı-mozaik karo üretimi için seramik kütlesinin bileşimini elde etmektir.

Materyal ve Metod

Araştırmanın ilk aşamasında, bir jeologun katılımıyla alanı maksimum düzeyde temsil eden örnekler aldık. Numuneler kurutuldu, kırıldı ve çeyrekleme yöntemiyle ortalaması alındı ve 0063 elekten elenen numuneler üzerinde kimyasal ve mineralojik bileşimleri ve termal özellikleri

belirlemek için bir çalışma yapıldı.

Pirofilitin kimyasal bileşimi bir S8 TIGER spektrometresinde, Bruger (Almanya) (Tablo 1) ve mineralojik bileşimi bir Miniflex 600 Rentgen difraktometresinde, Riqacu (Japonya), bir bakır anotta (Tablo 2 ve Şekil 1) incelenmiştir. Pirofillitin diferansiyel termal analizi, bir NETZSCH STA 449F3 STA449F3A-0836-M cihazında 30/30.0(K/min)/1200 (Şekil 2) [Topor N.D., 1987] aralığında N_2 atmosferinde gerçekleştirilmiştir.

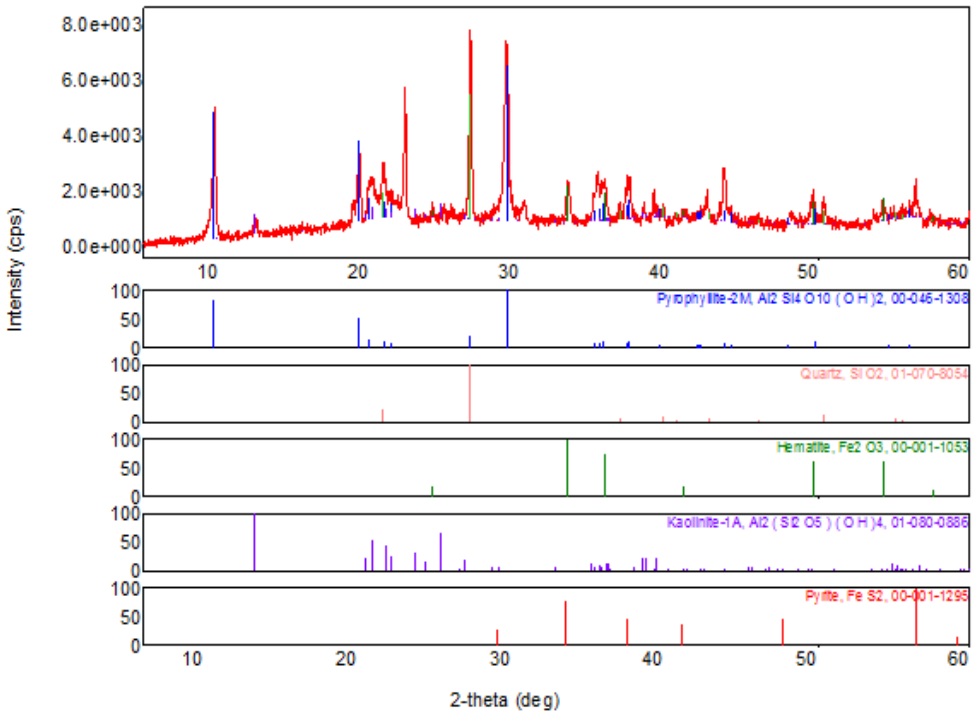
Sonuç ve Tartışma

Pirofilitin kimyasal analizinin sonuçları, kimyasal bileşiminin esas olarak alüminyum oksit ve kuvars ile temsil edildiğini göstermektedir. Artan demir oksit içeriği, bize göre, hammaddelerin dekoratif özelliklerini kötüleştirebilir, ancak onu çeşitli sınıflandırma yöntemleriyle bileşimden çıkarmak zor olmayacaktır.

Tablo 1. Numunenin kimyasal bileşimi

Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	K_2O	CaO	TiO_2	MnO	Fe_2O_3	SrO	Cl^-	YTİ
0,23	0,01	29,32	55,08	0,20	0,49	0,13	0,08	0,68	0,01	6,76	0,28	0,01	6,7

Difraktogramın (Şekil 1) ve mineralojik bileşimin analizi, ana mineral pirofilitin yüksek içeriğini gösterir, bu da Dashkesan pirofillit hammaddelerinin yüksek kalitesi hakkında konuşmamızı sağlar. Kuvars ve kaolinitin varlığı hammadde değerini arttırır.

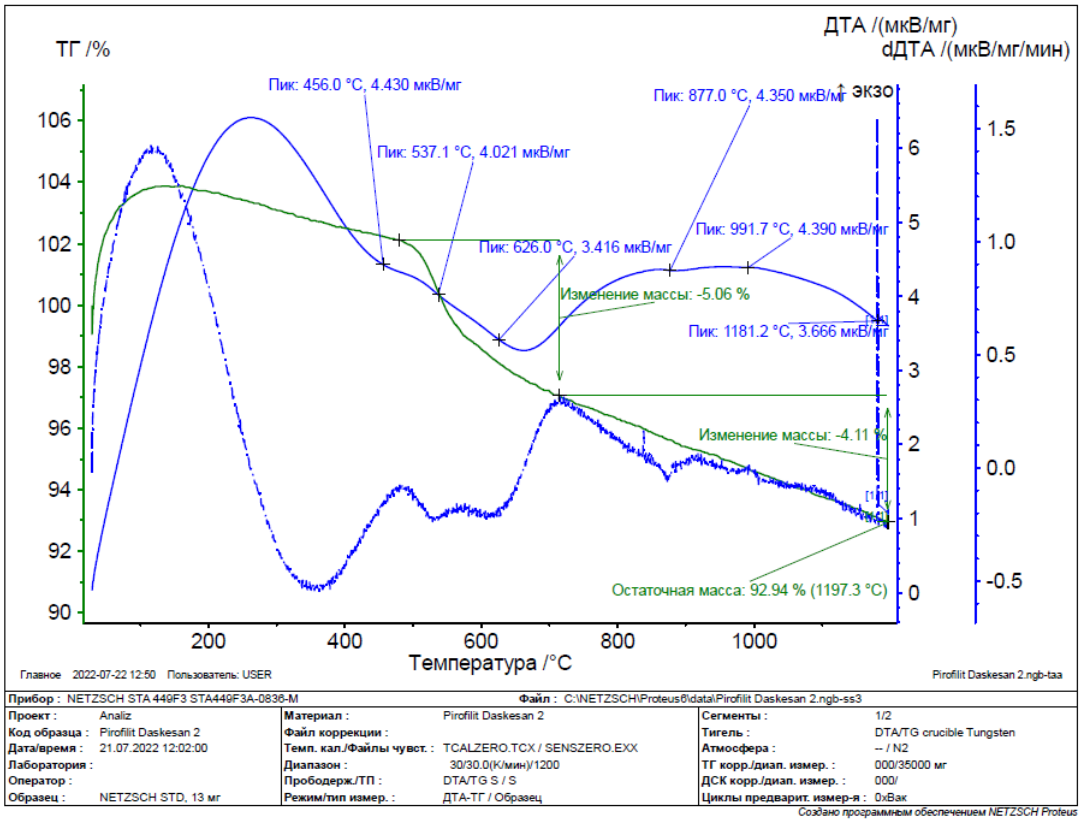


Şekil 1. Daşkesan yatağının pirofilitinin kırınım modeli

Tablo 2. Numunenin Mineralojik Bileşimi

SiO2 (α-kvars)	Al2Si2O5(OH) (kaolinit)	Al2Si4O10(OH)2 (pirofillit)	Fe2S (pirit)	Fe2O3 (hematit)	Digər qarışıqlar
10	10	72	2	4	2

Pirofilitin DTA eğrilerinden (Şekil 2) 537 ve 627^0C sıcaklıklarda pirofillitin karakteristik endo-etkilerinin olduğu ve bunların yapısal su salınımı ile ilişkili olduğu görülebilir. Bu sıcaklık aralığında kütlede %5,06 oranında bir azalma gözlenir. Bir sonraki endo-etkiyi 877^0C'de buluyoruz, bu da bize göre metapirofilitin kristal kafesinin yok edilmesiyle ilişkili olabilir. 971^0C'de küçük bir ekzotermik etki bulunur ve kristabolit salınımı ile açıklanır.



Şekil 2**.** Dashkesan yatağından pirofilitin DTA'sı

Deneylerin sonraki aşamalarında, iyi bilinen bir yönteme göre bir mufla fırınına 1300^0C'de bir pirofilit ateş numunesi yerleştirildi ve mozaik halı karoları üretimi için seramik döküm kütlesinin temel bileşimini geliştirmek amacı ile bir dizi ön deney işlemleri yapıldı. Denemelerde Dash-Salakhli yatağından gelen bentonit kil bileşeni olarak, Jeyrançöl yatağından gelen volkanik kül ise taşkın yatağı olarak kullanılmıştır. Temel bileşim, ağırlıkça %: Pirofillit - 60, bentonit - 5, volkanik kül - 30, kuvars kumu - 5. Ayırma tabakası olarak

pirofillit %95 ve bentonit -%5 karışımı kullanılmıştır. Sır olarak Frit RF-1 - %90, kaolin - %10, sodyum pirofosfat - %0.06 (%100'ün üzerinde) içeren bir karışım kullanıldı.

Fayansların kalitesi GOST 18623-82'ye göre değerlendirildi. Hava ve alev çekmesi ve su emmesi kontrol edildi. Test, 50x50x3 mm ölçülerindeki karolar üzerinde gerçekleştirilmiştir. Temel bileşim (elek üzerinde kalıntı 0063 - %12, nem %30, yoğunluk - 1.75 g/cm3) esas alınarak elde edilen karolar, bir mufla fırınında 10 saat boyunca sıcaklığı yavaş bir artışla 1150^0C'de pişirilmiştir. Ayırma tabakasının özellikleri: 1.05 g/cm^3 yoğunluğa sahip kayma, elekte kalıntı 0063 - %3, nem - % 93.

Baz bileşimli karoların hava çekmesi %4, yangın çekmesi %4 ve su emmesi %13 olmuştur. Karolara aşağıdaki parametrelerle sırlar uygulanmıştır: elek kalıntısı 0063 - %0.07-0.15, nem - %43, yoğunluk - 1.62 g/cm^3.

Daha sonra, karoların teknolojik parametrelerini ve özelliklerini optimize etmek için matematiksel deney planlama yöntemleri uygulandı [Montgomery, 1980].

Bunun için tam faktöriyel deney kullanmayı uygun görüyoruz. Aktif deneme, faktörlerin fiyatını bilerek seçmenize olanak tanır. Aktif deney, pasif deneye kıyasla deney sayısının en aza indirilmesini sağlar ve bunun sonucunda deney etkin ve verimli bir şekilde elde edilir. Bu tür deneyler planlanırken her faktöre belirli bir değer veya seviye atanır. Faktör sayısı k ise ve düzey sayısı n'ye eşitse, tam faktör analizi (TFA) üzerindeki deney sayısı $N=n^k$ olacaktır. Böyle bir deneyin planı (planlama matrisi), k faktörünün n seviyesinde değişen tüm olası N kombinasyonlarını öngörmektedir. 2 seviyeli bir n=2 deneyi daha yaygındır. Bu sırada üst ve alt seviyelere karşılık gelen z_{max} ve z_{min} değerlerinde z_j faktörü belirir.

$\Delta z_j=(z_{jmax}-z_{jmin})/2$, faktör j'nin tabana veya 0 düzeyine göre varyasyon aralığıdır $z_j^0=(z_{jmax}+z_{jmin})/2$.

Görüldüğü gibi, $z_{jmin}=z_j^0-\Delta z_j$, $z_{jmax}=z_j^0+\Delta z_j$. Seçilen z_j^0 ve Δz_j değerleri, deneysel faktör uzayının çalışma alanını kapsamalıdır. Δz_j aralığının değeri, çalışılan teknolojik nesnelerin gürültüsünün arka planına karşı faktörlerin varyasyon etkisinin kaybolmaması için yeterince geniş olmalıdır. Öte yandan, varyasyon aralığı çok genişse, ortaya çıkan regresyon modeli süreci yeterince tanımlayamayabilir. k boyutlu faktör uzayında, z_1^0, z_2^0...z_k^0 koordinatlarına sahip nokta deney planının merkezidir. TFA sonuçlarının işlenmesini kolaylaştırmak için doğal ölçekte yazılan z_j faktöründen aşağıdaki formülle boyutsuz x_j faktörüne geçilmesi uygun görülmüştür.

$$x_j=\frac{zj-zj0}{\Delta zj}$$

Sonra $x_{jmax}=\frac{zj0+\Delta zj-zj0}{\Delta zj}=1$, $x_{jmin}=\frac{zjmin-zj0}{\Delta zj}=-1$, $x_{j0}=\frac{zj0-zj0}{\Delta z}=0$

Böylece, matris grafiği varsayılan görünümü alır, alt seviye -1 ve üst seviye +1 olarak hareket eder.

Deney planlama matrisi aşağıdaki tablo 3'te verilmiştir.

Tablo 3. Planlama matrisi

Sıra №	X_0	X_1	X_2	X_3	Y
1	+1	-1	-1	-1	Y1
2	+1	+1	-1	-1	Y2
3	+1	-1	+1	-1	Y3
4	+1	+1	+1	-1	Y4
5	+1	-1	-1	+1	Y5
6	+1	+1	-1	+1	Y6
7	+1	-1	+1	+1	Y7
8	+1	+1	+1	+1	Y8

TFA yardımıyla, faktörleri ve seviyelerini belirliyoruz ve seramik kütlesinin bileşimini optimize etmek için bir planlama matrisi oluşturuyoruz. Temel bileşim olarak: pirofillit – 60, bentonit – 5, volkanik kül – 30, kuvars kumu – 5 kabul edilmiştir. Deneylerde, yerel bentonitin etkisini araştırmak için baz bileşimi de değiştirildi. Böylece pirofillit, kuvars kumu, volkanik külün payı %100 olarak hesaplanmış ve yuvarlatılmış, bentonit miktarı %100'ün üzerine alınmıştır: pirofillit - %63, volkanik kül - %32, kuvars kumu - %5. Tüm hammadde numuneleri önce kurutma fırınlarında %1-2 nem içeriğine kadar kurutulduktan sonra porselen küreler (küre:hammadde=3:1) yardımıyla seramik değirmeninde öğütülmüştür (0063 elekte kalıntı %10), kompozisyonlar 50x50x3 mm boyutlarında plaka şeklinde planlama matrisine uygun olarak hazırlanmış, döküm yöntemiyle kalıplanmış ve laboratuvar fırınında uygun modlarda fırınlanmıştır. Deneylerin bir kısmı Nargisporcelain şirketinin üretim üssünde gerçekleştirildi.

Pişirme sıcaklığını z_1 faktörü, pişirme süresini z_2 faktörü ve seramik kütle içeriğinin %100'ünün üzerindeki bentonit miktarını z_3 faktörü olarak kabul ediyoruz. Seramik karo su emmesi ve toplu büzülme, replika işlevler olarak kabul edildi. Seramik karoların rötre ve toplu rötreleri ilgili standart ve gereksinimlere göre belirlenir. Planın merkezi ve varyasyon aralığı aşağıdaki gibi alınır:

z_{10} = 1150^{0}C **Δz_1=25^{0}C**

z_{20} = 15 dəq **Δz_2=5 dəq**

z_{30} =5 % **Δz_3 = 2%**

8 deneyden oluşan TFA'nın düzeni aşağıdaki tablo 4'de verilmiştir.

Tablo 4. Planlama Matrisi

Deneyin sıra numarası	X_1	X_2	X_3	Su emme,%	Toplu küçülme, %
1	1125	10	3	10	6
2	1175	10	3	3	8
3	1125	20	3	13	7
4	1175	20	3	3	9
5	1125	10	7	11	8
6	1175	10	7	4	12
7	1125	20	7	14	9
8	1175	20	7	3 (defor-masiyon)	14

Çoğaltma denklemini aşağıdaki gibi tanımlarız:

$Y=b_0+b_1x_1+b_2x_2+b_3x_3$

b_0, b_1, b_2, b_3 - modelin faktörler üzerindeki etkisinin katsayılarıdır;

x_1, x_2, x_3 - çarpanlardır.

Serbestlik derecesi sayısı f=N-l=8-4=4>0

f>0 değerinde, deney tasarımı doymuş olarak kabul edilmez. Bu plan üzerinde yapılan deneylerin sonuçlarını kullanarak modelin tüm katsayılarını hesaplamak ve yeterliliğini kontrol etmek mümkündür.

Katsayılar aşağıdaki formüller kullanılarak hesaplanır:

$b_0 = \frac{1}{8}\sum_{i=1}^{8} yi = \frac{10+3+13+3+11+4+14+3}{8} = 7{,}625;$

$b_1 = \frac{1}{8}\sum x1iyi = \frac{-10+3-13+3-11+4-14+3}{8} = -4{,}37;$

$b_2 = \frac{1}{8}\sum_{i}^{8} x1iyi = \frac{-10-3+13+3-11-4+14+3}{8} = 0{,}625;$

$b_3 = \frac{1}{8}\sum_{i}^{8} x1iyi = \frac{-10-3-13-3+11+4+14+3}{8} = 0{,}375.$

Dolayısıyla regresyon denklemi

$Y=7{,}625-4{,}37X_1+0{,}625X_2+0{,}375X_3$

şeklinde ifade edilir.

TFA'nın kovaryans matrisi köşegen olduğundan katsayılar kendi aralarında korelasyon göstermez. Modelden önemsiz olan katsayı çıkarıldıktan sonra diğerlerini yeniden hesaplamaya gerek yoktur. Regresyon denkleminin katsayılarının anlamlılığı Student kriterine göre hesaplanır.$tj=\frac{bi}{sbj} > f_{1-\alpha,f}$,

α kabul edilen önem düzeyidir; $f=f_{tkr.}$; s_{bj}, b_i katsayısının ortalama kare sapma göstergesidir.

Kovaryans matrisinin köşegen katsayıları aynı ve N'ye eşit olduğundan, herhangi bir katsayının ortalama kare sapması

$s_{bj}=\frac{Stəkr}{\sqrt{N}}$ formülü ile hesaplanır.

Çoğaltma varyansını hesaplamak için grafiğin merkezinde herhangi bir 4 deney yaparız. Yapılan deney sonucunda %6,6,2,6,1,8,8 kuruma değerlerini aldık.

$Y_{ort}=\frac{6+6,2+6,1+5,8}{4}$=6,25% alırız. Daha sonra replikasyon varyansı

$S^2_{təkr}=\frac{1}{n0-1}\sum_1^n(yi0-yioort)^2=\frac{1}{4-1}$*(6,25-6)^2=0,02; $S_{təkr}$=0,14

$s_{bj}=\frac{Stəkr}{\sqrt{N}}$= 0,14/2,81=0,05

Kontrol kriterinin kritik değeri için $t_{0,05,3}$=3,18

Katsaylar üzre:

b_0 – 7,625/0,05=152,5>3,18

b_1 – 4,37/0,05=87,4>3,18

b_2 – 1,5/0,05=12,5>3,18

b_3 – 0,375/0,05=7,5>3,18

Bu nedenle, tüm faktörler önemli kabul edilir.

Faktörlerin doğal ölçeğine dönüş

$Y=7,625-4,37X_1+0,625X_2+0,375X_3$

$Y=7,625-4,37(z_1-1150)/25+0,625(z_2-15)/5+0,375(z_3-5)/2=205,8-0,175Z_1+0,125Z_2+0,188Z_3$

$Y=205,8-0,175Z_1+0,125Z_2+0,188Z_3$

Aynı zamanda, incelenen faktörlerin kütle küçülmesi üzerindeki etkisi de incelendi ve ilgili regresyon denklemi elde edildi:

$Y=9,125-1,625X_1+0,625X_2+1,75X_3$

Doğal bir ölçekte

Y= -

$71,87+0,065Z_1+0,125Z_2+0,875Z_3$

Deney yoluyla elde edilen regresyon denklemlerinin analizi, pişirme sıcaklığının bir faktör olarak belirlenen aralıkta üst kuruluk seviyesinde bir azalma sağladığını göstermektedir. Seçilen aralıkta bentonit miktarının arttırılması, aynı zamanda pişirme süresinin arttırılması su emmeni düşürür. Çalışılan aralıkta her üç faktörün artması toplu küçülmeni azaltır. Planlama matrisine göre 2, 4, 6 ve 8 numaralı deneyler için elde edilen numuneler sır altı boyaları ile boyanmış ve sırlanıp pişirildikten sonra normal göz ve büyüteç ile incelenmiştir. Bu sırada

fayanslarda herhangi bir çatlak, kıl gibi çatlaklar, renk ve ya sır akışı yoktu. Elde edilen sonuçlar endüstriyel kullanım için tavsiye edilir.

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Mimar Sinan Su Yolları: Su Yollarının Mimarisi ve Mühendisliği İle İlgili Çalışmaların İncelenmesi

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Öz

Mimar Sinan döneminde Edirne ve İstanbul'da inşa edilen su iletim sistemleri önemli su yapıları arasındadır. Sinan döneminde yapılan üç suyolu sistemi Edirne Taşlımüsellim, İstanbul Süleymaniye Su Yolları ve Kırkçeşme Su İletim Sistemi ülkemizdeki tarihi su yapıları açısından önemli bir yer tutmaktadır. Mimar Sinan'ın mimarlık ve özellikle su mühendisliğinin önemli eserleri olan bu yapılar arasında Kırkçeşme su sistemi Osmanlı İmparatorluğunun önemli su temin sistemidir. Kırkçeşme Su Sistemi boyunca Uzun Su Kemeri, Kırık Su Kemeri, Mağlova Kemeri, Güzelce Kemeri ve Paşa Kemeri gibi anıtsal su kemerleri ile birlikte 33 su kemeri ve dört baraj bulunmaktadır. Sinan'ın suyollarında özellikle bazı kemerlerde Bizans dönemine ait izlerin olduğu yönünde akademik tartışmalar devam etmektedir. Mimar Sinan'ın sadece su yapıları incelendiğinde bile onun sıra dışı ve zamanını aşan bir bilim ve sanat insanı olduğu söylenebilir. Günümüzün hidrolik mühendisleri, sadece yapıların tasarımını değil aynı zamanda suyun, havanın ve zeminin etkileştiği doğa olaylarını anlamak ve bunlara çözüm üretmeye de çalışmaktadır. Sinan'ın yaşadığı dönemde tüm bunları büyük ölçüde dikkate almış olması eserlerindeki mimari ve topografya uyumu dikkate değer derecededir. Mimar Sinan'ın su yapıları incelendiğinde onun hidrolik mühendisliği ve yapı fiziği bilgisi daha iyi anlaşılmaktadır. Bu makalede Mimar Sinan'ın en görkemli eserlerinden olan suyollarındaki sanatı ve mühendisliği ele alınmıştır.

Anahtar Kelimeler: Mimar Sinan, Suyolları, Taşlımüsellim suyolları, Süleymani ye Suyolları, Kırkçeşme Su İletim Sistemi, Su Kemerleri.

Mimar Sinan Waterways: An Investigation of Studies on the Architecture and Engineering of Waterways

Abstract

The water transmission systems built in Edirne and Istanbul during the period of Mimar Sinan are among the important water structures. The three waterway systems, Edirne Taşlımüsellim, İstanbul Süleymaniye Waterways and Kırkçeşme Water Transmission System, which were built during the Sinan period, have an important place in terms of historical water structures in our country. Among these structures, which are important works of Mimar Sinan's architecture and especially water engineering, Kırkçeşme water system is the important water supply system of the Ottoman Empire. Along the Kırkçeşme Water System, there are 33 aqueducts and four dams, along with monumental aqueducts such as the Long Aqueduct, the Broken Aqueduct, the Mağlova Aqueduct, the Güzelce Aqueduct and the Pasha Aqueduct. Academic debates continue in the direction that there are traces of Byzantine period in Sinan's waterways, especially in some arches. Even when only the water structures of Mimar Sinan are examined, it can be said that he was a man of science and art who an extraordinary and over of his time. Today's hydraulic engineers try not only to design structures, but also to understand and find solutions to natural phenomena where water, air and ground interact. All these to be took into account by Sinan to a great extent during his lifetime, the harmony of architecture and topography in his works is remarkable. When the water structures of Mimar Sinan are examined, his knowledge of hydraulic engineering and building physics is better understood. In this article, the art and engineering of waterways which is one of the most magnificent works of Mimar Sinan is discussed.

Keywords: Mimar Sinan, Waterways, Taşlımüsellim Waterways, Süleymaniye Waterways, Kırkçeşme Water Transmission System, Aqueducts.

Giriş

Anadolu ve Balkanlar'daki tarihi yığma köprülerin kalıntıları Roma'ya Selçuklu' ya ve Osmanlı'ya tarihlenmektedir (13. ila 19. yüzyıllar). Suyollarından geçen köprüler, ulaşıma hizmet etmenin yanı sıra önemli hidrolik yapılar olarak da düşünülmelidir. Hem askeri hem

de ekonomik amaçlarla inşa edilen yüzden fazla Osmanlı köprüsü[9] birkaç yüzyıl boyunca hizmet etmiştir. Bazıları halen faaliyette olan bu yapılar zamanlarının hidrolik bilgisinin ve sağlam yapı teknolojisinin sessiz tanıklarıdır (Baykan vd. 2011).

Sosyal ve kültürel anlamda uygarlık tarihinin önemli bir bölümünü oluşturan su kültürünün, Anadolu'da antik dönemden bu yana oluşturulan zengin örnekleri bulunmaktadır (Güner & Savran, 2013; Öziş, 1987). Tarih boyunca tüm önemli uygarlık merkezleri su kenarlarına kurulmuştur (Biçkici & Aras, 2013). Türkiye (Anadolu), coğrafi konumu ve zengin kültürel mirası nedeniyle tarihi yapı ve taş kemer köprüler konusunda da en önemli bölgelerden biridir (Biçkici & Aras, 2013,). Osmanlı İmparatorluğu'nun en parlak dönemi olan 16. yüzyılda köprülerin yapımı büyük mühendis ve mimar Sinan'ın imzasını taşımaktadır (Balkan vd. 2011; Alkan vd. 2011). Mimar Sinan döneminde, bu su yapıları altın çağını yaşamıştır (Güngör, 2021). Tüm zamanların en iyi mimarı olarak bilinen Mimar Sinan, yüzyıllardır ustalığı, mühendislik zekâsı ve işçiliği ile dikkatleri üzerine çekmiştir. Mimar Sinan, Osmanlı İmparatorluğu'nun en parlak siyasi dönemini mimari eserleriyle ölümsüzleştirmiştir (Karakuş, 2019).

Mimar Sinan, bir mühendislik dehası olduğunu gösteren eserler meydana getirmiş ve 16. yüzyılda İstanbul'un su sorununu çözmüştür. Kanuni Sultan Süleyman'ın saltanatının sonlarına doğru Osmanlı İmparatorluğu'nun sınırları çok genişlemiş ve İstanbul kalabalıklaşmış ve mevcut su tesisleri yetersiz kalmıştır. Kanuni Sultan Süleyman, Kağıthane'yi dolaşırken eski bir suyolundan sızan suyu görmüş ve bu suları şehre getirmenin mümkün olup olmadığını araştırmak için Mimar Sinan'ı görevlendirmiştir (Çeçen, 1998). Mimar Sinan bu bölgede bir araştırma yaparak seviye farklarını su terazisi ile ölçerek dere suyunun şehre gelebileceğini tespit etmiştir. Kanuni Sultan Süleyman'ın emriyle Mimar Sinan'a yaptırılan Kırkçeşme Su Sistemi'nin yapımına 1554 yılında başlanmıştır (Karakuş, 2019).

Sinan'ın köprüleri arasında, Ergene üzerinde Alpullu köprüsünde ana kemer açıklığı 20 m olup, Büyük Çekmece göl ayağı üzerindeki dört parçalı Sultan Süleyman köprüsünün toplam uzunluğu 635 m'dir. Beş yüze yakın eser inşa etmiş olan Sinan, Büyük Çekmece köprüsünü en önem verdiği altı eseri arasında saymıştır (Alkan vd., 2011).

Mimar Sinan ve eserleri hakkında sayısız makale ve çalışma yapılmıştır. Çoğunlukla Sinan'ın devasa camilerin baş mimarı olarak kabul edildiği görülmektedir. Ne yazık ki, Türkiye ve

[9] Bu köprülerin üçte ikisi Anadolu'da ve üçte biri Balkanlar'da bulunmaktadır (Baykan vd. 2011)

çevresinde Türk taş kemer köprüleri çok yaygın olmasına rağmen, bu yapılarla ilgili çalışmalar çok azdır (Biçkici & Aras, 2013). Ancak Mimar Sinan'ın su yapıları incelendiğinde onun hidrolik mühendisliği ve yapı fiziği bilgisi daha iyi anlaşılmaktadır. Bu makalede Mimar Sinan'ın en görkemli eserlerinden olan suyollardaki sanatı ve mühendisliği ele alınmıştır. Su yapılarının fazlalığı sebebiyle sadece suyun toplanması, taşınması ve dağıtılması için yapılan su yapıları makale kapsamında ele alınmıştır. Suyun kullanımı için yapılan çeşme, sebil, selsebil, şadırvan, hamam gibi yapılar inceleme dışında bırakılmıştır.

Çalışmanın İçeriği ve Yöntemi: Mimar Sinan suyollarının mimarisi ve mühendisliği ile ilgili çalışmaların incelenmesini içeren bu makalede: Giriş, çalışmanın içeriği ve yöntemi, literatür tarama stratejisi, Sinan'ın önemli suyolları, Taşlımüsellim-Edirne Su Yolları, Süleymaniye Su Yolları, Kırkçeşme su temin sistemi, Kırkçeşme hakkında önemli görüşler, Su kemerleri, Büyükçekmece Köprüsü, Mimar Sinan'ın su yapılarındaki inovasyonları, Sinan'ın su yapılarındaki mimarlık ve mühendisliği, değerlendirme ve sonuç başlıkları kapsamında bir düzenlemeye gidilmiştir.

Bu anlamda çalışmanın içeriği gereği kapsamlı literatür taraması aşağıdaki strateji ile yapılmıştır.

Literatür tarama stratejisi: Anahtar kelimeler için İngilizce ve Türkçe olarak ("Architect Sinan" OR "Sinan" OR "Mimar Sinan" OR " Engineer Sinan" OR "First civil engineer organization" OR " "First civil engineer") AND ("water supply" OR "waterway" OR "water network" OR "water work" OR "Aqueducts" OR "Bridges" OR "Hydraulic" OR "Hydraulic Engineer" OR "Water Engineer) Ulusal Tez Merkezi, ulakbim, Taylor & Francis, EBSCO, Google Scholor, ProQues, Web of Science, Academic Search Ultimate (EKUAL), Art & Architecture Source, ArtSTOR, Bridgeman Education ve Cambridge Online Journal veri tabanları 28.05.2021 - 20.06.2021 tarihleri arasında taranmıştır. Tam metinine ulaşılabilen eserler ve konu ile ilgili ulaşılabilen kitaplar incelenmiştir.

Sinan'ın Önemli Suyolları

Mimar Sinan döneminde Edirne ve İstanbul'da inşa edilen su iletim sistemleri önemli su yapıları arasındadır. Sinan döneminde yapılan üç suyolu sistemi; Taşlımüsellim, Süleymaniye Su Yolları ve Kırkçeşme, tarihi su yapıları arasında önemli bir yer tutmaktadır (Güngör, 2021; Saoud, 2007). Öziş ve Arısoy makalelerinde "İnsanların uygarca yaşayabilmesinin en önde gelen unsurlarından biri olan su ihtiyacının karşılanması konusunda Mimar Sinan'ın bu üç suyolu sistemi de anıt niteliğindedir" ifadesine yer vermişlerdir (Öziş & Arısoy, 1987, s.33).

Evliya Çelebi Seyahatnamesinde, mimarlık sanatıyla ilgili olarak, Sinan'ın Şehzade camiinin çıraklık, Süleymaniye camiinin kalfalık döneminin eserleri olduğunu, Selimiye camiinde ise ustalığını ifade ettiğini biliyoruz. Öziş ve Arısoy makalelerinde, **"**Bu benzetme Mimar Sinan'ın suyollarına uygulandığında, Taşlımüsellim/Edirne suyolunun çıraklık, Süleymaniye/İstanbul suyolunun kalfalık dönemini simgelediğini, Kırkçeşmeler/İstanbul suyolunun da ustalığını gösterdiğini ifade etmek yerinde olacaktır.**"** benzetmesini yapmışlardır (Öziş &Arısoy 1987, s.22).

Mimar Sinan'ın mimarlık ve özellikle su mühendisliğinin önemli eserleri olan bu yapılar bu belirtilen sıra ile aşağıda ele alınmıştır.

Taşlımüsellim-Edirne Su Yolları

Edirne – Taşlımüsellim Su Yolları 45 km'yi aşan hat üzerinde inşa edilen 13 kemer ve tünelleriyle 16. yüzyıldan günümüze değin varlığını sürdürmüştür (Güner ve Savran 2013). Güner ve Savran çalışmalarında; "Taşlımüsellim Su Yollarının Mimar Sinan tarafından inşa edilmiş olduğu genel kabul görmüş olmasına karşın Sinan'ın eserlerinin listelendiği "Tezkiret-ül Ebniye" ve "Tezkiret-ül Bünyan" yazmalarında bu suyolundan ve üzerindeki kemerlerden söz edilmemiştir. Tezkirelerde bu tesislerden söz edilmemesine karşın, Ahmet Badi Efendi, Ata Tarihine atıfta bulunarak, Haseki Hürrem Sultan tarafından yaptırılan tesislerin vakıfnamelerinde kayıtlar bulunduğunu bildirmektedir." şeklinde ifade etmektedir (Güner & Savran 2013, s.121).

Taşlımüsellim Su Yollarının, katmalar dışında, tamamının 1530'larda inşa edilmiş olabileceği görüşünün yanı sıra Sinanköy Pravadi kolunun 1530'larda inşa edilip Taşlımüsellim kolunun, Selimiye Camii inşasından önce yapılmış olabileceğinden söz edilmektedir. Taşlımüsellim kaynak sularının yeryüzüne çıkması sırasında yer altı ve yer üstü sularıyla karışarak kirlenmemesini, debi ve sıcaklığının değişmemesini sağlamak için oluşturulan toplama havuzu, kuyu galeri gibi yapıların tesis edildiği bilinmektedir. Taşlımüsellim köyünün güneyinde, bölgedeki kaynak suyun derlendiği bir tesis inşa edilmiştir. İki toplama havuzu ve bu yapıları bağlayan 50 cm. genişlik ve 130 cm. yüksekliğe sahip taş galerilerden oluşmaktadır (Öziş & Arısoy 1987, Güner & Savran 2013 ss.122-123) (Şekil 1a-b).



a. b.

Şekil 1 a. Taşlımüsellim, Derleme Yapıları Genel Görünüm b. Derleme Yapısı B, İç Mekan (Güner & Savran, (2013). Edirne ve Çevresindeki Su Kemerleri: Tespit, Lokalizasyon ve Koruma Önerileri. Trakya Üniversitesi Edebiyat Fakültesi Dergisi, 3(05), 117-139.)

"Fiziksel ve çevre şartlarının kemerler üzerinde meydana getirdiği tahribat nedeniyle ciddi şekilde tehdit altında oldukları saptanmıştır. Söz konusu varlıkların, insanlar ve doğal koşullar tarafından uğratıldığı yapısal, görsel ve diğer kayıpların giderilerek önemli bir tarihsel veri olarak gelecek kuşaklara aktarılması önemlidir" (Güner & Savran 2013,)

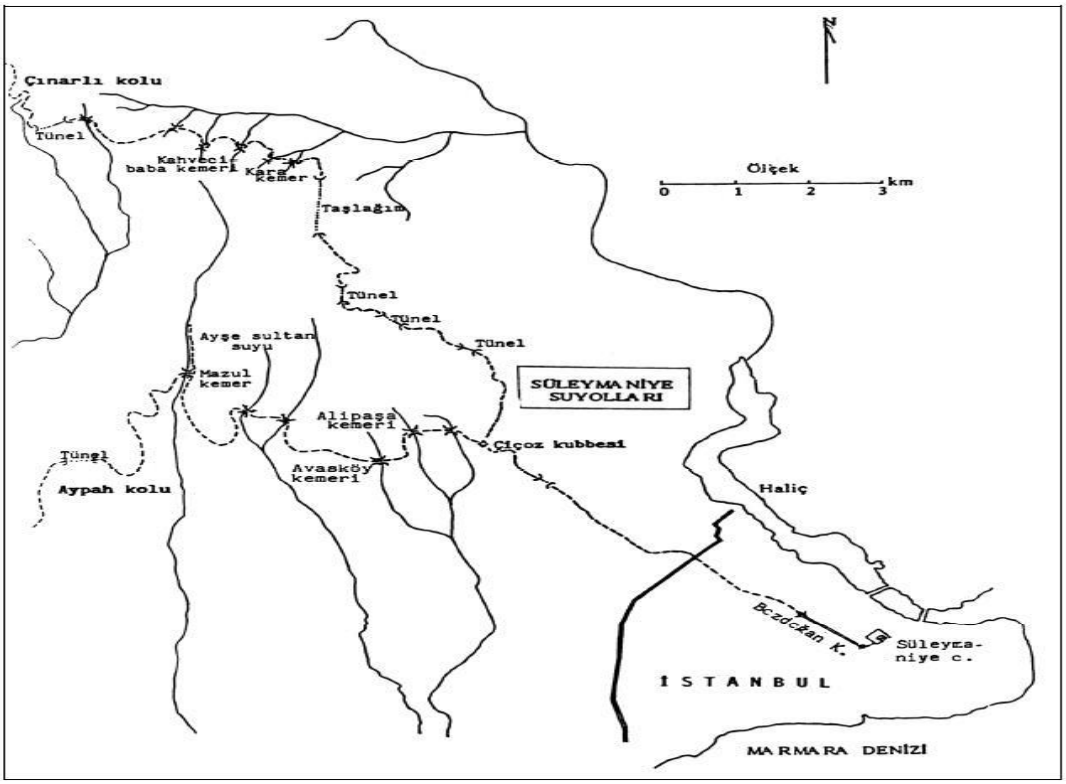
Öziş bir makalesinde " Taşlımüsellimdeki su taşıma sistemi İstanbul'un anıtsal nitelikteki Kırkçeşme Su Sisteminin ayak sesi olarak nitelendirilebilir. Taşlımüsellim su tesisleri Sinan'ın mühendislik dehasını bizlere göstermekle birlikte sadece Türk-İslam devletlerinde değil tüm dünyanın hidrolik teknoloji tarihinde özel bir yere sahiptir." yorumunu yapmıştır (Öziş, 1988, s.73).

Mimar Sinan'ın suyolları ile ilgili eserleri arasında çıraklık eseri olarak nitelendirilen Taşlımüsellim suyolunun halkın su ihtiyacını karşılamada önemli yere sahip olmakla birlikte döneminin özellikleri dikkate alındığında Sinan'ın hidrolik teknolojisinin de önemli olduğu söylenebilir. Sinan'ın Taşlımüsellimde edindiği tecrübe ve deneyim onun Kırkçeşme gibi bir mimarlık ve mühendislik eseri ortaya çıkarmasında etkili olmuştur diyebiliriz.

Süleymaniye Su Yolları

Osmanlı döneminde İstanbul'un Rumeli yakasını besleyen üç büyük sistemin birincisi, 15 ayrı suyolu alt sisteminden oluşan ve şehrin kuzeybatısındaki çeşitli kaynakların sularını getiren

Halkalı sistemi olup, Süleymaniye Suyolları[10] da bu 15 alt sistemin en uzunu ve debisi en fazla olanıdır (Öziş & Arısoy, 1987). Süleymaniye suyolları iki ayrı yörenin sularını Aypah ve Çınarlı olarak iki kolla iletmekte, Taşlı tarlada Çiçoz kubbesinde birleştikten sonra bazı ara dağıtımlarla Süleymaniye camiine ulaşmaktadır (Şekil 2). Üzerinden Halkalı sularının birkaçının geçtiği Bozdoğan kemerinin bir söylentiye göre deprem, başka bir söylentiye göre ise Mimar Sinan tarafından yıkılarak, Şehzade camii ile Süleymaniye camii arasındaki görünüşü engellememek amacıyla ters sifon tekniği ile suyun zeminden geçirildiği belirtilmektedir (Karakuş, 2019b; Öziş & Arısoy, 1987)



Şekil 2. Süleymaniye Su Yolları'nı gösteren harita (Karakuş, F. (2019). İstanbul'daki Osmanlı Dönemi Tarihi Su Sistemleri'nin İncelenmesi, Türk Hidrolik Dergisi, 3, (1), s.18)

Kırkçeşme Su Temin Sistemi

Fatih Sultan Mehmet döneminde Haliç tarafına doğru Bozdoğan Kemeri üzerinden birçok çeşme yapılmıştır. Bu çeşmelere çok çeşme anlamında "Kırkçeşme" adı verilmiştir. Daha sonra bu isim usta mimar Sinan'ın su sistemi için de kullanılmıştır (Biçkici ve Aras, 2013). Dokuz yıllık bir çalışma sonucunda, "Kırkçeşme"[11] adı verilen su nakil sistemi inşa edilmiş

[10] Osmanlı Dönemi'nde İstanbul'un Rumeli yakasını besleyen üç büyük sistemden biri olan Halkalı suyollarının en önemlisi Süleymaniye suyollarıdır. Halkalı sistemini oluşturan suyolları alt sistemi içinde en uzun ve debisi en fazla olanıdır. Süleymaniye suyolları iki ayrı yörenin sularını Aypah ve Çınarlı olarak anılan iki kolla iletmekte, Taşlıtarlada Çiçoz kubbesinde birleştikten sonra ara dağıtımlarla Süleymaniye Camii'ne ulaşmaktadır (Karakuş, 2019).

[11] Mimar Sinan'ın bu muhteşem eseri Belgrad Ormanları'ndan Edirnekapı Maksimi'ne kadar 55.375 metre

ve şehirdeki yaklaşık üç yüz çeşmeye su sağlanmıştır. Çökeltme havuzları, örtülü yığma kanallar, filtreler, dağıtım merkezleri ve kubbeleri, su kuleleri ve büyük bir şehir dağıtım şebekesi bulunan Kırkçeşme ikmal sistemi, Osmanlı döneminde en gelişmiş olanıydı ve 590 çeşmeyi besliyordu (Dinçkal, 2008). Kırkçeşme su sistemi Bizans ve Osmanlı İmparatorluğunun önemli su temin sistemidir. Bazı yerleri restore edilmiştir (Uyumaz & Dabanlı, 2013).Kurulduğundan beri faaliyettedir. Kanuni Sultan Süleyman döneminde İstanbul'un nüfusu 175.000'e ulaşmıştır. Suyun olmaması bu dönemde büyük sorunlara yol açmıştır. Çözüm olarak Mimar Sinan tarafından Kırkçeşme Su Sistemi'nin yapımına 1554 de başlanmış 1563 yılındaki sel felaketi ile hasar gören su kemerleri onarılmıştır. Kırkçeşme suyolunun 1564 yılında tamamlandığı varsayılmaktadır (Biçkici & Aras, 2013, Karakuş, 2019; Karakuş vd. 2019). Kırkçeşme Su Sistemi, İstanbul'un kuzeyinde Eyüp ve Sarıyer İlçeleri sınırları içindeki Belgrad Ormanı'nda başlayıp Sultangazi, Gaziosmanpaşa ve Bayrampaşa ilçeleri üzerinden Fatih İlçesi sınırlarında son bulmaktadır (Karakuş vd. 2019a).

Kırkçeşme su sisteminde, beş tanesi anıtsal nitelikte olan irili ufaklı 33 adet su kemeri, dört adet bent ve yedi adet su alma ve çökeltme havuzu bulunmaktadır. Kırkçeşme Su Sistemi'nin evrensel değeri, 55 374 m uzunluğundaki boru hattı üzerinde mimari şaheserlerin eşsiz birleşiminde ve başta Mimar Sinan olmak üzere Osmanlı dönemi mimarlarının yaratıcı dehalarının yarattığı eşsiz görüntü ve mühendislik çözümlerinde yatmaktadır. Daha da önemlisi bu sistem aradan geçen zamana rağmen hala çalışmaktadır (Karakuş, 2019a; Karakuş, 2019b; Saoud, 2007; Arıkan & Aras, 2013).

İstanbul'un kuzey kesiminin su kaynaklarını doğu ayağı ve batı ayağı olmak üzere iki ayakla toplar. Doğu kolu Karanlıkbent'ten başlar, Büyükbent ve Kirazlıbent tarafından beslendikten sonra Paşa Kemeri ve Kırık Kemeri'nden (Kovuk Kemeri) geçerek Başhavuz'a gider. Kırkçeşme su sisteminin batı kısmı Ayad Bendi'den başlar ve Uzunkemer suyun Başhavuz'a nakledilir. Başhavuz'da toplanan su, Mağlova ve Güzelce Kemerleri ile Savakalar Maksemi'ye aktarılır. Savaklar Maksemi'nin suyu şehre dağıtılır. Genellikle Kırkçeşme'den geçen kanal 55*170 cm^2 kesitlidir. Her 20-40 metrede bir muayene bacası yerleştirilmiştir. Her rezervuarın çıkışına bir ölçü kutusu bölümü ve bir tortu havuzu yapılmıştır. Sediment havuzunda sudaki tortular çökeltilerek şehre giden suyun saflığı kontrol edilmiştir (Göksu vd. 2009; Biçkici & Aras 2013).

Kırkçeşme Su Sistemi boyunca; Uzun Su Kemeri, Kırık (Eğri/Kovuk) Su Kemeri, Mağlova Kemeri, Güzelce Kemeri ve Paşa Kemeri gibi anıtsal su kemerleri (Şekil 3) olmak üzere 33 su

uzunluğundadır.

kemeri ve Karanlık Baraj, Büyük Baraj (Belgratbend) Kirazlı Barajı ve Ayvad Barajı olmak üzere dört baraj bulunmaktadır (Biçkici & Aras, 2013). Kemerlerin en uzunu ve hacimlisi 711 m. uzunluktaki Uzun Kemer, en yükseği ise en yükseği ise 36 m ile Mağlova Kemeri' dir (Çeçen, 1992). Kırkçeşme Su Sistemi'ndeki su kemerlerinin mühendislik ve mimari açıdan en önemlileri Mağlova Kemeri (Muallak Kemeri) Uzun Kemer, Gözlüce Kemeri (Güzelce Kemeri) ve Kovuk Kemer (Eğri/Kırık Kemer)'dir. Bu eserlerin bir bölümünün Roma Dönemi'ne ait olduğunun düşünüldüğünü ifade eden kaynaklarda vardır (Karakuş vd. 2019).

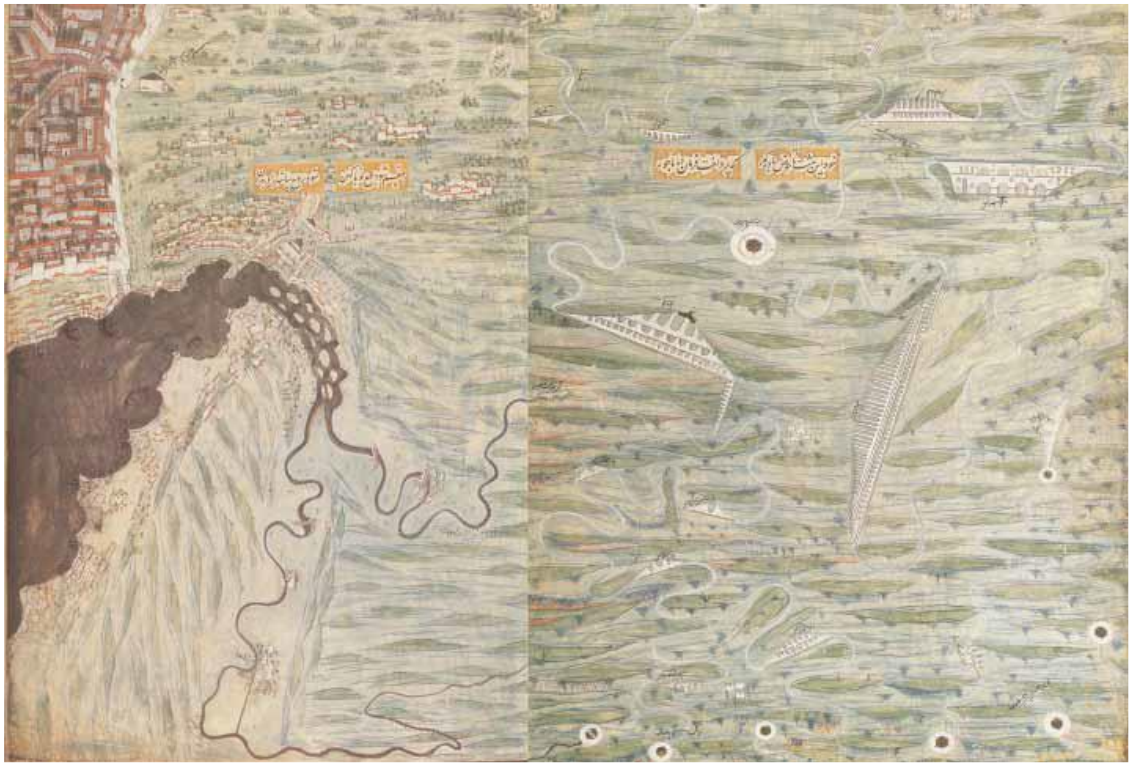


Şekil 3. Kırkçeşme su kanalları boyunca uzanan anıtsal su kemerleri **(**Biçkici & Aras, 2013). Historical Aqueducts of İstanbul and Dynamic Analysis of Paşa Kemeri Aqueduct. International. Conference: SE-50EEE, International Conference on Earthquake Engineering)

Kuban'ın kitabında da "Bu suyolu üzerindeki 33 su kemerinin bir bölümü Türk-öncesi temeller üzerinde kurulmuş bir bölümü Sinan tarafından yapılmıştır. "ifadesi yer almaktadır (Kuban, 2017, s.343). Kırkçeşme sistemi hakkında bazı önemli referanslar eski kütüphane arşivlerinde görülmektedir. İlk ve en eski referans Topkapı Sarayı Müzesi'ndeki III. Ahmed kütüphanesinde bulunan harita Mimar Sinan'dan önceki en eski eskiz olarak bilinir (Şekil 4) (Uyumaz & Dabanlı, 2013).

Saatçi'nin "Mimar Sinan'ın su mühendisliği" adlı eserinde "Kırkçeşme isale hattı üzerindeki kemerlerin Bizans dönemine ait olduğu yolunda, özellikle yabancı literatürlerde verilen bilgilerin, yapılan araştırmalar sonucu tamamen yanlış olduğu ortaya çıkmıştır. Konunun otoritesi olan Kazım Çeçen'in araştırmalarına göre, Roma devrinden kalan bir iki yerdeki temel ve temele yakın duvardan başka, bütün tesisin Osmanlı yapısı olduğu saptanmıştır.

Özellikle Mağlova Kemeri'nde bir taşın bile Roma veya Bizans devrinden kalmadığı, bu dünya şaheserinin tamamen Sinan eseri olduğu anlaşılmıştır." ifadesi yer almaktadır[12]



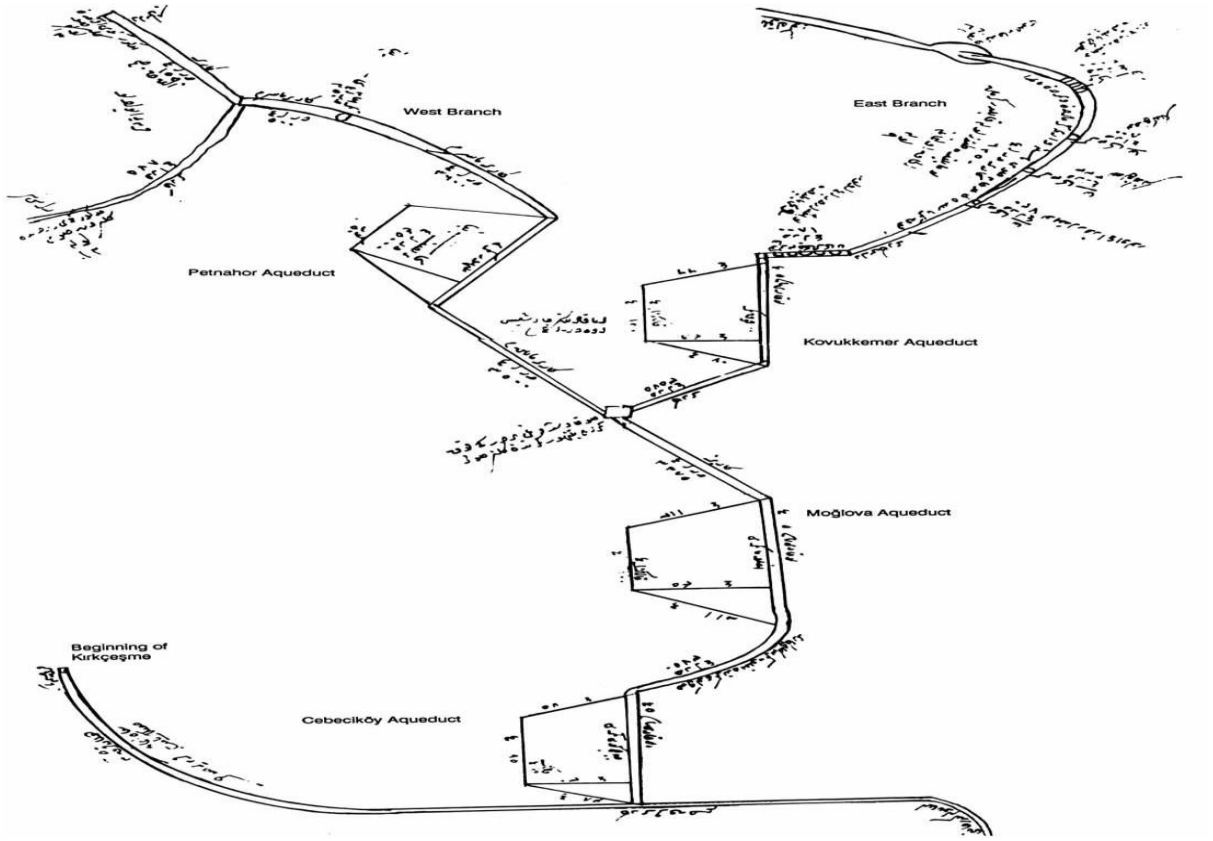
Şekil 4**.** En eski Kırkçeşme su hattı sistem haritası (The Chester Beatty Library MS 413) (Uyumaz & Dabanlı, 2013). Architect Sinan's Kırkçeşme water supply system outside the city of Istanbul and city network. Water Science and Technology: Water Supply, 13(3), 626-637.)

Bir diğer önemli referans ise "Tezkiretü'l Ebniye"[13] 'dir Mimar Sinan'ın eskizi Sai Çelebi[14] yazılarında yer almaktadır. Sistem olarak başlangıç zamanı veya periyodu ve sistem bileşenleri hakkında kilit bilgiler içermektedir (Şekil 5) (Uyumaz & Dabanlı, 2013).

[12] Saatçi, S. Mîmar Sinan'ın su mühendisliği. https://www.zdergisi.istanbul/makale/mimar- sinanin-su-muhendisligi-100 .Erişim Tarihi:16.06.2021.

[13] Tezkiretü'l-ebniye (Yapılar Kitabı), Sai Çelebi tarafından Mimar Sinan'ın ağzından nazım ve nesir olarak kaleme alınan bu eserde Mimar Sinan'ın hayatı ve yapılarının adları çeşitlerine göre on üç bölüm halinde verilmektedir. Kırkçeşme detaylarınıda içerir (*URL1:*https://islamansiklopedisi.org.tr/sai-mustafa-celebi).

[14]Sai Çelebi ; Osmanlı şair, nakkaş (ressam) ve biyografi yazarıdır (d.?-ö.1595, İstanbul). Çocukluk arkadaşı Mimar Sinan'ın biyografisini kaleme aldığı eserler ile tanınmıştır. Şair ve pek çok binanın kitabe yazarıdır. Tezkiret-ül Bünyan ve Tezkiret-ül Ebniye (Yapılar Kitabı) adlı kitapları Sinan'ın kendi anlatımıyla yazmıştır (*URL2:*https://tr.wikipedia.org/wiki/Sai_Mustafa_Celebi).



Şekil 5. Mimar Sinan'ın çizdiği Kırkçeşme içme suyu hattı krokisi (Çeçen 1996).

Bazı Kaynaklarda kırkçeşme sisteminde Bizansın varlığının gösterildiği ifade edilmektedir (Crow, 2012; Uyumaz & Dabanlı, 2013). Hem mimarisi hem de mühendislik tarzları ile önemli olan Kırık Kemer su kemeri nin ufak bir bölümü Bizans çağlarında inşa edilmiştir (Uyumaz & Dabanlı, 2013).

Sinan'ın mühendislik bilgisini ortaya koyan en büyük eseri Kırkçeşme su tesisidir[15]. Saatçi çalışmasında; Kırkçeşme su tesislerinin yapımına başlamadan önce, Sinan'ın bu alanda ileri düzeyde bilgi ve deneyim sahibi olduğunu, Kanuni Sultan Süleyman'la olan görüşmesinden de anlamak mümkündür. Sinan, Kanuni'nin huzurunda: ''Padişahım, suyolları yapılmasında özel ihtisasım vardır.'' diyerek iddiasını ortaya koyduğunu yazmıştır.[16]

Kırkçeşme Su İletim Sistemi Hakkında Önemli Görüşler

Bu kadar büyük bir tesisin dokuz senede tamamlanmış olması, o devirde organizasyonun ne kadar mükemmel olduğunun bir kanıtıdır. Kırkçeşme tesisi su alma, çökeltme havuzu, üstü kapalı kanallar, galeriler, kum yıkama tertibatı, kemerler, havuzlar, maksemler, dağıtma

[15] Öziş Çalışmasında Kırkçeşmenin Sinan'ın hidrolik mühendislik dehasının en önemli kanıtı olduğunu belirtmiştir, (Özis 1988)

[16] Saatçi, S. Mîmar Sinan'ın su mühendisliği. https://www.zdergisi.istanbul/makale/mimar-sinanin-su-muhendisligi-100 .Erişim Tarihi:16.06.2021.

şebekesi, su terazileri, debi ölçme tertibatı ve çeşmeleri ile çok sağlam ve teknik yönden mükemmel bir su tesisidir (Çeçen, 1992).

Klasik devirde ve Roma devrinde de çok büyük su tesisleri yapılmıştır. Ancak Sinan'ın yaptığı bu tesis, hepsinden mükemmel, sağlam ve eksiksizdir. 425 seneden fazla bir zamandan beri arızasız çalışması da bunu doğrulamaktadır. Çeçen'e göre "Bugünkü Kırkçeşme tesislerinin bütün parçalarının Osmanlı eseri olduğundan hiç şüphe yoktur. Yalnız bazı yerlerde Roma devrinden kalan tesislerin temellerinin kullanılmış olması ihtimal dâhilindedir" (Çeçen, 1992).

Mimar Sinan'ın yaşadığı çağ ve döneminden sonraki mimar ve mühendisler üzerindeki etkilerine değinen Prof. Dr. Suphi Saatçi, Sinan'ın eserlerini verdiği dönemde miras olarak devraldığı eski devir Osmanlı mimarlığının mühendislik yaklaşımlarını ve mimarlık anlayışını geliştirerek çok büyük adımlar attığını söylemiştir. Bir mühendislik harikası olan Kırk Çeşme Su Tesisinin, Osmanlı medeniyetinin dünya çapında bir projesi olduğunu vurgulamıştır. Sinan 16. yüzyılda İstanbul'da yaşanan su sorununu çözdüğünü aktaran Saatçi, Sinan'ın projeyi İstanbul'a binde bir meyille su sevk ederken ne elektrik enerjisi ne yakıt ve ne de herhangi enerji kaynağı kullanmadığını söyler. Bu isale hattı, günümüzde hala işlevselliğini sürdürmektedir. Saatçi ye göre bu tesisin önemli parçaları olan Kırık (Eğri) Kemer, Uzun Kemer ve özellikle Mağlova Kemeri dünyada eşi benzeri olmayan bir mimarlık ve mühendislik şaheseridir. Önemli bir ulusal değer olarak korunmaları elzemdir (Saatçi, 2020).

Önemli Su Kemerleri

Paşa Kemeri

Paşa Kemeri (Şekil 6), 1554-1564 yılları arasında Mimar Sinan tarafından yapılmıştır. Bahçeköy-Kemerburgaz orman yolu üzerinde bulunan bu su kemeri Balıklızade Kemeri olarak da bilinen Paşa Kemeri Kırkçeşme Su Sisteminin önemli bir parçasıdır. Paşa Kemeri Kemeri, İstanbul'a su sağlayan Kırkçeşme isale sistemi içindeki beş büyük su kemerinden biridir. Paşa Kemeri Su Kemeri o zamandan beri kullanılmaktadır ancak taşları bozulmuş ve çevresel değişimlerden etkilenmiştir (Arıkan & Aras, 2013; Çeçen, 1992).

Bahçeköy-Kemerburgaz arasındaki orman yolu üzerinde bulunan Paşa Su Kemeri, Paşa Çayı üzerinde yer almakta olup iki katlı kemer sistemine sahiptir. Yapının net uzunluğu 102 metre, yüksekliği ise 14.70 metredir. Su kemeri üzerinde 13 adet kemer bulunmaktadır. Kemerlerin her birinin genişliği 5 metredir (Biçkici & Aras 2013)

Biçkici ve Aras' ın İstanbul'daki tarihi su temini yapılarının incelenmesi amacıyla yaptıkları çalışmalarında büyük mimar ve mühendis Sinan tarafından 55.374 metre suyolunun bir

parçası olarak 1554-1564 yılları arasında yaptırılan Paşa Kemeri üzerinde de durulmuştur. Kemerin sayısal modeli Sonlu Elemanlar Metodu ile yapılmıştır. Su kemerinin dinamik özellikleri sayısal dinamik analizlerle ortaya konmuştur (Biçkici & Aras, 2013). Paşa Su Kemerinin yapısal davranışı sonlu elemanlar sayısal modeli kullanılarak incelenmiştir. Yapı SAP 2000'de modellenmiş ve dinamik davranış incelenmiştir. Bu çalışmada su kemerinin depreme bağlı şiddetli sarsıntılardan fazla etkilenmeyeceğini kanıtlamıştır (Biçkici & Aras, 2013).



Şekil 6. Paşa Kemeri (Biçkici & Aras, 2013). Historical Aqueducts of İstanbul and Dynamic Analysis of Paşa Kemeri Aqueduct. International. Conference: SE-50EEE, International Conference on Earthquake Engineering)

Mağlova Su Kemeri

Mağlova Su Kemeri'nin Özellikleri

Mağlova Su Kemeri 258 metre uzunluğundadır (Şekil 7) Kırkçeşme Su Sistemi'nin doğu ve batı hatlarından gelen su Başavuz'da birleşip güneye doğru devam ederek Mağlova Su Kemeri yardımıyla Alibey Deresi'nden geçmektedir. Mimar Sinan, yaptığı Tezkiretü'l Ebniye'deki su kemerlerini sayarken bu kemerin adını Mağlova veya Muğlava şeklinde yazmıştır. Tezkiretü'l Bünyan[17] adlı eserde bu su kemerinin adı Muallak kemer olarak geçmektedir (Çeçen, 1998). Mağlova Su Kemeri, üstte ve altta dört büyük açıklık ve yanlarda daha küçük bir açıklık olmak üzere toplam 16 kemerden oluşmaktadır. Bu su kemerinde yayaların geçmesi için yaya geçidi yapılmıştır. Geçidin iki yanında dairesel bir kemerle örtülü iki giriş vardır. Büyük kemerin dayandığı beş ayağın her birinde üçer adet aydınlatma kemeri bulunmaktadır. Böylece Mağlova Su Kemeri üzerindeki toplam kemer sayısı 33'tür (Karakuş, 2019). Mimar Sinan, Tezkiretü'l Bünyan'da temelin derinliğinin 13,5 metre olduğunu bildirmiştir. Üst kemerin kalınlığı 3.05 m, alt kemerin kalınlığı 4.05 metredir. Mimar Sinan'ın yaptığı bu su

[17] Tezkiretü'l Bünyan (Türkçe: Yapılar Kitabı), Mimar Sinan'ın arkadaşı şair ve nakkaş Sai Mustafa Çelebi tarafından Mimar Sinan'ın ağzından yazılan, Mimar Sinan'ın hayatını ve eserlerini anlattığı eserdir*(URL3)*.

kemeri her dönem için bir mühendislik ve mimarlık şaheseridir (Karakuş, 2019). Kuban'ın kitabında "Kırkçeşme isale sistemi içindeki sukemerlerinin tasarım açısından en önemlisi olan Mağlova (Muallak) Su Kemeri'nin bazı kemerleri 1563 su baskınında tahrip olmuş, 1563-64 yıllarında Sinan tarafından yeniden yapılmıştır. Bu ikinci aşamada kemer, yeni bir tasarımla yenilenmiş de olabilir" ifadesi yer almaktadır (Kuban, 2007, s. 343).



Şekil 7. Mağlova Su Kemeri (Karakuş, 2019). A Study on Mimar Sinan's Magnificent Work 'Maglova Aqueduct'. Proceedings of The World Conference on Engineering and Technology)

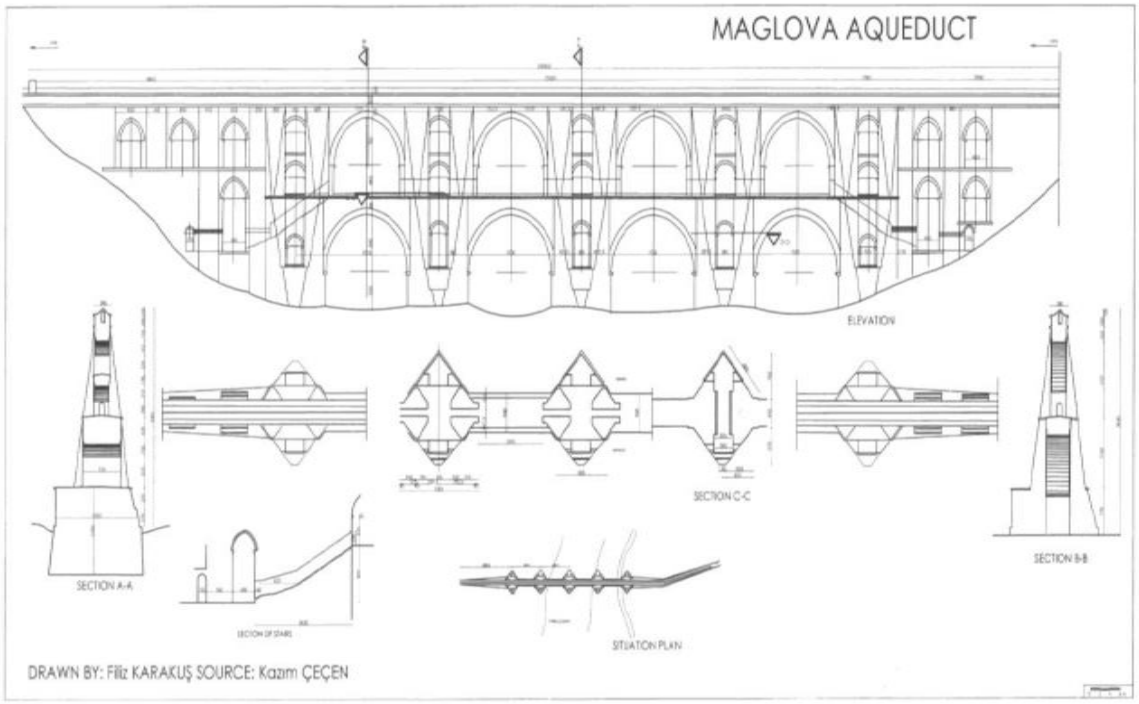
Çeçen'e göre Mağlova Kemeri'nin inceliği, haşmeti ve mühendislik bakımından önemi o tarihe kadar yapılan bütün köprü ve su kemerlerinin hiçbiri ile kıyaslanamaz. Camiler arasında Süleymaniye ve Selimiye'nin önemi ne ise, köprüler ve su kemerleri arasında Mağlova Kemeri'nin önemi odur. Kemerin geometrik yapısı büyük bir mühendislik maharetinin sonucudur. Sellerin ayaklar önünde oyuntu yapmaması için ayakların memba tarafına özel bir şekil verilmiştir (Çeçen, 1992).

Saatçi'nin ifadesine göre "Kırkçeşme tesisinin en göze çarpan parçaları, su kemerleridir. Aslında dereleri ve vadileri aşmak için birer viyadük olan bu kemerler, suyun geçişini sağlayan birer köprü işlevi görmektedirler. Kemerler mimari açıdan büyük değer taşırlar. Özellikle bir okuma yanlışlığı sonucunda Mağlova Kemeri diye adlandırılan ve aslında "Asma Kemer" anlamına gelen "Muallak Kemer", hem mühendislik alanında hem de mimari anlamda bir şaheserdir" (Saatçi, 2020).

Uzunkemer, Kovukkemer ve Güzelcekemer'de Mimar Sinan, tabandan yukarıya doğru ayak kalınlıklarını azaltarak yatay kuvvetlere dayanıklı bir yapı oluşturmuştur. Mimar Sinan, Mağlova Kemeri'n de büyük su basıncına karşı sadece gövde hacminin kütlesel ağırlığıyla

karşı koyacak şekilde bir yapı inşa etmek yerine, alışılmış su kemer biçimlerinden farklı olarak, karmaşık bir geometrik yapı kullanılmıştır (Şekil 8) (Birinci, 2017, s.588). İlginç bir rota izleyerek kemerin ağırlığını çok küçük tutarak hafifletip, ayakları piramit şeklinde ve kemerlere dik yönde uzatarak stabilitesini arttırmıştır. Bu bacakların ağırlıklarını azaltmak için her birinin üzerine üçer adet yıldırım kemeri yapılmış ve bir afet durumunda bu açıklıklar yanlarında bulunan piramit şeklindeki bacakların üçgen uçları suyun akışının geçebilmesi için yapmıştır (Karakuş, 2019). Bu mühendislik çözümü zamanın bilgi birikimin önünde yer alması bakımından önemlidir (Birinci, 2017, s.588).

Mağlova Kemeri'nde vadinin ortasından iki katlı dört kemerle geçilir. Kemerlerin açıklıkları 16,75 m, üst kemerler 13,45 m'dir. Bu çözüm ile stabilite artırılır ve estetik güzellik sağlanır. Mağlova Su Kemeri'nin 115,45 metre uzunluğundaki orta bölümünün dışında, temele doğru yan alanlarda duvar kalınlığı artmaktadır. Fakat tüm duvarın görünümünü ortadan kaldırmak ve rüzgârın etkisini azaltmak için her iki duvara da 4,5 m açıklıklı dört kemer inşa edildi (Karakuş, 2019,). Mağlova Kemeri, Alibey Barajı suları altında kalarak hasar görmüştür. Dünyada eşsiz bir mimari ve mühendislik anıtı olan Mağlova Su Kemeri'nde bilinçsizlik, bayındırlık, yanlış politikalar ve planlama hataları nedeniyle yapıda meydana gelen değişiklik ve bozulmalar tespit edildiği bildirilmiştir (Karakuş, 2019).



Şekil 8. Maglova Su Kemeri Rölöve Çizimleri (Karakuş, 2019). A Study on Mimar Sinan's Magnificent Work 'Maglova Aqueduct'. Proceedings of The World Conference on Engineering and Technology)

Uzun Kemer

Kırkçeşme suyunun batı kolundaki en büyük sistemdir. Hat iki katlı olup 25 m yüksekliğinde 711 m uzunluğundadır (Şekil 9) Uzun Kemer'de ikinci kat 50 kemerlidir, birinci katta ise 47 kemer vardır. Sayılar akış yönüne göre kemerlere verilir. Suyun yönündeki değişiklik üzerinde görülebilir. 23. ve 24. Kemerlerin galeri ölçüsü 60 cm genişlik ve 175 cm yüksekliğinde olup galerinin içi harç ile sıvalıdır bazı kısımları tahrip olmuştur. Uyumaz ve Dabanlı'nın "Architect Sinan's Kırkçeşme water supply system outside the city of Istanbul and city network. Water Science and Technology: Water Supply" isimli makalelerinde "Kemerin inşası ile ilgili tartışmalı bir durum yoktur. Fakat kemerdeki bazı taşlar geç Bizans dönemine aittir. Açıktır ki uzun kemer Osmanlı dönemine aittir ve bir Sinan yapısıdır. Bunun

kanıtı da yapıyı saklama metodu ve kemer bağlantı stillerinden anlaşılabilir" ifadesi yer almaktadır (Uyumaz & Dabanlı, 2013).



Şekil 9. Uzun Kemer (Url 4)

Güzelce Kemer

Güzelce Kemeri, Cebeciköy deresi üzerinde yer almaktadır. Üstte 11, altta 8 kemerli olmak üzere iki katlı olarak inşa edilmiştir. Kemer açıklıkları yaklaşık 5,90 m'dir. Hepsi 16. yüzyıl Osmanlı İmparatorluğu'nun karakteristik sivri uçlu kemerleridir (Arıkan & Aras, 2013.) Güzelce Kemer (Şekil 10) temelden dikey daralan payandalara sahiptir. Mağlova su kemeri gibi piramidal bitişlidir. Ayakların ortalama kalınlığı 3.26 m ve üçgendir (Uyumaz & Dabanlı 2013,).



Şekil 10. Güzelce Kemer (Url5)

Kırık / Eğri Su Kemeri (Kovuk kemer)

Kırık Su Kemeri, 207 metre uzunluğunda ve 35 metre yüksekliğinde üç kademeli bir su kemeridir. Kemerlerden üçünün geç Roma dönemine ait olduğu ancak diğerlerinin daha sonra yapıldığı bilinmektedir. Bu su kemeri 33 yarım daire kemer ve 14 sivri uçlu kemere sahiptir. Sivri uçlu kemerlerin Osmanlı İmparatorluğu'nun 16. yüzyılda yapıldığı bilinmektedir (Arıkan & Aras, 2013.)

Kırkçeşme Su Sistemindeki su kemerleri arasında kökenini belirlemekte güçlük çekilen tek su kemeri Eğri Su Kemeri'dir (Kovukkemer) (Şekil 11). Kırkçeşme Su Sistemi'ndeki tüm yapılar Osmanlı yapıları olmasına rağmen Kovukkemer'in tamamen Osmanlı olduğunu söylemek güçtür. Çeçen'e göre büyük ihtimalle Kovuk kemerin 2. Katı aşağı bölmelerine kadar yıkılmış ve 2.katın yıkılan kısımları ile 3.katın tamamı Mimar Sinan tarafından yeniden inşa edilmiştir (Karakuş vd., 2019).

Uyumaz ve Dabanlı makalelerinde "Pek çok kaynakta kırık kemerde Sinan'a atıf da bulunulmamaktadır. Ancak bu kemerin muhtemelen Sinan tarafından yapıldığı açıktır. Osmanlılardan önce de Valens veya Theodosius tarafından aynı yerde baraj yapılmıştır. Daha sonra bu yapı İstanbul'un Fatih tarafından fethinden sonra yıkılmıştır. Sinan yapısı olduğunun bir diğer önemli kanıtı, 16. yüzyıl kemer tipi Osmanlı üslubunu yansıtmasıdır" şeklinde ifade etmişlerdir (Uyumaz & Dabanlı 2013,s.632).



Şekil 11. Eğri Kemer(Kovuk Kemer) (Karakuş, Urak, Özcan, 2019). Analysis and Typology Studies on Aqueducts in Historical Kırkçeşme Water System. Online Journal of Art and Design, 7(5), 22-37.)

Kırkçeşme Su Sistemindeki Su Kemerlerinin Analizi ve Tipolojisi

Yapılan analizlerin değerlendirilmesi sonucunda İstanbul Kırkçeşme Su Sistemindeki su kemerleri yerinde tespitlerden yararlanılarak, tarihi bilgi, belge ve ilgili kaynaklar,

bulundukları dönem yapımı, kolları, genel özellikleri, mimari özellikleri, yapısal sistemi özellikleri ve yapı malzemesi tipolojik özellikleri belirlenmiştir. İncelenen su kemerlerinden 31'i (%93,94) Kanuni Sultan Süleyman tarafından yaptırılmıştır (Karakuş vd. 2019,).

Yığma Köprüler

Büyükçekmece Köprüsü

Sinan'ın yaptırdığı köprülerden Ergene üzerindeki Alpullu' nun ana kemeri 20 m, Büyük Çekmece Gölü üzerinde dört kırık hattan köprünün uzunluğu 635 m'dir. Büyükçekmece köprüsü (Şekil 12), eser sayısı 500'e yaklaşan Sinan'ın saygın altı saygın eserinden biridir (Baykan vd. , 2011). Büyükçekmece Köprüsü 1567 yılında kullanıma açılmıştır (Ritchie, 2016). Kendine has formu ile inşa metodu yanında ahşaplarla desteklenmiş taş temellerden oluşmuştur. Tasarım Sinan'ın sanatsal yönü ve mühendisliğindeki yeteneğinin öne çıktığı köprülerindendir. Bu köprünün halen işlevini sürdürmesi de Sinan'ın mühendislik yeteneğinin kanıtıdır (Özgüleş, 2003). Ritchie yayınında Büyükçekmece Köprüsü konseptinin Sinan'ın estetik dehasını ve hidrodinamik konusundaki derin bilgisini ifade etiğine vurgu yapmıştır (Ritchie, 2016,). Yarı hidrolik yapılar olarak sayılabilecek bu köprüler, modern köprü açıklığı belirleme tekniklerimizin düzeltilmesi konusunda fikir vermenin yanı sıra yeni yöntemler oluşturmamıza da yardımcı olabilir (Baykan vd., 2011).



Şekil 12**.** Büyükçekmece köprüsü (Baykan, Alkan, Ozdemir, Baykan, Ozis, 2011). Ottoman Masonry Bridges in Anatolia and the Balkans. International Balkans Conference on Challenges of Civil Engineering. BCCCE, EPOKA University, Tirana, Albania)

Sinan Tarafından Yapılan Diğer Önemli Su Yapıları

Edirnekapı'da 1565 yılında yapılan Mihrimah Sultan Camii ve külliyesine su ileten Mihrimah suyolu, 1548 yılında tamamlanan Üsküdar Mihrimah Sultan Camii ve külliyesi, 1583 yılında inşa edilen Top taşı Atik Valide ve külliyesini besleyen suyolları yine Sinan'ın bilinen önemli su yapıları arasındadır (Güngör, 2021).

Mimar Sinan'ın Su Yapılarındaki İnovasyonları

Özgüleş çalışmasında Roger'e atıf yaparak onun Mimar Sinan'ın mühendisliğinin inovatif olduğunun söylenebileceğini vurguladığını ve Köprü ve kemerlerin Sinan'ın iki büyük tarihi mirası olarak değerlendirildiğini bildirmiştir (Özgüleş, 2003).

Kuban kitabında "Osmanlı tarihinde efsaneleşen tek sanatçı Sinan'dır. Onun için hazırlanan ikinci vakfiye de ünlü mühendislerin gözbebeği, büyük kurucuların süsü, çağının bilginlerinin ve bütün çağların ustası, çağının Öklid'i, sultanın mimarı ve İmparatorluk'un hocası olarak tanımlanmıştır" bilgisine yer vermiştir (Kuban 2007, s.256). Kuban kitabın da "Osmanlı Hassa Mimar başının çağının en büyük mühendisi ve matematikçisi diye yüceltilmesi, matematikle mimari arasındaki geleneksel ilişkinin, bir klişe olarak kalmış olsa bile, hala değişmediğini gösterir. Sinan geometriyi kuramsal olarak değil, fakat pratikte öğrenmiş olmalıdır" ifadesi yer almaktadır (Kuban 2007, s.256). Saoud çalışmasında "Sinan'ın eserlerindeki mimarı ve topografya uyumunun 16. Yüzyıla kadar Avrupa'da bulunmadığını" söylemiştir (Saoud,2007 s.9).

Sinan sadece camileriyle değil, büyük külliye kompozisyonları, bu külliyelerdeki medrese ve diğer yapı planlamaları ve bu yapılar dışında İstanbul'un su gereksinimi için gerçekleştirdiği Kırkçeşme sistemi ile de çağının en büyük mühendisi olarak ün kazanmıştır. Bu faydacı yapılar içinde Büyükçekmece Köprüsü ve özellikle Mağlova Su kemeri tasarım kaliteleri bakımından büyük cami yapılarıyla eşdeğerde estetik nitelikli yapıtlardır (Kuban 2007, s.256; Ozgüles 2008, s.23).

Sinan'ın Su Yapılarındaki Mimarlık ve Mühendisliği

İngiliz Mimar Ian Ritchie Sinan üzerine makalesinde "Sinan, mühendislik ve mimarlık arasındaki sınırları belki de oldukça masum bir şekilde ortadan kaldırıyordu" ifadesini kullanmış ve onu muazzam bir zekaya ve hayal gücüne sahip, bitmek bilmeyen bir merakı ve arzusu olan bir adam olarak tanımlamıştır (Ritchie, 2016). Ritchie'nin bu ifadesine benzer şekilde Saatçi'de "Sinan yapılarının değerini kavrayabilmek için strüktürel biçimin, estetik düşünceyle bağını ve strüktürü güçlendiren her öğenin, estetik biçimin bir parçası olduğunu kavramak gerekir. Nitekim köprü ve su kemeri gibi tek işlevi olan mühendislik yapılarında bile Sinan'ın estetik kaygıyı göz ardı etmediği görülmektedir"[18] şeklinde görüşünü sunmuştur. Karakuş' da Mimar Sinan'ın bir mühendislik dehası olduğunu gösteren eserler meydana getirdiğini ve 16. yüzyılda İstanbul'un su sorununu çözdüğünü bildirmiştir (Karakuş, 2019).

[18] Saatçi, S. Mimar Sinan'ın su mühendisliği. https://www.zdergisi.istanbul/makale/mimar-sinanin-su-muhendisligi-100 .Erişim Tarihi:16.06.2021.

Prof. Dr. Suphi Saatçi, Sinan'ın yaşadığı dönemde miras olarak devraldığı erken devir Osmanlı mimarlığının yapım teknolojisini ve mimarlık anlayışını geliştirerek çok büyük adımlar attığını söylemiştir. Mimar Sinan'ın yaşadığı çağ ve kendisinden sonra gelenler üzerindeki etkilerine değinen Saatçi, "Özellikle hem tasarım alanında hem de yapısal kuruluş açısından taşıyıcı düzenini mühendislik birikimi sayesinde çok ileri düzeye götürdü. Hem sürekli hem noktasal taşıyıcı elemanları, yapı detaylarını yeni çözümlere götürerek Osmanlı mimarlık tarihinde büyük bir devrim yaptı. Bu yanı ile Sinan hem Osmanlı coğrafyasında hem de dünya mimarisinde Osmanlı mimarisinin özgünlüğünü ortaya koymuş oldu." diye ifade etmiştir.[19]

Ömrünün yaklaşık 30 yılını Mimar Sinan'ı tanımaya ve eserlerindeki detayları gün yüzüne çıkarmaya adayan Okumuş, Sinan hakkında kitabında, "Sinan söyledikleri gibi sadece mimar değil, o nedenle Sinan'a mimar demek onu mimarlığa mahkûm etmektir. Çünkü Sinan bir filozoftur, filozofların da unvanı yoktur. Onun için ona Sinan demelisiniz. Mesela Einstein isimli birçok insan vardır ama Einstein denildiğinde biz sadece bilim adamı olan Einstein'ı anlarız." değerlendirmesini yapıyor, Sinan'a "Mimar Sinan" denilmesini doğru bulmadığını ifade ediyor. "Mimar Sinan'ın bilimsel bulguları bugün kimse tarafından bilinmiyor ve de kullanılmıyor." diyen Okumuş, üniversitelerde Sinan'ın bilgilerinin aktarılacağı "Mimar Sinan Mühendisliği" bölümlerinin açılabileceğini söylemektedir (Okumuş, 2020).

Birinci, makalesinde "Sinan, zemin-temel (Geoteknik), yol-köprü-tünel (Ulaştırma), hesaplama-malzeme seçimi (Yapı-Mekanik-Yapı Malzemesi), su yapıları (Hidrolik), her türlü bina-yaşaması için kullanım şekillerinin temini dahil (Yapı İşletmesi) yaptığına göre, bunlar da inşaat mühendisliği için en geniş tanımlı anabilim dalları olduğundan, tam bir inşaat mühendisidir" ifadesini kullanmıştır (Birinci, 2017, s.586).

Büyük Türk Mühendisi ve Mimarı Sinan'ın dehasının ve eserlerinin mimarlık ile güzel sanatlar alanlarındaki evrensel önemi gerek ulusal, gerekse uluslararası ortamlarda yıllardır ele alınıp, ortaya konulduğu halde, inşaat mühendisliği alanındaki evrensel önemi üzerinde ancak son yıllarda ciddiyetle durulmaya başlanmıştır. Sayıları çok fazla olmamakla birlikte, bugün hepsi ayakta durmaktadır. Ana taşıyıcı unsuru kemerler olan yol köprüleri önemli yollardan kritik geçişleri sağlayan, bazılarının temellerinin inşaatı önemli özellikler gösteren, bütünüyle inşaat mühendisliğinin yapı, ulaşım ve geoteknik alanlarının tarihi gelişiminde özel

[19] Saatçi, S. Mimar Sinan'ın su mühendisliği. https://www.zdergisi.istanbul/makale/mimar-sinanin-su-muhendisligi-100 .Erişim Tarihi:16.06.2021.

bir yeri olan eserlerdir (Öziş 1991, s.38; Öziş vd.1997,). Yarı hidrolik yapılar olarak sayılabilecek bu köprüler, modern köprü açıklığı belirleme tekniklerimizin düzeltilmesi konusunda fikir vermenin yanı sıra yeni yöntemler oluşturmamıza da yardımcı olabilir. Ayrıca bu köprülerin malzemelerin sağlamlığı, tasarımın dayanıklılığı ve sürdürülebilirliği de test edilebilir (Baykan vd. 2011).

Değerlendirme ve Sonuç

Mimar Sinan'ın sadece su yapıları incelendiğinde bile onun sıra dışı ve zamanı aşan bir bilim ve sanat insanı olduğu rahatlıkla söylenebilir. Günümüzün hidrolik mühendisleri, sadece yapıların tasarımını değil aynı zamanda suyun, havanın ve zeminin etkileştiği doğa olaylarını anlamak ve bunlara çözüm üretmeye de çalışmaktadır. Sinan'ın yaşadığı dönemde tüm bunları büyük ölçüde dikkate almış olması eserlerindeki mimari ve topografya uyumu dikkate değer derecededir.

Sinan'ın suyollarında özellikle bazı kemerlerin Bizans döneminden kaldığı ya da Sinan tarafından restore edildiği bazı kaynaklarda iddia edilmekle birlikte daha yoğun olarak araştırmacıların görüşleri bu eserlerdeki Bizans etkisinin yok denecek kadar az olduğu ya da hiç olmadığı yönündedir. Bu konunun netlik kazanmasının yapılacak kapsamlı araştırma ve analizlerle günümüz şartlarında mümkün olacağı düşünülmektedir.

Kuşkusuz Sinan'ın çağının su sorunlarının çözümüne büyük katkı sağlayan ve günümüze kadar gelen ve önemli bir kısmi hala çalışır durumdaki su yapıları onun mimarlık ve mühendislikte çağının çok önünde bir dehaya sahip olduğunun kanıtıdır.

Günümüz teknolojisi ile bu yapıların nitelik ve niceliğinin tespitine yönelik yapılacak olan projeler ve çalışmalar bu eserlerin içinde sakladığı gizleri ortaya çıkararak bizleri daha da hayrette bırakacak sonuçlar sunabilir. İnşa edildikleri dönemin alt yapı teknolojisine ait belge niteliği taşıyan bu yapıların uygun yöntemlerle korunması, gerekiyorsa güçlendirilmesi ve geleceğe güvenle devredilmesi önemlidir. *"Eğer Sinan'ın mühendisliğini, mimarisini, yaratıcı yeteneğini ifade edecek bir kelime varsa o da "akış" tır. Hayatı, bir dere olarak başlayıp, kollarını toplayan ve büyüyerek, üzerinde bulunduğu araziyi şekillendirerek biten bir nehir gibiydi."* IAN RITCHIE.

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Investıgation of the Use of Bio Based Plastic Material in the Construction Industry: Samples of Mycelium-Based Building Material

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Abstract

As a result of the life cycle evaluations of various materials used in the construction industry, the understanding of their negative effects on the environment has led to the search for new materials. It is one of the materials frequently used in the plastic construction industry. The first plastics produced consisted of bio-based materials. The discovery of petroleum-based plastics has eclipsed natural-origin plastic alternatives. Petroleum-based plastics have been preferred for reasons such as being cheaper, being produced quickly, being easily shaped, and enabling different alternative plastic types. The emission of carbon dioxide gas that occurs during plastic production, the fact that it is very difficult to recycle, turning into micro-plastics when it completes its life cycle, threatening human and environmental health for a long time has led to the research of environmentally friendly plastic production. Bio-based / biodegradable plastics are the leading eco-friendly alternatives. Bio-based plastics are plastics produced with bio-based raw materials such as starch, fungus, gelatin, without the need for synthetic materials. Most bioplastics can be composted, biodegradable and biodegradable in a short time. In this study, the use of bio-based plastics in the construction industry was examined and classified according to their raw materials. Bioplastics used in the construction industry can be examined in four categories: mushroom-based bioplastic, starch-based bioplastic, cellulose-based bioplastic, and organic waste-based bioplastic. The study focuses on mushroom-based bioplastics. While mentioning examples of mushroom-based bioplastics, its contribution to construction production and technologies is evaluated and examples of use in the sector are given.

Keywords: bioplastic, mycelium-based bioplastic, innovative building materials.

Introduction

Plastic production causes an annual average of 400 million tons of carbon dioxide gas emissions. A plastic product breaks down and after became millions of invisible microplastics and mixes with nature. Micro plastics pose a serious danger to the health of all living things because they contain toxic substances, can be swallowed by living things, cannot be filtered in waste water treatment plants, are easily transported in water sources and disappear in nature for a very long time (Yurtsever, 2018).

It is claimed that only 9% of the plastics produced can be recycled, but this is not recycling but is defined as downcycle because recycled plastics lose quality. If we define recycling as recycling without loss of quality, only 2% of plastics can be recycled in this way (Web 1). The rest is incinerated, buried or released to nature under suitable conditions. Non-recyclable plastics threaten nature and human health. Due to all these negative effects, various industries, especially the packaging industry, turned to environmentally friendly alternatives.

Bio-based plastics are one of the leading eco-friendly alternatives. Bio-based plastics are plastics produced with bio-based raw materials such as starch, fungus, gelatin without the need for synthetic materials. Bioplastics can be composted, biodegradable and can be degraded in a short time in nature. Although studies on bioplastics were initially aimed at single-use plastics, they started to be used in the construction sector with the discoveries of new materials.

Starch, algae, fruit peels, fish skin, shrimp and mushroom are biomass widely used in making bioplastics (Kıyga O, 2022).

The underground mycelium of fungi is very suitable for use as a raw material in the production of bioplastics. Since the mycelium also acts as an adhesive, it acts as a binder to other materials used in making bioplastics. The rapid growth of fungi, their resistance to high heat and pressure, and their low cost production have led to a trend towards fungi in the bio-based plastics industry.

In this study, the use of bio-based plastics in the construction industry was investigated. The study focuses on mushroom-based bioplastics. While mentioning the mushroom-based bioplastic examples, its contribution to construction production and technologies was evaluated and usage examples in the sector were given.

Bio Based Plastics

According to TDK (Turkish Language Society), the word plastic means "material that is formed by the effect of heat and pressure, made organically or synthetically". Although it is in French, it is derived from the Latin plasticus, which means "can take shape, can be shaped".

Bioplastics, on the other hand, are plastics produced from bio-based raw materials without synthetic materials. The vast majority of bioplastics are biodegradable, that is, biodegradable. Thus, they do not leave any waste behind. A simple bioplastic forming equation is as follows: (Özdamar & Ateş, 2018).

"Biopolymers + plasticizers + other additives = BIOPLASTIC"

Today, bioplastics production less than one percent of plastic production, but the bioplastics industry is developing day by day. Global bioplastic production is expected to more than triple, reaching 7.5 million tons in 2026 (Figure 1). "Before 2026, the share of bioplastics in total global plastics production will exceed two percent for the first time," said François de Bie, President of European Bioplastics (Web 2, 2021).

Although bioplastic studies focus on single-use plastics, especially packaging, it can be used in various sectors. According to the graphic published in 2020, 0.085% of bioplastic

production is for the building sector (Figure 2). But other categories are related with the construction.

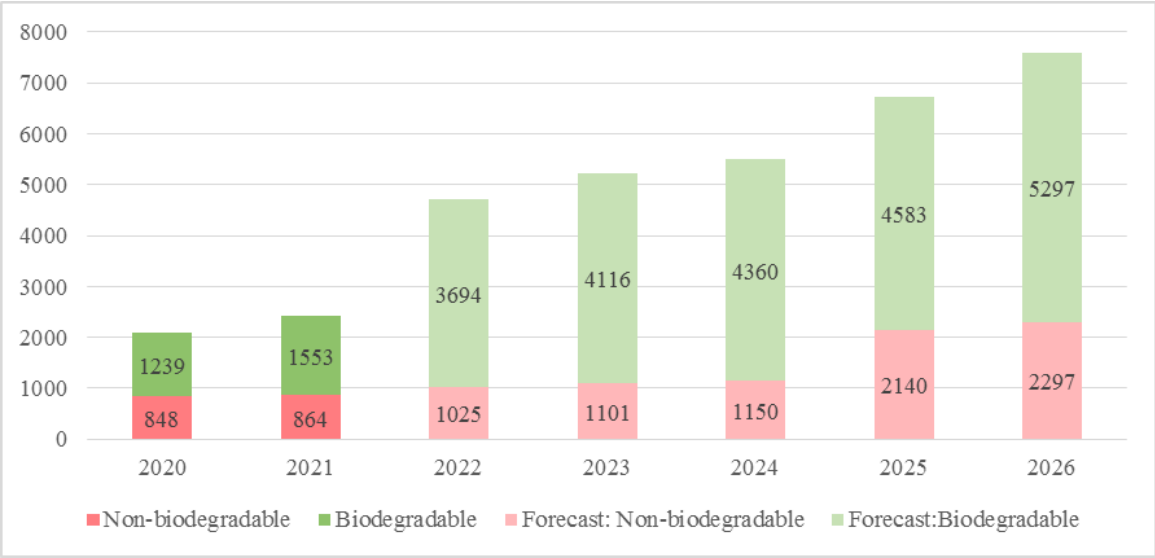


Figure 1. Global Production Capacity of Bioplastic (Web 3)

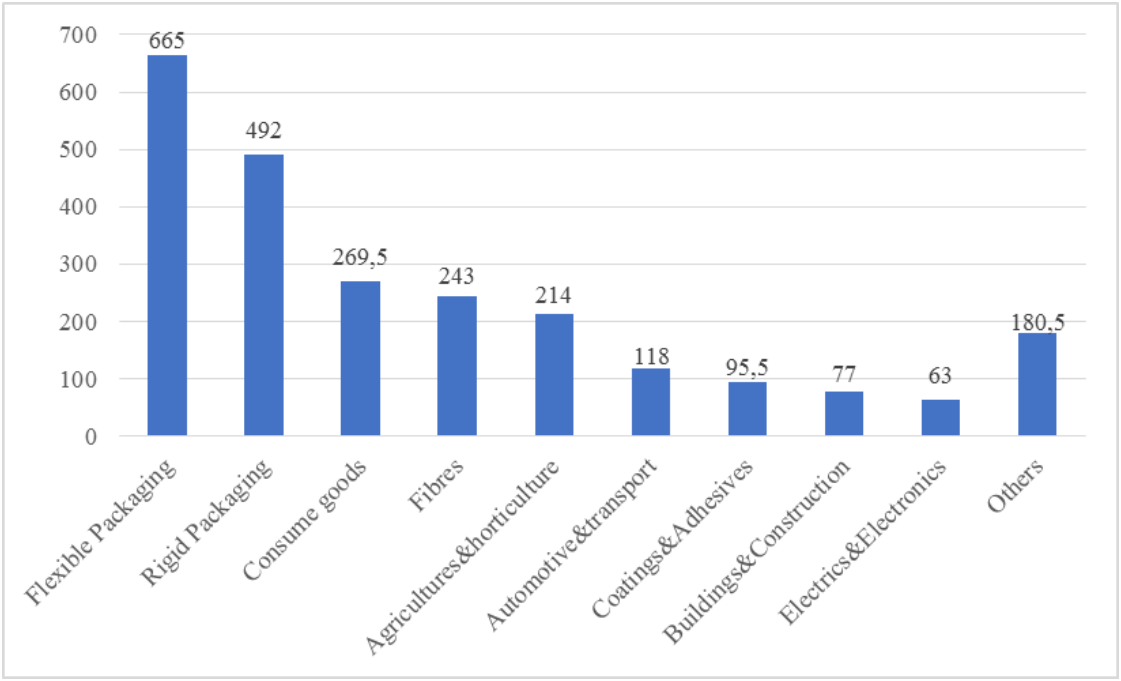


Figure 2. Global Production Capacity of Bioplastics 2021 (by market segment) (Web 3)

Raw Materials Used in Making Bio-Based Plastic

Bio-based raw materials with usage examples in the building industry: Starch, Cellulose, Organic Waste, Mushroom

Starch Based Bioplastics

Starch is the most widely used polymer in making bioplastics. It has 80% market share. Starch can be obtained from sources such as corn, potatoes, wheat, banana peel, peas, rice. It does not need toxic chemicals to be need (Ozdemir, et al., 2018). Starch is used primarily in the food industry, in paper and cardboard production, as a binder in the pharmaceutical industry, and in the textile industry (Shrirakshaya et al., 2020).

Because of starch is used as a nutrient by various microorganisms, microorganisms break down the plastic with the help of enzymes to reach the starch in the plastic. Thus, starch-based bioplastics can easily degrade in nature (Gümüşderelioğlu, 2012).

Starch has binder and adhesive properties, so chemicals with binding and adhesive properties are not needed in plastic production. However, starch-based bioplastic materials are very soft and have low resistance and strength. For this reason, it is used with various additives or reinforcing fibrous biomaterials (Özdemir et al., 2018).

Cellulose Based Bioplastics

Cellulose is the most abundant natural polymer on earth. Cellulose is found in the cell wall of various plants such as wood, flax, bamboo and cotton. Plant-derived cellulose is usually found with a mixture of lignin, hemicellulose, pectin and other substances.

Due to the hydrogen bonds in its structure, cellulose does not melt or soften (Shrirakshaya S., et al., 2020). With its cellulose fiber structure, it provides more durable and strong bioplastics. A disadvantage of cellulose-based bioplastics is that the fibers are insoluble in water, they must be treated at high temperature with sodium chloride and concentrated acids to obtain pure cellulose (Janster & Fink, 2013).

Organic Waste Based Bioplastics

There is competition for agricultural raw materials between food, animal feed, bioenergy and bio-based plastics. For efficient use of existing raw materials and lands, efforts should be made.

Production of raw materials for bioplastics causes high values in life cycle assessment, especially in categories such as land use and energy. A recent statistical study shown that almost a quarter of grain-producing farmland is used to produce biofuels and bioplastics (Raschka et al., 2013).

In order for bio-based plastics to achieve their main purpose, the evaluation of waste raw materials provides better results in terms of life cycle assessments.

Mushroom Based Bioplastics

Mushroom is a versatile material and highly suitable for making bioplastics; Mushroom-based materials are highly durable, easily molded and shaped, and cost-effective. They are environmentally friendly, decomposable in nature; are biodegradable materials (Web 4).

Mushrooms are a completely separate species, although they share common features with plants and animals. They form an important part of the life cycle in the ecosystem. There are 1.5 million species discovered (Web 5).

Mycelium is the roots of fungi, consisting of thin web-like branching structures called hyphae found underground (Web 4). Fungi carry out most of their metabolic activities with the help of hyphae. They grow and expand, producing new hyphae for the purpose of finding food (Web 5).

Myceliums can spread over very large areas, they have been described as the largest living organism in the world. Found in the Blue Mountains of Oregon, the mycelium is spread over an area of 10 kilometers (Web 6). Mycelium consists of natural polymers such as chitin, cellulose, and protein, it is a composite fibrous material (Hanif et al., 2017).

Mycelium establishes a communication network not only between fungi but also between other plants in the forest. For this reason, they are called nature's internet. They assist in the cycle of living and dead organisms (Web 5). Micellar networks are as different and unique as possible from each other. Despite their thinness, they are quite strong and durable. They are resistant to water, rot, internal and external pressures. Thanks to these branching structures, myceliums can form structures with maximum carrying capacity with minimum energy (Web 7).

Recent studies have found that fungi can decompose toxic substances such as pesticides, petroleum, and plastic (Web 6).

There are various organizations that conduct research on the production of bioplastics from fungi; Ecovative, Mugo and Mycoworks are the leading ones.

Building Samples Made From Fungus-Based Materials

Because of mycelium-based building materials are new technologies, product variety and studies are very limited. The first research on the use of mycelium as a building material started in 2009 with MycoWorks micologist Phil Ross. Ross began cultivating mushrooms for medicinal use, but when he discovered that Reishi mushrooms respond to factors such as light, air, gravity, and temperature, he began using mycelium as an art material. Mycelium

artworks and installations have been displayed at various locations. He co-founded MycoWorks with Sophia Wang in 2013 (Figure 3) (Web 8).



a b

Figure 3. Mycowork's projects (Web 8)

The other work on mycelium is the pavilion of mycelium-based bricks named "Hy-Fi", which was built in the garden of the New York Museum of Modern Art (MoMA). The tower was designed in collaboration with architect David Benjamin and Ecovative Design. More than 10,000 mycelium-based bricks were used in the tower, which exceeds 12 meters in height. Bricks are not as strong as conventional brick; traditional bricks have a compressive strength of 28MPa, while mycelium bricks have a strength of only 0.2MPa. But it is 60 times lighter than traditional brick. In this way, the tower has a height of 12 m (Figure 4) (Web 9, 2020).



a b

Figure 4. Hy-Fi Tower (Web 9)

The Grown Structures project was prepared in collaboration with Brunel University London student Aleksi Vesaluoma and Astudio. A stronger form was obtained by turning the material

obtained from mycelium material and cardboard into mushroom sausages. The structure was grown in 4 weeks and is biodegradable when it completes its life cycle (Figure 5) (Web 10).



a b



c

Figure 5. The Grown Structures (Web 10)

Mycotree was designed in collaboration with ETH Zurich and Future Cities Lab as part of the 2017 Seoul Biennial of Architecture and Urbanism. Designers architect Dirk Hebel and engineer Philippe Block suggest that the mycelium, if designed with the right geometries, can provide the structure of a two-story building. The blocks that make up the structure of MycoTree are combined with the help of bamboo tips, but the main carrier task is mycelium blocks. The blocks grown in 2 weeks consist of a mixture of mycelium, sawdust and sugar cane (Figure 6) (Web 11).







a b c

Figure 6. Mycotree (Web 11)

The Growing Pavilion was produced for Dutch Design week in 2019. It was produced as a collaboration between sound designer and artist Pascal Leboucq and Amsterdam-based studio Biobased Creations. The pavilion is made entirely of bio-based materials (Web 12). The 5 main materials used are wood, mycelium, agricultural waste, reeds and cotton (Web 13). The facade panels are made of mycelium. The panels are combined with a wooden frame, the mycelium-based panels can be removed and used for other purposes as needed, reused or composted after the structure has been demolished. Panels were growing and baked in front of the audience during construction, thus making the construction process interactive (Figure 7) (Web 12).



Figure 7. The Growing Pavilion (Web 12)

"The Circular Garden" was designed in collaboration with Carlo Ratti Associati and Grown Bio for 2019 Milan Design Week. The installation, which consists of 60 pieces of 4 meter high arches, was completed in six weeks. When the building completes its life cycle, it can be composted and biodegradable (Figure 8) (Web 14).



Figure 8. The Circular Garden (Web 14)

Mushroom Based Building Material

In the construction sector, a trend towards mushroom-based materials has started. The main advantages of mycelium building materials are; low cost, light weight, low energy production, environmental friendly, low carbon footprint and biodegradability. They are resistant to high temperatures and are anti-allergens (Jiang, Walczyk & Mcintyre, 2014).

In addition to all these advantages, mushroom-based bioplastic building materials have various limitations, one of the biggest disadvantages is that they cannot carry much weight. It is recommended to be used in non-load-bearing structural elements (Web 9, 2020).

Another limitation of the use of mushroom-based bioplastics in the construction industry is their high water absorption. Exposure to moisture can affect the performance of mycelium-based building materials; may cause a decrease in tensile and compressive strength (A Javadian et al, 2020). However, a study published in 2019 showed that the mechanical properties and high water absorption of mycelium-based materials can be regulated by varying production methods, various fungi species and substrates (Karana et al., 2019).

Mushroom-based bioplastics can be used in building wall and floor panels, insulation materials and furniture products.

Mycelium Based Insulation Material

Biohm – Insulation

Biohm produces mycelium-based insulation materials. It uses waste materials to keep the mycelium growing. Biohm, which defines its production processes as carbon negative, claims to capture at least 16 tons of carbon per month.

Mycelium-based material is breathable, moisture-absorbent and shows superior properties in heat and sound insulation than petroleum-based plastics. Thermal tests prove that mycelium-based insulation material outperforms various synthetic and organic insulation products. Glass fiber (0.032-0.044W/mK), mineral wool (0.032-0.044W/mK), EPS (0.036W/mK), XPS (0.029-0.036W/mK) values, while mycelium-based insulation material is up to 0.024W/mK achieved a low thermal conductivity.

The material does not contain toxic additives that can trigger a fire. It releases less heat and smoke during fire and has a charring behavior that prevents the spread of fire.

Also mycelium materials very successful in acoustic insulation, tests have shown that it provides 75% acoustic absorption.

Research conducted by the Munster Chamber of Crafts shows that the material is at least as durable as conventional materials and retains its insulating property for life (Figure 9) (Web 15).



Figure 9. Biohm Insulation (Web 15)

Grown Bio – Insulation

Based in the Netherlands, Grown bio offers a variety of mushroom-based products. Grown Bio is a brand that designs mycelium-based packaging, insulation panels and interior design products. The completely organic and compostable panels are suitable for indoor use. It collaborates with Ecovative, a pioneer in mycelium-based products. Products are Cradle2Cradle Gold certified (Figure 10) (Web 16).



Figure 10. Grown Bio Insulation Panel (Web 16)

Greensulate – Mycelium Insulation Panel

Collaborating with Greensulate and Ecovative produces mycelium-based insulation panel. The panels are made of 100% biodegradable and completely natural materials. It consists of agricultural waste such as cotton seeds and buckwheat hulls. No resin is used as the mycelium

acts as an adhesive. It can be used for indoor walls, exterior, roof and floor insulation (Figure 11) (Web 17).



Figure 11. Greensulate Insulation Panel (Web 17)

Flooring

Mogu - Floor Flex

Mogu Floor Flex consists of 67% bio-based polyurathane and oyster shells. It is a roll-shaped material with a flexible design. Contains 30% recycled pet and resin that provides fire protection. Besides residential buildings, it is also suitable for use in high-density areas such as offices and libraries (Figure 12) (Web 18).

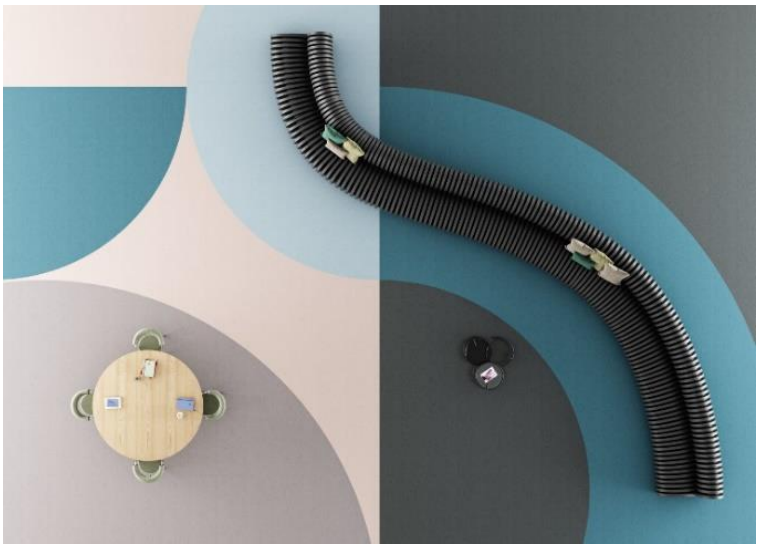
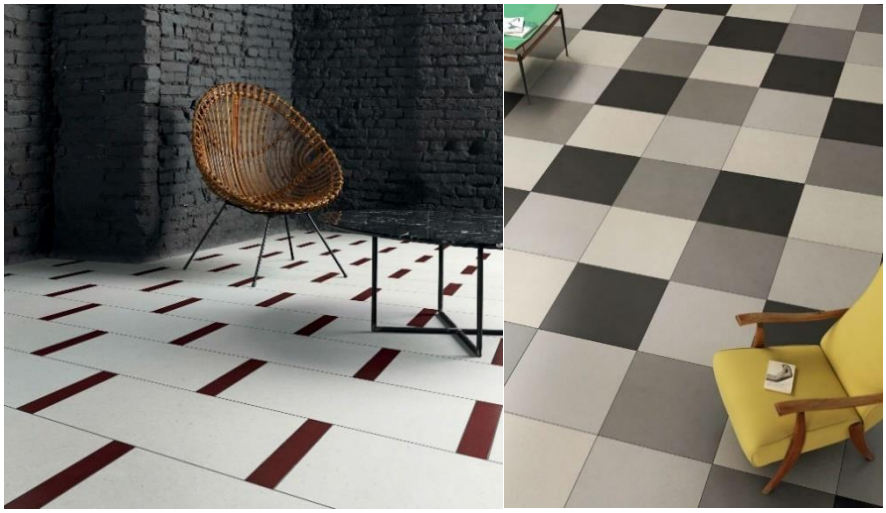


Figure 12. Mogu Floor Flex (Web 18)

Mogu – Floor Tiles

Mogu Floor Tiles consist of 3 layers. It contains 100% bio-based fiberboard, 67% bio-based polyurethane and a protection layer. Bio-based fiberboard contains fiber waste from the textile industry along with mycelium. Bio-based protection coating provides long-term durability. When the product has completed its life cycle, the fiberboard can be separated from the biopolyurethane layer so it can be biodegraded and composted (Figure 13) (Web 19).



a b

Figure 13. Mogu Floor Tiles (Web 18)

Although their appearance is similar to standard floor tiles, Mogu Floor Tiles have a warm and soft texture. It has two types in square (500x500 mm) and rectangular (250x500 mm) dimensions. The tiles have a thickness of 7 mm. Square tiles weigh 1.7kg while rectangular tiles weigh 0.9 kg (Web 19).

Production process;

Core Layer:

• Industrial waste cotton fibers are sterilized and placed in special bags and inoculated for mycelium formation. They are grown in controlled temperature and humidity suitable for mycelium growth.

• Fully incubated material is broken down and organic binders are added to the material.

• Pressed to obtain high density material.

• The incubated mycelium acts as a natural glue.

• The core layer is laminated with bio-based resin.

Bio-based Polyurethane:

• Oyster, mussel and mother-of-pearl shells are ground and natural pigments are obtained. This mixture is added to the bio-based polyurethane formula.

• The Bio Polyurethane mixture is dried under the appropriate temperature.

Lamination:

• The final product is obtained by combining the mycelium-based core layer and the bio-based polyurethane layer (Figure 14) (Web 28).



a b c

Figure 14. Mogu Mycelium Growings (Web 28)

Acoustic Wall Coverings

Mogu – Acoustic Panel

Mogu Acoustic panels are produced from mycelium and recycled textile residues. Panels with 5 types have various acoustic absorbency values. Foresta has won the 2022 German Design Awards. The mycelium is naturally white, but can be colored. It is fire and water resistant and does not contain heavy metals (Figure 15) (Web 20).



a b

Figure 15. Mogu Acoustic Panel (Web 20)

Myamo Acoustic Panel

It is a modular acoustic panel suitable for indoor use, created in a growth process based on mycelium, the underground root structure of fungi, together with agricultural wastes. Inspired

by cellular structures in nature, the parametric design produces an interesting aesthetic and harmonic surface that offers a wide variety of design possibilities (Figure 16) (Web 21).



Figure 16. Myamo Acoustic Panel (Web 21)

Myceen

Myceen grows carbon negative materials that combine fungal mycelium and industrial byproducts. It currently focuses on furniture and interior products. The Acoustic Panel has two different finishes: mycelium white with a soft velvet-like surface and mushroom brown with a harder surface and a range of earthy tones from white to brown. The panels are used in their natural state without being colored (Figure 17) (Web 23).

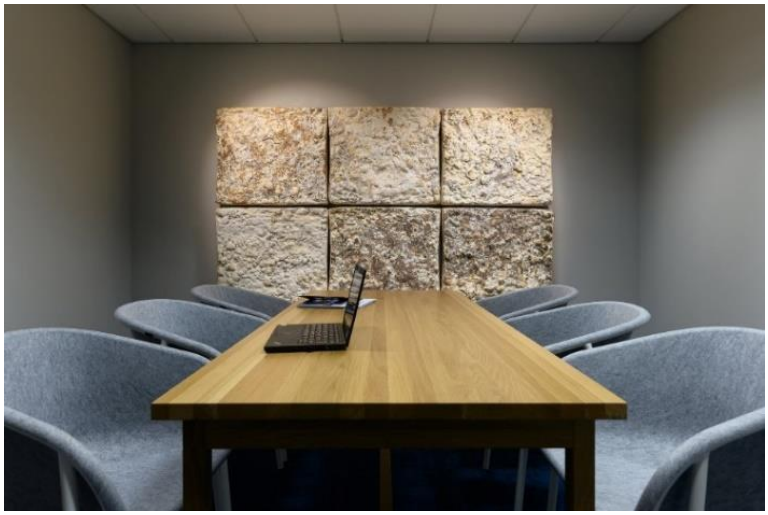


Figure 17. Myceen Acoustic Panel (Web 23)

Furniture

Sebastian Cox – Mycelium Lighting

Lighting is produced from fungal mycelium and wood waste. Various trials were made for this combination, and it was determined that the combination of Fomes fomentarius mushroom species and goat willow and hazelnut tree was the most effective. This method of using biological organisms to produce new materials is known as biofactory. The application of this method in the furniture industry is quite innovative. Materials made from mycelium are quite light and strong and can be completely composted. It is produced in two different sizes (175 mm diameter x 250 mm height, 400 mm diameter x 325 mm height) (Figure 18) (Web 24).

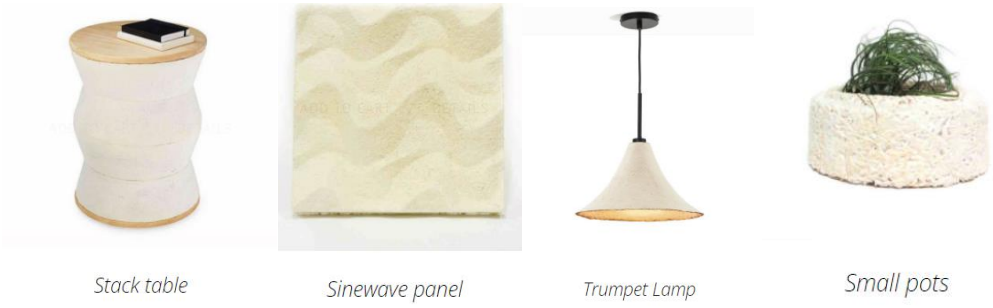


Figure 18. Sebastian Cox Mycelium Lighting (Web 24)

Grown Bio

Grown; is a brand that designs mycelium-based packaging, insulation panels and interior design products. It collaborates with Ecovative, a pioneer in mycelium-based products. The shape, flexibility, mass, etc. of mycelium-based products can be adjusted. The material is not produced, it is grown. It is used with agricultural waste products such as hemp, flax and corn straw. Reusable molds are 3D printed and can be broken down and reprinted at the end of the process. These molds are filled with local agricultural waste, water and binding mycelium. In a period of 1 week, the material grows. The products are CO2 scavenger and can be biodegraded and composted at the end of their life cycle. Products are Cradle2Cradle Gold certified (Figure 19) (Web 16).

In addition to many products, Grown It Yourself kits provide users with the opportunity to design their own mycelium-based products (Figure 20).



a b c d

Figure 19. Grown Bio Mycelium Products (Web 16)



Figure 20. Grown Bio DIY Kit (Web 29)

Daniele Trofe - MushLume Cup Light Table Lamp

The brand takes care to ensure that its products are completely sustainable. The table stand is made from trees that are cut or dying in New York, and sustainably harvested woods are used by female entrepreneurs. All parts are designed to be at end-of-life to recycle and compost. The MushLume lighting collection is grown from mushrooms. Mycelium material can be left natural/untreated and show more golden hues over time or can be painted white with a non-toxic, all-natural milk dye (Figure 19) (Web 25).



a b c

Figure 21. Daniele Trofe Mushlume Lightings (Web 25)

Nir Meiri

The lighting products obtained by using mycelium and waste materials together are the collaboration of nir meiri studio and biohm (Figure 22) (Web 26).



a b c

Figure 22. Nir Meiri Lighting (Web 26)

Mycl - Mycelium Fixture

Originating in Indonesia, Mycl offers a variety of mushroom-based products. In addition to various accessories, it has a mycelium-based lighting product suitable for indoor use (Figure 23) (Web 27).



Figure 23. Mycl Mycelium Lighting (Web 27)

Conclusıon and Recommendatıons

Plastics have negative effects on the environment, both at the production stage and when they complete their life cycle. Although it is claimed that 9% of plastics are recycled, only 2% can be 'upcycled', that is, recycled without losing quality (Web 1). The rest of waste plastics, buried or mixed with nature under suitable conditions. Thus, it turns into microplastics and threatens the health of all living things (Yurtsever M., 2018). Due to all these negative effects, it has caused various industries, especially the packaging sector, to turn to environmentally friendly alternatives. Bio-based plastics are at the one of the ecological alternatives. Bio-based plastics are plastics obtained from raw materials such as starch, fungus, cellulose, gelatin.

They do not need synthetic materials. Most of the bioplastics are biodegradable and biodegradable (Kıyga, 2022).

There are not enough studies on life cycle assessments of bio-based plastics. However, it is seen that the sector is developing. Studies have shown that the life cycle evaluations of bio-based plastics are negatively affected by the raw material production processes. In order to reduce this effect, it will be very beneficial to use agricultural wastes in the production of bio-based plastics instead of raw material production. Plasticizers and additives used in making bio-based plastics should not contain harmful chemicals.

Mycelium roots of fungi are often used in the production of bioplastics. Myceliums grow very quickly, they can stretch for kilometers. Since they act as binders and adhesives, they are suitable for use in making bioplastics. In the building sector, there are examples of use in acoustic wall panels, insulation materials, flooring panels and furniture.

Within the scope of the study, the building products that we can access industrially were examined. There are examples that we can access in acoustic wall panels, insulation materials, flooring and furniture. Various studies continue to be carried out in universities and research laboratories. The emerging sector is promising.

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Environmental Impact Analysis of Geopolymer Concrete Facade Cladding: Istanbul Case

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Abstract

People spend their lives in the artificial environment they have created. The increase in population and the development of the built environment occur in direct proportion. In the creation of this artificial environment, concrete is often preferred because its technical properties are suitable and its production is more economical than other materials. On the other hand, high energy is needed to obtain the raw materials used in concrete production. It is necessary to reduce the energy used in the production of concrete, which is frequently preferred in the construction industry, and it is of great importance in terms of environmental protection. For this purpose, various R&D studies are carried out to reduce the use of products in concrete in order to solve the energy consumption problem in many countries. In industrialized countries, cement and concrete are considered to be a suitable building product because of the possibility of mass production. In order to compete with an optimized system, a product with a low environmental impact is needed as it is a medium cost and ecological material with technical performance in line with the demands of the market. In line with this need, it has been observed that studies on the production of Geopolymer concrete have become widespread. In many sources on the subject, it is stated that Geopolymer concrete material has similar technical characteristics with conventional concrete and is a more environmentally friendly material. Due to the use of secondary/waste materials such as fly ash (UK), blast furnace slag (FFC), it is claimed to be the first environmentally friendly alternative material with low initial embodied energy. In this study, the usage possibilities of geopolymer concrete, which is considered as sustainable concrete that can replace conventional concrete with high production energy cement, as a building product and material, and its environmental effects throughout its life cycle are examined within the scope of life cycle assessment (LCA) method. The results of energy consumption, emissions and environmental impacts during 1 year of life of an office building in Istanbul, where a geopolymer concrete facade cladding product was used, were given and evaluated. Annual gas, electricity and total energy consumptions of the models created were found and compared according to facade types and insulation conditions. Emissions resulting from annual gas consumption have been calculated, and global warming, acidification and eutrophication potentials created by emissions from natural gas have been found and examined.

Keywords: Geopolymer Concrete, Life Cycle Assessment, Energy, Façade Cladding.

Introduction

People spend their lives in the artificial environment they have created. The increase in population and the development of the built environment occur in direct proportion. In the creation of this artificial environment, concrete is often preferred because its technical properties are suitable and its production is more economical than other materials. On the other hand, high energy is needed to obtain the raw materials used in concrete production. It is necessary to reduce the energy used in the production of concrete, which is frequently preferred in the construction industry, and it is of great importance in terms of environmental protection. For this purpose, various R&D studies are carried out to reduce the use of products

in concrete in order to solve the energy consumption problem in many countries. In industrialized countries, cement and concrete are considered to be a suitable building product because of the possibility of mass production. In order to compete with an optimized system, a product with a low environmental impact is needed as it is a medium cost and ecological material with technical performance in line with the demands of the market. In line with this need, it has been observed that studies on the production of Geopolymer concrete have become widespread. In many sources on the subject, it is stated that Geopolymer concrete material has similar technical characteristics with conventional concrete and is a more environmentally friendly material. Due to the use of secondary/waste materials such as fly ash (UK), blast furnace slag (FFC), it is claimed to be the first environmentally friendly alternative material with low initial embodied energy.

Feret made a study in 1939, which can be considered as one of the first, on alkali activation by replacing slag in cement. By 1940 Purdon was working on the alkali-slag combination (Pacheco-Torgal, 2015). In 1970-1993, studies were carried out in search of solutions to fires caused by organic-based plastic. As a result of the studies, the geopolymer was named and started to be studied. After lime and traditional Portland cement, geopolymer cement is considered as the third-generation cement (Singh et al., 2013, Duxson et al., 2007).

Geopolymer concrete is formed by activating materials containing free silica and alumina with alkaline activators. This synthesis is called geopolymerization. In the formation of geopolymers, water is used to increase the workability in the mixing stage, and it moves away from the structure during the curing-drying stage to form a nano-void structure. There is no water in the geopolymer. Hollow structure adds positive effects to geopolymer such as lightness, fire resistance and thermal insulation (Topçu & Toprak, 2009). It is formed by hydrothermal polycondensation reaction. The alumina silicate soil material, which is separated from zeolite crystals due to its amorphous three-dimensional hexagonal molecular bond structure, which resembles zeolite rocks in particle structure by throwing out water from its structure by chemical and physical methods, is called geopolymer (Keyte et al., 2006). The determining factor about the molecular structure to be obtained in the production process of geopolymers is the Si/Al molar ratio of the materials to be activated and the alkali silicates in the activators (Davidovits, 2008). The general judgment in the studies is that the physical and mechanical properties of geopolymer concrete are positive.

There are 9 types of geopolymer materials defined (Url-1).

- Sodium silicate (glass water) based geopolymer (Si:Al=1:0)

- Kaolin hydrosodalite based geopolymer (Si:Al=1:1)
- Metakaolin based geopolymer (Si:Al=2:1)
- Calcium-based geopolymer (Si:Al=1, 2, 3)
- Rock-based geopolymer (1< Si:Al<5)
- Silica-based geopolymer (Si:Al>5)
- Phosphate based geopolymer
- Organic mineral based geopolymer
- Fly ash based geopolymer

Pozzolans activated by alkali activators are as follows (Baradan et al., 2012, Khale & Chaudhary, 2007).

- Fly ash
- Fly ash and slag mixture
- Fly ash and metakaolin
- Blast furnace slag
- Blast furnace slag and metakaolin
- Blast furnace slag and red mud
- Metakaolin
- Kaolin Clay
- Fly ash and red mud
- Blast furnace slag and silica füme
- Zeolite

Activators: Alkali activators are used to activate materials containing silica and alumina. Four activators are used for the realization of geopolymerization. These:

- Sodium hydroxide (NaOH),
- Sodium silicate, also known as glass water (Na_2SiO_3)
- Potassium hydroxide (KOH),
- Potassium silicate ($nSiO_2K_2O$) are mixtures (Baradan et al., 2012, Khale & Chaudhary, 2007).

Withstands undamaged up to 1,200 °C. The thermal conductivity of geopolymer concrete is lower than other building materials and products and varies between 0.24-0.3 W/mK (Swanepoel & Strydom, 2002).

Environmental sustainability of geopolymer material can be examined under 3 headings (Paya et al., 2015). These:

- Useful use of waste materials
- Conservation of natural resources
- Less energy requirement and less CO_2 emissions than Portland cement

Table 1. Material Comparison of Conventional Concrete And Geopolymer Concrete (Kayhan & Özgünler Acun, 2021).

Conventional Concrete	**Geopolymer Concrete**
Cement	Waste and Fly Ashes
Aggregate	Aggregate
Water	Water (It does not remain in the material with the curing process.)
Additives	Additives
	Alkaline Activator

The waste materials substituted in the production of geopolymer concrete are the blast furnace slag generated as waste during iron production or the fly ash from the chimneys of thermal power plants using coal. The use of by-products has an important role in reducing emissions. Since substitute materials are not produced specifically for concrete production and require low curing temperatures during the geopolymerization phase, CO_2 emissions are lower and energy consumption is lower than conventional concrete. When the production stages of conventional concrete and geopolymer concrete are compared, a 64% difference in emission was observed between two alternative concretes. It is a low-emission material in terms of geopolymer formation (McLellan et al., 2011) (Table 1).

Building trials and constructions using alkaline activated concretes have been carried out for more than 80 years, especially in Russia, Ukraine, Poland and China (Shi et al., 2006, Provis & Van Deventer, 2014).

Geopolymer concrete, which has the potential to appear in many places, is a new and sensitive material because its usage possibilities are parallel with the places where concrete is used (Özodabaş, 2014, Shi et al., 2006). Usage possibilities:

*Structural Concrete	*Wall Block Element Production
*Electric Poles	*Prefabricated Building Construction
*Aerated Concrete Applications	* Irrigation System and Breakwater Construction
*Oil Wells	* Concrete Pavement Construction
* Concrete Cone Pipe Making	* Flooring and Foundation Construction

* Fine Arts	* High Temperature Resistant Concrete
* Hazardous and Radioactive Waste Stabilization Concretes	

Materials and Methods

Geopolymer concretes formed by using artificial pozzolan (waste ash) instead of cement in their structure have shown a good performance in the research. It has been observed that geopolymer concrete, which meets most of the physical and mechanical criteria that conventional concrete should meet, is more durable in outdoor conditions. Considering its properties, it can be used as a building product and material, but the possibilities of use for each building element should be tested one by one and investigated in detail by adhering to the specifications and standards. As a building product and material, geopolymer concrete is not a mass-produced building material. 343 national and international sources, especially the conferences held by the Geopolymer Institute between 2010-2020, were examined. By compiling 70 sources, numerical values for the material structure were obtained.

The desired properties can be gained with the additives in the geopolymer concrete construction products, which are produced as special production. The results of the laboratory studies for geopolymer concrete, which is still in search of a standard, were compiled and the simulation was made by entering the simulation program.

The CML method was chosen in order to make an environmental impact assessment. It is a midpoint approach model developed by the Institute of Environmental Sciences of Leiden University in the Netherlands in 1992. A group of scientists under the name of CML published a guide for the impact assessment step called "operational guide" for ISO (International Organization for Standardization) standards in 2001, which suggested a series of impact categories and characterization methods. The CML method, which is a problem-oriented approach with 7 impact categories (global warming, ozone depletion, acidification (have and land), eutrophication, photochemical fog formation, depletion of abiotic resources-elements, depletion of abiotic resources-fossil fuels), was developed and applied (Hischier et al., 2013, Öztaş, 2014). CML, which is a global method, is based on Europe in the headings of acidification and photochemical fog formation (Öztaş, 2014) In the study, global warming, acidification and eutrophication potentials created by natural gas emissions were found and interpreted.

Choosing an international method and standard is an important point when modeling energy. The correct selection and planning of the systems of the building to be simulated together with the chosen method will increase the energy efficiency.

During the study, the UK-based DesignBuilder 7.0.1.006 program was used. The program can be integrated into Autodesk-based 3D modeling programs as well as a drawing option. In the first stage, three-dimensional modeling of the building to be simulated is made. Then, the selection of the systems that will affect the calculation and the customization of the materials are made where necessary. The heat transmittance coefficient of the building envelope, the shading coefficient of the windows, the occupancy rate of the building, the efficiency of the equipment (COP, IPLV etc.), the lighting parameters ($W/m^2$100lux), the automation scenarios, the selection of heating, cooling and sanitary systems, alternative energy systems and The model is created by entering the user loads in the building into the program. Values can be changed easily and simulation can be done in a short time.

Within the scope of the study, it was aimed to observe whether the geopolymer concrete facade coating product is an alternative to the concrete facade coating product in Istanbul. Comparison of the two products was made considering their environmental impact. After determining the data of the building and the indoor and outdoor conditions, alternatives derived from different facade claddings were created. Annual heating, cooling and total energy loads of the created alternatives were calculated. Emission amount was found by multiplying the annual heating data with the values determined by the IEA. Environmental impact values were calculated by multiplying the emission amounts with the coefficients given according to CML 3.4. Global warming, acidification potential and eutrophication calculations, which are among the environmental impact values, were compared.

Operating Parameters

While creating alternative models to be simulated in line with the purpose, method, program used, criteria and data of the study mentioned in the title of performance evaluation method, some parameters were kept constant while some were changed to evaluate the performance of the building product. The evaluated volume is proposed as a theoretical volume so that it does not affect the performance of the material due to heat exchange on other surfaces in the space. Service spaces related to functions such as stair landing were neglected in the planning.

Standing Data

- Building Form
- Building Location

- Transparency Rate
- Building Systems

-Ventilation System

-Heating and Cooling System

-Lighting

-Office Equipment

- User Load

Building Form

It is a 5-storey office building with a floor area of 25x20 m in a rectangular form, 1 floor of which is 500 m^2, with the building form kept constant. In the alternatives created, the floor resting on the ground, the mezzanine floor, the roof and the inner wall layers were kept constant. The simulation model is shown in Figure 1.

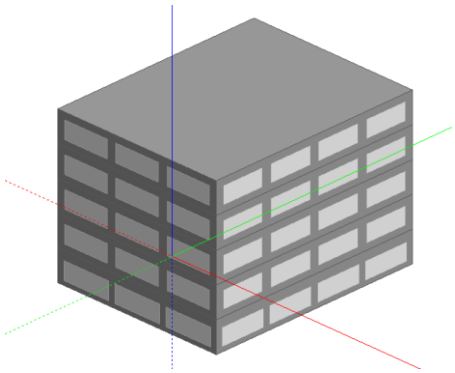


Figure 1. Simulation model.

Building Location

Istanbul was chosen as the location.

Transparency Rate

Since the office building has a building typology where daytime use is intense, the transparency rate has been tried not to be low. Since the role of the outer shell of the building in energy consumption was examined, the transparency rate on the facade was determined as 50%. The windows have a height of 2m with a parapet of 0.5m. Low-E glass with 6/13/6mm argon gas with a U value of 1.493 W/m^2-K is used.

Building Systems

- Fancoil was chosen as the mechanical ventilation system. In order to better evaluate the shell performance, it is assumed that there is no natural ventilation in the building. It was

compared whether there was natural ventilation or not. There were no major differences in the results.

- It is thought that the heating will be done by using natural gas. Ambient temperature in cold months is 21°C. It is accepted that the heating system will operate as of 19°C.
- It is expected to release the solar energy stored in the building envelope to the indoor environment during the day. Electricity was adopted as the source of the cooling system. In hot months, the ambient temperature is accepted as 26°C and it is assumed that the cooling system will be activated when the temperature rises to 28°C and above. Cooling loads are not included in the environmental impact assessment calculations.
- According to the information given in ASHRAE Standard 55 and BEP-TR (Energy Performance Calculation Method in Buildings) in all of the alternatives, the impermeability value (infiltration) has been accepted as 0.5 ac/h.
- Office lighting is determined as spot lighting.
- Simulations are made assuming office equipment and computers are turned on.

User Load

It is assumed that there are 60 people on each floor of the office staff and a total of 300 people work. The rate of people per square meter is 0.12. Based on official and religious holidays in Turkey, it is assumed that there are 14 days of holidays per year.

Variable Data

- Facade Cladding Product
- Building Insulation Status

Façade Cladding Product

Two different stratifications were created as Control and Geopolymer concrete stratification. Four different crust formations were created by simulating the non-insulated alternatives of the formed stratifications. Table 2, 3,4, 5 stratification table is given.

Table 2. Geopolymer Layering

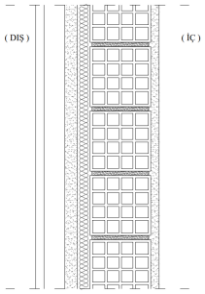
WALL		GEOPOLYMER	2	0,463
		AIR	5	
		PLASTER	3	
		TERMAL INSULATION - XPS	3	
		BRICK	19	
		PLASTER	2	
		PAINT	0,013	

Table 3. Control Layering

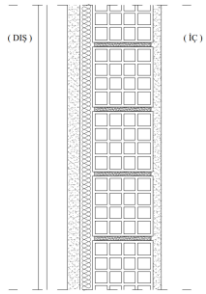
WALL		CONCRETE PANEL	2	0,467
		AIR	5	
		PLASTER	3	
		TERMAL INSULATION - XPS	3	
		BRICK	19	
		PLASTER	2	
		PAINT	0,013	

Table 4. Geopolymer Layering (Non-Isolated)

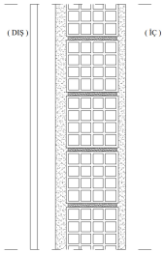
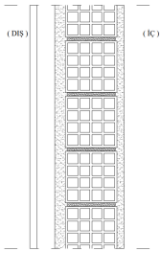
WALL		GEOPOLYMER	2	0,781
		AIR	5	
		PLASTER	3	
		BRICK	19	
		PLASTER	2	
		PAINT	0,013	

Table 5. Control Layering (Non-Isolated)

WALL		CONCRETE PANEL	2	0,795
		AIR	5	
		PLASTER	3	
		BRICK	19	
		PLASTER	2	
		PAINT	0,013	

Concrete tile in the DesignBuilder 7.0.1.006 library was chosen as the control layering coating product for the stratifications whose final differences are the cladding product difference. The properties of the selected tile are as in Table 6.

Table 6. Concrete tile properties.

Property	Value
Thermal Conductivity	1,1 W/m-K
Specific Heat	840 J/Kg-K
Density	2.100 kg/m^3
Toughness	Tough
Embedded Energy	0,22 kgCO_2/kg

Accepted properties for geopolymer concrete are given in Table 7.

Table 7. Geopolymer concrete properties.

Property	Value	Percentage of Change
Thermal Conductivity	0,49 W/m-K	∨ %55,45
Specific Heat	1.139 J/Kg-K	∧ %35,59
Density	1.807,7 kg/m^3	∨ %13,91
Toughness	Tough	-
Embedded Energy	0,15 kgCO_2/kg	∨ %31,81

Building Insulation

Non-insulated alternatives of control and geopolymer stratification were also examined in order to examine and compare the effect of insulation material on energy consumption over the alternatives (Table 8).

Table 8. Alternatives list.

Alternatives	Code	Layers	City	Insulation Condition	Number of Floors	Transparency Rate
1	G-İST-Y	Geopolymer Layers	İSTANBUL	Insulated	5	50
2	K-İST-Y	Control Layers	İSTANBUL	Insulated	5	50
3	G-İST-Z	Geopolymer Layers	İSTANBUL	Non-Insulated	5	50
4	K-İST-Z	Control Layers	İSTANBUL	Non-Insulated	5	50

Findings and Discussion

In this section, the heating, cooling and total energy consumption amounts of 4 alternatives, including insulated and non-insulated alternatives of geopolymer cladding and control stratifications, obtained with the DesignBuilder 7.1.006 program, are given in the cities of Istanbul.

One of the main purposes of the study is to propose a building product that can be used in the building envelope. The environmental effects are examined by looking at the 1 year of the product life cycle (Table 9).

Table 9. Consumptions.

		ALTERNATIVES	Gas (Heating)	Electricity (Cooling + Equipment)	Total
			kWh	kWh	kWh
GEOPOLYMER LAYERS	INSULATED	G-İST-Y	15.940	463.880	479.820
	NON-INSULATED	G-İST-Z	54.010	445.700	499.710
CONTROL LAYERS	INSULATED	K-İST-Y	16.040	463.800	479.840
	NON-INSULATED	K-İST-Z	54.370	445.540	499.910

Geopolymer concrete façade cladding with a low U value and higher insulating properties than concrete façade cladding has reduced heating consumption in all alternatives. However, the insulation property increased the cooling loads. Total energy consumption remained below the control group.

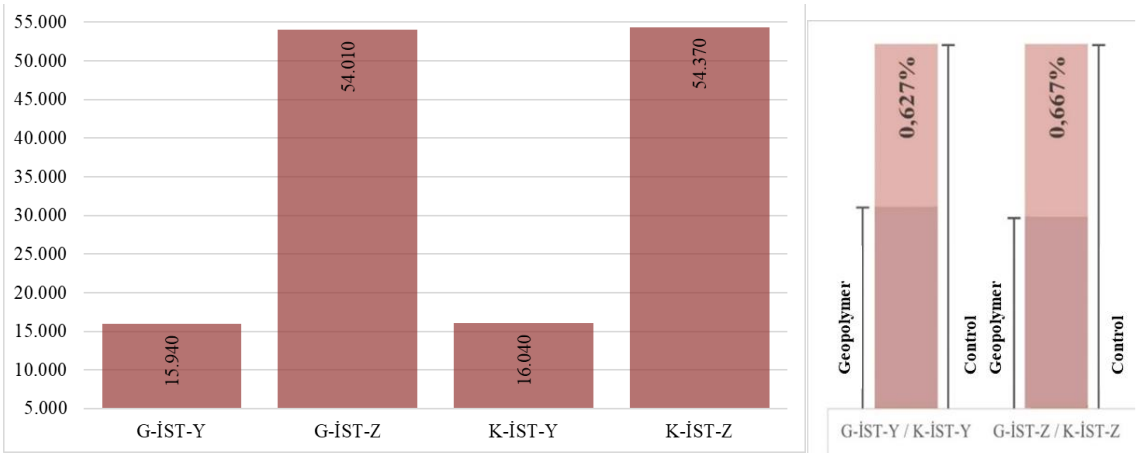


Figure 2. Gas Consumption

In all alternatives using geopolymer, gas consumption for heating decreased compared to the control groups. The decreases are 0.627% and 0.667%. The porous structure of the geopolymer gives the shell an insulating property (Figure 2).

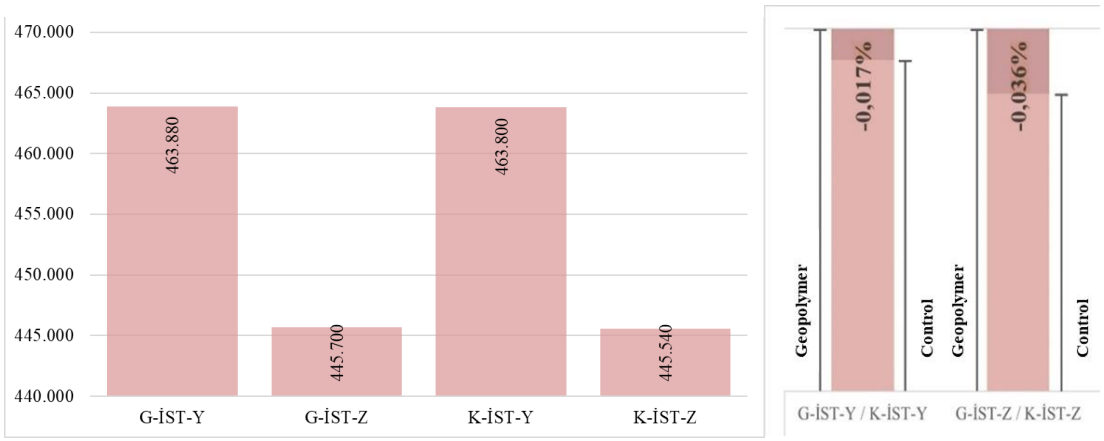


Figure 3. Electricity Consumption

The amount of electricity used for annual cooling has increased in all alternatives with geopolymer concrete façade cladding. The high specific heat of the geopolymer concrete and the insulating property increase the electricity consumption used for cooling in the stratification, which is accepted. Electricity consumption increased by 0.017% - 0.036% in geopolymer façade cladding alternatives (Figure 3).

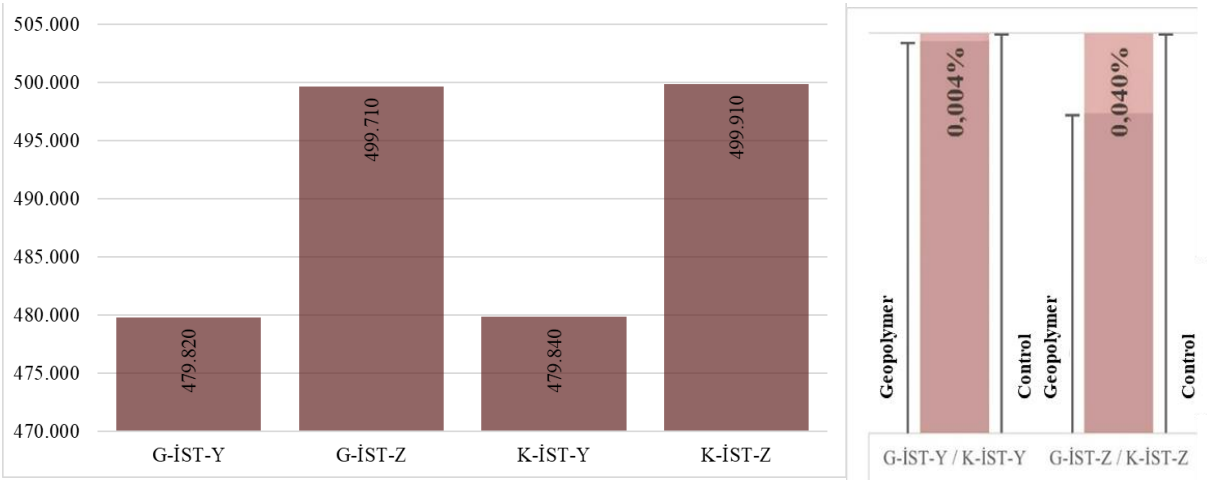


Figure 4. Total Consumption

When the geopolymer stratification alternatives and the control stratification alternatives are compared, the total loads are close but lower, while the heating loads are low under all conditions. The results support the usability of geopolymer with lower embedded energy instead of concrete cladding. There was a decrease in total energy in geopolymer stratifications by 0.004% - 0.040% (Figure 4).

Change rates are not significant, but geopolymer concrete facade cladding should be preferred because its initial concretization energy is lower than concrete cladding. In addition, low rates of change affect the environmental impact in a logarithmic manner.

The annual heating consumption amounts of the 4 alternatives, whose annual energy consumption was calculated with a computer program, were found. Natural gas was used as the heating source. The amount of emissions per natural gas consumption is calculated by multiplying the coefficients determined by the International Energy Agency (EIA). Decline rates in order from largest to smallest; G-İST-Y > K-İST-Y > G-İST-Z > K-İST-Z

Table 10. Emissions

ALTERNATİFLER	KARBON DİOKSİT kg/kWh	KARBON MONOKSİT kg/kWh	NİTROJEN OKSİT kg/kWh	SÜLFÜR DİOKSİT kg/kWh	PARTİKÜLLER kg/kWh
G-İST-Y	2.887.167.263,34	987.065,73	2.270.251,18	24.676,64	172.736,50
G-İST-Z	9.782.679.039,73	3.344.505,65	7.692.363,01	83.612,64	585.288,49
K-İST-Y	2.905.279.981,43	993.258,11	2.284.493,66	24.831,45	173.820,17
K-İST-Z	9.847.884.824,85	3.366.798,23	7.743.635,93	84.169,96	589.189,69

The geopolymer layering, which reduces the amount of heating energy according to the reference of each alternative, has released less emissions to the atmosphere than the reference group in all emissions. The amount of carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxide (NO), sulfur dioxide (SO_2) and particulate emissions released to the atmosphere as a

result of the use of natural gas are, in order from least to high; They are G-IST-Y, K-IST-Y, G-IST-Z and K-IST-Z (Table 10 – Figure 5).

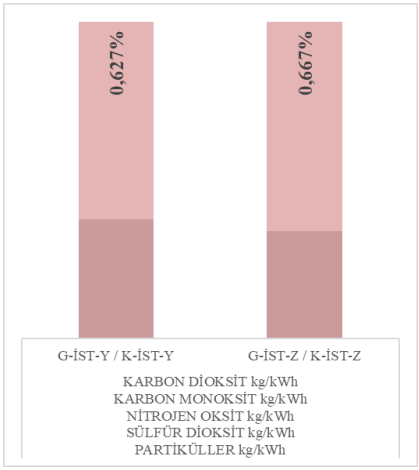


Figure 5. Emissions Change Rate

Using the CML method, the environmental impact values are calculated by multiplying the emissions generated by the alternatives by the characterization factors that vary according to the impact method. Within the scope of the thesis, consumption from natural gas causes 3 environmental effects. These; Global Warming Potential (GWP - unit: $kg.CO_{2.eq}$), Acidification Potential (AP - unit: $kg.SO_{2.eq}$) and Eutrophication Potential (EP - unit: $kg.PO_{4.eq}$). (Figure 6-7-8)

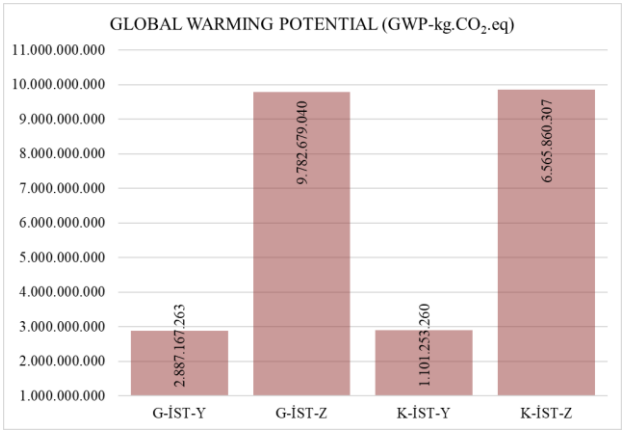


Figure 6. Global Warming Potential

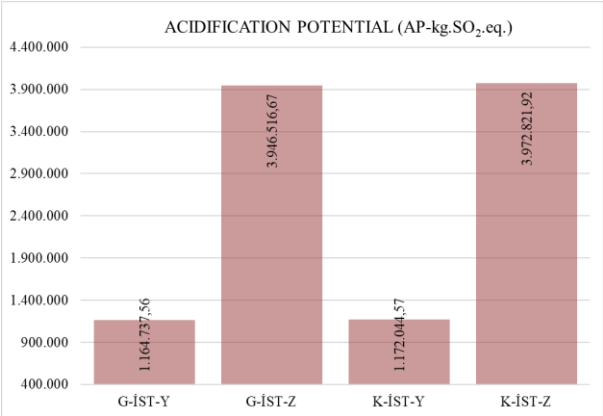


Figure 7. Acidification Potential

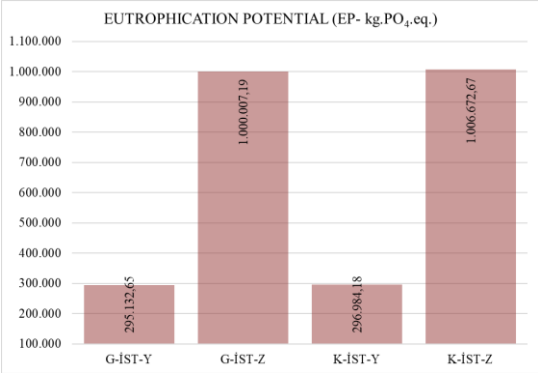


Figure 8. Eutrophication Potential

Since geopolymer stratification reduces the energy consumption used for heating, alternatives with geopolymer stratification have fewer environmental emissions than control alternatives. Environmental impacts from less to more; G-İST-Y < K-İST-Y < G-İST-Z < K-İST-Z

Conclusion and Recommendations

Geopolymer concrete façade cladding with a low U value and higher insulating properties than concrete façade cladding has reduced heating consumption in all alternatives. However, the insulation property increased the increased shell cooling loads. Total energy consumption remained below the control group. The results support the usability of geopolymer with lower embedded energy instead of concrete cladding.

Change rates are not significant, but geopolymer concrete façade cladding should be preferred because its embedded energy is 64% - 70% lower than concrete façade cladding.

It has been shown to provide better performance in moderate-humid climate.

In all of the emissions, it released less emissions to the atmosphere than the reference group.

Geopolymer alternatives always have the lowest environmental impact (global warming, acidification and eutrophication).

The use of geopolymer concrete façade cladding in an insulated office building in Istanbul reduces the annual global warming, acidification and eutrophication potentials by 0.627%.

Geopolymer concretes provided the expected performance from concrete in physical, mechanical, durability, thermal and acoustic tests and showed better performance. Considering its performance, it can be used as a building product and material.

Geopolymer concrete had a low environmental impact compared to the concrete control group within the scope of the study. However, the environmental impact differences are not large. Although these results seem low for geopolymer concrete, whose content can be changed according to the needs and whose properties can be improved, the product can be customized to give better results. Also, as environmental impacts increase logarithmically, small differences will cause even bigger differences each year. Improved results can be obtained by supporting the product features determined for the simulation method with research specific to the façade.

The storage of wastes and the area used because of storage pose a problem today. Geopolymer contains waste materials in the formation of concrete. The use of geopolymer concrete instead of the most preferred concrete in the built environment will contribute significantly to the waste storage problem.

Considering the materials contained in geopolymer concrete, which uses waste material as pozzolan, its embedded energy and formation energy are 64% - 70% lower than concrete. It can be preferred in the building sector because it provides the desired properties in the geopolymer concrete product market and is a more advantageous product than the cradle-to-site approach.

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Types of Glass Material from Architectural Building Elements and Examples of Use in Turkey

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Abstract

Glass has become an important building element in our country and in the world with the advancing technology recently. The glass types used with the developing technology have been enriched according to human needs. Naturally, this change has affected the building and space design. In this study, the types of glass materials used in architecture were examined. It has been determined by doing research on the issues related to when these varieties are used and why. In this context, the types of glass materials and usage examples in Turkey are discussed. In the introduction part, the definition of glass building material is made. Its characteristics and varieties are discussed. In the second part, the classification of the glass material used in architectural design is made and examples of this use in Turkey are discussed. In the third chapter, the advantages of different glass types in the examples are discussed. It has been determined that the function and task of the different glass materials examined are different from each other. It has been determined that there are aspects that facilitate human life. It also undertakes the task of creating comfortable spaces for people. Different types of glass appeal to spaces with different functions. Another feature of glass, one of the building materials, is that it has the largest share in the emergence of spacious, bright and breathing spaces. In this way, the choice of glass in architectural design has become very important for architects. There are many options for this glass selection and frame design in terms of functionality, security and meeting aesthetic requirements. The glass types and sizes they choose add a unique identity to the houses they design. The information obtained at the end of the study was discussed and interpreted.

Keywords: Glass, Space, Design, Aesthetics.

1. Introduction

Glasses are liquids with a high viscosity (viscosity) even at high temperature, and it is an inorganic based silicate system that solidifies without crystallization at normal temperature and displays the properties of liquid objects as well as the mechanical properties of solid objects. The main material of the glass is silicon dioxide (SiO2), which provides transparency and is dissolved and dispersed in the amorphous body.

Glasses are transparent building materials with amorphous internal structure, high resistance to especially mechanical, lateral effects, atmospheric effects and temperature changes, having the property of refracting light properly, and permeable to solar radiation. Glass has a higher transparency than most transparent plastic (Eric, 2002).

2. Features of Glass

2.1. Physical Properties

Normal glass is a non-crystalline material that is brittle and exhibits linear elastic behavior until fracture. Breakage of glass occurs with cracks on the glass surface. In most cases these cracks are too small to be seen with the naked eye. Due to the change in crack length, there is also a change in breaking stresses. Short-time stress values can vary between 20-200 MPa. Stress differences in glass are caused by many factors. These factors include environmental conditions, glass type, production effects, humidity. The property of changing the length of the object under temperature is related to the linear dilatation coefficient. This coefficient determines the amount of change in length. This value of the glass material is 8.7x10-6. Compared to other materials, this coefficient is quite close to that of steel (11x10-6) and much smaller than that of aluminum (23x10-6). Hardness is the resistance of an object to the mechanical action of another object. Various measurements are available, such as diamond scratch hardness, sharpening hardness, Mohs comparison hardness. According to Mohs, the mineral-hardness table is used for comparison (Başer, 1999).

2.2. Mechanical Properties

Compressive strength is found by measuring the deformations caused by the force applied to the surfaces by placing the cube or cylindrical sample taken from the tested material between two parallel steel surfaces. In other words, it is the connection between a force large enough to cause the solid body to break and its surface. The compressive strength of the glass is 10000 kgf/cm² as the breaking load. Tensile strength or tensile strength is tested by tearing a rod-shaped sample of an object without bending it. As a result of the tensile test, the mechanical behavior of the object is determined. The tensile strength of the glass is 400-600 kgf/cm² as the breaking load. The breaking load of the tempered glass should be taken as 5x107. Glass material is made resistant to mechanical shocks by tempering process. Tempered glasses are tested mechanically with the "High Ball Drop Test". A tempered 6 mm glass, 500 g falling from a height of 2.00 m. While the untempered glass is broken by the effect of a steel ball weighing 30-40 cm, in the same experiment, it is broken by a ball of the same weight falling from a height of 30-40 cm. Thus, the resistance of tempered glass against impacts increases approximately 7 times and its bending strength increases 5 times (Toydemir, 1990)

2.3. Thermal Properties

The softening temperature of the glass has a value between 500-600 °C. This value can give varying reactions depending on the type and amount of elements in the glass. Materials show a resistance to temperature changes. This resistance, in general, refers to the temperature difference that can occur without breaking in the material. There are special standards for various glass building materials that describe resistance to temperature changes. The glass material is made more resistant to thermal shocks by the tempering process. For non-tempered glass material, a thermal shock of 30-50°C can cause breakage, while a tempered glass sheet can resist a thermal shock of 300°C.

2.4. Optical Properties

The backscattering of light incident on the surface of a material by the material is called reflection. The reflectance rate, which describes the reflectance feature as a numerical value, is the ratio of the reflected light intensity to the incident light intensity. It can be said that the reflection rate is low in transparent solids. The reflectance rate for glass is around 10-12%. Light incident on the surface of a material is partially absorbed and decreases in intensity as it travels through the mass. The absorption state of the material depends on the wave tolerance of the light and the type of material. For glass, this value is around 5%. This value can be increased or decreased by adding different elements to the structure of the glass (Kahraman, 2002).

3. Classification of Glass Used in Architectural Design and Use Examples in Turkey

3.1. Normal Glass

Normal glass can be divided into two as clear-colorless glass and tinted glass.

Transparent and colorless glass, which we use extensively as window glass in buildings in architecture, is produced in 2, 3, 4, 5, 6, 7 mm thicknesses. Tinted glasses; It is obtained by adding metal oxides to normal glass. The coating color of the glass increases, thereby increasing the heat absorption rate of the glass. With the use of coated glass, there is a 1/3 reduction in the transfer of solar energy to the interior. A disadvantage of this glass is that the temperature is constantly increasing due to the fact that it absorbs heat. Thanks to the coloring, the light is filtered, it conducts electricity, the light and heat are reflected and a decorative effect is achieved. Facade coating colors are green, blue, pink, bronze and gray (Button, & Pye, 1993). Green color is mostly preferred for usage. Green glass only transmits low levels and the iron oxide in it absorbs the radiation between 700 wavelength and 2500 wavelength well (Wigginton, 1996).

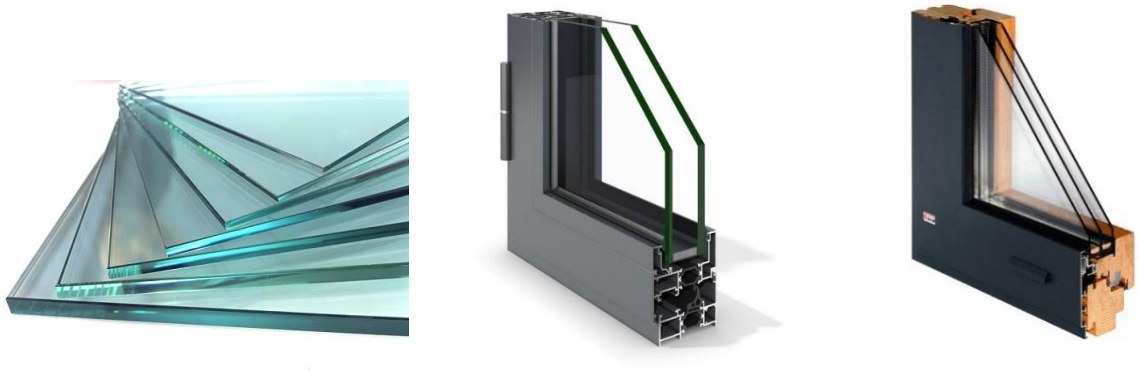


Figure 1. Double Glazing and Triple Glazing system (Url-1)



Figure 2. Architect Kaan Zontul Design-Kayseri

3.2. Surface Coated Glasses

The properties of glass in solar control and emission conditions depend on the level of light transmission. These properties could be highly modified by the addition of a thin layer of precious metals or metal oxides. Such coatings affect the area of transmitted light as well as its intensity (Compagno, 2002).

The temperature control of the glass depends on the level of radiation transmission. The radiation transmission level of the glass can be changed by adding thick layers of metal and metal oxides to the glass. These coatings affect the radiation transmission rate and intensity. An effective solar control on glass is achieved by coating the glass with reflective. Glass with reflective coating is obtained by coating one side of white glass or colored glass with metal (Kahraman, 2002).

Coatings are widely and effectively used to reduce heating costs in winter and cooling costs in summer, and to improve the comfort level of living and working spaces inside the building. With the reflective solar control coatings of the glazed buildings that we often see around us.

"invisible" heat control coatings are actually metal or metal alloys that integrate with the glass surface (Turhan, 2007).

3.2.1. Low-E coated glasses

The sun's rays spread in the form of short wavelengths and enter the building through the windows. The short wavelength sun rays that have entered the room are absorbed by the items in the room. Heated objects emit long-wavelength radiation to the environment by back-radiating. Long wavelength radiation is also emitted by heating systems in the room. Long wavelength radiation is controlled in Low-E glasses.

Flat glass absorbs and transmits heat in a short time as it does not have any coating on it. Low-E coated glasses, on the other hand, reduce the heat transferred to the cold outdoor environment. By using Low-E coated glass instead of white flat glass, the escaping of the heat inside can be prevented three times more. Low-E coated glass units have a thick metal coating on the glass surface inside. This coating reflects ultraviolet and infrared wavelengths in the energy spectrum. Low-E coatings allow the use of natural daylight. Because it has high light transmission (Kahraman, 2002).

Low-E heat control coatings let in most of the shortwave solar energy. While the long-wave radiation emitted from sources such as carpets, furniture, walls, radiators, lighting fixtures, and the human body, which absorbs the sun's rays, escapes from the windows, it is reflected back Inside Like An Invisible Mirror By Low-E Coatings, Preventing The Escape Of Heat Şişecam, (1999).

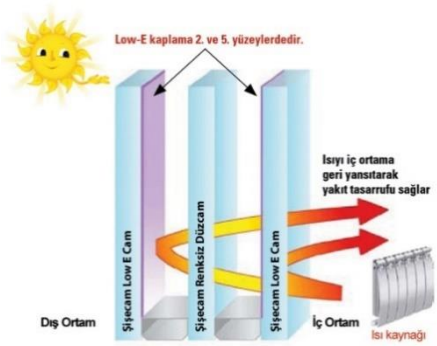


Figure 3. Löw Coated Glass Diagram (Url-2)



Figure 4. Löw Coated Glass Applıcatıons-Samsun (Url-3)

3.2.2. Ceramic-enamel coated glasses



Glaze coated glass has a ceramic-coated glass that is resistant and durable. Cooking glass can develop on a glass plate, it can be grown on a glass plate in the kitchen baking earth in a very good drawing in color and enamel, which can develop on a hard glass plate. After this process, it is air-conditioned to harden. A wide range of ceramic-enamel coatings are quite achieved, from translucent to transparent. More parts, glazed glass panels, can have various patterns and dots, lines and mesh. Patterns, either by a cylinder process or by the curtain method (Button & Pye, 1993).

The glazed glass has a weatherproof and durable ceramic-enamel layer. The hard layer is produced by applying an enamel glaze to a very well formed glass powder floor by spreading various additives and color pigments on a glass plate and baking the glass at a temperature of about 650°C at a temperature where it softens sufficiently with the glaze attached to the glass surface by melting. . After this process, the glass is cooled with air to harden. A wide range of ceramic-enamel coatings can be obtained in translucent to transparent colors (Button & Pye, 1993).

3.3. Safety Glasses

Safety glasses can be characterized as tempered glass and laminated glass. When tempered glasses are broken, they break into small pieces that do not exceed the size of the membrane, reducing the risk of injury. Tempered glass, which is 4 or 5 times more resistant to impacts than normal glass, is first heated up to 690-700ºC in special furnaces; It is then obtained by cooling it suddenly with air (Akyürek, 2001).

On the windows on the exterior of the buildings; It is especially used in crowded places such as shopping malls, schools, public institutions, hospitals and kindergartens (Url-4).

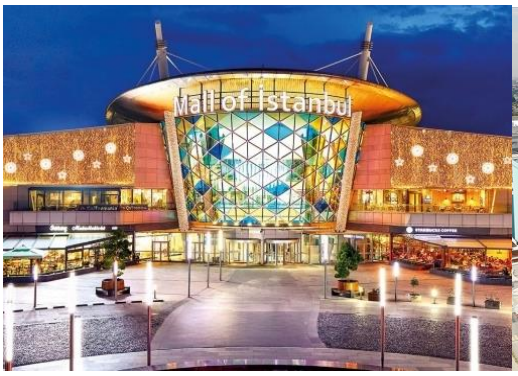


Figure 5. Mall Of Istanbul Mall



Figure 6. Konya City Hospital

Layered Glass, on the other hand, is obtained as a result of combining two or more glass plates with the help of a special binder polyvinyl butyral (PVB) under heat and pressure. These glasses are effective in preventing the scattering of glass pieces and unwanted transitions from one side to the other in case of breakage (Akyürek, 2001).



Figure 7. Bahcesehir University-İstanbul



Figure **8.** Hatila Valley-Glass Terrace in Artvin

Lamination can be done with tempered glass. This material is called layered tempered glass. This glass combination, in which the properties of laminated and tempered glasses are combined, increases the safety of breakage. Today, in most of the architectural structures, security glasses with different degrees of transparency are used in different places (Turhan, 2007).



Figure 9. Glass Balcony and Guillotine Applications-Kayseri

3.4. Glass Bricks

Glass bricks are hollow glass blocks used to make translucent walls. The use of glass bricks in the dividing wall system allows the conditions of space setups such as the continuity of visual integrity, thermal-acoustic comfort conditions and user safety against impact effects to be fulfilled at the same time.

In places where transparency is sought in the space, the recognition of dimensional and formal freedom in the design can be achieved by producing the glass divider element in desired curvilinear forms. However, it is not possible for the glass to bend further as a sheet in certain dimensions outside the bending tolerance determined by the standards. However, by using glass blocks consisting of small pieces, dividing walls with desired curvilinear lines can be created (Turhan, 2007).



Figure 10. Applications of Glass Brick (Url-5)

4. Results

The advantages of different glass types in the examples are discussed. It has been determined that the function and task of the different glass materials examined are different from each other. It has been determined that there are aspects that facilitate human life. It also undertakes the task of creating comfortable spaces for people. Different types of glass appeal

to spaces with different functions. The importance of surface coated glasses and safety glasses in human life has been understood. While surface-coated glasses save energy in many ways, safety glasses have also seen that many risks in human life are eliminated. Recently, architects have started to prefer safety glasses and coated glasses in many areas.

Glass bricks, on the other hand, sometimes appeared as an element of the facade, but sometimes they became a part of the interior. Another feature of glass, one of the building materials, is that it has the largest share in the emergence of spacious, bright and breathing spaces. In this way, the choice of glass in architectural design has become very important for architects. There are many options for this glass selection and frame design in terms of functionality, safety and aesthetic requirements. The glass types and sizes they choose add a unique identity to the houses they design.

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"The Participatory Approach" As the Main Axis of Strategic Planning, Towards a Sustainable Urban Development of Cities; Case of Algeria

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Abstract

Since independence, the Algerian policy applied at the level of regional planning is based on a strong formalism based on a centralized development process. This is the process of centralization where the state makes all the decisions. In recent decades, faced with problems related to sustainable urban development, the world has experienced institutional and strategic changes. Algeria is also experiencing social, economic, and political changes. Since the end of the 1980s, the Algerian authorities have implemented public policies aimed at improving the living conditions of citizens, the objective of which is to encourage the decentralization of actions and the intervention of local communities in terms of the decision. At this stage, strategic planning appears as an alternative to the old policies planned to better manage the territories. One of its objectives is the coordination of local actors in decision-making actions, it is the participatory approach. These actors can be relevant or irrelevant, institutional (DUC, DLEP, OPGI, ACP, etc.) or non-institutional (representatives of society, etc.). So, to better quantify the level of development of the Algerian territories and characterize the level of coordination of the various actors in the approach to sustainable development, a survey work based on a questionnaire directed towards the various actors of the city of Oum El Bouagui in eastern Algeria has been elaborated. The object of this investigation is to form an idea on the degree of the contribution to the reflection according to which the local public services of the town of Oum El Bouaguive an importanin of any strategy of local development and sustainable development. The results showed that the experience of the city of Oum El Bouagui in terms of management and urban planning is still very limited and uncertain, or the participatory approach is very insufficient.

Keywords: Decentralization, strategic planning, participatory approach, local actors, local development.

Introduction

Since independence, the Algerian experience in the field of city management has clearly failed. It operates according to the principles of classic urban planning and development, which does not take into account all the parameters necessary to achieve a certain concrete development. As a result, our societies are marked by increasing individualism and the crisis of social ties, disparities, and marginalisation among the people. It is the centralisation of the "all-state" or the state that plans, executes, and exercises over all territories without taking into account the specific characteristics of each region. [1]

These circumstances have led to a crisis of governance, where citizens feel that they are not listened to or involved in the decisions that concern them, creating difficulties in the management of cities and the control of their development. However, the state has tried to find solutions to improve the living conditions of citizens, but these solutions are still very inadequate compared to their aspirations. It is time to have a vision that imposes new

approaches and urban policies allowing the control of the failures which have appeared in our cities. In this context, strategic planning has emerged as a new alternative to traditional planning to better manage territories. One of the objectives of strategic planning is to encourage coordination between the various actors of civil society in decision-making actions. These actors may be relevant or irrelevant, institutional (DUC, DLEP, OPGI, DUC, APC, etc.) or non-institutional (representatives of society, etc.). Furthermore, the development of the participatory approach is declared in the promulgation of law 06-06 of 20 February 2006 on the orientation of the city and encourages citizen participation. Despite this legislative will on the part of the state to implement major decisions for the success of urban improvement in our country, the absence of application texts relating to this law maintains the situation of cities as it is and the citizen is still marginalised. [2]

Today, the different cities of our country are experiencing an urban crisis, and the city of Oum El Bouagui is no exception to the rule. The city of Oum El Bouagui, which has experienced accelerated urban demographic growth accompanied by problems of management and urban planning, raises questions about the future of this city. Therefore, the present work aims to lift the veil on the urban planning practices applied in this city by the local authorities and to characterise the level of coordination between the main actors of the city in any strategy of local development and sustainable development whose objective is to remove the obstacles preventing the concretisation of a cooperative society. [3]

Methods

The method of investigation is in the form of a non-probabilistic questionnaire, directed towards the different actors of the city of Oum El Bouagui to try to understand the urban planning policy applied in this city. Then, to build an idea on the degree of coordination between the different actors of the city concerning the decision of development actions for the future of their place of life. The objective of this statistical analysis is to collect data on the obstacles which prevent the coordination between the various actors. The questionnaire is dedicated, then, to the institutional and non-institutional actors of the city of Oum El Bouagui. We asked 8 questions and the number of people interviewed was 100, distributed as follows:

- For the institutional actors, 10 people were interviewed, who are

-The director of the Directorate of Programming and Budget Monitoring.

-the director of the DUC and 3 heads of department

-2 heads of department of OPGI

-3 agents of the Environment Directorate

- For the non-institutional actors, the questionnaire was directed towards 80 people from the public and professionals from various sections of society. These actors consisted of 5 people responsible for non-profit associations and preserved the environment, professionals such as 10 architects, 8 teachers and 8 technicians. Then 49 people from civil society (from the general public).

Results and Discussion

In this section, we will analyse the results obtained through this questionnaire and highlight the obstacles preventing the development of a participatory approach. The number of respondents was 100, divided between men (66.7%) and women (33.3%) of different ages (Figure 1).

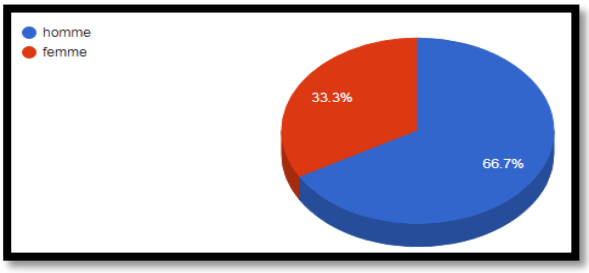


Figure 1. Gender graph [4]

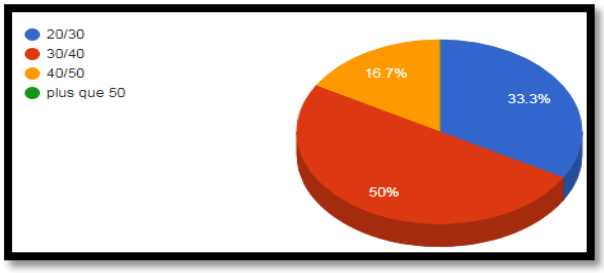


Figure 2. Age graph [4]

The term "Strategic Planning" is known by 83.3% of the people interviewed, while 16.7% do not know this word. This indicates that there is a certain culture of sustainability in this society (Figure 3). For the consultation between the different partners of the city, 87.5% say that the local authorities of the city of Oum El Bouagui do not take into consideration the opinion of the inhabitants in the case of a construction operation, renovation, extension, etc. Whereas, 12.5% say that there is a certain timid consultation (Figure 4). According to people's opinion, these consultations are about approval to build, to demolish, ... by signatures only, without detailed discussion. This confirms that there is a great lack of communication and coordination between the decision makers of the city and the inhabitants.

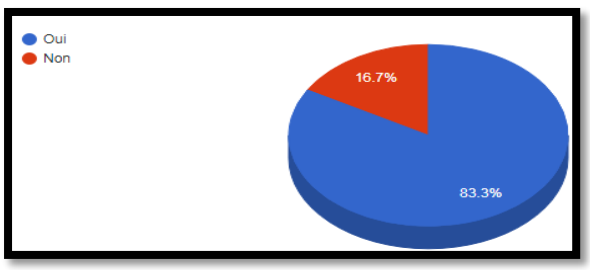


Figure 3. sens de planification stratégique [5]

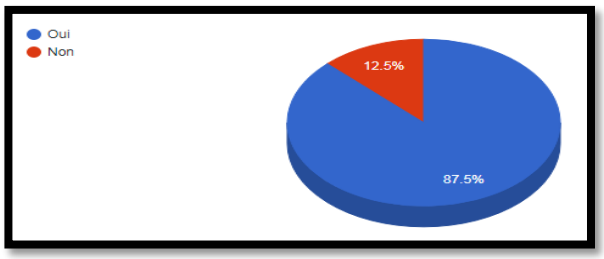


Figure 4. Concertation entre décideurs/habitants [5]

Furthermore, 83.3% of people say that there are no meeting places between the inhabitants and the local authorities. On the other hand, 16.7% say that there are some contact spaces (Figure 5). There is only one day of reception determined by the person in charge to listen to the individual concerns of the citizens, otherwise there are none. In addition, the inhabitants complain about the quality of the outdoor spaces, i.e. the plazas, clubs, etc. These spaces are in poor condition and are not accessible to the public. These spaces are in bad condition and are not well arranged so that people can meet and discuss the problems of their city; even the woman cannot intervene. For the opinion of the people concerning the future of their city, 50% of the people are optimistic and 50% are pessimistic (Figure 6).

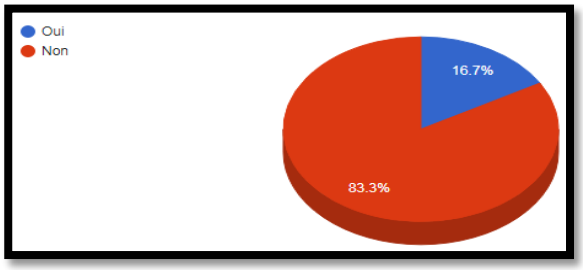


Figure 5: existence of meeting places [6]

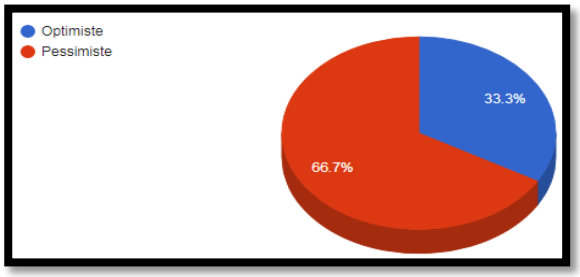


Figure 6: opinion on the future of the city [6]

Concerning the opinion of the people towards the strategy of the planners of the city of Oum El Bouagui on the economic, social and environmental level, the majority of the answers are dissatisfied with the strategies adopted in this city with a lack of contact between the partners. According to the director of DPAT, urban policies in the city of Oum El Bouagui are very limited and are done by injection or the state decides without real consultation with the citizen. He says that Oum El Bouagui has problems preventing their evolution: the land, the existing context, the citizen himself who is not aware of the importance of intervening in the decisions concerning the future of their city. Moreover, the lack of urban culture affects the encouragement of citizen participation.

Conclusion

The fight for a better city, which concerns us all, requires the implementation of real approaches and new urban policies that allow the control of the failures that have appeared in our cities [7]. Gradually, the concept of strategic planning has emerged to address the problems of uncontrolled urban management and development in cities. Strategic planning calls for the adoption of a participatory approach, where the citizen is the active and effective driving force, to promote the human development of those who live there. The application of the participatory approach translates into various procedures: consensus conferences, public

debates, community meetings. These new forms of citizenship promote contact between local communities and their leaders for the benefit of a better quality of towards a cooperative city.

Through this modest work, it appears that strategic urban practices have not yet found a favourable ground for their application and generalisation in Algeria, even if there are the beginnings of regulatory texts and laws which announce a change in the future. The experience of the city of Oum El Bouagui in terms of urban management and planning is still very limited and uncertain, and the participatory approach is very inadequate. The lack of contact between the local authorities and the inhabitants on the one hand, and the contact between the inhabitants themselves on the other hand, leads to poor management and consequently to an anarchic city which does not meet the real expectations of the inhabitants. As a result, some advice can be offered to improve current management practices. These reflections are summarised in the following points:

- On the social level: by encouraging an urban culture based on the expansion of consultation among the different actors in a city.

- On the political level: by a well-planned urban policy in which the role of the state should encourage the emergence of citizen actors who should give viable ideas for a participatory approach towards a better urban character [8].

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Evaluation of the Durability of Fiber Ceramic Mortar in Aggressive Environments

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Abstract
L'objectif de cette étude est de définir le comportement du béton avec ajout de la pouzzolane renforcé de fibres en environnement agressif. Le travail consiste à préparer plusieurs séries d'échantillons du béton en utilisant la céramique sous forme d'une poudre très fine (passant au tamis 80 µm), puis on a variés les pourcentages des fibres utilisés: métalliques, avec un rapport E / C = 0,3. Ensuite Les éprouvettes en mortiers de dimensions de 4×4×16cm³ ont été conservé dans l'eau saturé en chaux jusqu'à l'âge de 7, 14 et 28 jours, puis elles ont été placé dans des solutions d'acide d'acide sulfurique H_2SO_4 et chlor sodium Nacl avec une concentration de 5% pour chaque milieu. L'évaluation de la durabilité de ces mortiers ainsi que le comportement mécanique ont été obtenu par la mesure de la perte de masse et la résistance en compression mécanique.

Keywords: Mortar, Mechanical, Physical Properties, Ceramics powder, Metal fibers.

1. Introduction

Recently, there is motivation from researchers in the built environment to explore the potential reuse of wastes that are mostly generated during industrial and construction activities. The research efforts are in line with a key part of the sustainable development goals, which is to make the environment a conductive place for the society by ensuring environmental sustainability. The approach also focuses on helping to reduce the amount of wastes that are disposed into landfill sites to avoid soil contamination and destruction of biodiversity[1]. With the booming development of construction, more and more old buildings have been exhausting their service life and need to be demolished for rebuilding. Owing to this, a lot of construction and demolition waste (C&DW) are continuously produced [2], where waste concrete is the main component accountings for at least 60% [3]. They are normally discarded at landfills and stockpiles, leading to the increasing cost of economy and environment [4]. Therefore, numerous researchers try to reuse C&DW to alleviate these problems ([5], [11], [8], [13]). For instance, the use of supplementary cementitious materials (SCMs) as cement alternative is an effective method to reduce CO_2 emissions during the production of concrete [14]. In addition, the incorporation of recycled aggregate can reduce the consumption of natural aggregates, save landfilling space, as well as contribute to the

ecological benefits of concrete industry [15].Nowadays, ceramics are the most popular architectural decoration, and widely used as tableware and sanitary ware. In China, around 25% waste ceramics accounting for 13 million tones, are produced and discarded every year due to the damage during the transportation and other reasons [16]. Among them, around 95% is not recycled by any effective means. With the increasing demand for ceramics, it is foreseeable that the amount of ceramic waste will continue to increase [17]. Using ceramic waste as SCMs is an effective means to solve the problem of ceramic waste accumulation and reduce energy consumption and CO_2 emissions during cement production [18]. Like plant shell ash [19], tailings slag [11], glass [8], solid waste incineration bottom ash [20] and other SCMs [37], ceramic waste powders (CWP) still have significant pozzolanic reactivity coming from reactive SiO_2 and Al_2O_3. For some ceramic powders, the content of reactive silica is more than 25% [7]. The CWP shows no obvious positive effect on the early strength development of cement mortar [8], which mainly plays a role as micro-filler and leads to lower early-age strength of cement mortar [11]. However, the late-age strength development of concrete incorporated CWP is enhanced due to the pozzolanic reactivity of CWP [8]. Furthermore, the addition of CWP can greatly contribute to refining the pore structure in concrete [6]. Many researchers have conducted enormous application investigations regarding the use of CWP in cement-based materials, but very few of them focus on its application to RAC. Meanwhile, the mechanical properties and microstructure of RAC containing CWP have not been conducted yet. Due to the advantages of CWP as an SCM, it can be predicted that its combination with RCA will almost certainly improve the performance of RAC.

Therefore, this study aims to increase the utilization efficiency of industrial solid wastes, the cement is partial replaced by CWP in the preparation of mortar. The impacts of CWP on the mechanical properties and the durability of mortar are first evaluated based on compressive strength, and capillary water absorption and determined in order to establish the mechanical characteristics of the mortar. Other investigations are focused on determining the durability characteristics of the mortar, this includes the resistance in aggressive environments, such as d'acide sulfuric H_2SO_4 et Chlor sodium NaCl in mortar over a long period of time.

2. Materials and Experimental Techniques

2.1. Materials Used

The Portland cement type CEM II/A 42.5 from Hammam Dalâa local factory was used in this experimental study. The used cement type has an absolute density, consistency and fineness values of 3.1 g/cm^3, 28 % and 3410 cm^2/g, respectively. The fne ceramic particles were then

sieved through the standard sieves specifed by ASTM C33-13 to remove large particles in order to range between the standard limits for fne aggregates. Also, to use the waste ceramic as a cement replacement, the very fne particles were ground in a modifed Los Angeles abrasion test machine for 4 h of each 4 kg of ceramic powder. The grinding process was continued until 90% of the powders passed through the sieve of size 80 µm following the specifcations by ASTM C618-15. The chemical compositions of the Portland cement and ceramic powder used in this study are listed in Table 1. The dune sand with particles ranging from 0.08 mm to 5 mm in size was taken from Boussâada region (Algeria). The sieve analysis is according to the Eurepean standard (NF EN 933-1) [9]. Metal shavings: The addition of fibers to the concrete brings a certain ductility; for a fiber length equal to 50 mm and a percentage of fibers of 1% and 2%, the result is better with fibers in chips. However, with regard to the breaking energy, it is greater in the case of specimens reinforced with Dra mix fibers (for Lf=50 mm). This can be explained by the fact that these fibers have an anchoring system, they are provided with hooks at the ends. Fiber-matrix (concrete) adhesion is thus better.

Table 1. The chemical and physical properties of cement and ceramic powder

	Cement (%)	Ceramic Powder (%)
SiO_2 Al_2O_3 Fe_2O_3	18.51	74.1017.80
CaO MgO SO_3	04.88	3.58
CL K_2O	02.96	1.13
T_iO_2	58.30	-----
L.0.I	01.85	-----
	2.39	-----
	0.016	2.65
	-	0,44
	-	0.10
	-	

2.2. Mortar sample preparation

Mortar samples were constructed by replacement of 10% cement with activated materials by weight. The mortars were designed using sand to cementitious material ratio (S/C) of 3.0 and W/C of 0.5. The mortar was mixed mechanically, cast in moulds and then compacted with the aid of a vibrating table. After casting, the specimens were covered with ahessian for 24 hours under laboratory conditions before demoulding. Prior to testing, all the specimens were cured in lime saturated water for 28 days. The final compositions of mortars with addition, after optimization is reported on Table 2.

Table 2. The mortar composition

Mix (g)	M0	M10	1M10	2M10
Cement	450	405		
Sand	1350			
Ceramic	0	45		
Metal fiber	0%	0%	1%	2%

Workability: Slump values of mortar sample have been tested for different sample of concrete mix. It was evaluated by partially replacing ceramic powder in place of cement in proportions of 0% and 10%. It was evident that the workability of a mortar mix was decreased with increase in the ceramic powder content. As per NF EN 12350-5 [9] slump test was used to examine workability of the all mixtures.

Compressive strength: For the compression strength test, three samples were used for each mixture, and the average strength values of these samples were determined as compressive strengths for the mixtures with a square section of 40 mm × 40 mm and a length of 160 mm in accordance with NF EN 196-1 [10].

Porosity: The protocol of porosity accessible to water conforms to the recommendations of AFREM [12] group. The open porosity allows us to appreciate the evolution of hydration and structuration of hydrated products; this is a key for identification of the most sustainable concrete [12]. The porosity test is carried out on test pieces of dimensions 4× 4×16 cm^3 , by applying the following steps:

1. Drying in an oven at 105 °C of the sample for at least 24 hours until obtaining a constant mass. Then they were weighed once dry (A);
2. Immersion of the sample in water for 24 hours;
3. Heating to boiling for 5 hours, then weighing the sample in air (weight "C");
4. Finally, hydrostatic weighing (D: weight of saturated samples subjected to Archimedes).

The porosity was calculated by the formula: P (%) = [(C-A) /(C-D)].100

3. Results and Discussion

3.1. Characterization in the fresh state of mortars

The amount of mixing water determines, to a large extent, the workability of a mortar if there were a way to specify and measure it, however, it would be based on workability. The quantity of mixing water determines, to a large extent, the workability of a mortar, if there

were however a means of specifying it and measuring it, it would be according to the workability. The histograms in figure 1 represent the variation in workability as a function of ceramic powder substitution rates for the metal fiber case.

Figure 1 shows that the percentage of water in the control mortar was greater, compared to mortars that contain 8% of 10% CR. Also, the percentage continued to decrease in mortars containing 1% to 2% metal fiber. This means that ceramic powder does not absorb water. This is in agreement with other results on the subject found previously where there was an improved fluidity of the fresh mortars of these types with incorporation of cement with the cementitious additions and fibers [7] [8].

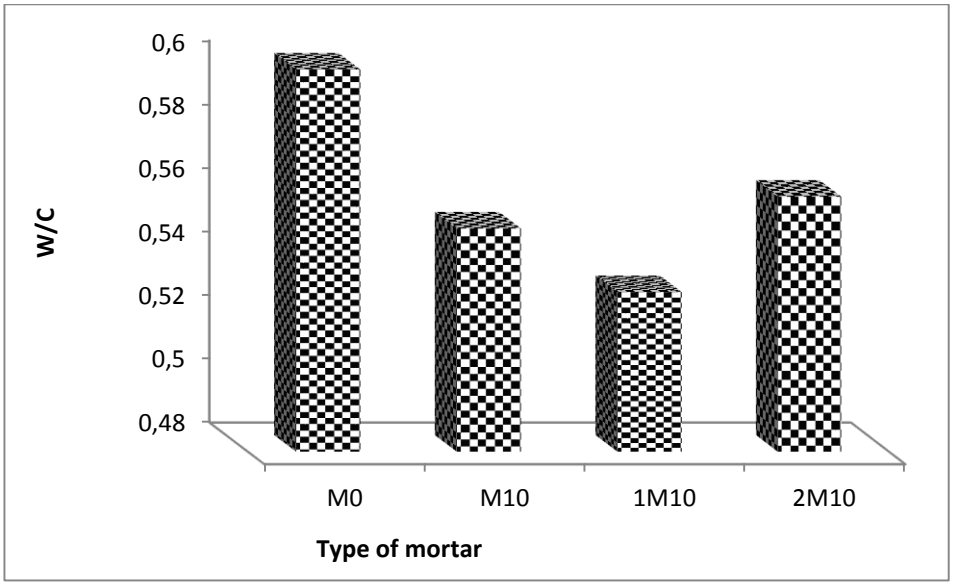


Figure 1. Effect of ceramic powder as cement mixture replacement on workability of mortar

3. 2. Evolution of Sound Velocity (V):

The comparison between the speeds of sound of the different mortars studied allows us to study the influence of the mixing water and acid, chlorine on the degree of compactness and the homogeneity of the mortar. The results of the speed of sound of the different mortars are presented in the form of a histogram in fig. 2. The results of compactness and homogeneity of mortar which are assessed by the speed of sound, can be analyzed in parallel with the results of the compressive strength of the different mortars which are generated by the type of addition used, the age of the specimens and the effect of the percentage of metallic fibre. The mortar with ceramic powder has a better compactness, namely its speed of sound obtained compared to the two other types of mortar, which confirms the results of the mechanical resistance in compression. The current results obtained are consistent with research work undertaken by Z.EL. Rahmouni et al (2022) [6][8].

Note that all suspensions are analogically changeable with respect to the evolution of the ultrasonic velocity over time, but the values depend mainly on the composition of the suspension profile and the type and proportion of the additive; The ultrasonic speed information gives us the evolution of the environment in which it is immersed as a function of time on the adhesion and the homogeneity of the concrete, and is thus a good indicator of the mechanical behavior of this mortar and its durability. .

Note that all sludges are a portable analogue in terms of the evolution of ultrasonic velocity over time, but the values depend mainly on the composition of the sludge profile and the type and proportion of the additive; The nature of the medium gives us ultrasonic velocity information on the adhesion and homogeneity of the mortar, and is therefore a good indication of the mechanical behavior of this mortar.

The evolution of the speed of sound with time is explained by the hydration reaction which improves the compactness and the resistance of the mortar.

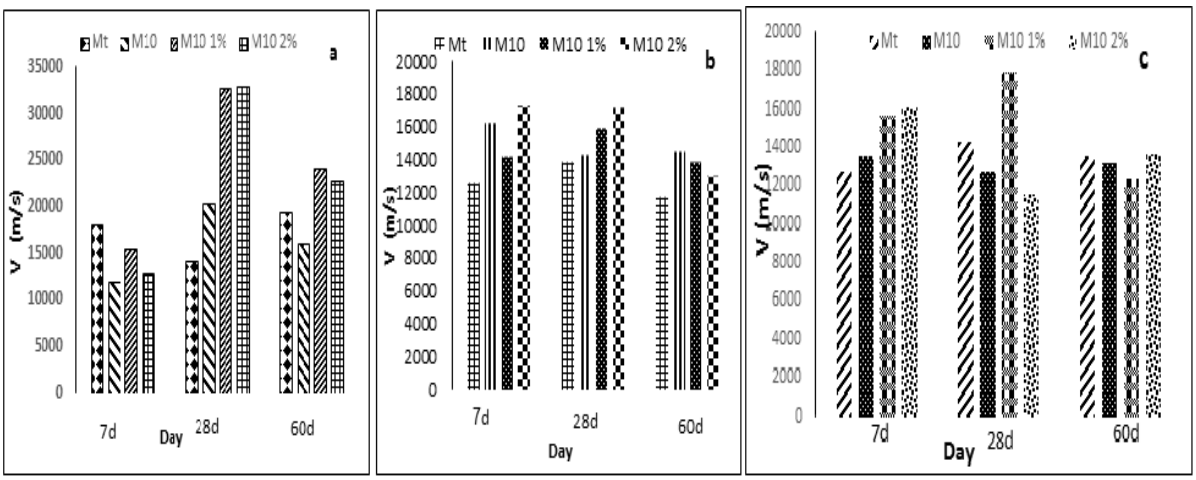


Figure 2. Evolution of the ultrasound speed in terms of percentage added to the mortar at 7, 28 and 60 days in (a) water, (b) acid and (c) Na cl

2. Compressive strength (RC):

The compressive strength results of the mortar with the two percentages of ceramic addition and percentages of metallic fibers obtained at 7, 28 and 60 days are shown in the figure 3.

The incorporation of the fibers was able to improve the resistance of the fiber mortars (1 and 2%) by 4 and 8% at the age of 7 days and by 12 and 25% at the age of 28 days respectively compared to the mortar(R) exposed to water. In the case where part of the cement which makes up the fiber-reinforced mortars (1 and 2%) has been substituted by 10% of the ceramic

powder, the compressive strengths of these mortars have increased respectively from 8 to 22% at age 7 days and 5 to 28% at 28 days of age.

Fig.3a shows that the evolution of the compressive strength follows a Parabola law slow in the range (0-7) days, advanced in the range (7-28) days and fast after 28 days For all mortars with or without fiber and for mixed ceramics.

The incorporation of the ceramic powders in the mortar is advantageous because it could improve the resistance at the age of 7 and 28 days.

Fig.3b shows the evolution of the compressive strength of muds containing various types of mineral additives such as ceramic powder and metal fibers. It can be seen that these slurries generate resistances that are always lower than those of the control slurries and this at all ages. At a young age (first days) the resistance of this cement is weak the first days and increases with time, at 7 days resistance to grouts containing 8% and 10% of silica and ceramic powder and it is noted that the resistance to pressure increases over time.

Fig. 3c represents the result of the compressive strength test in terms of duration (days) in the Na cl medium through this graph, we see that the highest value was recorded after 28 days for M10 2% due to the presence of a percentage of metallic fibers. The latter increases the resistance to mortar shells.

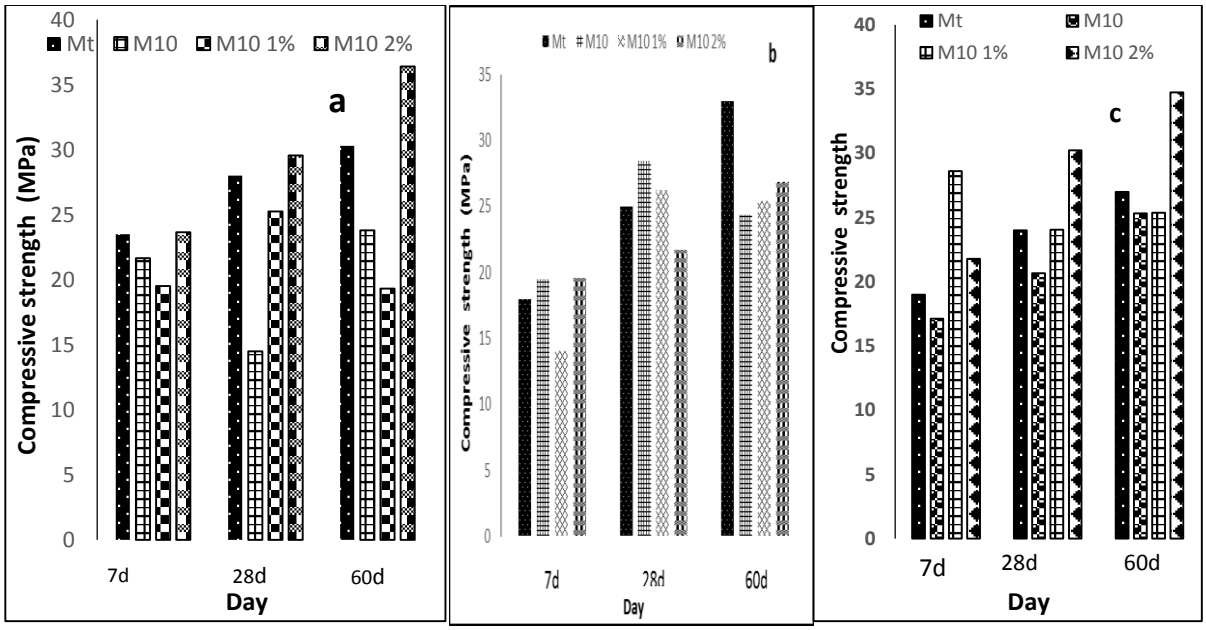


Figure 3. Result of the compressive strength test in terms of duration in water, acid and NaCl

3. 4. Porosity

Figure 4, shows the porosity results of mortar containing ceramic and metal fiber. It was observed that, the specimens with ceramic to 10% showed lower porosity values than the control mortar at 7,28 and 60 days.

The reduction in porosity leads to a decrease in the overall water absorption by the mineral additives. Whereas a smaller pore size leads to a lower absorption rate, indicating a lower void volume. This is how we are Open porosity would be lower in slurries containing additives of various types, including a significant reduction in pore size compared to the same matrix without waste. Low porosity It is caused by the presence of ceramic powder improving the durability of the mortar used.

Fig. 4a,b shows through the results obtained that the percentage of porosity varies, which leads to a difference in water absorption in general through the mineral additions used in the experimental work. According to Tebbal (2022), the first characteristic that should be represented as a function of mechanical resistance is the porosity accessible to water. This parameter is therefore directly linked to the mechanical strength of the concrete [7] [20].

Figure 4c, shows the result of the porosity test in Na cl medium, and it can be seen that the porosity value varies during the period studied for all types of slurry which have been treated according to working practices.

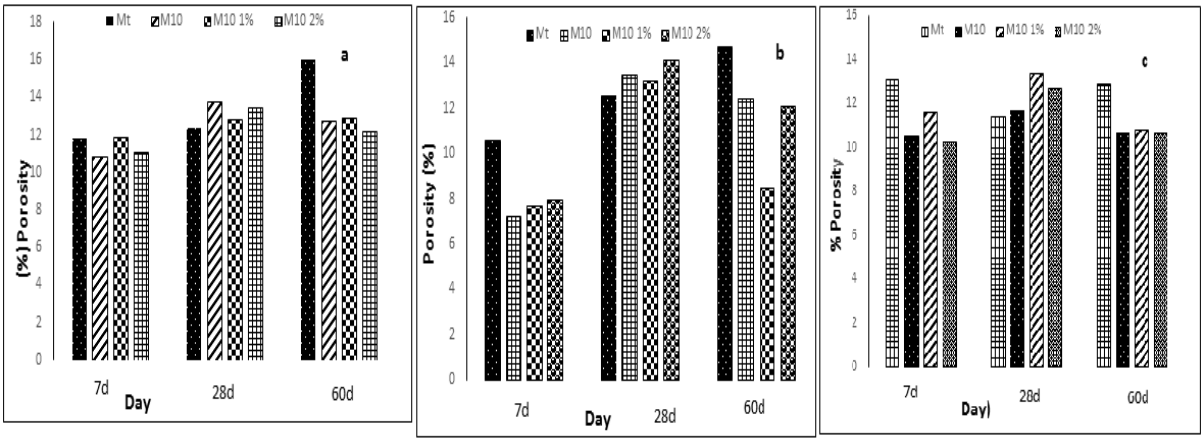


Figure 4. Evolution of porosity as a function of time in (a)water, (b) acid and (c) Na cl

Conclusion

Based on the experimental investigations the following conclusions are drawn:

✓ The contribution of the addition of the ceramic by the formation of a more compact hardened cement paste, due to the gels called second generation gel, resulting from the reaction between the silica and the alumina of the pozzolanic addition and the cement hydration products.

✓ Similarly replacing cement with metakaolin by 10% increases the workability;

✓ From the above compressive strength results, it is observed that mortars have achieved an increase in strength for 10% replacement of cement by ceramic at the age of 28 days when compared to control mortar.

✓ The pozzolanic addition makes it possible to fight against deterioration by chemical attack by bringing the following modifications: Reduction of the porosity of the material; Reduction of pore size; Reduction of $Ca(OH)_2$.

✓ Basic solutions have no adverse effect on cementitious matrix materials, regardless of the concentration of the basic medium.

✓ At the first 60 days of immersion, the compressive and tensile strength of metallic fibers mortar in tap water, sodium chloride solutions and sulphuric acid solutions decreased; while after 60 days, its strength restored again.

✓ The strength fluctuation of metallic fibers mortar in sulphuric acid solutions is higher than that in sodium chloride solutions.

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A Parametric Study to Improve the Heat Transfer of Solar Air Heater Through CFD Analysis

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Abstract

In this article optimized the performance of solar air heater (SAH) considering design 2 and design 3 through computationally fluid dynamic (CFD) analysis. Two designs are considered to study the effect of different rib heights (e=1, 1.2, 1.4, 1.6, 1.8) and depth of duct (h =16, 18, 20, 22, 24) with the help of ANSYS fluent. The effect of different parameters such as velocity, temperature, turbulence kinetic energy and turbulence energy are compared to optimize the performance of design 2 and design 3. It is noticed that except temperature, all other parameters are on the lower side for design 2 as compared to design 3, due to improper air mixing in design 2.Authors presented the optimized design 3 with rib height e = 1.8 and depth of duct h = 16 after consideration of all the parameters (temperature, velocity, turbulence kinetic energy and turbulence intensity) at various rib height and depth of duct. These numerical results will work as benchmark for future research to improve the efficacy of solar air heaters.

Keywords: Solar air heaters, CFD, Rib-height, Depth of duct, Simulation.

1. Introduction

The energy obtained by collecting the Sun's heat and light is known as solar energy. Solar energy is the energy that comes from the Sun. This rich resource may now be used in a variety of ways thanks to technological advancements [1]. Because it does not emit greenhouse gases, it is considered a green technology. Solar energy is plentiful and has long been used as both a source of power and a source of heat[2]. Solar technology may be divided into two categories: Active and Passive.

To harness the energy, active solar approaches such as photovoltaic systems, concentrated solar power, and solar water heating are used. Active solar is used directly in activities like drying clothes and heating the air. Passive solar heating orient a structure to the Sun, selecting materials with favourable thermal mass or light-dispersing characteristics, and creating areas that naturally circulate air are all examples of passive solar methods [3]**.** Recently, investigated the static and dynamic characteristics of curved panels by [16-19] employing finite element formulation based on first order shear deformation theory.

1.1 Solar Heating

Solar heating is a renewable energy system that absorbs energy from the sun in the form of heat rather than using it to generate electricity, like solar photovoltaics does [4]. Solar heating systems can be utilised in residential, commercial, or industrial buildings to offer space and water heating[5]. Solar air heating technology uses only clean, renewable and free energy and can help reduce rising conventional energy costs. A solar air heating system absorbs heat from direct sunlight to heat the air; this heated air can circulate through buildings to provide heat [6-7].

1.2 Mechanism of Heating

Elementarily heating composes of two basic and simultaneous processes: (a) mass is transferred as a liquid or vapour within the solid and as a vapour from the surface (b) heat is moved to evaporate the liquid. The aspects leading the rates of these processes conclude the heating rate[8 -9].

The structure of the solid concludes the mechanism for which internal liquid flow may occur and these mechanisms can be stated as [10].

1. Capillary flow in porous and granular solids
2. Diffusion in uniform and uninterrupted solids
3. Flow due to a vaporization and condensation chain
4. Flow due to pressure gradients and contraction
5. Flow of liquid due to gravity

1.3 Methodology

The scope of this work is multiple; the study covers the study of the parameters, a design study taking into account the technological considerations due to the CFD analysis of the solar air heater, at the level of the system, the study approach is placed in several studies of parameters that are important for understanding solar work heaters. At the level of components, a combination of study of two new different designs by varying different designs and lead a study based on the comparison and, together with it, an experimental validation is carried out [11-12].

Table 1.1. Different Parameters And Their Ranges

Parameters	Range
Entrance length of duct, L1	245 mm
Test length of duct, L2	300 mm
Exit length of duct, L3	120 mm

Width of duct, W	100 mm
Depth of duct, H	16, 18, 20, 22, 24 mm
Rib height, e	1.0, 1.2, 1.4, 1.6, 1.8 mm
Rib Pitch, P	10
Reynolds number, Re	15000
Prandtl number, Pr	0.7441
Heat Flux, I	1000 2

1.3.1 Hydraulic diameter of duct

The hydraulic diameter, D_h, is a commonly used term when handling flow in non-circular tubes and channels. Various parameters and the range of these parameters is given in Table 1.1. The hydraulic diameter transforms non-circular ducts into pipes of equivalent diameter. Using this term, one can calculate many things in the same way as for a round tube. In this equation A is the cross-sectional area, and P is the wetted perimeter of the cross-section.

$$D_h = \frac{4 \times W \times H}{2(W + H)}$$

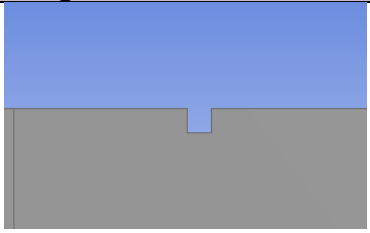
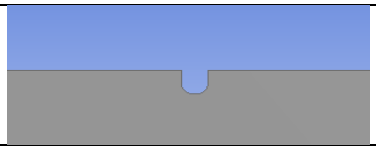
$$D_h = \frac{4 \times 100 \times 20}{2(100 + 20)} = 33.33mm$$

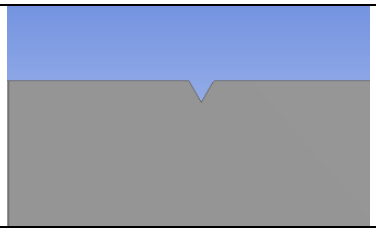
Here W and $H$are width and depth of duct; respectively.

1.3.2 Case design

The design of the ribs in the absorber plate will be varied in the CFD model for different values of e = 1.0, 1.2, 1.4, 1.6 and 1.8. The various values obtained for rib-height e are presented in Table 1.2. three designs are given in Table 1.2 with rectangular cross-section, U-shape cross-section and V-shape cross-section in Design 1, Design 2 and Design 3; respectively.

Table 1.2. Various Designs To Enhance The Heat Transfer of Solar Air Heater.

Design	*e* (mm)	*D* (mm)	Image
Design 1	1.4	33.33	
Design 2	1.0	27.59	
	1.2	30.51	
	1.4	33.33	
	1.6	36.07	

	1.8	38.71	
Design 3	1.0	27.59	
	1.2	30.51	
	1.4	33.33	
	1.6	36.07	
	1.8	38.71	

1.3.3 Material Property

The material properties have distinct role in CFD modeling as they will be used to simulate the flow material. The properties for Air and aluminum are given in the Table 1.3.

Table 1.3. Properties of Air and Aluminum Considered For CFD Analysis.

Properties	Air	Aluminium
Density, ρ (kg/m^3)	1.225	2719
Specific heat, *Cp* (kJ/kg-K)	1006.43	871
Viscosity, μ (N-s/m^2)	1.7894e-05	--
Thermal conductivity, *K* (W/m-K)	0.0242	202.4

2. Design in Ansys Modular

Figure 1. shows the details about the design of the absorber plate along with the ribs incorporated in them as per the design parameters discussed above. The design of absorber plate will be used in CFD model for analysis.

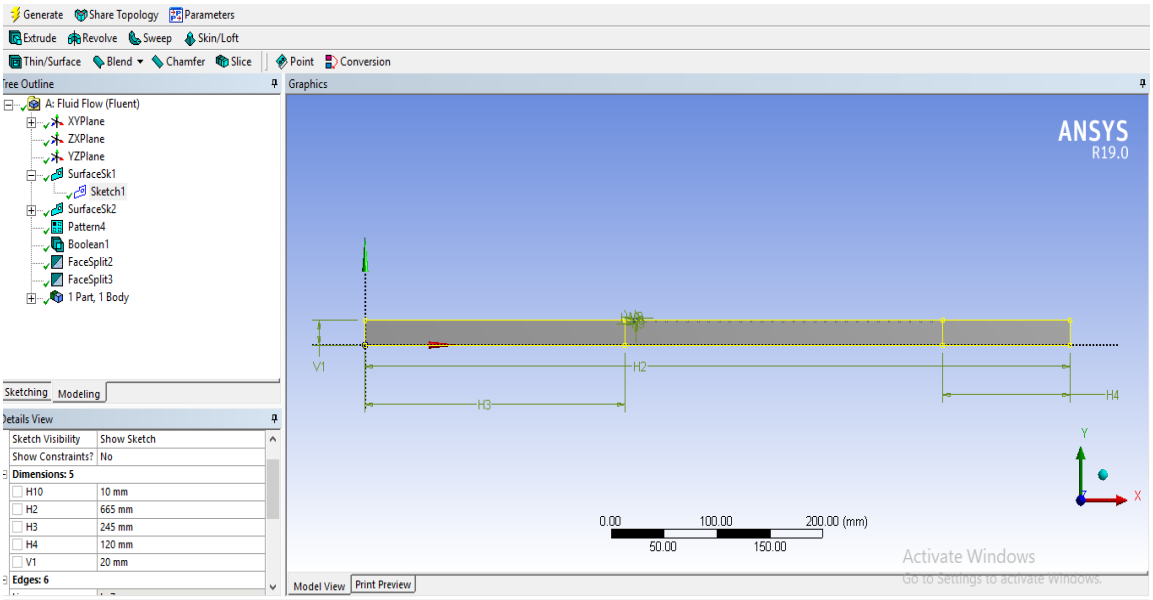


Figure 1. Design in ANSYS Design Modular

2.1 Name Selection

The different sections of the absorber plate are identified as given nomenclature in **Figure2.2:***A* – Inlet, *B*– outlet, *C* – Absorber plate, *D* – Inlet Top, *E* – Inlet Bottom, *F* – Outlet Top, *G* – Outlet Bottom, *H* – Absorber plate bottom.

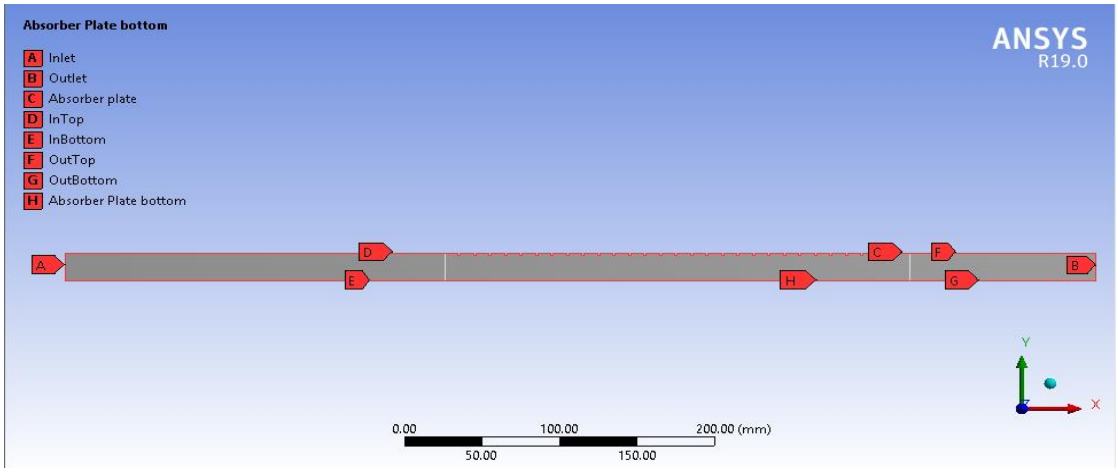
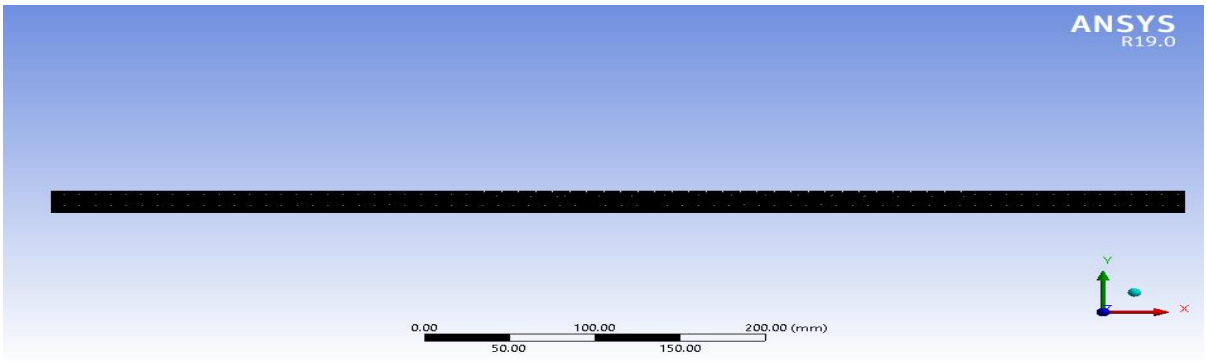


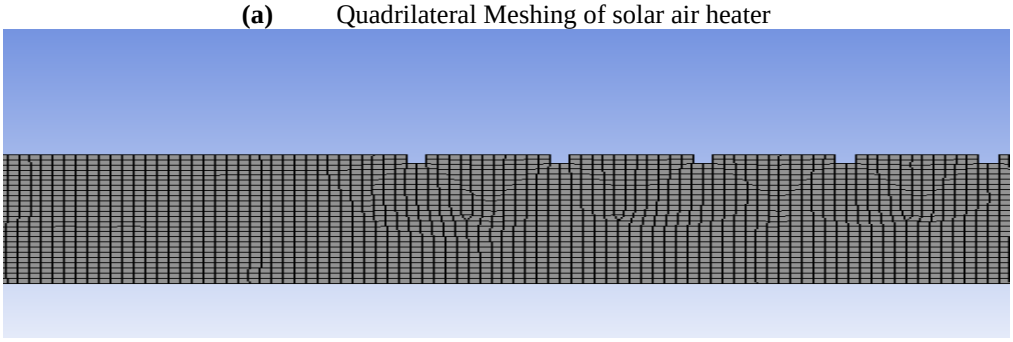
Figure 2. Different Selections of Absorber Plate

Figure 2. will be helpful in identification and understanding the functions of absorber plate.

2.2 Meshing



(a) Quadrilateral Meshing of solar air heater



(b) Zoomed view of Quadrilateral Meshing

Figure 3. Meshing of Solar Air Heater

For meshing Quadrilateral element is used to mesh the solar air heater as presented in Figure 3(a). to mesh the present model of solar air heater 20770 elements and 21678 nodes are created and zoomed view of it is presented in Figure 3(b).

2.3 Boundary Condition

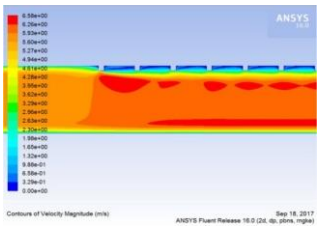
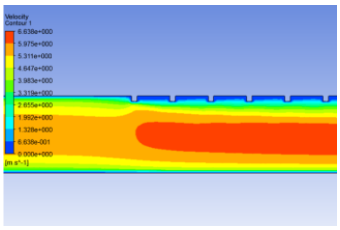
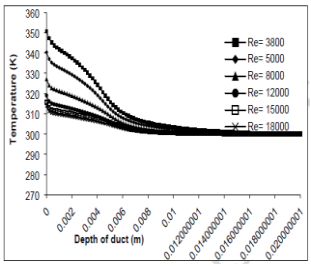
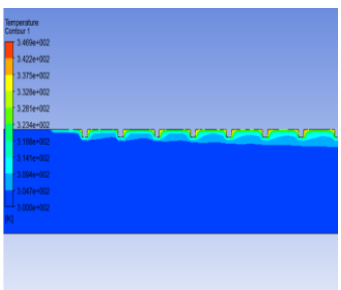
The left edge is assumed as inlet and right edge as outlet. Top edges of the duct are named as in top, absorber plate and out top. Bottom edge may be specified as insulation to avoid heat loss by conduction and convection. A velocity condition might be given at inlet and atmospheric pressure outlet at exit boundary condition. The air enters into the entrance section at 300 K when no-slip conditions considered over duct walls. A constant heat flux (1000 W/m^2) is used on the absorber plate.

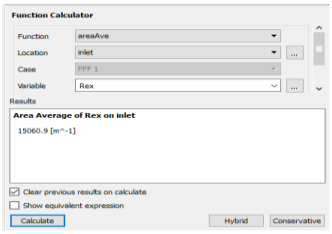
3. Results and Discussions

Firstly, validation study was performed to check the accuracy of present numerical results with available published results. Design 1 is considered here for validation study and compared the present numerical results with computational fluid dynamic results [13 – 15] and computational fluid dynamic results are presented in Table 3.1. Percentage of error is 0.87% and 1.21% with published result by [14] for maximum velocity and maximum temperature attained in solar air heater; respectively. Moreover, percentage of error is 0.4%withavailable result by Abn and Son [15]for case of Reynold's number.

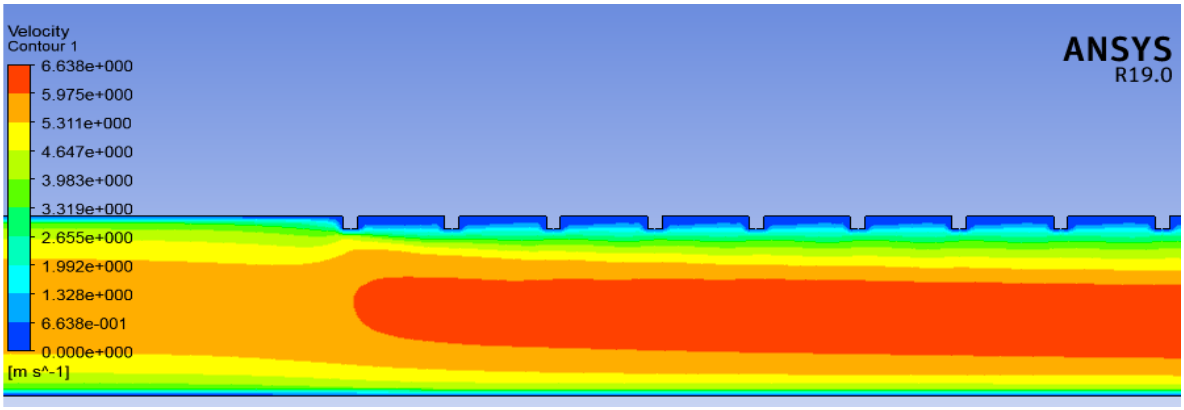
3.1 Validation of Result

Table 3.1. Comparison of velocity, temperature and Reynold's number with available published numerical results.

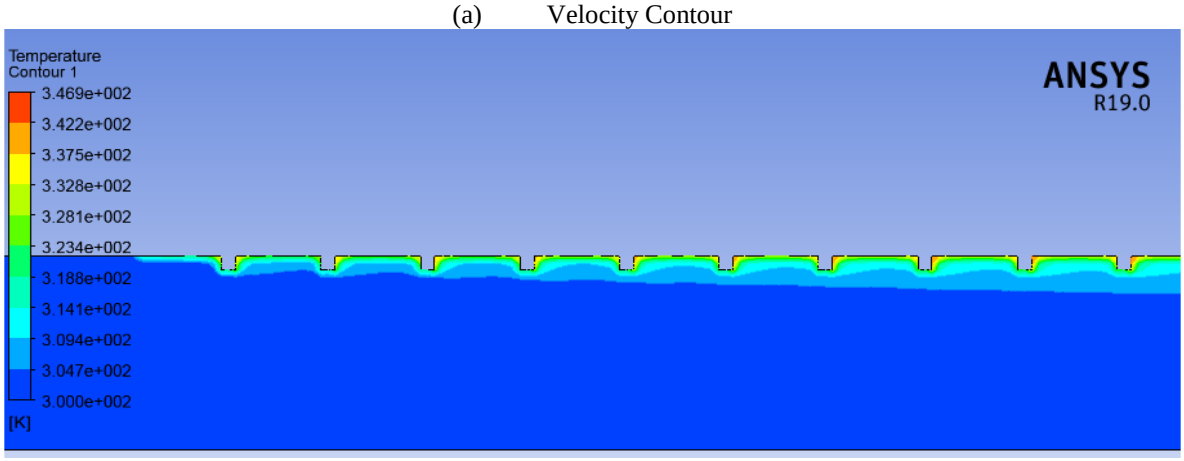
Parameter	Base Paper	Present	Validation
Velocity			Maximum velocity attained in the present study is 6.638 m/s which is similar to 6.58 m/s of Abhay *et al.*[14].
Temperature			Maximum temperature attained in the present study is 346.2K which comparatively similar to 342K of Abhay *et al.* [14].

Reynolds's number (Experimental result) [5]	15000		This paper evaluated Reynolds number of 15060.9 which is similar to that of 15000 attained by Abn and Son[15].

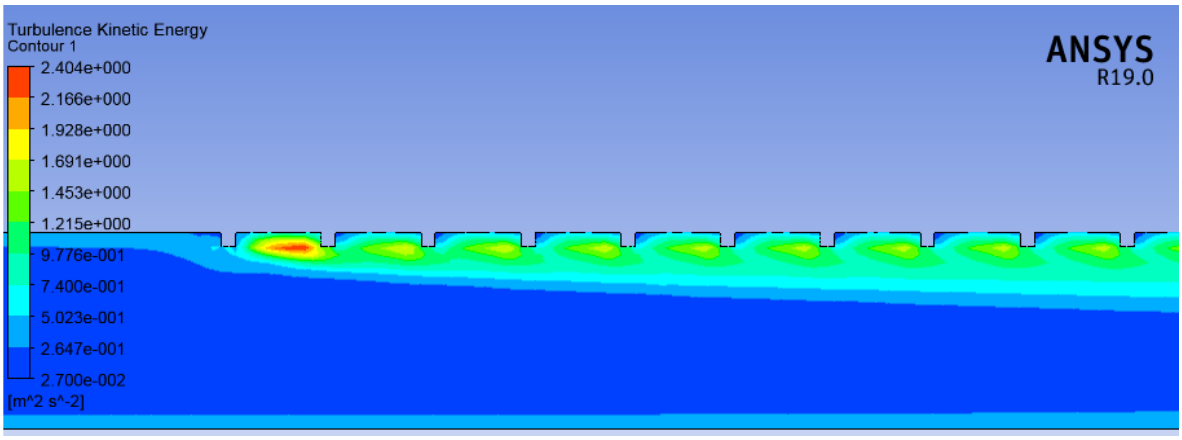
3.2 Result for Design 1 at *e*=1.4



(a) Velocity Contour



(b) Temperature Contour



(c) Turbulence KE contour

Figure 4. Contour plots for Design 1 (**e**=1.4)

The maximum velocity was found to be 6.638 (m/s) in the middle section of the absorber plate shown in orange shaded region. Near ribs and at bottom most area it is observed to be 0 (m/s) as shown by blue shaded regions.

The velocity is higher in the middle region of the absorber plate, the temperature doesn't increase at middle section of the plate, temperature will increase near the ribs; change in temperature will be seen (shown in yellow and red regions) up to 348.1K. Rest of the area in the absorber plate shown by blue shades has temperature near to the inlet air temperature ranging from 300K to 319K which means that high temperature is only obtained at the top of the plate and is not properly distributed throughout the duct.

The turbulence kinetic energy contour at *e*=1.4 Figure 4. shows that the turbulent kinetic energy is high at regions near to the ribs shown by yellow-green shades reaching up to 2.404 (m^2/s^2) but we are not getting high value of turbulence intensity throughout the absorber plate therefore to solve this problem we need to change the design and also vary different parameters to increase the heat transfer of solar air heater.

3.3 Performance of Design 2 for various rib height and depth of duct

3.3.1 Result with change in rib height (*e*)

It is evident from the resultant values from Figure 5 that the Velocity is increased from 6.628 to 6.685m/s by increasing the rib height *e* = 1.0 to 1.8 and corresponding value of temperature, turbulence and turbulence intensity for *e* = 1.8 are 346.1K, 2.371m^2/s^2 and 1.256; respectively which means that higher side value of rib-height (*e*) is desirable for Design 2 that is presented in Table 3.2.

Table 3.2. Variation of parameters with respect to rib-height (*e*) and depth of duct (*h*) for Design 2.

		Velocity (m/s)	Temperature (K)	Turbulence Kinetic Energy (m^2/s^2)	Turbulence Intensity
Rib-height (e)	1.0	6.628	346.7	2.618	1.318
	1.2	6.577	343.3	2.366	1.243
	1.4	6.590	348.1	2.062	1.169
	1.6	6.696	352.4	2.136	1.191
	1.8	6.858	346.1	2.371	1.256
depth of duct (h)	16	6.686	347.3	2.312	1.237
	18	6.637	347.7	2.202	1.208
	20	6.590	348.1	2.062	1.169
	22	6.551	348.6	2.398	1.261
	24	6.515	349.1	2.146	1.194

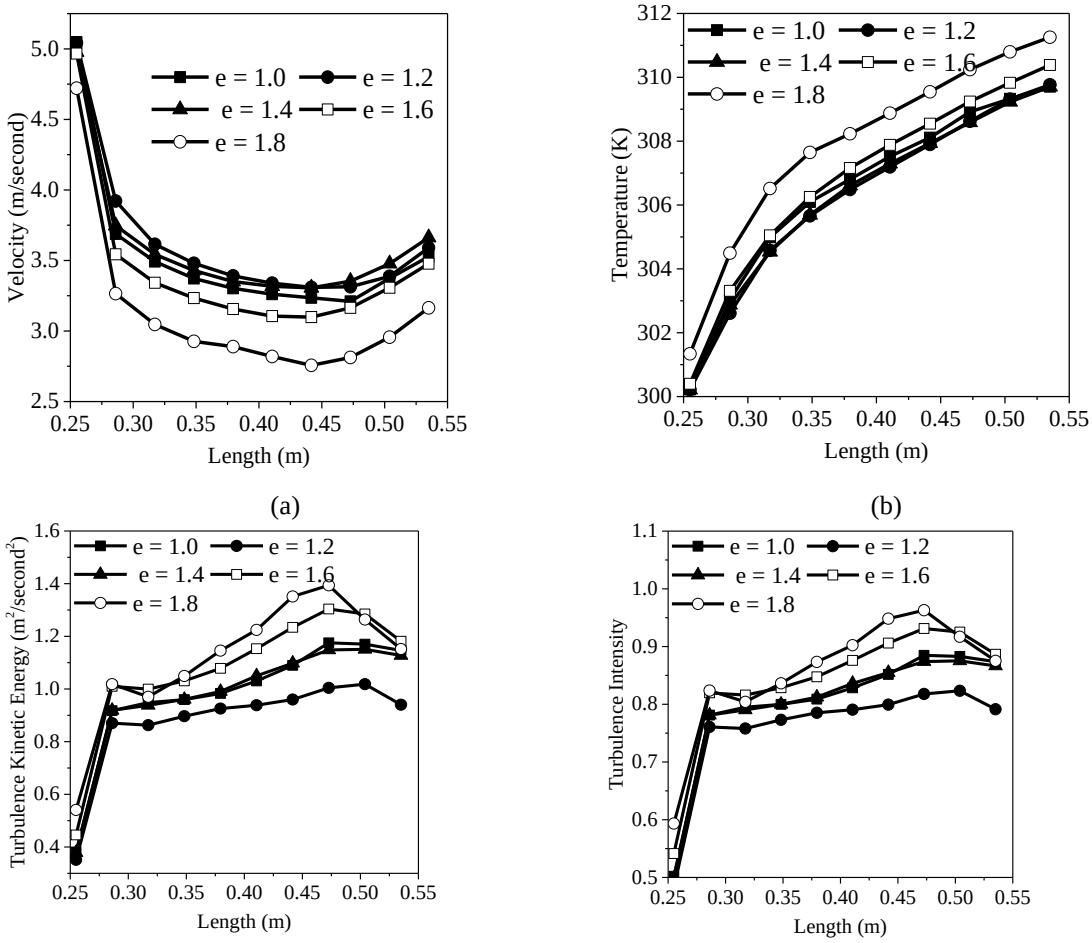


Figure 5. Comparison of different values of e for velocity, temperature, turbulence KE and turbulence intensity for Design 2

3.3.2 Result with change in depth of duct (*h*).

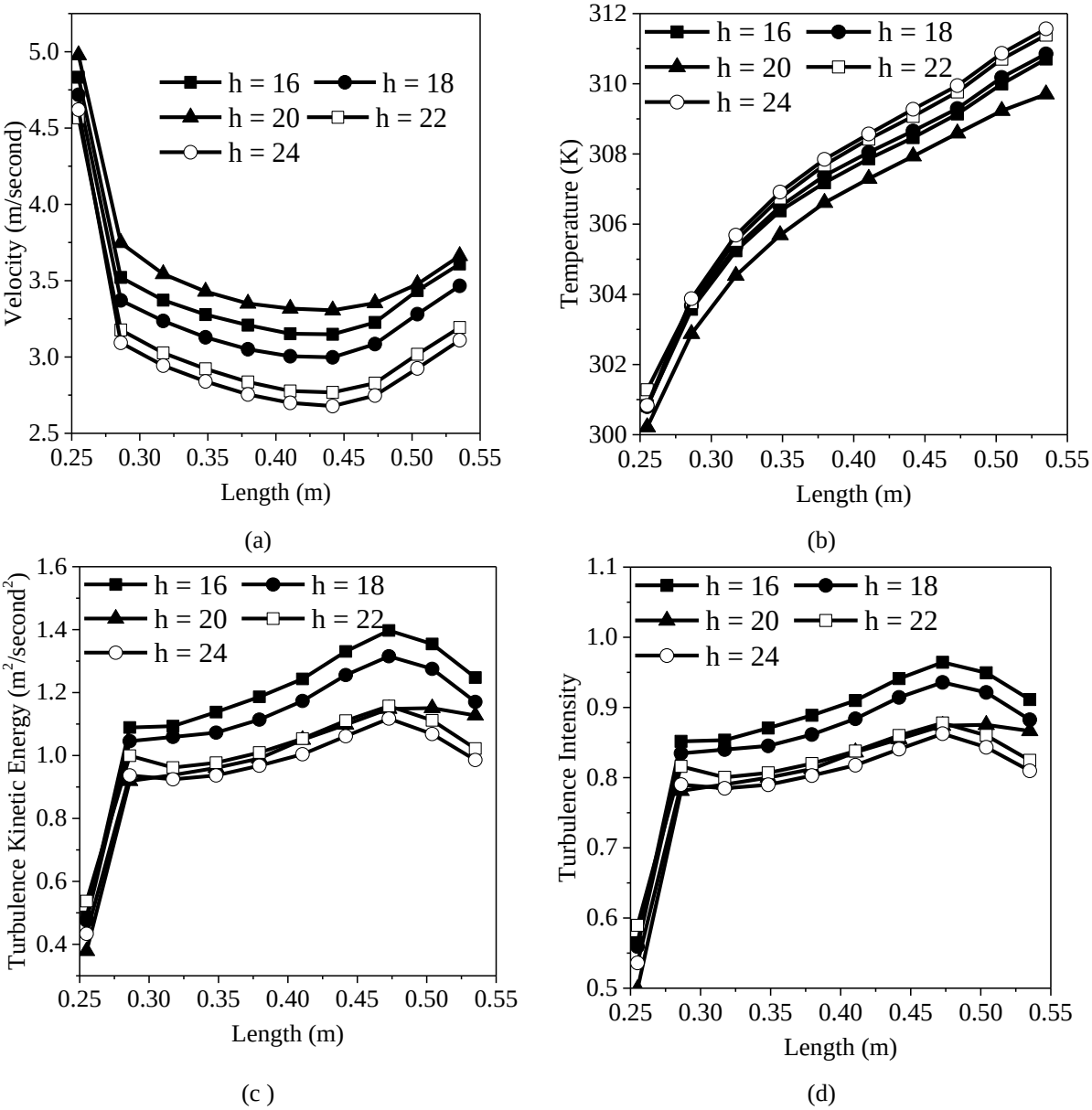


Figure 6. Comparison of different values of *h* for velocity, temperature, turbulence KE and turbulence intensity for Design 2.

The following results were obtained after changing different value of (*h*) Depth of duct as shown in Figure 6.The depth of the duct (*h*) shows the reverse response with change in depth of duct from *h* = 16, 18, 20, 22, 24 as compare to height of rib. It is noticed that the velocity is decreased from 6.686 to 6.515 m/s on increasing the depth of duct, therefore *h*=16 shows best results having uniform distribution of temperature throughout and highest value of turbulence kinetic energy and intensity 2.618m^2/s^2 and 1.237; respectively.

3.4 Design3

3.4.1 Effect of rib height (*e*)

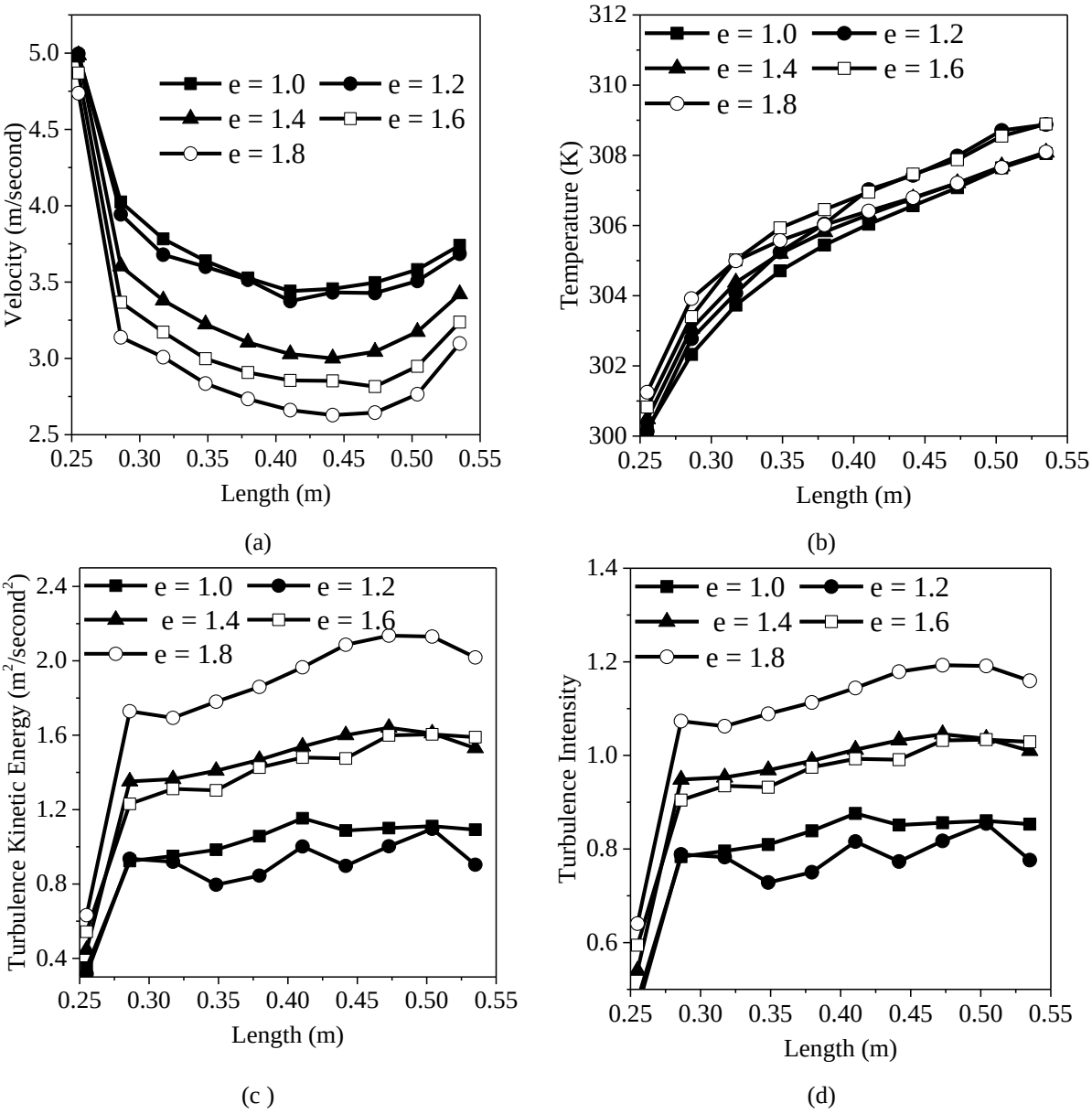


Figure 7. Comparison of different values of e for velocity, temperature, turbulence KE and turbulence intensity for Design 3.

Now, effect of rib height is examined for design 3 and results are presented in Figure 7. It is observed that the above graphs that value of velocity keeps on increasing with respect to the value of *e* and highest value is obtained at *e*=1.8 which is 6.990 m/s that is much higher than 6.474 m/s that was obtained at *e*=1.0.Therefore, for the designing purpose height of rib *e*=1.8 will be considered and corresponding to it value of turbulence kinetic energy and turbulence intensity are highest 2.894$m^2/s^2$and 1.389; respectively. When these two values are high then

there will be uniform distribution of temperature throughout the absorber plate. Highest temperature may be obtained for different value as it will be obtained only on the top of plate.

Table 3.3. Variation of parameters with respect to rib-height (*e*) and depth of duct (*h*) for Design 3.

		Velocity (m/s)	Temperature (*K*)	Turbulence Kinetic Energy (m^2/s^2)	Turbulence Intensity
Rib-height (e)	1.0	6.474	339.2	1.995	1.153
	1.2	6.526	342.9	2.124	1.163
	1.4	6.737	334.5	2.807	1.365
	1.6	6.837	336.9	2.885	1.381
	1.8	6.990	333.1	2.894	1.389
depth of duct (h)	16	6.850	333.8	3.213	1.461
	18	6.790	333.8	2.953	1.401
	20	6.737	334.5	2.807	1.365
	22	6.696	335	2.704	1.340
	24	6.658	335.3	2.608	1.316

3.4.2 Effect of depth of duct (*h*)

Next, the effect of depth of duct has been studied with help of Table 3.3 here for different values of *h* = 16, 18, 20, 22 and 24 and present numerical results are shown in Figure 8 (a–d).It is evident from the resultant values that the velocity is gradually decreasing on increasing the value of depth of duct which means lowest value of depth of duct needs to considered, i.e. (*h*=16) for which value of velocity is obtained as 6.850 m/s and highest value of turbulence kinetic energy and turbulence intensity as 3.213m^2/s^2 and 1.461; respectively. Whereas corresponding higher value of temperature as 333.8K.It is found that both designs 2 and 3 have similar. To increase the heat transfer rate the higher value of the rib-height (*e*) and lower value of depth of duct (*h*) is required for good performance of solar air heater.

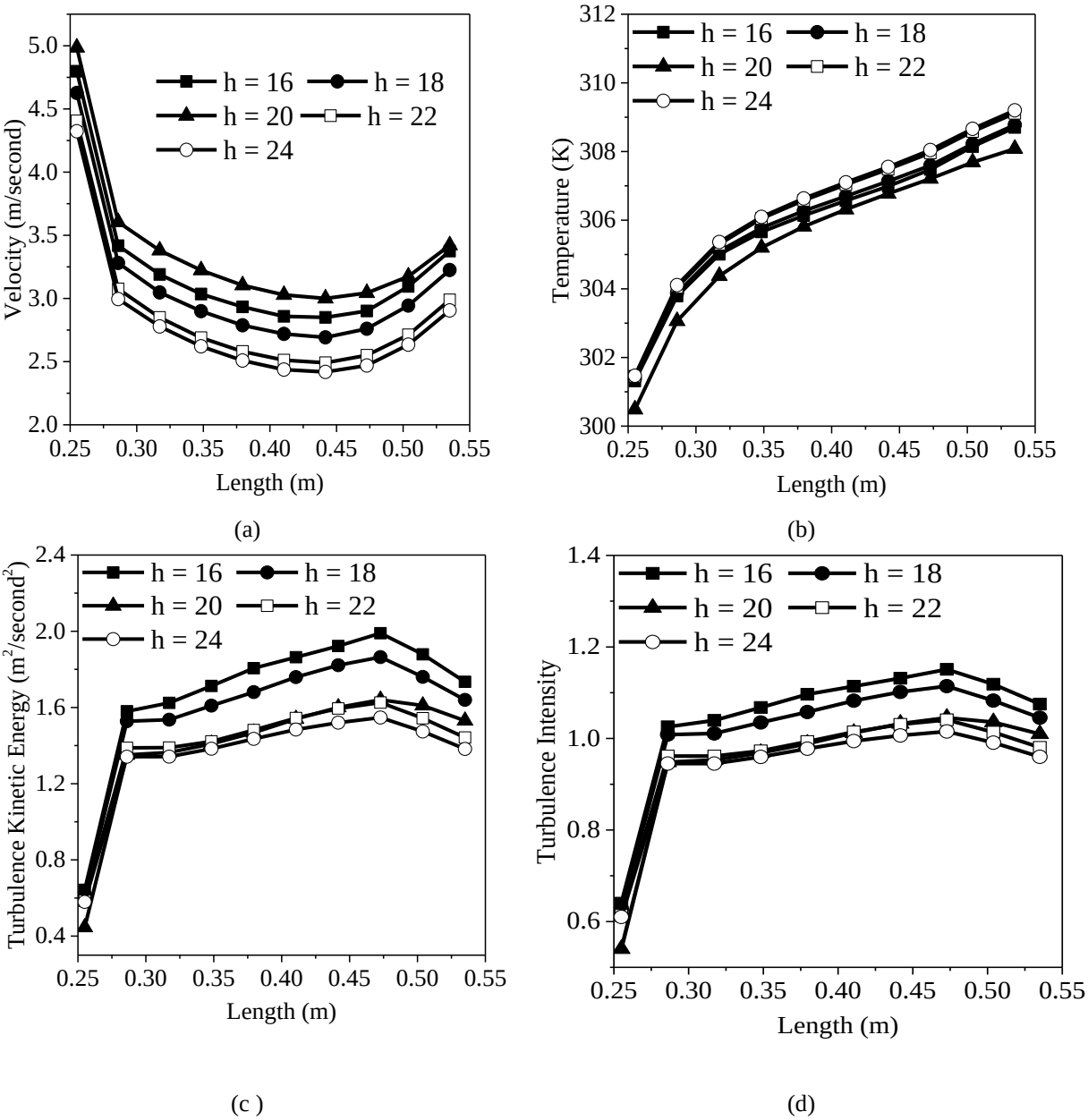


Figure 8. Comparison of different values of h for velocity, temperature, turbulence KE and turbulence intensity for Design 3.

3.5 Comparison in design 2 and 3 by change in rib-height (*e*)

Next, comparison study is conducted to clearly identifythe effects of rib height on design 2 and design 3 as shown in Figure 9. It isseen that at starting value of velocity is higher for design 2 but at the end highest value of velocity (velocity V = 6.990 m/second) is being observed for design 3 at e=1.8; whereas minimum temperature (T = 333.1 K) is noticed for design 3 with respect to maximum turbulence kinetic energy and turbulence intensity 2.894 m^2/$second^2$ and 1.389; respectively. This shows that out of both these new designs, design 3 for value for e=1.8 will be selected is showing the velocity 7.0 m/s and also the turbulence

kinetic energyand turbulence intensity both are higher for design 3 at same rib height (e = 1.8).

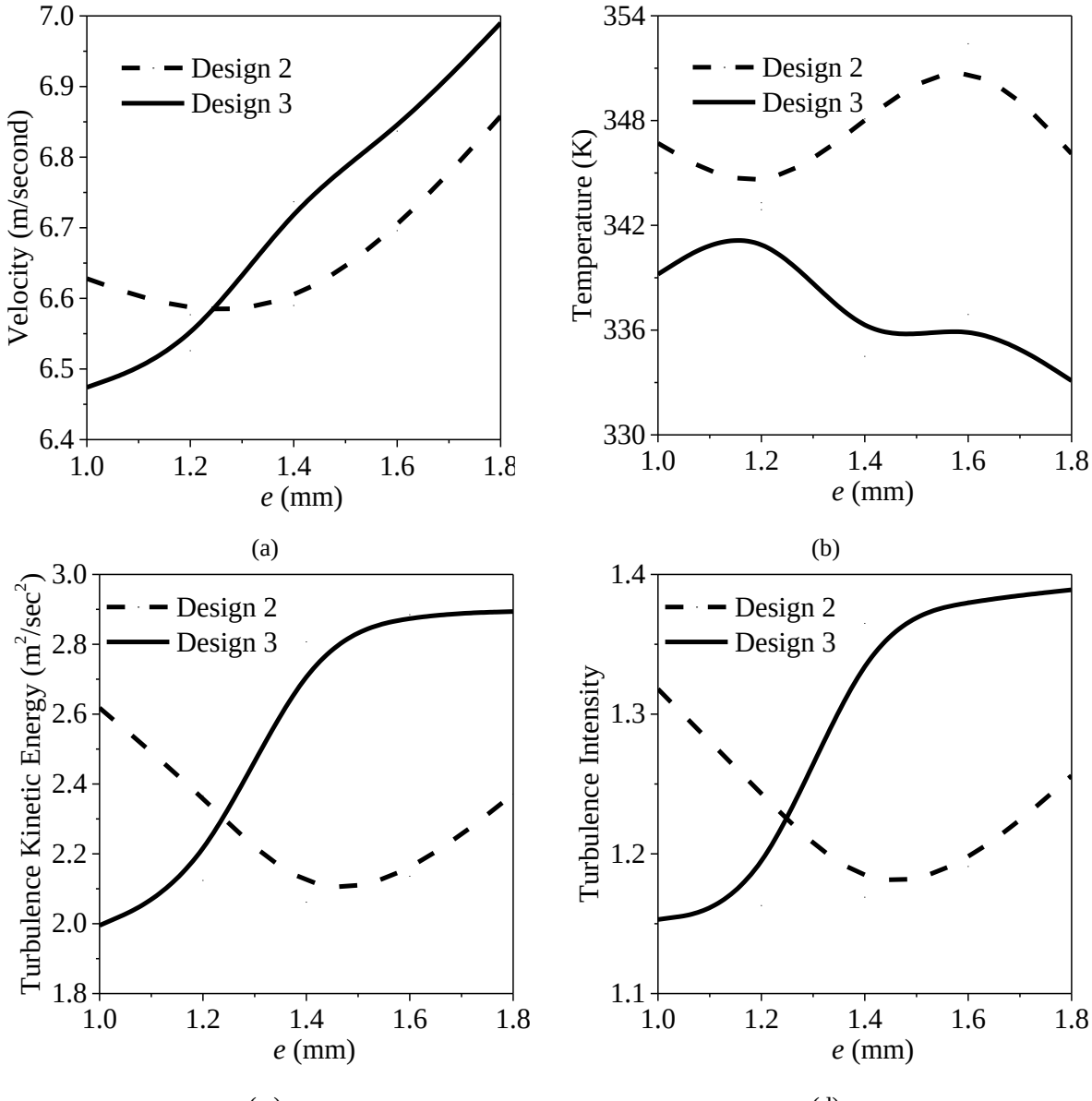


Figure 9. Comparison based graph of Design 2 and Design 3 by variation in e

3.6 Comparison in design 2 and 3 with change in depth of duct (*h*)

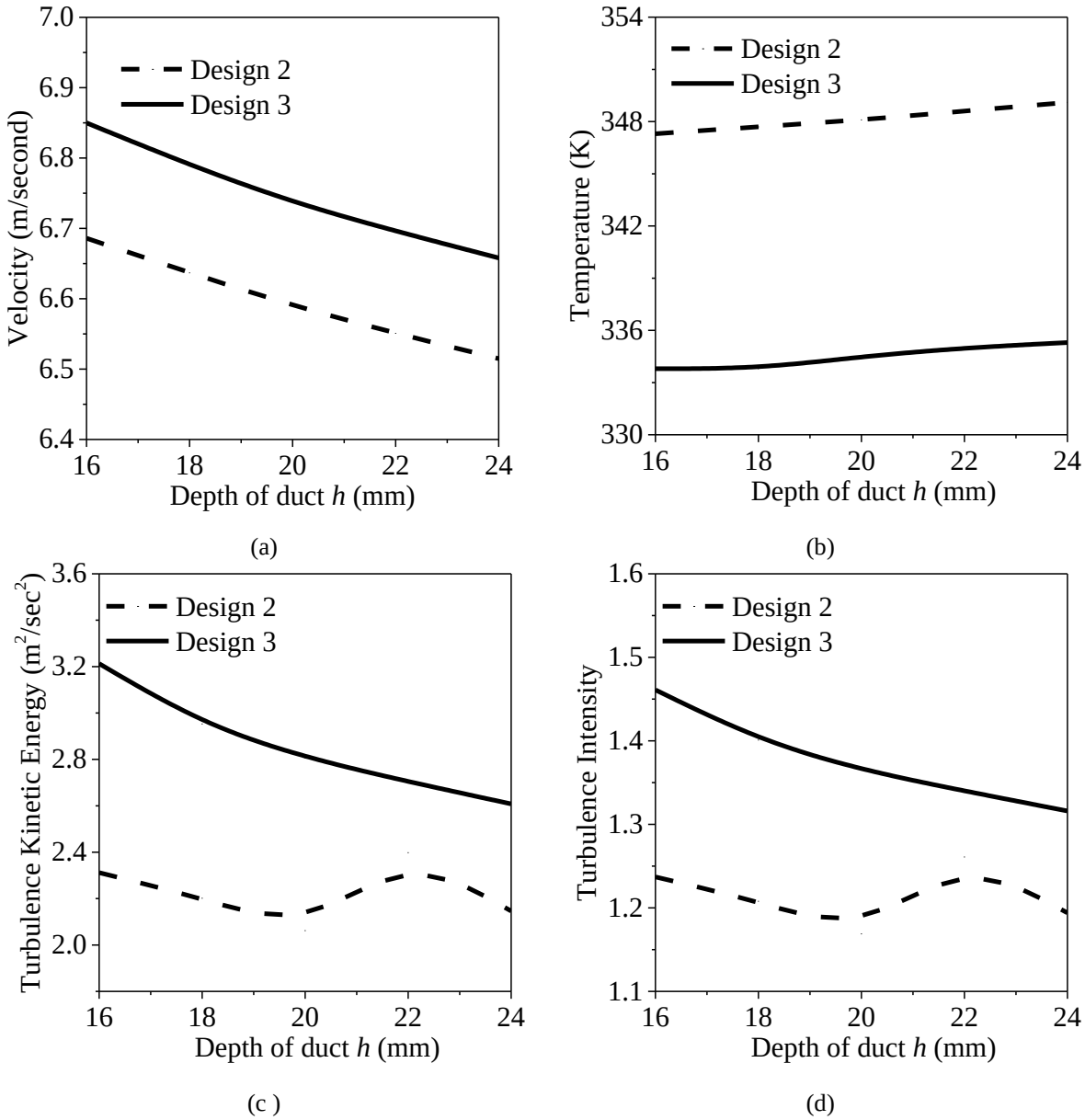


Figure 10. Comparison based graph of Design 2 and Design 3 with change in depth of duct *h*

Now, investigated the effect of depth of duct (*h* = 16, 18, 20, 22 and 24) and demonstrated the performance of solar air heater in Figure 10. It can be clearly seen by graph that at all the points' design 3 have higher velocity than design2. The highest velocity (*V* = 6.850 m/second) for design 3 is obtained at *h* = 16. Similarly for same value of depth of duct(*h* = 16) the highest value of turbulence kinetic energy (3.213 m^2/$second^2$) and turbulence intensity (1.461) is obtained along with high value of temperature (*T* = 333.8 K), therefore this value needs to be considered on the basis of comparison based study.

4. Conclusion

Here, discussed the prospects of design of solar air heater and optimized the performance of solar air heater through computationally fluid dynamic analysis. Authors investigated the effect of velocity, temperature, turbulence kinetic energy and turbulence intensityon design 2 and design 3. For the optimization of solar air heater design, Comparison study has been performed for design 2 and design 3 and studied the effects of various parameters rib-height (*e*) and depth of duct (*h*).

From this numerical analysis, it is concluded that the initial velocity of design 2when rib height *e* = 1.0 the velocity of air in the solar air heater will be*V* = 6.628m/secondthat ishigher than the design 3in which velocity will *V* = 6.474 m/second.But when rib-height is increased to *e* = 1.8 then the design 3 have highest velocity*V* =6.990 m/second among the both the Design 2 and 3.Moreover, design 2 attained more temperature *T* = 345Kthan the design 3which is attains *T* = 335K. Whereas, the initial turbulence kinetic energy is higher in design 22.6 $m^2/second^2$for rib height *e* = 1.0 as compare to 1.995 $m^2/second^2$ for design 3. Maximum turbulence kinetic energy is attained for design 3; which is2.894 $m^2/second^2$ when rib-height is*e* = 1.8. Similarly, the initial turbulence energy was higher in design 2 (i.e. 1.3) but at the end, design 3 gained a higher turbulence intensity of 1.4.

- Different cases were performed by varying depth of duct with keeping rib height constant (*e*=1.4) in both designs. By comparing all cases with respect to velocity, it is found that velocity will decrease if depth of duct increases.
- Turbulence kinetic energy and turbulence intensity also follows the same trend as velocity with increasing the depth of duct.
- Some cases were performed by varying rib height and keeping depth of duct constant in both designs. As shown in results, velocity will increase if rib height increased.
- If, all cases are considered with all parameters (temperature, velocity, turbulence kinetic energy and turbulence intensity) then the optimized design is design 3 having rib height *e* = 1.8and depth of duct *h* = 16.

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Modelling and Comparison of Box Equalization-Based Detectors in Massive Mimo Systems

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Abstract

In massive MIMO systems, the signal detection process at the receiver becomes more challenging task because of high complexity. In this research article, modelling and comparison of BOX equalization-based detectors is conducted to gain optimal error rate performance along-with less complex computations. Different MIMO scenarios are considered for the modelling of detectors to reduce the complexity and enhance the performance. The comparison is conducted with the conventional minimum mean square error (MMSE) detector. Simulation results demonstrate that BOX equalization-based detectors provide the significant performance and a large diminution in the computational complexity under various MIMO configurations.

Introduction

Multiple input multiple output (MIMO) technology is a well-liked technology to enhance the performance of wireless systems using the multiple antennas at the transmitter as well as at the receiver. As the number of mobile users are continuously increasing every year, higher data rates, higher spectral efficiency, large network capacity and better mobility are required [1]. To handle these issues, the massive MIMO technology is adopted for fifth generation wireless systems which is an extension of conventional MIMO technology. Massive MIMO systems have large number (hundreds or even thousands) of antennas in a single antenna array that makes them more resistant to noise, interference and jamming than the conventional systems [2]. Also, it is assumed that user terminals must have a single antenna and the number of antennas at the base station must be higher than the number of user terminals. Sometimes, multiple interference signals due to the large number of antenna arrays at the BS affect the transmitted or received data. Due to this, various detection algorithms are introduced in literature. The basic maximum likelihood (ML) detector gives the optimum performance but it has high computational complexity. Therefore, using ML based detector in massive MIMO systems is a challenging task as the complexity of detection process grows exponentially with the increasing number of antennas at the BS. Thus, detection problem is one of the crucial problems in uplink massive MIMO system [3].

Several researchers have proposed different algorithms for detection purpose in massive MIMO systems. The aim of this research is to find the detector with optimum BER performance along-with lesser number of complex computations. Based on ML detector, linear detectors like matched filter (MF), zero forcing (ZF) and minimum mean square error (MMSE) are considered as they provide better performance but they involve large computation of matrix inversions and multiplications. Computational complexity of matrix inversion in linear detectors is $O(K^3)$. The performance of ZF and MMSE detectors is good but the complexity w.r.t total number of complex multiplications is $K^3 + 2(K^2)N$, where K is the number of user terminals and N is number of BS antennas. Several iterative methods are proposed to reduce the computational complexity in which approximate matrix inversion concept is introduced (Albreem, Juntti, and Shahabuddin 2019). These approximate matrix inversion-based linear detectors perform well with the assumption that the number of BS antennas is larger than the number of users. But the conventional MMSE algorithm outperforms these iterative algorithms.

A brief overview of various detection algorithms and recent advances is presented in the survey paper on massive MIMO detection algorithms for the development of optimal detectors but no simulation results in terms of performance and complexity comparison is provided [3]. Hybrid detectors are proposed by the authors in their research article [4] based on approximate message passing (AMP) with iterative methods like GS, SOR and Jacobi and BER performance is compared with MMSE detector. Some researchers have provided a comparative study of low complexity linear detectors for massive MIMO along-with numerical results in terms of BER and computational complexity [5]. A novel data detection based on alternating direction method of multipliers (ADMM) is proposed in [6] and performs box relaxation-

based equalization. The authors have reported that the proposed algorithm outperforms linear detectors even when the ratio of number of BS antennas and users is small.

In this research study, modelling of non-linear BOX equalization detectors is done and comparison of these detectors is conducted with conventional MMSE detector in terms of error rate performance and computational complexity with different MIMO size i.e., using (i) different ratio (β) of number of BS antennas and users (ii) different number of iterations (n). The main objective of this research is to find the optimal detector which can balance between high performance and low complexity.

Massıve Mımo Detection and System Model

Massive MIMO is the most promising 5G technology which provides potential benefits in comparison to conventional MIMO systems. Due to large number of antenna arrays, it relies on increased spatial multiplexing gain and diversity gain to serve various users from all the antennas [3].

Consider a massive MIMO system as shown in figure 1 with M number of antennas at the base station which serves K single-antenna users where K is assumed to be much less than N i.e K<<N. At the transmitting side, a symbol vector of K users is represented as

$$x = [x_1, x_2, \ldots, x_K]^T \quad (1)$$

The input symbols are transmitted over the massive MIMO channel and at the receiving side, a vector of N base station antennas corrupted by noise and channel effects is observed as

$$y = [y_1, y_2, \ldots, y_N]^T \quad (2)$$

$$y = Hx + w \quad (3)$$

where H is the channel matrix which is assumed to be perfectly estimated at the BS and w is $N \times 1$ additive white gaussian noise (AWGN).

The objective of MIMO detector is to obtain the transmitted vector **x** from the received vector **y.** The basic detection algorithm is the maximum likelihood detection algorithm that estimates all possible signals as

$$\hat{x}_{ML} = \min_{x \in O^K} \|y - Hx\|^2 \quad (4)$$

ML algorithm can achieve optimum BER performance but it involves large number of computations which makes it unsuitable for detection process in massive MIMO with numerous antennas. Several algorithms are introduced in literature to reduce the computational complexity [4]. This research is aimed to achieve high BER performance with a smaller number of computations involved.

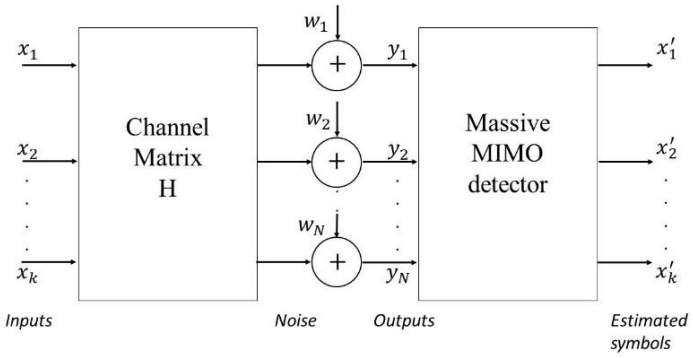


Figure 1. Massive MIMO system

Minimum mean square error (MMSE) detector

In linear detectors, the received signal is multiplied by the equalization matrix **A**

$$A = G + \sigma^2 I_K \quad (5)$$

where $G = H^H H$ is the gram matrix, σ^2 is the noise variance and I_K is K x K identity matrix and provides the estimation as

$$\hat{x} = s(A^H y) \quad (6)$$

where s is the slicer which quantizes each entry to the nearest neighbour in constellation.

MMSE detector [7] considers the noise effect in the equalization process by minimizing the mean square error between the transmitted signal x and the estimated signal $H^H y$ as:

$$A^H_{MMSE} = \min_{H \in C^{NXK}} E\|x - H^H y\|^2 \quad (7)$$

Considering noise effect:

$$A^H_{MMSE} = (H^H H + \frac{K}{SNR} I)^{-1} H^H \quad (8)$$

The output of the MMSE detector is:

$$\hat{x}_{MMSE} = S(A^H_{MMSE} y) \quad (9)$$

Equalization matrix A is also known as MMSE weighting matrix.

In MMSE detector, because of the involvement of matrix inversion, the computational complexity increases exponentially due to large number of antenna arrays in massive MIMO systems.

Box Equalization Detectors

Linear equalization-based detectors are commonly used in MIMO systems, some non-linear equalizers are also examined and have shown comparable results in terms of error-rate performance with low complexity [8]. One of the most favourable non-linear equalizers is box-constrained equalizer (or BOX equalization) that simply put a box with a given radius around the square constellation as shown in Figure 2. This equalizer relaxes the finite alphabet constraint $x \in \mathcal{O}^K$ to the convex polytype $C_\mathcal{O}$ around the constellation set $\mathcal{O}$ and estimates this version of the ML problem as

$$\hat{x}_{BOX} = \min_{x \in C_\mathcal{O}^K} \|y - Hx\|^2 \quad (10)$$

For QAM symbols, the convex polytype is represented as $C_\mathcal{O} = \{x_R + x_I : x_R, x_I \in [-\alpha, \alpha]\}$, where α is the radius of the compact box around the squared constellation like for QPSK symbols, the convex prototype is $C_\mathcal{O} = \{x_R + x_I : x_R, x_I \in [-1,1]\}$ with constellation set $\mathcal{O}$={1+j, -1+j, -1-j,1-j} which represents a box with radius 1 around the squared constellation.

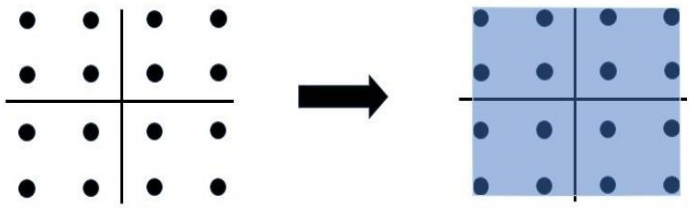


Figure 2. Concept of BOX equalizer

ADMM with infinity norm (ADMIN): The alternating direction method of multipliers (ADMM) is a well-liked numerical method to solve convex optimization problems whose objective function and constraints are convex. It decomposes large convex problem into smaller sub-problems to solve them efficiently. ADMIN method solves the box-constrained problem of equation(10) iteratively and performs linear MMSE equalization in first iteration by initializing z and λ to zero [8, 9]. ADMIN represents the equation (10) as

$$\min_{x,z\in C^K} \frac{1}{2}\|y - Hx\|^2 + g(z) \qquad (11)$$

where $z = x$ and $g(z)$ is an indicator function or convex regularizer for the convex prototype C_O given by

$$g(z) = \begin{cases} 0, & if\ z \in C_O^K \\ \infty, & otherwise \end{cases} \qquad (12)$$

In the ADMM first iteration, x is minimized, and z remains fixed which estimates the transmitted signal as

$$\hat{x} = (H^H H + \beta I)^{-1}(H^H y + \sigma^2(z - \lambda)) \qquad (13)$$

Rewriting above equation

$$\hat{x} = A^{-1}(\hat{x}_{MF} + \sigma^2(z - \lambda)) \qquad (14)$$

Where, $A = (H^H H + \sigma^2 I)$ is the regularized Gram matrix or equalization matrix and $\hat{x}_{MF} = H^H y$ is the matched filter estimate. To perform linear MMSE equalization in the first iteration, z and λ are initialized to zero and afterwards they are iteratively updated as shown in Table 1. The update step of z is given as

$$\hat{z} = \arg\min_{z\in C_O^K} \frac{\sigma^2}{2}\|z - (\hat{x} + \lambda)\|^2 \qquad (15)$$

Above equation is an orthogonal projection of $\hat{x} + \lambda$ onto the convex prototype C_O^K.

And λ is updated as

$$\lambda \leftarrow \lambda - \gamma(\hat{z} - \hat{x}) \qquad (16)$$

Where γ is penalty parameter chosen as $\gamma > 0$ for the ADMIN algorithm.

To implement the x-update of ADMIN, inversion of regularized gram matrix is required and it can be computed using an LDL decomposition. Therefore, during pre-processing, inversion of L and D is calculated to simplify the detection process.

Table 1. BOX equalization detectors

Algorithm	Inputs	Preprocessing	Initialization	Detection
ADMIN	y, H N_o, E_s	A $= H^H H + \left(\frac{N_o}{E_s}\right) I_k$ $G = LDL^H$ $\tilde{L} = L^{-1}, \tilde{D} = D^{-1}$	$z = 0$ $\lambda = 0$	$\hat{x}_{MF} = H^H y$ for n=1:M $\hat{x} \leftarrow \tilde{L}^H \tilde{L} \tilde{D} (\hat{x}_{MF} + \sigma^2 (z - \lambda))$ $\hat{z} \leftarrow proj_{C_0}(\hat{x} + \lambda, \alpha)$ $\lambda \leftarrow \lambda - \gamma(\hat{z} - \hat{x})$ $z \leftarrow \hat{z}$ End
OCDBOX	y, H N_o, E_s	$d_k^{-1} = \left(\left\|h_k\right\|^2\right)^{-1}$ k=1…K	$C = C_o$	for n=1…M for k=1…K $x_k^{(n)} = (d_k^{-1} h_k^H r + x_k^{(n-1)})$ $\Delta x_k^{(n)} = x_k^{(n)} - x_k^{(n-1)}$ $r \leftarrow r - h_k \Delta x_k^{(n)}$ end end

Optimum coordinate descent (OCD): Coordinate descent is a well-known iterative method to resolve a large number of convex optimization problems [10]. The update rule for BOX equalization problem according to equation (10) is derived as

$$\hat{x}_k = (\|h_k\|^2)^{-1} h_k^H \left(y - \sum_{j \neq k} h_j \, k_j\right) \quad (17)$$

Instead of computing all the updates, pre-processing and algorithm restructuring is performed during each iteration so that recurrent operations can be minimized without any performance loss. In the pre-processing stage, OCD precomputes certain key quantities during each iteration to reduce the complex computations and simplify the hardware implementation. During the equalization process, OCD performs incremental updates and re-uses intermediate components during each iteration to avoid recurrent operations (Wu et al. 2016). By setting the gradient of equation w.r.t. k component to zero, Hx can be decomposed as $Hx = h_k x_k + \sum_{j \neq k} h_j x_j$. Solving for x_k, we get:

$$\hat{x}_k = (\|h_k\|^2)^{-1} h_k^H \left(y - \sum_{j \neq k} h_j \, k_j\right) \quad (18)$$

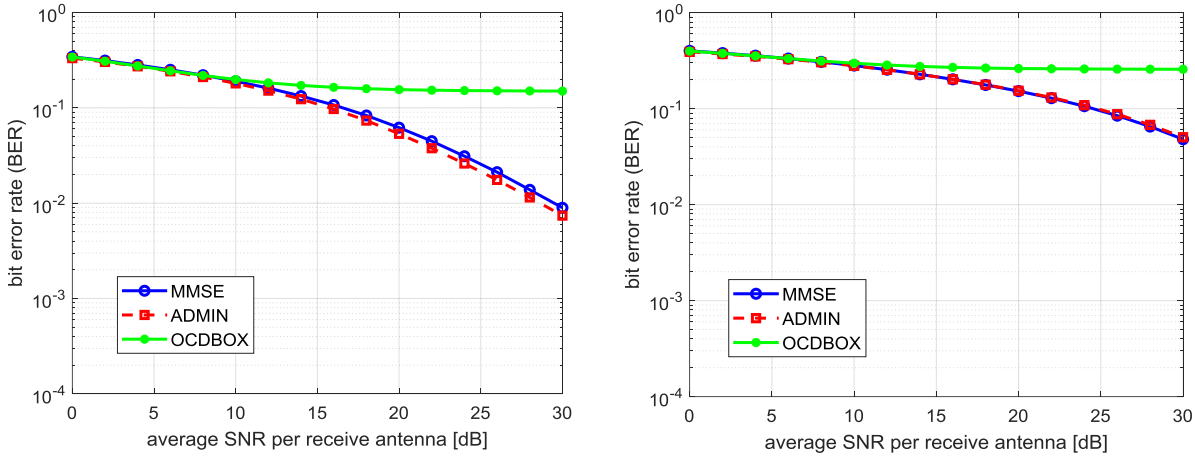
This step is repeated for total number of iterations M. Here, $r = y - \sum_{j \neq k} h_j \, k_j$is the residual approximation vector which is updated in every iteration and for each user by computing the symbol estimates $\hat{x}_k$ first. OCD algorithm is shown in the Table 1.

Results And Dıscussıon

This section provides the comparative analysis of MMSE and BOX equalization detection algorithms in uplink massive MIMO systems in terms of error rate performance and computational complexity. Different massive MIMO environments i.e 16×16, 16×32, 16×64,16×128, 16×256, 32×64, 32×128, 32×256, 64×256 for modulation techniques 16QAM and 64-QAM are considered. Simulations are done in MATLAB 2019 by showing the relationship between bit error rate (BER) and average SNR per receive antenna. The comparison is done using the ratio of number of BS antennas and users (β) to obtain an optimum performance. Also, different number of iterations are evaluated. Objective is to select the algorithm which can balance between BER performance and computational complexity.

a) Error rate performance

Figure 3 shows the BER performance of MMSE, ADMIN and OCDBOX detectors in 16×16 massive MIMO using 16QAM and 64QAM respectively. For lower order modulation, the non-linear detector ADMIN achieves the best BER performance. For higher order modulation like 64QAM, ADMIN detector converges to the MMSE performance while OCD detector is ineffective for square MIMO system.

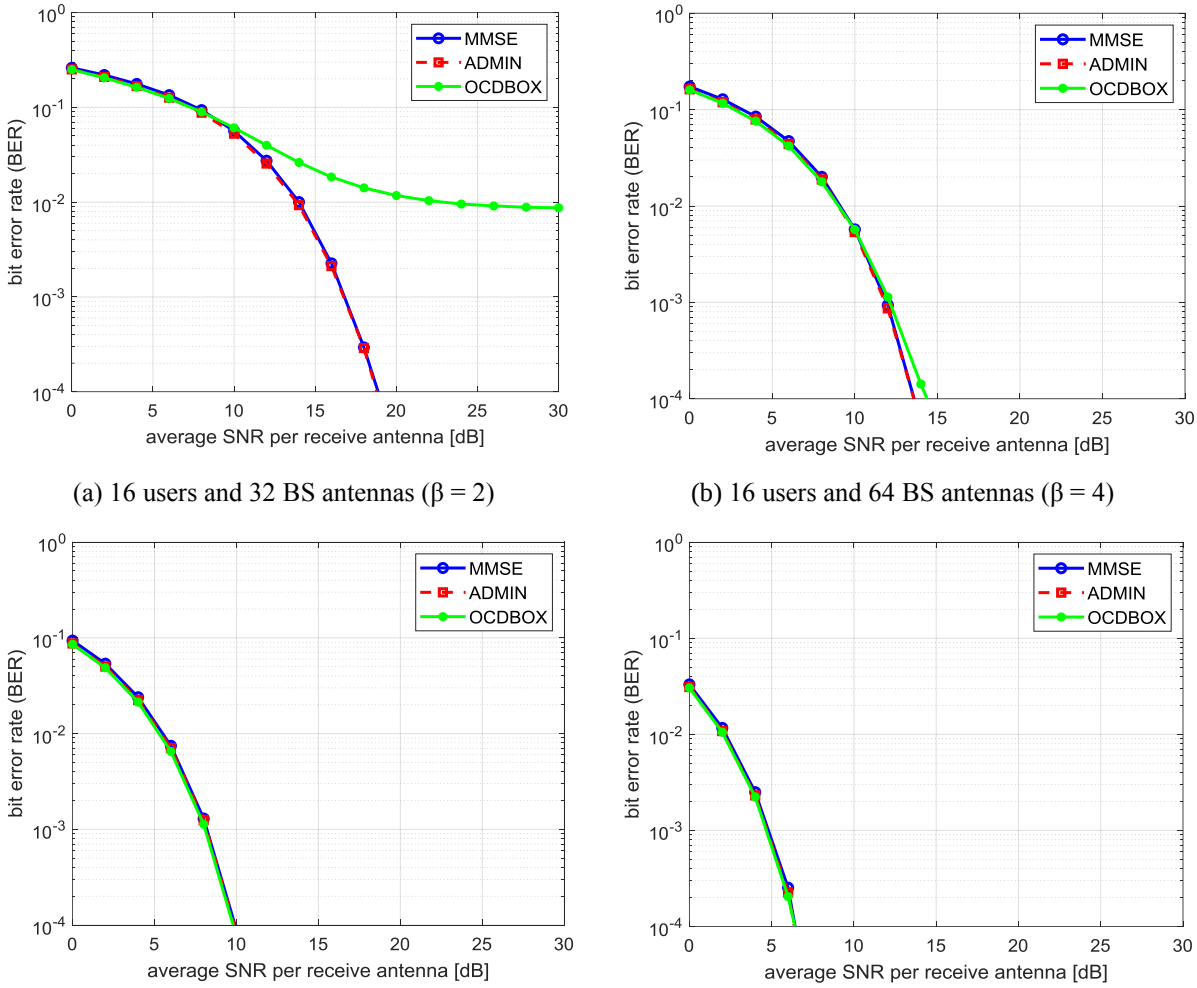


(a)16QAM (b) 64 QAM

Figure 3. BER performance for 16x16 MIMO

Figure 4. and Figure 5. demonstrate the BER vs. SNR performance of three detectors at different massive MIMO sizes using 16QAM and 64QAM respectively. The results reveal that the BOX equalization detector, the ADMIN algorithm, gives the optimum performance irrespective of the value of β and the OCDBOX algorithm is performing better with increasing β. From these figures, it is noted that when $\beta = 2$, the performance of ADMIN

detector converges to MMSE and OCDBOX provides the mediocre performance. As β increases to 4, the algorithm OCDBOX provides the significant BER. With further increase of β i.e when the ratio between BS antennas and users is 8 or 16, all the three detection methods perform very efficiently with fixed number of iterations and OCDBOX also converges to MMSE and ADMIN detector.



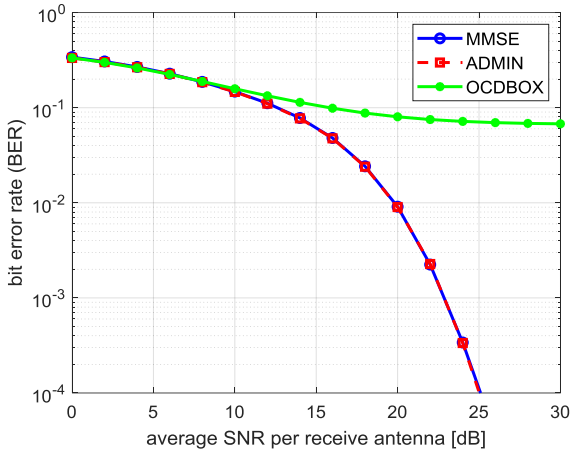
(a) 16 users and 32 BS antennas (β = 2)

(b) 16 users and 64 BS antennas (β = 4)

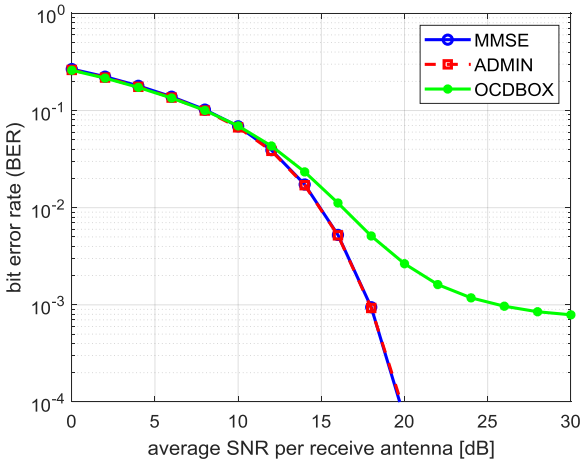
(c) 16 users and 128 BS antennas (β = 8)

(d) 16 users and 256 BS antennas (β = 16)

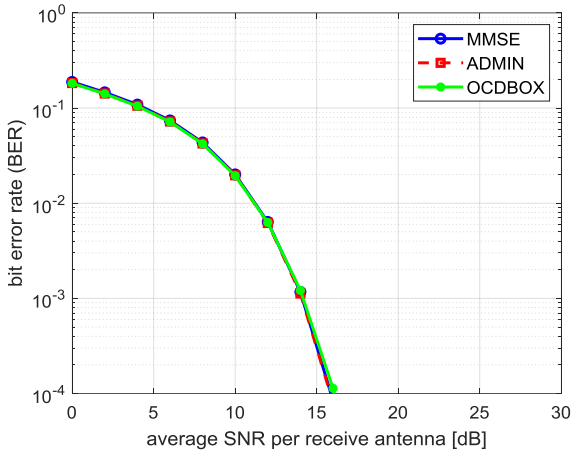
Figure 4. BER performance for different MIMO configurations in 16 QAM



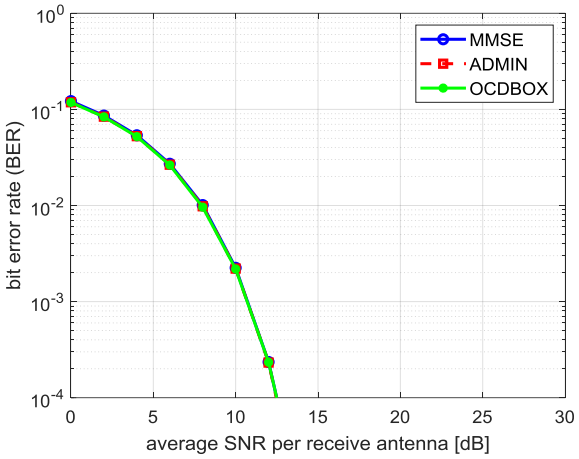
(a) 16 users and 32 BS antennas (β = 2)



(b) 16 users and 64 BS antennas (β = 2)



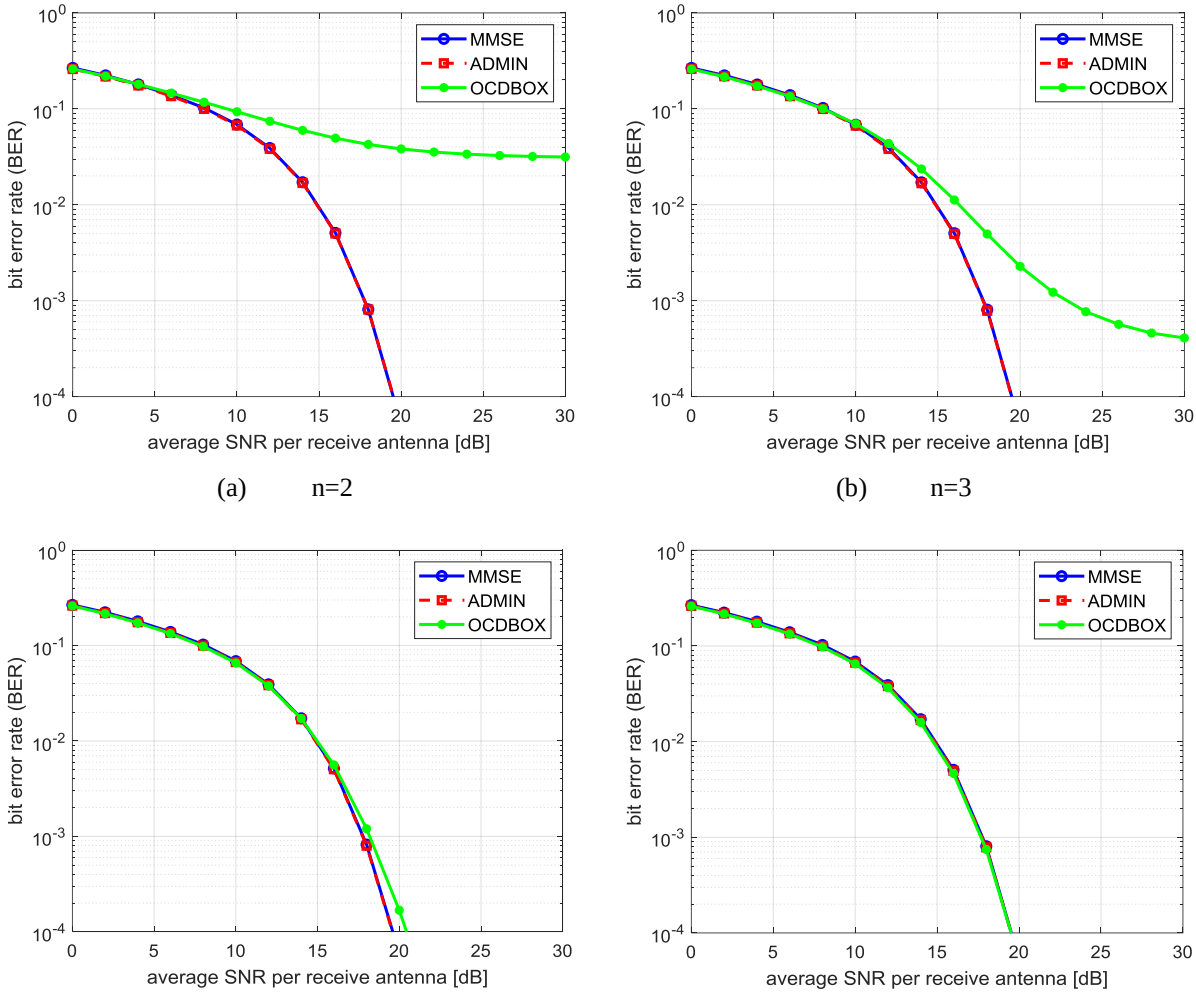
(c) 16 users and 128 BS antennas (β = 8)



(d) 16 users and 256 BS antennas (β = 16)

Figure 5. BER performance for different MIMO configurations in 64 QAM

In these figures, number of iterations is considered as $n = 3$, it can be concluded that for lower order modulation (16QAM) when $\beta = 8$, all the detectors show the significant performance while the ADMIN algorithm is efficient in all the scenarios. For higher order modulation, the results represent the efficacy of ADMIN detector in such scenarios.



(a) n=2 (b) n=3

(c) n=4 (d) n=5

Figure 6. BER performance for 64 x 256 massive MIMO with different number of iterations.

Figure 6 shows the BER vs. SNR for 64 x 256 (β = 4) massive MIMO using 64 QAM with different number of iterations n. With fixed β and different n, it can be seen that, as number of iteration increases, the detectors show the much improvement in their performance and when $n = 5$, OCDBOX converges to the MMSE and ADMIN. The ADMIN detector provides the leading performance for all values of n.

b) Complexity Analysis

The computational complexity of three detectors is evaluated using the number of real valued multiplications of a single iteration. Table 2. shows the computational complexity of the detectors.

Table 2. Complexity analysis

Detector algorithm	Computational complexity
ADMIN	$M(8K^2 + 12K) + 4NK$

OCD	$M(8NK + 4K)$
MMSE	$4K(K^2 + N^2 + N)$

Conclusion

The research study addresses the modelling of BOX equalization-based detectors and its performance comparison with the conventional MMSE detector in massive MIMO systems. The simulation results have depicted that the ADMIN detector performs best in comparison to other detectors with reduced complexity. Also, the OCDBOX detector has shown significant performance for increasing β. The conventional method MMSE plays a pivotal role as it is used in the initialization and pre-processing of other detectors. Due to the proper initialization of various parameters, BOX detectors can achieve comparable performance to the ideal MMSE detection algorithm with a smaller number of iterations. It can be concluded that ADMIN detector can be used for the detection process in the massive MIMO systems with lower computations.

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NOMENCLATURE

x	transmitted sequence vector
y	received sequence vector
N	number of BS antennas
H	channel matrix
I	interference
W	additive white gaussian noise
G	Gram matrix
n	number of iterations
A	Equalization matrix
D	Diagonal matrix
L	lower triangular matrix
U	upper triangular matrix
p	conjugate direction
O	Constellation set
CO	Convex prototype
M	total number of iterations

ABBREVİATİONS

ADMIN ADMM with infinity norm
ADMM alternating method of multipliers
AMP Approximate message passing
AWGN additive white gaussian noise
BER bit error rate
BS Base station
CG Conjugate gradient
GS Gauss Seidel
MF Matched filter
MIMO Multiple input multiple output
MMSE Minimum mean square error
MRC Maximum ratio combining
NI Newton iteration
NS Neumann series
OCD Optimum coordinate descent
QAM quadrature amplitude modulation
QPSK Quadrature phase shift keying
SER symbol error rate
SNR signal to noise ratio

ZF	Zero forcing

GREEK LETTER

α	radius of the tightest box around the QAM constellation
β	ratio of number of BS antennas and number of users
λ	update parameter
σ^2	noise variance

A Review on the Types of Zeolites as Refining Catalysts

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Abstract

The current primary reliable and cost-effective energy source that ensures the production of required product quality is fossil fuels. We arrived at this situation as a result of the level of maturity that has been attained in petrochemistry and oil refining as a result of the significant investment in research and innovation. The remarkable efficiency of oil refining is largely base on the use of zeolites as catalysts. This finding has been considered one of the major accomplishments in the chemistry of the present century. In relation to their use as solid acids, this paper illustrates the various zeolite types. The review's main body describes significant zeolite-based refining procedures like light naphtha isomerization, olefin alkylation, reforming, cracking, and hydrocracking. Our predictions for the field's future developments, including an improvement in transportation fuel quality and the coprocessing of an increasing proportion of biofuels with oil streams, are presented in the final section. The goal of this review is to introduce the fundamentals of zeolites used to improve catalysis as there is significant increase in energy demand.

Introduction

Zeolites are solids with a relatively open, three-dimensional crystal structure built from the elements aluminium, oxygen, and silicon, with alkali or alkaline-Earth metals (such as sodium, potassium, and magnesium) plus water molecules trapped in the gaps between them (Drisko, 2018). There are natural and synthetic zeolites (Strathmann *et al.*, 2010). Zeolite was first discovered by a Swedish mineralogist Cronstedt, who observed the vapor released upon heating of a stone nowadays called stilbite as a new type of mineral in 1756. The word "zeolite" is derived from two words "zeo" and "lithos" which are Greek words for "boil" and "stone" because, when gently heated, natural zeolite stones lose water rapidly and thus seem to boil. After several years of practical applications, the main properties of natural zeolites such as their reversible water-adsorption capability were recognized (Pinto *et al.*, 2019). During utilization of ion-exchange capacity of some soils at the end of the 19th century, it was found that natural zeolites exhibited similar properties, and some cations in natural zeolites could be ion-exchanged by other cations. Moreover, it was observed that natural chabazite could adsorb water, methanol, ethanol, and formic acid vapor, but it could not readily adsorb acetone, diethyl ether, or benzene. The importance of these features was soon recognized and natural zeolites found applications as adsorbents and desiccants. Later, natural

zeolites were also used widely in separation and purification of air (Pinto *et al.*, 2019; Strathmann *et al.*, 2010).

Efforts to synthesize silicates in the laboratory under hydrothermal conditions were initiated by Schafhautle in 1845, who reported the synthesis of quartz by heating a silicate gel with water in an autoclave for the first time. Levynite (LEV) was the first synthetic zeolite that was hydrothermally synthesized by St Claire Deville in 1862. Schulten reported the synthesis of analcime (ANA) in 1882. Several other zeolites were synthesized in succeeding years. However, the early synthetic work was not very well recognized because essential data for identification was not available. The synthesis of zeolites was continued by the pioneering work of Barrer that began in the 1940s and initially investigated the conversion of known mineral phases in strong salt solutions at rather high temperatures (ca. 170–270 °C). Later in 1948, Barrer synthesized the first synthetic zeolite with no natural counterpart using the same approach (Ratel et al., 2022).

In the late 1940s, Milton and co-workers successfully synthesized zeolites A (LTA), X (FAU), and P (GIS) through hydrothermal crystallization of reactive alkali metal aluminosilicate gels at low temperatures (100 °C) and autogenous pressures under alkaline conditions with pH values higher than. By 1953, they were able to synthesize 20 types of zeolites, 14 of which did not have natural counterparts, and developed synthetic methodologies which initiated the zeolite technology. Significant progress in the production of zeolites was made from 1954 to the early 1980s. Zeolites with low, medium, and high silica to alumina ratios (SAR) were widely explored, which greatly facilitated the applications of zeolites and led to innovations in industrial processes. Synthesis of zeolite Y by Breck et al., which represented higher thermal stability and acidity, played a significant role in the catalysis of hydrocarbon conversion. Moreover, in 1967 Milton synthesized new type A, X and Y zeolites, which led to their commercial applications as selective adsorbents and catalysts. From then on, many different zeolite structures with a variety of Si/Al ratios such as zeolite Y (Si/Al=1.5-3), L (Si/Al=3-6), ZSM-5 (Si/Al>12) have been synthesized (Ratel *et al.*, 2022). The use of organic components, nowadays known as structure directing agents or templates, in the synthesis of zeolites played an essential role in initiating the significant advances of zeolite synthesis. For instance, high-silica zeolite ZSM-5 (MFI) was initially obtained using the tetrapropylammonium (TPA) cation (Dyer, 2001).

2.2 Structure of Zeolite

Zeolites are seen in a succinctly form as crystalline aluminosilicates that possess a uniform crystal structure which are identified by a large number of regular small cavities interconnected by a large number of even smaller rectangular channels. A traditional definition of zeolites is that they are crystalline aluminotectosilicates with cavities, channels and windows of "molecular dimensions". However, some successful geo-inspiration has produced such an explosion of new compositions that has in fact broken this narrow definition. The Structure Commission (SC) of the International Zeolite Association (IZA) has been given the IUPAC authority to classify and name the different zeolitic topologies; "zeolitic" topologies have been discovered first as aluminophosphates or SiO_4 and later on as aluminosilicates. TShe definition can broaden to materials that contain a framework of tetrahedral elements that share every vertex once and only once with four neighbors, and which have a density "significantly lower" than the corresponding "dense" phases. Thus, a Pure SiO_4 or $AlPO_4$ material is a zeolite if is much less dense than quartz or berlinite, respectively. The SC-IZA determines, on the basis of crystallographic reports, if a proposed structure is sound enough and new, and assigns a three letter code to its "topology". Topology refers to the way in which the tetrahedral are interconnected, irrespective of its composition, symmetry or physicochemical properties. For instance, the SOD topology, first discovered in the aluminosilicate sodalite, actually exists also as pure silica, $AlPO_4$ zincosilicate, beryllosilicate, berylloarsenate, beryllogermanate, and many other compositional variants (Dyer, 2001).

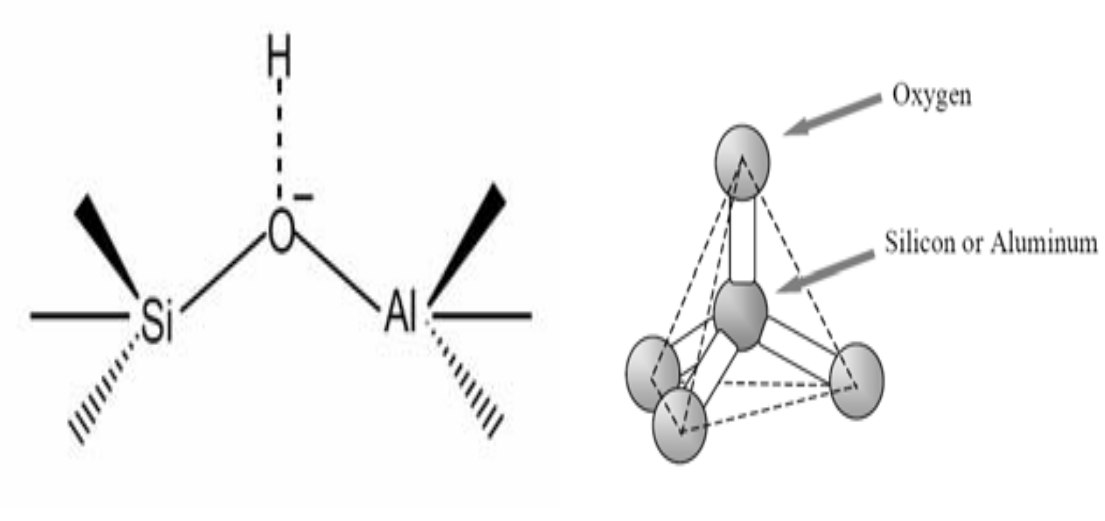
The tetravalent Si can be replaced by trivalent Al to produce an aluminosilicate. Therefore, a negative charge is introduced into the framework for each substitution, and a cation is needed to counterbalance this negative charge. The presence of these cations, known as extra-framework cations, counterbalances the negative charge of the framework due to the presence of alumina, and it results in a strong electrostatic field on the internal surface of zeolites. Zeolites can generally be expressed by formula 1 bellow;

$$Mx/n[(AlO_2)x(SiO_2)y].wH_2O \quad (1)$$

Where M represents the extra-framework cation of valance n, w is the number of water molecules and x and y are integers such that $y/x \geq 1$. The expression enclosed in the square brackets shows the anionic framework composition. The very regular structure and pore sizes give these materials a sponge-like appearance.

2.2.1 Framework Structure of Zeolite

The primary building unit for zeolites is the tetrahedron and the secondary building units (SBUs) are the geometric arrangements of tetrahedra. The SBUs may be simple polyhedra such as cubes, hexagonal prisms, or cubo-octahedra(Basina *et al.*, 2018). The structures can be formed by repeating SBUs and according to them zeolites can be classified into eight groups. Figures.1a and 1b presents components of the structure of zeolite.



(a) **(b)**

Figure 1 a. Chemical Structure of Zeolite**.** b. Primary Building Unit of Zeolite Structure.

The open-structure framework consists of many channels and/or interconnected voids of discrete size (in the range 0.3-20 Å) which are occupied by cations and water molecules. Each AlO4 tetrahedron in the framework bears a net negative charge which is balanced by a cation (Basina *et al.*, 2018).

2.3.2 Nomenclatures

The wide variety of possible zeolite structures is due to the large number of ways in which the SBU can be linked to form various polyhedra. These polyhedra create networks of regular channels and cavities. One such polyhedron is the truncated octahedron; better known as the sodalite cage. Each sodalite cage consists of 24 linked tetrahedra which are further linked to form different zeolites with distinct framework topologies as depicted in Figure 2. Figure 3c presents the general framework topologies of zeolites A/ZK4 and zeolites X/Y, and that of sodalite, $Na_3Al_3Si_3O_{12}$. The small face sharing β-cages characteristic of sodalite are linked through double four ring and six ring units in zeolites A/ZK4 and zeolites X/Y, respectively, to produce larger cages. Each type of zeolite has specific uniform pore size, for instance, 3.5-4.5 Å for zeolite LTA, 4.5-6.0 Å for ZSM-5 and 6.0-8.0 Å for zeolite X, Y type (Chen *et al.*, 2017).

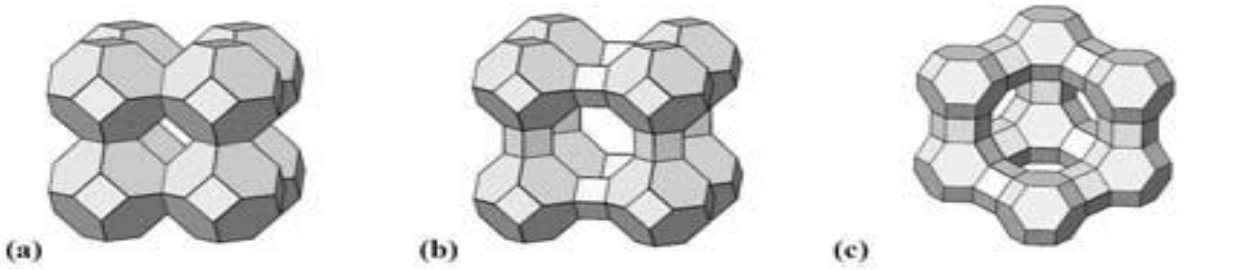


Figure 2. Framework Topologies of: a-Sodalite; b-Zeolite A/ZK-4; c-ZeoliteX/Y

2.2.2 Main Structure

Characteristics of the framework type of a zeolite alone can explain many of the observe properties of a zeolite. The framework type describes the connectivity (topology) of the framework tetrahedra without reference to chemical composition, and defines the size and shapes of the pore openings, as well the dimensionality of the channels, and the types of cation sites available. However, the chemical composition of the framework, the nature of the species within the channels, and the type of post-synthesis modifications applied are important factors in determining the specific properties of a particular zeolite. For example, a large cation can block or reduce the effective size of a pore opening, a small cation might distort a pore opening, and a sorbed species can influence the catalytic, magnetic, or electronic properties of a zeolite (Chen *et al.*, 2017). Precise understanding of the structure, the nature of the distortion of a framework from ideal symmetry and the location and distribution of the extra- framework species are fundamental to the understanding of zeolite chemistry is depicted in figure 3 bellow. Such understanding can be obtained to some extent through surface area and sorption analysis (pore size), electron microscopy (symmetry, faulting), and powder diffraction or other similar characterization techniques. In 1970, Meier and Olson proposed a classification for zeolites which has gained wide acceptance and is used as a reference in zeolite studies (Buekenhoudt *et al.*, 2010).

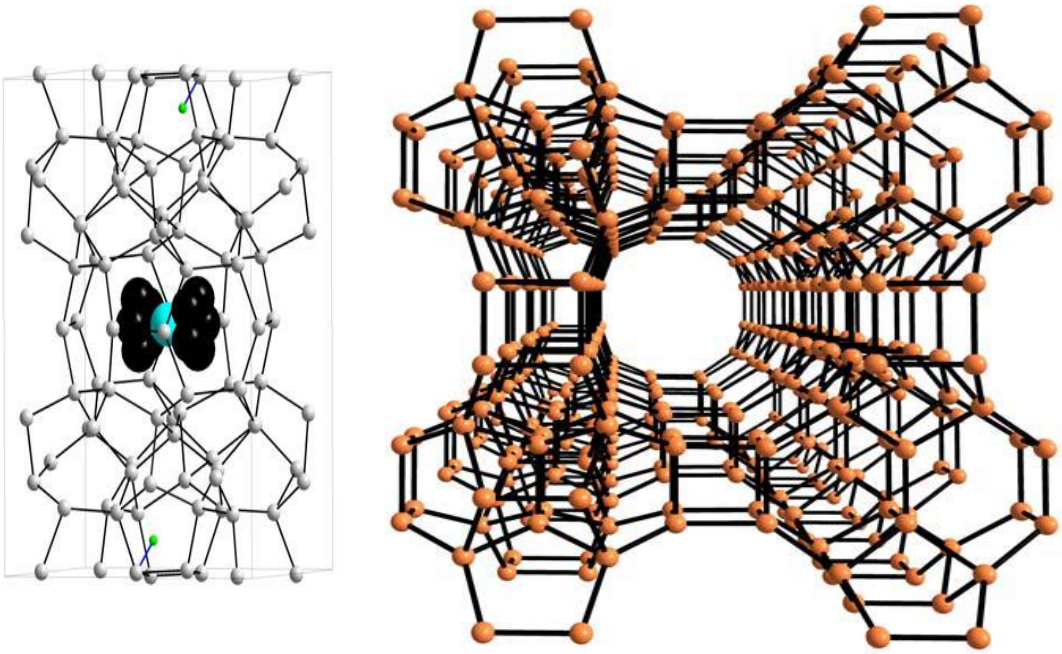


Figure 3. Typical Structures of Zeolites

2.3 Zeolite Materials

2.3.1 Microporous and Mesoporous Materials

Materials that are porous in nature are classified according to their pore sizes. They can be microporous or mesoporous materials. Microporous materials are those which have pore diameters of less than 2 nm. Microporous materials are often used in laboratory environments to facilitate contaminant-free exchange of gases. Mold spores, bacteria, and other airborne contaminants will become trapped, while allowing gases to pass through the material. This allows for a sterile environment in the contained area and zeolites are a very important member of this family (Buekenhoudt et al., 2010).

Mesoporous materials in the other hand are those with pores in the range 20-500 Å in diameter. They have huge surface areas, providing a vast number of sites where sorption processes can occur. These materials have numerous applications in catalysis, separation and many other fields. The synthesis of these materials is of considerable interest and is constantly being developed to introduce different properties. Typical mesoporous materials include some kinds of silica and alumina that have similar sized fine mesopores. Mesoporous oxides of niobium, tantalum, titanium, zirconium, cerium and tin have also been reported.

2.3.2 Molecular Sieves

During the past half century, compounds with diverse elemental composition have been studied. Zeolite-like materials have structures similar to zeolites but other elements other than

Si, Al and O are present in them. The ability to adjust the pores precisely determines the uniform openings to allow for molecules smaller than its pore diameter to be adsorbed whist excluding larger molecules hence the name "Molecular Sieves". Thus zeolites, silicalites, and aluminophosphates were classified as molecular sieves. Zeolite molecular sieves have precisely uniform pore sizes and molecular dimensions between 0.3- 2.0 nm. This translates into a sieve-like selectivity where molecules of varying size and polarity may be readily adsorbed, slowly adsorbed or completely excluded (Wise, 2013). This selectivity, combined with a high capacity over a wide range of operating conditions, gives each zeolite molecular sieve a high level of adsorption efficacy. Molecular sieves are often utilized in the petroleum industry. Use of zeolite molecular sieves to dry, purify and separate liquids and gases prevents unwanted side reactions, helps meet product specifications, and avoids costly complications from equipment corrosion and freeze-up. Examples include carbons, glasses and oxides. Therefore, the difference between molecular sieves and zeolite is presented in the table below.

Table 1. Differences between Molecular Sieves and Zeolites

Molecular Sieves	Zeolites
Composition varies and distinguishes materials on the basis of their size	Special class of molecular sieves with aluminosilicates as skeletal composition
May be crystalline, non-crystalline, para- crystalline or pillared clays	They are highly crystalline materials
Variable framework charge with porous Structure	Have anionic framework with microporous and crystalline structure

2.4 Properties of Zeolite

Zeolite property depends upon its crystal structures and thus the type of inner cavities such as the pores, their size and form. Many of these properties are especially desirable for environmental protection, such as cation exchange capacity and wet attrition resistance. Table 3 shows a broad range of physio-chemical properties of zeolites and related materials. Likewise Table 2 briefly shows the description of each type of common zeolites properties. In connection with the structures of the zeolite, the Si/Al ratio determines a number of important properties useful for adsorption, catalysis and ion exchange.

Table 2. Physio-chemical Properties of Zeolite and Molecular Sieves

Property	Range
Pore size	~4-13 Å
Pore shape	Circular, elliptical
Dimensionality of pore system	1-D, 2-D, 3-D.
Pore configuration	Channels, cages

Surface properties	Hydrophilic, hydrophobic (high silica)
Void volume	Less than ~50%
Framework oxide composition	Si, Al, P, Ga, Ge, B, Be, Zn: minor Ti, Fe, Co, Cr, V, Mg, Mn: minor

Table 3: Physical Properties of Four Types of Zeolite.

Type	Isotopes	Pore window (freediameter)	Si/Al ratio	Pores(channels)
LTA	A zeolite	8-ring : 0.41 nm	~1	3D spherical 1.14 nm cavities
FAU	X zeolite Y zeolite	12-ring : 0.74 nm	1 - 1.5 (X) 1.5 - 3 (Y)	3D spherical 1.18 nm cavities
MOR	Mordenite	12 ring : 0.70 nm	5 – 20	2D spherical 0.70 nm channels
MHI	ZSM-5 Silicate-1	10-ring : 0.60 nm	~30(ZSM-5)	3D spherical 0.60 nm channels with 0.90 intersection cavities.

2.5 Uses and Application of Zeolite

2.5.1 Commercial and Domestic

Zeolites are widely used as ion-exchange beds in domestic and commercial water purification, softening, and other applications. In chemistry, zeolites are used to separate molecules (only molecules of certain sizes and shapes can pass through), as traps for molecules so they can be analyzed.

Zeolites have the potential of providing precise and specific separation of gases including the removal of H_2O, CO_2 and SO_2 from low-grade natural gas streams. Other separations include noble gases, N_2, O_2, freon and formaldehyde. However, at present, the true potential to improve the handling of such gases in this manner remains unknown (Wise, 2013).

2.5.2 Petrochemical Industry

Synthetic zeolites are widely used as catalysts in the petrochemical industry, for instance in fluid catalytic cracking (FCC) and hydro-cracking. Zeolites confine molecules in small spaces, which cause changes in their structure and reactivity. The hydrogen form of zeolites (prepared by ion-exchange) is a powerful solid-state acid, and can facilitate a host of acid-catalyzed reactions, such as isomerisation, alkylation, and cracking. The specific activation modality of most zeolitic catalysts used in petrochemical applications involves quantum-chemical Lewis acid site reactions (Boaventura *et al.*, 2022).

2.5.3 Nuclear Industry

Zeolites have uses in advanced reprocessing methods, where their micro-porous ability to capture some ions while allowing others to pass freely allow many fission products to be efficiently removed from nuclear waste and permanently trapped. Equally important are the mineral properties of zeolites. Their alumino-silicate construction is extremely durable and resistant to radiation even in porous form. Additionally, once they are loaded with trapped

fission products, the zeolite-waste combination can be hot pressed into an extremely durable ceramic form, closing the pores and trapping the waste in a solid stone block. This is a waste form factor that greatly reduces its hazard compared to conventional reprocessing systems. An example of use is that sandbags of zeolite were dropped into the seawater near the Fukushima nuclear plant to adsorb radioactive cesium that was present there in high levels (Jiao et al., 2020).

2.5.4 Heating and Refrigeration

Zeolites can be used as solar thermal collectors and for adsorption refrigeration. In these applications, their high heat of adsorption and ability to hydrate and dehydrate while maintaining structural stability is exploited. This hygroscopic property coupled with an inherent exothermic (heat-producing) reaction when transitioning from a dehydrated to a hydrated form make natural zeolites useful in harvesting waste heat and solar heat energy (Jiao et al., 2020).

2.5.5 Detergents

The largest single use for zeolite is the global laundry detergent market. This amounted to 1.44 million metric tons per year of anhydrous zeolite A in 1992 (Jiao et al., 2020).

2.5.6 Construction

Synthetic zeolite is also being used as an additive in the production process of warm mix asphalt concrete. The development of this application started in Germany in the 1990s. It helps by decreasing the temperature level during manufacture and laying of asphalt concrete, resulting in lower consumption of fossil fuels, thus releasing less carbon dioxide, aerosols, and vapours. Other than that, the use of synthetic zeolite in hot mixed asphalt leads to easier compaction and, to a certain degree, allows cold weather paving and longer hauls. When added to Portland cement as a pozzolan, it can reduce chloride permeability and improve workability. It reduces weight and helps moderate water content while allowing for slower drying which improves break strength (Jiao *et al.*, 2020).

2.5.7 Agriculture

In agriculture, clinoptilolite (a naturally occurring zeolite) is used as a soil treatment. It provides a source of slowly released potassium. If previously loaded with ammonium, the zeolite can serve a similar function in the slow release of nitrogen. Zeolites can also act as water moderators, in which they will adsorb up to 55 % of their weight in water and slowly release it under plant demand. This property can prevent root rot and moderate drought cycles (Jiao *et al.*, 2020).

2.6 Types of Zeolite

2.6.1 Natural Zeolite

Natural zeolites are formed where volcanic rocks and ash layers react with alkaline groundwater. Zeolites also crystallize in post-depositional environments over periods ranging from thousands to millions of years in shallow marine basins. Naturally occurring zeolites are rarely pure and are contaminated to varying degrees by other minerals, metals, quartz, or other zeolites. For this reason, naturally occurring zeolites are excluded from many important commercial applications where uniformity and purity are essential.

There are about 40 natural zeolites that have been identified during the past 200 years. The most common are analcime, chabazite, clinoptiloplite, erionite, ferrierite, heulandites, laumontite, mordenite, and phillipsite.

2.6.2 Artificial or Synthetic Zeolite

In the late 1940s Richard Barrer investigated the conversion of known mineral phases under the action of strong salt solutions and high temperature (170-270 °C). Some of the obtained products were later found to be zeolites. Robert Milton pioneered the use of more reactive starting material (freshly precipitated aluminosilicate gels). In 1961 the range of reactants was expanded to include quaternary ammonium cations. There has subsequently been a large rise in the number of known synthetic zeolites, such as the ZSM-5 (Jiao *et al.*, 2020).

New families of zeolite-like or zeolite-related materials were also discovered in the early 1990s (a major class of mesoporous zeolite-related phases, typified by the M41S and SBA series, was synthesized with the aid of surfactant molecules or centrifugation, washing and drying) The elements (Si and Al) which will make up the microporous framework are imported in an oxide form, usually amorphous precursors containing Si-O and Al-O bonds. The crystalline zeolite contains Si-O-Al links. The overall free energy change for zeolite synthesis is usually small because the bond types are very similar. Zeolite synthesis is usually kinetically controlled and the product is metastable. There are several types of synthetic zeolites that are formed by a process of slow crystallization of a silica-alumina gel in the presence of alkalis and organic templates. One of the important processes used to carry out zeolite synthesis is sol-gel processing. The product properties depend on reaction mixture composition, pH of the system, operating temperature, pre-reaction 'seeding' time, reaction time as well as the templates used. In sol-gel process, other elements (metals, metal oxides) can be easily incorporated. The silicalite sol formed by the hydrothermal method is very

stable. The ease of scaling up this process makes it a favorite route for zeolite synthesis (Naraki *et al.*, 2017).

2.7 ZSM-5 Zeolite

Argauer and Landolt in 1967 worked out parameters for the synthesis of pentasil zeolites, particularly those relating to the following molar ratios: OH^-/SiO_2 = 0.07-10, SiO_2/Al_2O_3 = 5–100, H_2O/SiO_2 = 1–240. However, the Argauer and Landolt procedure succeeded in synthesizing a reasonably pure phase ZSM-5 zeolite only if organic amines with a structure-giving function (i.e. template function), such as tetrapropyleneammonium compounds were used (Dyer, 2001). Subsequent publications have disclosed methods of conducting the synthesis of pentasil-zeolites without requiring the very expensive, toxic and easily inflammable organic amine templates. Still other subsequent publications have disclosed substitutes for these amines (Liu *et al.*, 2022). In addition to their expense, toxicity and flammability, such amines are disfavored because they are subject to thermal decomposition which can destroy the zeolite structure. Further publications have disclosed modifications of the Argauer and Landolt process directed towards improving the reactivity of the SiO_2 and Al_2O_3 starting materials. The ZSM-5 (Zeolite Socony Mobil) is a moleculer sieve made up of aluminosilicate with high silica-alumina ratio and suitable properties for catalysis, adsorption and membrane applications. Researchers obtained the first patent on the synthesis of ZSM-5 zeolite, in which they described that this zeolite can be formed with molar ratios of SiO_2/Al_2O_3 varying between 20 and 120 (Dyer, 2001; Liu *et al.*, 2022). Depending on this ratio, the acidity and surface properties of ZSM-5 vary and therefore it is important to carefully control this parameter in the final product. Zeolites have received much attention for chemical industry and academia owing to their high thermal stability, shape selectivity and high catalytic activity. ZSM-5, a member of the zeolite family with high-silica content has been widely employed in petrochemical catalytic processes, oil refining and environmental protection fields, such as cracking, isomerization, aromatization and alkylation processes ZSM-5 crystalline aluminosilicate is characterized by a silica- to-alumina mole ratio of greater than 5 and more precisely in the anhydrous state by the general formula expressed bellow;

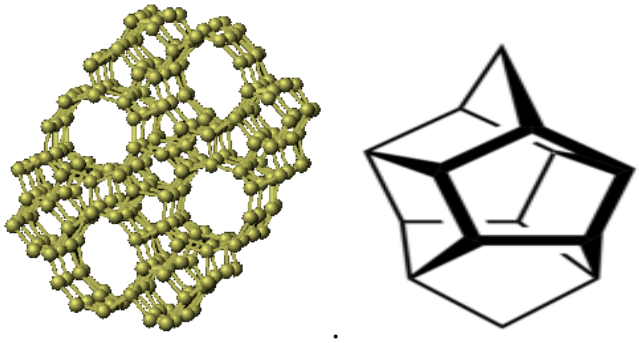
$$[0.9\pm0.2M_{2/n}O:Al_2O_3:>5SiO_2] \qquad (2)$$

M having a valence n is selected from the group consisting of a mixture of alkali metal, cations and organo ammonium cations particularly a mixture of sodium and tetraalkyl ammonium cations. The alkyl groups of which preferably contain 2 to 5 carbon atoms. The

term "anhydrous" as used in the above context means that molecular water is not included in the formula. In general, the mole ratio of $Si0_2$ to $A1_20_3$ for a ZSM-5 zeolite can vary widely. For example, ZSM-5 zeolites can be aluminum-free in which the ZSM-5 is formed from an alkali mixture of silica containing only impurities of aluminum (Dyer, 2001).

2.7.1 Structure of ZSM-5 Zeolite

ZSM-5 is composed of several pentasil units linked together by oxygen bridges to form pentasil chains. A pentasil unit consists of eight five-membered rings. In these rings, the vertices are Al or Si and an O is assumed to be bonded between the vertices. The pentasil chains are interconnected by oxygen bridges to form corrugated sheets with 10-ring holes. Like the pentasil units, each 10-ring hole has Al or Si as vertices with an O assumed to be bonded between each vertex. Each corrugated sheet is connected by oxygen bridges to form a structure with "straight 10-ring channels running parallel to the corrugations and sinusoidal 10-ring channels perpendicular to the sheets as illustrated in figure 4a and 4b (Liu *et al.*, 2022). The crystallographic unit cell of ZSM-5 has 96 T sites (Si or Al), 192 O sites, and a number of compensating cations depending on the Si/Al ratio, which ranges from 12 to infinity. The structure is orthorhombic at high temperatures, but a phase transition to the monoclinic space group occurs on cooling below a transition temperature, located between 300 and 350 K.



(a) **(b)**

Figure 4**.** Framework Structure of ZSM-5 Zeolite

The MFI structure in figure 5 consists of five-member ring building units that are linked together to form channel systems, one sinusoidal and the other one straight view along the [100] direction of a zeolite with MFI type shows a view of the ZSM-5 zeolite along the [100] direction

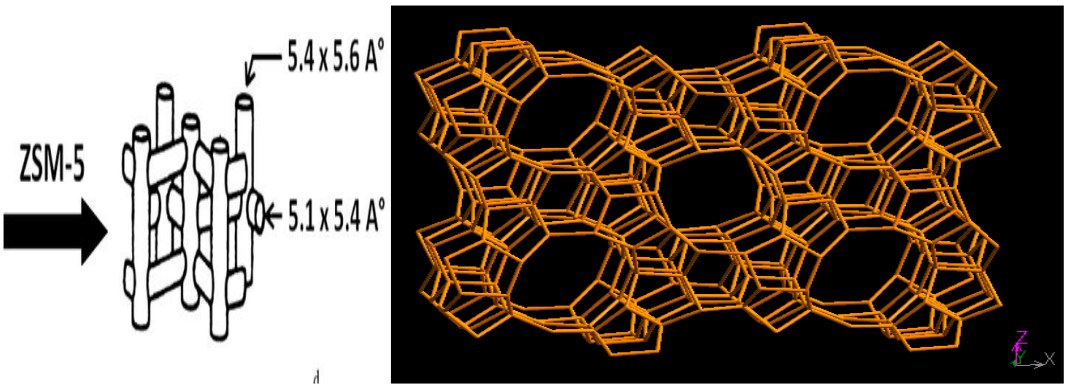


Figure 5. The Pore Size of the Channels in ZSM-5.

It is a medium pore zeolite with channels defined by ten-membered rings. The synthesis involves three different solutions. The first solution is the source of alumina, sodium ions, and hydroxide ions; in the presence of excess base the alumina will form soluble $Al(OH)_4^-$ ions. The second solution has the tetrapropylammonium cation that acts as a templating agent. The third solution is the source of silica, one of the basic building blocks for the framework structure of a zeolite. Mixing the three solutions produces supersaturated tetrapropylammonium ZSM-5, which can be heated to recrystallize and produce a solid (Liu et a*l.*, 2022).

2.7.2 Properties of ZSM-5

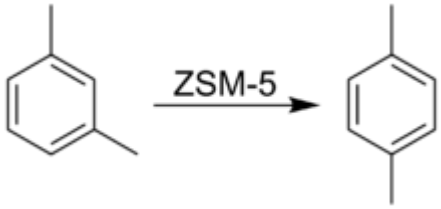
It is because of the good pore channel system of ZSM-5 that makes some organic linear molecules such as olefin and paraffin to enter to the sieve of ZSM-5, and then cracked to propylene by the concept of shape selectivity of ZSM-5. ZSM-5 has a good crystal size in a micrometer range which could influence the catalytic performance for synthesis of large molecules appropriated to a limitation of mass transfer. Moreover, ZSM-5 has exceptionally high degree of thermal and acid stability and its high selectivity and activity in certain catalytic conversions with their potential in the separation of light hydrocarbon. Hence, many researchers have been attracted to; High thermal and hydrothermal stability in the industrial environment, High internal surface area,Ion exchange ability to allow the formation of highly dispersed catalytically active sites, Pores structure provides shape selectivity, High acidity promotes the oligomerisation, isomerisation, cracking and aromatization reactions synthesize ZSM-5 (Liu et al., 2022).

2.7.3 Uses and Applications of ZSM-5

ZSM-5 has high silicon to aluminum ratio. Whenever an Al_3+ cation replaces a Si_4+ cation, an additional positive charge is required to keep the material charge-neutral. With proton (H+) as the cation, the material becomes very acidic (Feng et al., 2022). Thus the acidity is

proportional to the Al content. The very regular 3-D structure and the acidity of ZSM-5 can be utilized for acid-catalyzed reactions such as hydrocarbon isomerization and the alkylation of hydrocarbons. One such reaction is the isomerization of meta-xylene to para-xylene. Within the pores of the ZSM-5 zeolite, para-xylene has a much higher diffusion coefficient than meta-xylene. When the isomerization reaction is allowed to occur within the pores of ZSM-5, para-xylene is able to traverse along the pores of the zeolite, diffusing out of the catalyst very quickly. This size-selectivity allows the isomerization reaction to occur quickly in high yield isomerisation of meta-xylene to para-xylene on passing through a ZSM-5 catalyst as shown in equation 3 bellow;

(3)



ZSM-5 has been used as a support material for catalysis. In one such example, copper is deposited on the zeolite and a stream of ethanol is passed through at temperatures of 240 to 320 °C as a vapour stream, which causes the ethanol to oxidize to acetaldehyde; two hydrogens are lost by the ethanol as hydrogen gas. It appears that the specific pore size of ZSM-5 is of benefit to this process, which also functions for other alcohols and oxidations. The copper is occasionally combined with other metals, such as chromium, to fine tune the diversity and specificity of the products, as there is likely to be more than one. Acetic acid is an example of one possible byproduct from hot copper oxidation. ZSM-5 has been widely employed as an additive in industrial practice since its first commercial use in 1983. Because of its unique pore structure, zeolite ZSM-5 can crack selective gasoline-range linear or mono-branched hydrocarbons to C3-C4 olefins, and its moderate acidity can largely suppress hydrogen-transfer reactions (Feng et al., 2022).

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The Impact of the Ventilated Facade on the Thermal Comfort and Aesthetics of the Architectural Envelope in Arid Zones (Case of the City of Ghardaia)

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Abstract

In recent years in Algeria, household energy consumption has increased considerably due to the growing comfort needs of occupants and the rapid growth of the housing stock as a result of an acute housing crisis. To meet this need, a large number of dwellings have been built without considering their thermal quality, which has led to over-consumption of energy for heating and cooling, particularly in the south of the country where the majority of buildings are constructed with concrete blocks, despite the fact that the climate is very harsh in summer and winter [1]. The production of the necessary energy is becoming increasingly expensive for the state, which subsidises its price, but it also has a harmful impact on the environment through the release of greenhouse gases, especially as the residential and tertiary sectors in Algeria are among the most energy-intensive, consuming 41% of final energy [2]. In recent years in Algeria, household energy consumption has increased considerably due to the growing comfort needs of occupants and the rapid growth of the housing stock as a result of an acute housing crisis. To meet this need, a large number of dwellings have been built, but without taking into consideration their thermal quality, which has led to an over-consumption of energy for heating and cooling, particularly in the south of the country where the majority of buildings are constructed with concrete blocks, despite the fact that the climate is very harsh in both summer and winter [1]. The production of the necessary energy is becoming increasingly expensive for the state, which subsidises its price, but it also has a harmful impact on the environment through the release of greenhouse gases, especially as the residential and tertiary sectors in Algeria are among the most energy-intensive, consuming 41% of final energy [2]. The choice of a high-performance envelope is an important decision in the architectural design process due to the complexity of its hyper-interested aspects. The ventilated facade, as a multifunctional envelope within the thematic the ventilated façade, as a multifunctional envelope within the thematic perspective of high energy performance and thermal comfort buildings. This paper summarises a research undertaken with the aim of testing and evaluating the impact of the ventilated façade on thermal comfort in arid. thermal comfort in arid zones. For this purpose, the thermal behaviour of the ventilated façade is studied under the climatic conditions of the city of Ghardaia (hot and arid climate). The investigation has crossed techniques, it has involved both the investigation crossed techniques, it concerned both measurements taken in situ on a real case, the elaboration of a reduced cell as well as the simulation carried out by the Energy Plus" software. Empirical verification in the form of a questionnaire survey was also carried out to allow the evaluation of the aesthetic quality of this façade according to the MATEA model.

Key words: Ventilated facade; thermal comfort; performance; aesthetics; arid zones.

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Introduction

Since ancient times, man has always sought to protect himself against the dangers that surround him and the environment, in particular the climate. His objective for protection has evolved and varied according to according to periods, needs and the environment. Thus, man has always tried to acclimatise himself to his environment, making the act of building one of his fundamental occupations: "the man who builds above all, to shelter and protect himself, and despite the evolution of cultural, economic, constructional and energy conditions, the essential objective of all building activity is still to protect man against the elements, the sun and the weather. Against the climatic elements, excessive sunlight, extreme temperatures, precipitation and wind" [Sophie (2012)]. According to the evolution of the field and of construction techniques, energy consumption was not, at first, a major issue in the construction of buildings. energy consumption was not initially a major issue in the production of the built environment. Designers' intentions ranging from protection to comfort and comfort and aesthetics have rather imposed energy-intensive projects that ultimately have a negative impact on the environment. However, the energy crisis of the 1970s called This crisis everything into question The energy crisis of the 1970s triggered an awareness of the excessive consumption of energy in buildings and was seen as a factor in the and was seen as a factor for change. After this crisis, the primary issue for the primary challenge for designers was to reduce energy consumption and to create economical buildings with less negative effects on the environment. A number of research projects have been part of a comprehensive approach to mitigating these effects and finding passive environmental solutions that ensure human well-being. The ventilated façade was one of the ventilated façade was one of the recommended solutions acting at the scale of the architectural envelope. Many researchers have been interested in it Many researchers have been interested in it because it represents the interface where the contact with the external environment takes place. The ventilated

The ventilated façade as a climate control device combines the objectives of light, comfort and the ventilated facade as a climate control device combines the objectives of light, thermal comfort and rational energy consumption.

Study of the performance of the ventilated facade in wrinkle zones:

Several researchers confirm the importance of different climate control techniques at the envelope level and their impact on thermal comfort and energy consumption.

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Envelope and their impact on thermal comfort and the reduction of energy consumption. Thus, Florence et al, state that "to reduce energy consumption in buildings, passive solutions have been developed by increasing the energy efficiency of the building. Passive solutions have been developed by strongly increasing the insulation of external walls. One of the ways One way to improve the energy efficiency of buildings is to design multifunctional facades" [Florence, J. et al, (2008)]. However, the energy performance of the envelope is dependent on a number of factors Design elements such as building orientation, formal choices and technical characteristics of materials. Technical characteristics of the materials. In addition, the designer must take into account the climatic conditions of the site. In order to study the thermal behaviour of the ventilated facade in the hot and arid climatic context of the city of Ghardaia, a In order to study the thermal behaviour of the ventilated facade in the hot and arid climatic context of the city of ghardaia, research was carried out, involving in situ measurements on a real case, the study and a simulation.

The study of a real case:

Presentation of the case study and protocol of the measurements:

The Ghardaïa Post Office is the first building, a "realised fragment", of the Ghardaïa Square of the Ghardaïa Square Detail Plan (1960-62) which was designed and built between 1966 and 1967. This building is fundamental for the experience of the site; it constitutes a preparatory moment for the realization of the other works. preparatory moment for the realisation of the other works. In fact, Ravéreau combines here, for the first time the use of reinforced concrete with the natural materials present in the valley, thus recovering certain valley, thus recovering certain local constructional solutions learnt over the years spent in the years spent in the M'Zab. Thus, the limestone base was built using local building techniques. with local building techniques. On the upper floors, he studied a wall with a ventilated cavity, which he called a mask wall, built from the inside out, of cement block and clay brick, completed on the outside by a plaster made in the Mozabite tradition made in the Mozabite tradition with layers of plaster. The air temperature measurements inside and outside (in degrees Celsius) were taken during the summer of 2022 during the hot season (August) and during a cold period (December). Measurements were taken every two hours under natural conditions without heating and air conditioning.

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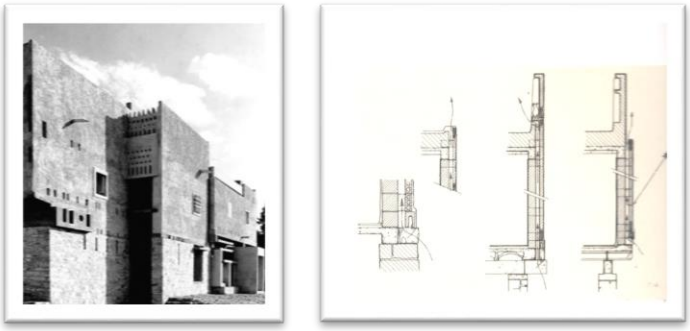


Figure 1. Ghardaïa Post Office, The ventilated façade of the case study (Author, 2021).

Interpretation of results:

The air temperatures obtained indoors and outdoors during the day in each month are plotted (Figure 2 and 3). The month of August (22/08/2021): An indoor temperature with an amplitude of 5°C between a minimum of 35°C at 8am and a maximum of 40°C at 2pm. The outdoor temperature has a high amplitude of 7°C between a minimum of 40°C at 8am and a maximum of 47°C at 2pm. We note a difference in temperature between inside and outside ranging from 5°C to 7°C.

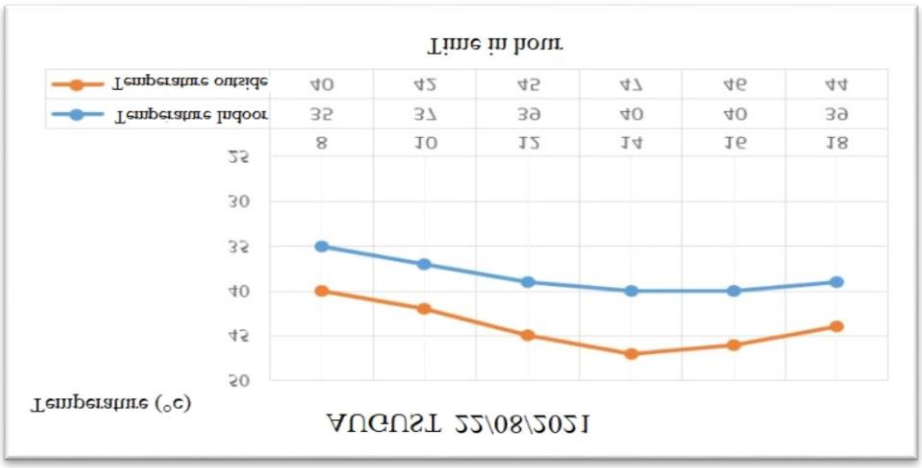


Figure 2. Int. and ext. temperature graph of the study case of 22/08/2021 (Author, 2021).

The wall acts as a heat flow damper from 40°C to 42°C with a medium phase shift. The wall counteracts excessive heat values due to its thermal storage capacity.

The temperature values inside remain high due to the lack of thermal insulation and effective ventilation of the air cavity which could have contributed to the reduction of convective heat transfer.

December (05/12/2021):

An almost stable indoor temperature throughout the day with a small amplitude of 2°C between a minimum of 18°C at 8am and a maximum of 20°C at 4pm. The outdoor temperature shows a

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strong amplitude of 5°C between a minimum of 12°C at 8am and a maximum of 17°C at 4pm. There is a temperature difference between the inside and outside of 3°C to 6°C. The wall counteracts the low temperatures and ensures an indoor temperature of between 18°C and 20°C throughout the day.

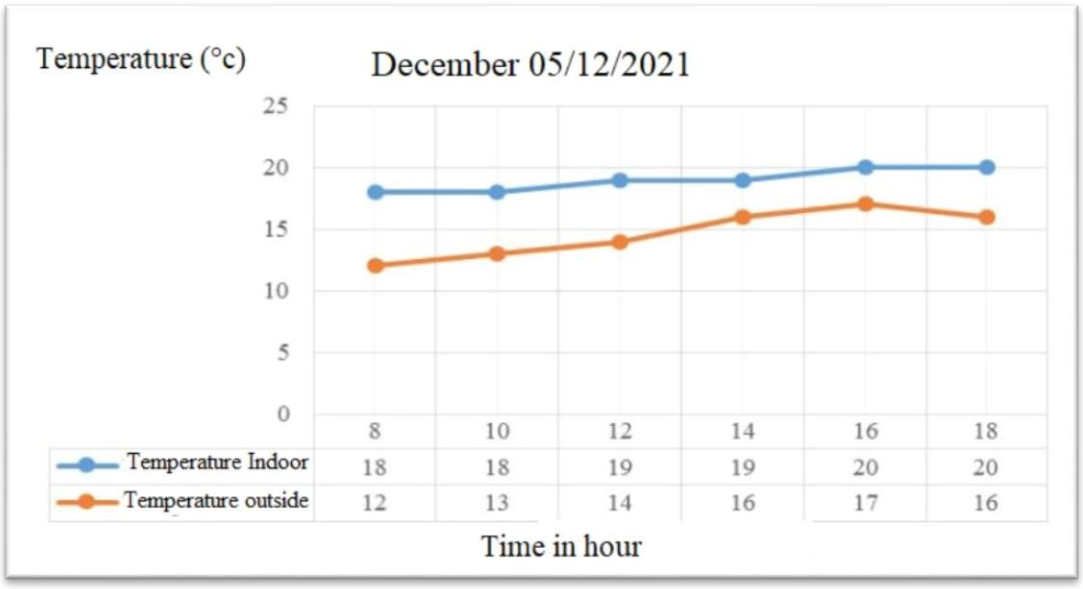


Figure 3. Int. and ext. temperature graph of the study case of 05/12/2021 (Author, 2021).

Simulation of the behaviour of the ventilated façade in ghardaia:

The third means of evaluation is simulation. It allows to get as close as possible to the real conditions (in some cases), it gives the possibility to test several parameters while allowing to intervene on them for possible modifications and improvements.

Presentation of the software and simulation protocol:

The simulation was carried out using the "Energy Plus" software. A real case was simulated by inserting the materials with their characteristics as well as the climatic file of the Algerian territory and the climatic data of the city of Ghardaia. The simulation was carried out on a summer day (21 June) and a winter day (21 December) with the indication of the interior temperature for each hour according to the following protocol (single wall, ventilated facade wall 'FV' without insulation and ventilated facade wall 'FV' with insulation) and exterior. For the ventilated air space, the following characteristics were used (thermal conductivity λ=0.192 w/m.k and density ρ=0.001 Kg/m3). The results obtained for the month of December and the month of June are presented in the form of graphs (figure 7 and 8).

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Interpretation of the results:

June 21: It can be seen that the temperatures in the three cases are close, but in general the third case of the ventilated façade performs better than the other two.

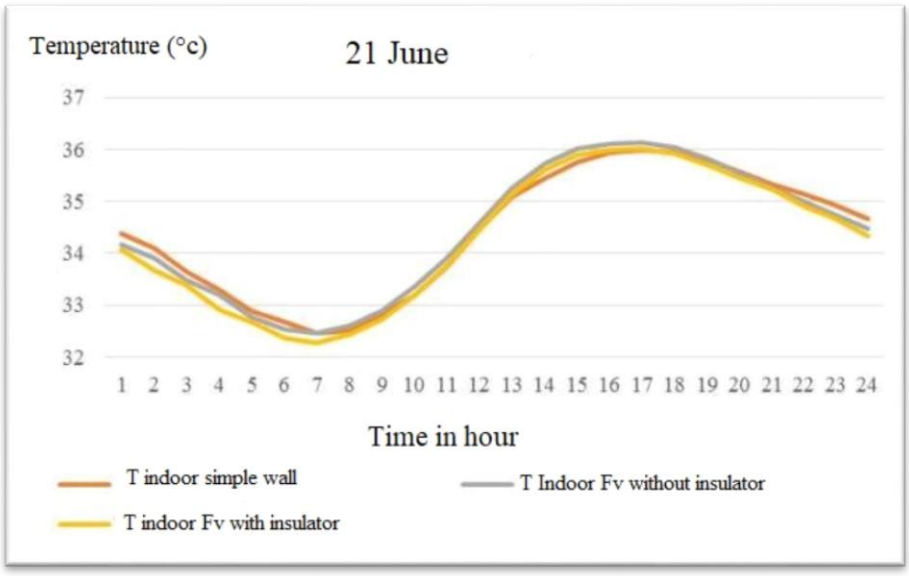


Figure 7. Graphs of the results obtained by Energy Plus in summer (Author, 2021).

21 December:

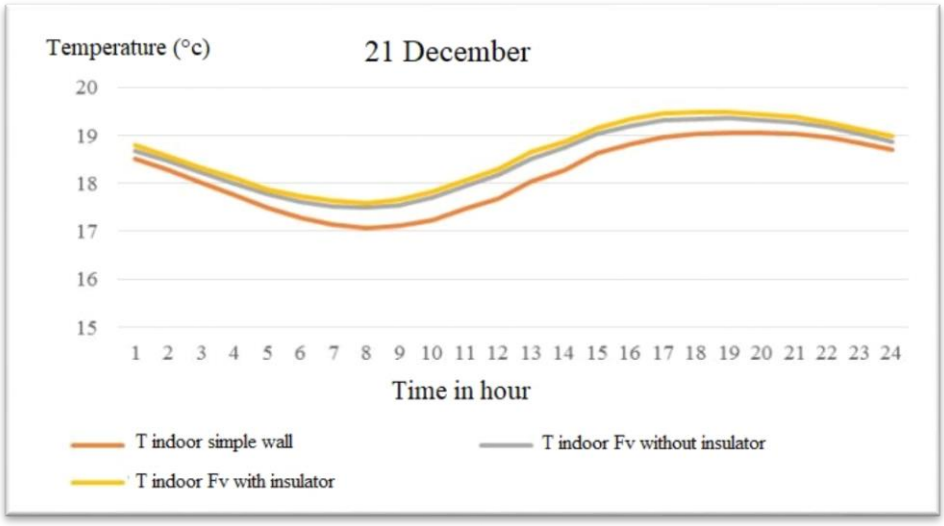


Figure 8. Graphs of the results obtained by Energy Plus in winter (Author, 2021).

It can be seen that the ventilated facade with insulation is the most interesting, however the climatic performance of the system seems limited since it is difficult to simulate a thermo-aerodynamic phenomenon.

The behaviour of the ventilated facade in arid zones:

In view of the results obtained by the experimentation and those of the simulation, it can be said that the use of the ventilated limestone façade system in Ghardaia is quite beneficial

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because it offers thermal and energetic advantages regardless of the winter or summer period (depending on the limits and conditions of the study). During the summer period, the system reduces the impact of direct solar radiation on the façade by reflecting part of the radiation, and it also reduces heat transfer by conduction and removes heat by the chimney effect. This allows a considerable increase in the phase shift time with a minimum variation in the temperature of the interior surface. During the winter period, the ventilated terracotta facade prevents heat loss from the inside to the outside. It increases the thermal inertia of the wall, eliminates thermal bridges and favours the elimination of humidity due to rain, which ensures the preservation of the insulation against condensation thanks to the phenomenon of thermal draft. Finally, depending on the season, this device allows for the reduction of energy consumption for heating and air conditioning of the building with the possibility of integrating photovoltaic cells in the panels in order to produce free renewable energy (especially in an arid zone) which increases the energy performance of the envelope.

Study of the aesthetic aspect of the ventilated façade:

The ventilated facade has an impact on the aesthetic aspect of the building because it envelops all its faces. It is considered as a membrane whose parameters are manageable and can be evaluated from different points of view by an appropriate method.

Presentation of the MATEA model:

The MATEA model (Models for Architectural Analysis, Theory and Experimentation) is an analysis method developed by Professor Stéphane Hanrot who worked on the evaluation of architectural quality relative to the points of view of the actors in an objective way while asking the question "How to objectify the evaluation of architectural quality without losing its richness and complexity? (Hanrot, 2009). According to Hanrot, (2009) this method is "focused on the quality of architectural objects", it is based on the collection of the stakeholders' points of view on the different aspects related to the object of study through a conceptual analysis taking into account the relation with the life cycle analysis of this object.

Evaluation criteria and data analysis:

Applying the MATEA model, the evaluation criteria of the quality of the ventilated façade is the basic concept divided into two dimensions: comfort and aesthetics, which are subdivided into sub-dimensions and indicators (observable and measurable object). This decomposition makes it possible to draw up the table of analysis data below:

ISBN: 978-625-8246-12-4

Table 1. Evaluation of users and visitors on the ventilated facade of the case study (Author, 2021).

Concept	Dimension	Subdimension	Indicator	The average (users)	The average (visitors)
The quality	Comfort	Thermal	Temperature	4.2	4.2
			Performance of material	5.0	5.0
			Service life	4.9	5.2
			The influence of insulation	5.4	5.2
		Acoustics	Finish	4.0	3.6
			Openings	2.7	2.2
		Visual	Illumination	3.0	2.8
			Orientation	4.1	4.0
			Size of openings	4.4	5.0
		Olfactory	Air quality	3.7	3.6

Table. 1 (continued). Evaluation of users and visitors on the ventilated facade of the study case (Source: Author, 2021).

the ventilated facade	Aesthetics	Tactile	Temperature	4.0	4.2
		The morphology	Shape	4.1	4.8
			Dimensions	4.0	5.0
			Thickness	3.0	2.6
			Flexibility	2.5	2.6
			Seals	5.0	3.8
			Fixing	5.4	4.6
the ventilated facade	Aesthetics	The appearance	Colour	5.0	4.6
		The appearance	Texture	5.5	5.0
			Material	4.9	4.6
			Transparency	2.7	3.2
			Symmetry	2.6	3.0
			Rhythm	3.3	4.0
the ventilated facade	Aesthetics	The appearance	proportion	3.9	4.0
			Harmony	3.4	3.6
			Technical	5.0	5.4
			Perfection	5.0	4.6
			Finished product	5.1	5.2
			Maintenance	4.0	4.6

ISBN: 978-625-8246-12-4

The application of the MATEA model for the evaluation of the quality of the ventilated clay façade:

The infra radar allows to compare the views of users and visitors on the quality of the ventilated clay façade in terms of aesthetics (appearance and morphology) and comfort.

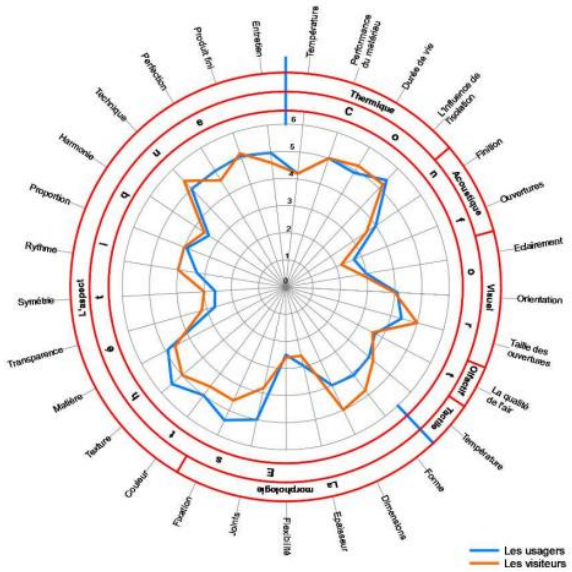


Figure 9. Synthetic radar of VF quality according to users and visitors (Author, 2021).

The views of both groups of respondents are above average but marked by heterogeneity with very positive peaks relating to joints, fixing, texture and technique. Paradoxically, we note negative peaks on thickness, flexibility, transparency, symmetry, lighting and acoustics. Between the two groups, there is a homogeneity on most points of view except for the shape, dimensions, joints and fixing with average differences where users are more satisfied than visitors.

The synthesis diagram according to users and visitors is good but in an unbalanced and divergent form that shows a difference on the aesthetic side and a satisfaction with the thermal comfort quality of this system. Thanks to the application of the MATEA model on the ventilated limestone facade, we were able to obtain efficient results that allowed us to determine the appropriate criteria of this device to generate aesthetics. The results of this evaluation elucidated these criteria, which are mainly: dimensions, joints, fixing, colour, texture, material, technique and perfection of the finished architectural product and the quality of the flat surface.

Conclusion

The results of the present work have been positive in elucidating the ambiguity about the impacts of the ventilated facade in arid zones. Through a combination of experimental and

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simulation approaches, it was demonstrated that the ventilated limestone facade is quite effective in ghardaia as a multifunctional envelope to protect the building and increase its thermal and energy performance during winter and summer conditions and according to the specific constraints of this type of climate. In addition to maintaining acceptable thermal comfort conditions, this system also contributes to the improvement of the aesthetic aspect. The use of the ventilated facade is recommended in arid zones with the proposal of integrating a mobile device at the air inlet that will allow it to be controlled and closed in certain cases such as in winter when the air circulation can create heat loss. The results of this study open up a number of topical areas of research, study and optimisation possibilities. It reflects a general concern to reduce energy consumption and therefore the preservation of our environment.

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A Research on the Causes and Types of Deterioration in Traditional Bricks

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Abstract

Historical buildings are a document that reflects the characteristics of the period in which they were built. The preservation of these structures, which reinforce the feelings of trust and belonging, is very important for the continuity of societies. The preservation of historical buildings in the context of their unique construction techniques and materials is the basic condition for maintaining the original value of the buildings. For this reason, it is necessary to develop material-oriented protection practices and to work up to date with techniques and methods in the protection of structures. One of the main traditional building materials used in monumental buildings in our country is brick. Brick material has been used frequently in different geographies in different periods in our country. It is seen in different building elements as both a structural element and an ornamental element in the Roman, Byzantine, Seljuk and Ottoman periods. Buildings made of bricks suffer serious damage over time due to environmental factors and human use. This situation makes it necessary to carry out studies to repair the deteriorations in brick structures. Extending the life of the brick material is the basic condition for ensuring the continuity of the structures. The detection phase is very important before intervening in the building in the protection and improvement of the quality of the brick. The aim of the study is to contribute to the development of brick repair and protection methods by determining the damages seen in brick structures and the factors causing the damage. In the study, first of all, the usage periods of the brick in Turkey will be mentioned and the deterioration factors and types of bricks will be explained. The study is an approach that can provide a systematic and practical application for the detection of damages in the interventions to be carried out in brick structures in our country.

Keywords: Brick, preservation, deterioration factors, types of deterioration.

1. Introduction

In our country, which has hosted countless civilizations, a wide cultural accumulation has existed for thousands of years. The lifestyles, traditions, beliefs and architectural products of various cultures constitute an important part of the cultural accumulation. In the formation of the architectural heritage in our country, it is seen that different building materials are used as a result of the possibilities of the region and cultural interactions. Our country has various opportunities in terms of building materials. The presence of rich stone deposits enabled the use of stone in monumental structures that were expected to be permanent. However, this situation has changed from time to time in regions where the stone is scarce or with the effects of various cultures. As a result of these changes, terracotta materials were used as an alternative

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to stone in some periods. Bricks constitute an important part of the terracotta material used in traditional buildings.

2. Traditional Brick Material and Production Process

The main material of brick is clay. Clay-rich soils formed by the decomposition of clayey, sandy alluviums and clayey schists are generally used in brick production. The main chemical components of this material obtained from nature are aluminum hydrosilicates. It often also contains significant amounts of iron, alkaline earth and alkali metals. If clay is replaced by water, it is found mixed with minerals such as quartz, feldspar, and mica (Kahya, 1992).

The production process of brick material consists of several stages. These; removing the clay, preparing the dough, shaping, drying and firing. In brick production in the traditional way, after the clay is removed from the quarry, it is rested. Sometimes additives are added to the clay, which is purified from foreign materials, in order to gain the desired properties. Sand, the most important of these substances, balances the consistency of the clay and controls shrinkage. To obtain a good brick, the clay dough should be as homogeneous as possible. The prepared dough is placed in wooden molds by pressing it by hand or with simple tools. The shaped clay is turned upside down and removed from the mold and left to dry under atmospheric conditions. The material, whose drying process is completed, is fired in the kilns created in the area where it is transported. The firing process is done in kilns called "field kilns" or "threshing kiln" (Toydemir, 1991).

3. Usage History of Traditional Brick in Our Country

3.1. Roman Period

During the Roman Empire in Anatolia, mudbrick and baked brick were used as the main building materials. Brick was a primary contributor to the establishment of the empire. Thanks to the brick production, the rapid expansion of the city of Rome was ensured; it was possible to build walls and aqueducts (Strikland, 2010).

Soils with high clay content were preferred for raw material for brick production in the Roman period. Standardized large square bricks in the first century AD were used as the basic element. Specific names and sizes have been established for bricks in the main format: bessales- 19.7cm; sesquipedales - 44.4cm; bipedales - 59.2 cm (Adam, 2005). Brick was commonly used together with stone in Roman period structures in Anatolia. Depending on the purpose of use and technical knowledge in the building, the bricks may differ in shape as square or rectangular. Square shaped bricks are seen in Anatolia, where the application of the double-skinned wall

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construction technique, which is an understanding unique to Rome, takes place. The Red Basilica in Bergama was built with this technique by the Romans. The fact that the entire building is made of bricks has made it known as the "Red Basilica". The building is among the best examples of the use of bricks among the structures that have survived in Anatolia.



Figure 1. Pergamon, Red Basilica (URL 1)

3.2. Byzantine Period

From the early period to the last period of Byzantine architecture, brick was the main material. The Byzantines, who used stone and brick skillfully, also influenced the architecture and facade arrangement of the cultures that came after them.

Brick became the basic building material for Byzantine architecture. Beyond connecting the walls, it also determined the wall thickness, thus serving as a kind of measurement or adjustment. Considering the dimensions of the bricks seen in the Byzantine period, the square bricks are in the dimensions of 35-34-36 cm. Their thickness varies between 2.5 cm and 5-6 cm. Byzantine bricks are slightly larger than Roman bricks. (Mango, 2006).

In this period, stone was used as a secondary material; It was used to reinforce brickwork in places or as a filling material in the wall brick in Byzantine architecture; It has been used for structural purposes in masonry, arches, cover systems such as vaults and domes. The brick is also used as an ornamental element, giving the façade an aesthetic appearance.

ISBN: 978-625-8246-12-4



Figure 2. Fenari Isa Mosque (URL 2)

3.3. Seljuk Period

During the eleventh century, the Great Seljuks gave priority to bare brick in all their structural activities, regardless of function and scale, and benefited from all the possibilities of the material. However, when it came to Anatolia, the local material, stone, took the place of brick. Although brick structures are less than stone structures, remarkable examples are given in terms of quality (Bakırer, 1981).

Brick units used in braids during the Seljuk period can be diversified as full, half and minaret bricks according to their shapes. Full bricks are always square; half bricks are always rectangular; On the other hand, minaret bricks are always prepared with their forward facing surfaces convex and curved and their side surfaces chamfered towards the back. These full, half and minaret bricks may differ in size, but their shapes do not change. During the 13th century, the most produced whole brick sizes in Anatolia were generally square bricks with two sides between 20-21 cm and 21-22 cm and their thickness between 3.5-5 cm (Bakırer, 1981).

While brick was generally used alone in the mosques and tombs of the Seljuk period, it was used in some parts or in the cover system in large-scale structures such as mosques and madrasahs. Konya Iplikci Mosque, built at the beginning of the 13th century, is the only large-scale mosque structure made entirely of bricks.



Figure 3. Konya, Iplikci Mosque (URL 3)

ISBN: 978-625-8246-12-4

3.4. Ottoman Period

In every period of Ottoman architecture, the use of brick material was used in a very intense and original way, both for structural and ornamental purposes, with the influence of Seljuk and Byzantine culture. Baked brick was highly preferred in the Ottoman monumental architecture in Anatolia, especially in Iznik, Bursa, Istanbul and Edirne.

Ottoman baked brick; It is mainly used in walls, arches, dome and elements that provide transition to the dome, as well as covering systems, floors, furnaces. In general terms, when the brick dimensions in Ottoman architecture are considered, there are no general and consistent measurements until the end of the 15th century. Ayverdi identifies two types for the 14th century; measuring 14x28 cm and 30x30 cm and the thicknesses are usually 4 cm, rarely 4.5 cm. During the Sinan period, the bricks were thinned up to 3.5 and 4 cm and continued to thin out over time. Bricks whose thickness decreased to 3 cm and 3.5 cm in the 17th century, 2.5 and 3 cm in the 18th century they have been. In short, although there is a thinning of the bricks over time, a definite situation and development direction for the dimensions could not be determined (Ayverdi, 1989).

Brick, which is one of the main building materials of Ottoman architecture, takes place in many building types in our country, such as mosques, madrasahs, soup kitchens, tombs, cupolas, inns, covered bazaars, arastas, baths, and fountains. In these buildings, brick material was sometimes used in combination with stone and sometimes purely in some parts of the building. Three rows of bricks and one row of cut stone can be seen on all facades of the Hudavendigar Mosque in Bursa, which is one of the early structures. The stone-brick technique was also used in the arches in the building, where the workmanship was very elaborate.



Figure 4. Bursa, Hudavendigar Mosque (Eryiğit Şenel, 2022)

ISBN: 978-625-8246-12-4

4. Factors of Deterioration

In order to prevent deterioration in historical brick structures in our country and to ensure the sustainability of structures, it is necessary to know the factors that cause deterioration in bricks and to take precautions accordingly. When brick structures are examined, it is seen that deterioration occurs due to many different reasons. Although deterioration problems in brick structures sometimes seem to be a single main cause, they can often occur under the influence of many factors. Therefore, in order to make an accurate diagnosis, the factors of deterioration should be evaluated in a broad framework (McCaig, 2015).

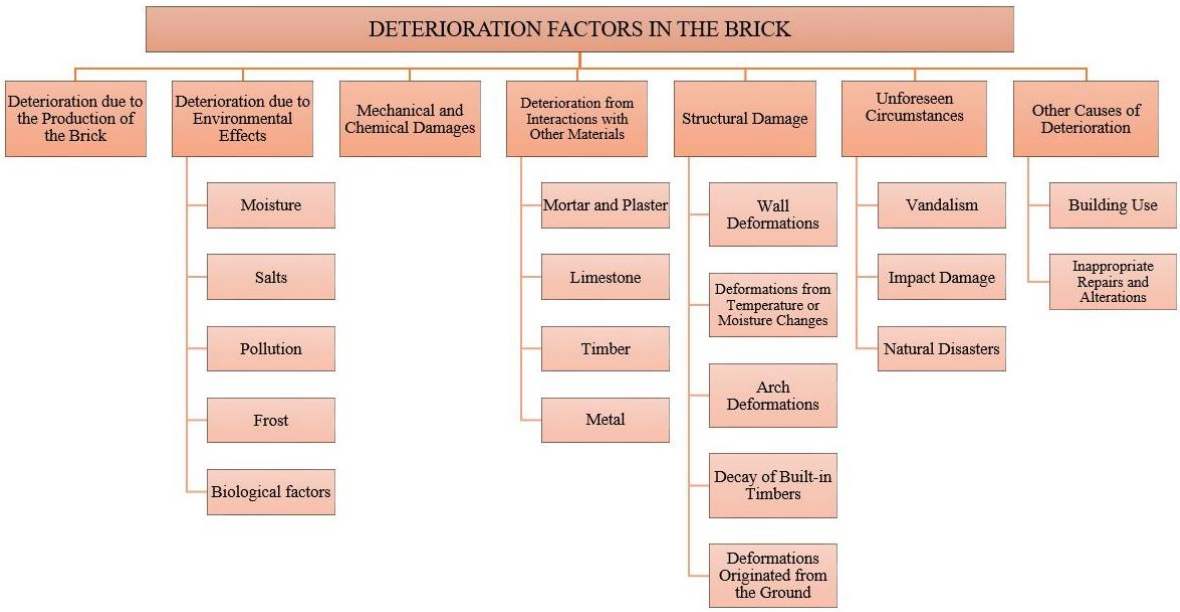


Figure 5. Deterioration factors in the brick

4.1. Deterioration due to the Production of Brick

Manufacturing defects can occur at any stage of the brick making process. Bricks made of unsuitable clay may bend excessively or crack during drying; may be brittle after firing. Overfiring or underfiring during the firing phase can also cause defects in the bricks. Overfired bricks tend to be smaller and brittle. Underfiring can result in the production of weaker, softer and more porous bricks.

4.2. Deterioration due to Environmental Effects

Various environmental factors affect the performance and behavior of the brick. The activities of these factors; vary depending on the location, direction, form, construction and use of the building. The main factor in damages caused by environmental factors is water.

Moisture: It is the most important factor in the deterioration of bricks. When water meets brick material; water absorption, capillarity and moisture formations occur. As a result of these

ISBN: 978-625-8246-12-4

formations, many damages such as disintegration, freezing, salinization, efflorescence, shape deformations and condensation can be seen in the material.

Salts: Bricks can be damaged as a result of salts coming from various sources such as raw materials used in their manufacture, materials used incorrectly and cement, atmospheric pollution, wetting-drying cycles, living organism wastes. In different ways, these salts can accumulate on the surface or by entering the structure. As a result of this situation, various deteriorations may occur as a result of stresses in the material and accumulation on the surface.

Pollution: Air pollution has a significant effect on the deterioration of bricks. Air pollution not only contaminates bricks, but also changes the physical and chemical properties of surfaces. Carbon dioxide and sulfur dioxide in the air accumulate on brick surfaces in the form of acid rain in dry form or by combining with water. Over time, the accumulation of salts and atmospheric pollution in the pores causes the formation of a crust on the surface of the building. When exposed to pollution for a long time, the crust gradually thickens and forms an impermeable layer. This causes stresses within the material (Baer, Fitz, 1998).

Frost: Brick material may vary in reaction to frost. If the porosity is high, the strength is low. When water enters the pores and freezes, internal stresses occur in the pores. The internal stresses created can cause damage when the tensile strength of the materials is exceeded. Repeated freezing and thawing cycles cause more gradual deterioration. Typical deterioration symptoms include granulation, spalling, and lens-shaped fragmentation (McCaig, 2015).

Biological factors: Brick structures can be damaged by a number of biological effects such as animals, plants, algae and lichens, fungi and bacteria living in and around historical buildings.

4.3. Mechanical and Chemical Damages

Mechanical damages: Generally, bricks have high compressive strength; however, they can break when subjected to shear, tensile or torsional stresses. These forces may be the result of thermal expansion, eccentric loading, moisture movement, physical motion or expansion of salts within the pores of the material (Warren, 1999). Underfiried bricks are prone to damage from physical abrasion.

Chemical damage: Chemical damage to bricks can occur if hydrofluoric acid-based cleaning systems are used incorrectly.

4.4. Deterioration from Interactions with Other Materials

Mortar and plaster: Mortar has a significant impact on its performance and behavior as it makes up about 20% of the volume of the brick wall. Abrasion of mortars can cause unstable and

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easily decomposable brickworks by damaging their stability due to loss of support provided by the mortar.

Limestone: Brickwork located just below architectural elements such as cladding, jambs, beams and cornices made of limestone, is susceptible to deterioration. Calcite and gypsum may accumulate on brick surfaces as a result of washing the limestone with rain water. The forces exerted by the salts deposited through repeated wetting and drying cycles as they dissolve and recrystallize can lead to erosion of brick surfaces.

Timber: Built-in timber in brick structures will rot and infestation in areas where the building is exposed to water ingress and humid conditions. Decay of embedded wood often leads to wall damage such as cracking, warping and bulging (Ridout, 2000).

Metal: Corrosion of iron works such as clamps, tenons and ties in brick construction can damage bricks. The forces generated by rusting cause opening-up of mortar joints, cracking, blistering and staining.

4.5. Structural Damages

Structural movements in bricks can occur for many reasons, including inadequate design, overloading of the building, deterioration and movement of surrounding structures, unsuitable repairs and alterations, settlement and vibrations. The resulting deformations and displacements can cause the walls to crack, bend and sag (Douglas, 2015). The severity of the deformation depends on the properties of both the brick and mortar and the supporting structural members made of timber, iron or steel.

4.6. Unforeseen Circumstances

All structures can potentially be damaged by natural disasters such as fire, flood, or as a result of deliberate, sometimes malicious actions.

Vandalism: Historical buildings are damaged in the past and today due to cultural, religious factors, war or unconscious destruction.

Impact damage: In brick structures, especially in the arches located on the transition routes, accidents and impact damage occur from time to time due to pedestrian and vehicle traffic.

Natural disasters: Sudden natural events such as earthquakes, storms, floods, and fires cause damage to brick buildings and materials.

4.7. Other Causes of Deterioration

Building use: Historic buildings can be modified or adapted to meet the changing needs and expectations of their users. Changes to heating, ventilation and air-conditioning systems or

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adding insulation can affect the balance between the brick and its surroundings; may cause changes in moisture and salt behavior of the structure.

Inappropriate repairs and alterations: Some interventions to historical brick buildings may damage the original materials of the building. At the beginning of these are the processes made with cement, painting and plastering of surfaces and the use of faulty techniques in repairs. Faulty repairs can also cause other deteorations.

5. Types of Deteoration

Accurate identification of the types of deterioration seen in brick buildings is necessary and very important for the application of correct intervention methods. The intervention method applied to each type of deterioration is different. Therefore, if a clear and correct classification can be made according to the types of deterioration, it can be determined how the damage factors can be reduced or eliminated (MEB, 2013). The most common types of deterioration that occur in brick buildings are described below.

5.1. Lime Blowing

Limestone, which is dense and in large pieces in the clay used in brick making, turns into calcium oxide (quicklime) during the firing stage. When the baked bricks subsequently absorb moisture, the lime particles swell. Large particles can burst by applying pressure to the surface of the brick. This situation, called "lime blowing", manifests itself as pitting and pockmarking of the brick (McCaig, 2015).



Figure 6. Lime blowing (URL-4)

5.2. Lack of Joints

Brickwork consists of bricks and mortar. Joint mortar weaken and separate from bricks as a result of washing with rain water. As a result of this situation, voids may occur at various depths in brickwork.

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Figure 7. Lack of joints (Eryiğit Şenel, 2022)

5.3. Detach of Part (Fracture)

Generally, bricks have high compressive strength. However, when exposed to shear, tensile or torsional stresses, a part of the brick material may separate from the main mass as a result of these effects.



Figure 8. Fragmentation of brick cornice (McCaig, 2015)

5.4. Holes

In brick structures, the holes opened on the bricks or in their joints for the purpose of mounting an element may not be closed later. These holes may cause the formation of plants or the ingress of water into the structure.



Figure 9. Holes in brick (Eryiğit Şenel, 2022)

5.5. Abrasion

It is the deterioration of brick surfaces as a result of exposure to external conditions for a long time. Underfired bricks are particularly susceptible to abrasion. The severity of the abrasion

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may vary depending on the use of the building and the environmental factors it is exposed to. Doors, door sills and arches may abrasion from pedestrian and vehicle traffic. On brick surfaces, deformation occurs in the form of softening and thinning in the material section.



Figure 10. Abrasion of brick arch caused by high vehicles (McCaig, 2015)

5.6. Crack

Cracks on the surface that do not pose a structural risk are "micro cracks" (MEB, 2013). In brick builndings, deep cracks may occur in the structure in cases such as settlements as a result of structural movements, excessive loading on the building, exposure to earthquakes and vibrations. These deep cracks in the structure are called "structural cracks".



Figure 11. Micro crack (Eryiğit Şenel, 2022)



Figure 12. Structural crack in brick wall (Eryiğit Şenel, 2022)

5.7. Surface Contamination

A dark thin layer may form on brick surfaces, usually due to air pollution.

ISBN: 978-625-8246-12-4



Figure 13. Surface contamination (Eryiğit Şenel, 2022)

5.8. Crusting

As a result of the accumulation of salts and atmospheric pollution in the pores of the brick surfaces over time, it forms a thick and usually dark gray-black colored crust. The color, structure and thickness of the crust vary depending on the brick material and the source of the contamination. As the exposure to pollution continues, the crust thickens, forming an impermeable cover. This situation creates stresses in the structure, causing swelling, dusting and separation.



Figure 14. Crusting (Eryiğit Şenel, 2022)

5.9. Spalling

Deformations in the form of swelling that develop parallel to the brick surface are characterized as "spalling". As a result of repeated freezing and thawing cycles, thin blistering and exfoliation may occur in bricks exposed to freezing (Stock, 2008).

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Figure 15. Spalling in frost damaged brick wall (Eryiğit Şenel, 2022)

5.10. Efflorescence

Bricks contain varying amounts of soluble salts from the raw materials used in their manufacture. In addition, salts may be transported by pollution or may be formed as a result of the chemical reaction occurring within the brick and mortar itself. Water acts as a catalyst in the reaction of brick and mortar materials and ensures the dissolution of the salts in the materials together with the salts formed as a result of the reaction.

As the water evaporates, the salt density increases and salt crystals form on the surface of the brick and mortar, inside the pores or at the interfaces of the materials (McCaig, 2015). Efflorescence occurs when salt crystals rise to the surface during drying and accumulate. A white appearance occurs on brick surfaces with efflorescence.



Figure 16. Efflorescence (Eryiğit Şenel, 2022)

5.11. Crypto Florescence

Salts that crystallize below the surface of the brick or in the pores of the brick and mortar exert pressure on the pores. As a result of the repeated dissolution and crystallization cycles of salts, deterioration in the form of powdering and exfoliation occurs in bricks (McCaig, 2015).

ISBN: 978-625-8246-12-4



Figure 17. (left). Salts causing exfoliation on the surface (Eryiğit Şenel, 2022)

Figure 18. (right). Salts causing powdering on the surface (Lubelli, 2018)

5.12. Plant Formation

Plant formation, which is a type of biological deterioration; covers a wide scale from trees to root crops and grasses. Damages may occur in brick structures by the growth of plants. Ivy and similar species provide support from structures by clinging to brick surfaces and wrapping them with their roots. This situation creates pressure on brick surfaces. The pressure effect created within the structure by the penetration and expansion of the roots creates strong, destructive forces in the mortar and bricks (Warren, 1999).



Figure 19. Plant formation (Eryiğit Şenel, 2022)

5.13. Moss Formation

Moss formation is green during rainy periods on surfaces that are constantly exposed to humid conditions; it appears yellow in summer. These lower plants have root systems similar to higher plants but less complex. Root tips can produce higher acidity. However, they break up the surface structures in the brick and open the way to the deeper destructive effects of large root crops (Warren, 1999). Mosses also cover the surface, preventing the masonry from breathing.

ISBN: 978-625-8246-12-4



Figure 20. Moss growth on brick wall (Eryiğit Şenel, 2022)

5.14. Corrosion

Corrosion is the condition of metal and metal alloys being worn by oxidation or other chemical effects. Corrosion of iron work such as clamps, tenons and tensioners can damage bricks. As iron or steel rusts, it expands in volume; It causes mortar joints to open, cracking, blistering and staining by applying forces exceeding the shear and tensile strengths of bricks.



Figure 21. Brick damage caused by the corrosion of iron (Eryiğit Şenel, 2022)

5.15. Rust Stain

The corrosion that occurs in the iron elements around the brick structures flows over the brick surfaces with washing and creates rust stains.



Figure 22. Rust stain (URL 5)

ISBN: 978-625-8246-12-4

5.16. Faulty Repairs

Brick structures may have been repaired or altered at various times in their history. Incorrect repairs and alterations can distort the shape of the structure and accelerate the deterioration of the building fabric. Problems may arise where materials with physical or chemical properties that are incompatible with the original materials are applied.

- Use of Cement

The use of cementitious mortars in the repairs to be made in brick structures is very damaging to the brick. Impermeable cement mortars prevent evaporation and cause moisture formation on the bricks. This can cause erosion and deterioration of bricks, especially where soluble salts are present.



Figure 23. Bricks deteriorated due to the use of dense, impermeable cement mortar (Eryiğit Şenel, 2022)

- Plastering or Coating Brick Surfaces

Brick building sections covered with strong cement plasters respond differently to thermal and humidity cycles. The resulting stresses can lead to separation, cracking and mechanical damage to the surface of the bricks.



Figure 24. Damage to brickwork caused by the use of strong render (Eryiğit Şenel, 2022)

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6. Conclusion

Brick, which is a terracotta product in traditional architecture; It has been used both as an auxiliary material and as a primary material in different periods, on a large scale and in wide geographies. When we examine the usage history of brick in our country, it is seen that it is sometimes used as a structural element and sometimes as an ornamental element in buildings by making use of all the opportunities provided by the material. While the brick material was used for structural purposes in the Roman period; It was used for both structural and ornamental purposes by forming the main character of the architecture in the Byzantine period. In the Seljuk period, although the use of brick material was influenced by the cultures before it, it created examples specific to Anatolian Turkish architecture as a structural and decorative element. As a result of the contributions of geographical data and cultural interactions, although there were various alternatives as a building material in the Ottoman architectural culture, especially in its early periods, the use of bricks came to the fore. This effect lasted for many years, and the practices under the influence of original examples of early Ottoman architecture continued until late periods.

The use of brick for ornamental throughout history, after its use for structural purposes; The trends of tradition, artists and employers started and developed with the increase of competence in the use of materials. Especially in stone structures, it has found a wide area of use in terms of adding color, movement and visual richness to the structure.

In addition to regional possibilities and cultural interactions, brick is a healthy material, easy to produce, recyclable to nature, and suitable for people's expectations in terms of aesthetic properties. It is the most important product designed and diversified by human hands throughout history. The supply of raw materials is easier than other materials and does not harm the nature.

It is necessary to carry out studies in order to transfer future generations and to ensure the sustainability of the original brickwork structures belonging to the Roman, Byzantine, Seljuk and Ottoman periods, which still have examples in our country. Although the structures made of bricks have survived for a long time, they suffer serious damage due to various factors.

Deterioration in a brick building is caused by production, atmospheric and environmental effects, mechanical and chemical effects, structural conditions, interactions with other materials, unforeseen circumstances such as flood, fire, changes in building use over time, and improper repairs. Such problems appear as many damage symptoms such as deformities,

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granulation, fragmentation, cracking, swelling, efflorescence and abrasion in the brick structure.

Each brick is unique to the period it was made and reflects the characteristics of the period. If traditional bricks are damaged, it can be difficult to produce them in accordance with the original, both in terms of time and cost. For this reason, it is necessary to take precautions without losing the original brick material. Correct detection of damages when dealing with damaged brick structure; After the underlying causes of the problems are investigated and analyzed, intervention methods need to be developed. At this point, it is thought that the study will provide systematic and practical data for the detection of damages in the interventions to be carried out on brick structures by raising awareness. Since Turkey is one of the richest countries in the world in terms of historical artifacts and has a large number of brick structures in this context, it is clear that studies and material opportunities should be presented for the preservation and repair of the structures.

As a result, it is thought that this study will contribute to the research on the use of brick materials in historical brick structures in Turkey and will guide practitioners in the detection and analysis of damage in interventions to such structures.

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URL 3 http://www.meram.gov.tr/iplikci-camii

URL 4 https://sylcreate.com/how-to-turn-modelling-putty-into-a-material-for-brick-restoration/)

URL 5 https://www.youtube.com/watch?v=9HBUK-YOPTQ

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Comparison of Fiber Reinforced Cement Based and Geopolymer Mortars

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Abstract

The research aimed to examine the use of cellulosic fibers in mortars, as well as to reuse the wastes that cause environmental pollution, to bring them into the economy. For this purpose, cellulosic fiber reinforced geopolymer and cement-based mortars were produced. Wastepaper fibers were used as cellulosic fiber. Geopolymer mortars are produced using basaltic pumice and silica fume. Sodium hydroxide (NaOH) was used as activator. Fresh and hardened mortars were subjected to various tests to determine the physical properties of the produced mortars. By comparing the obtained results, the effect of fiber additive on cement-based and geopolymer mortars was observed.

Keywords: Fiber, geopolymer, mortar, properties.

Introduction

This study aims to investigate the effect of fiber additives on cement-based concretes and geopolymer concretes. By comparing the results obtained, it will be determined on which type of concrete the fiber additive is more effective and usable. Considering long-term effects while consuming resources is especially important for sustainability. Disposal of paper into nature after use has a negative impact on the environment. The annual amount of paper waste in China, The United States and Japan is 27, 122 and 39 Mt, respectively (Xiao et al., 2019). The systems that will dispose of the waste as garbage also harm the nature. Generally, the separated paper waste can be reused to produce hygienic paper (Qin et. al, 2018). Recycling and use of cellulosic waste is the subject of literature studies. In one research on the use of paper wastes in cement-based mixtures, mixtures were prepared using 2 different fiber types at the rate of 2% and 5% by weight of waste fibers and these samples were compared with control samples containing 99,5% waste fiber and 0% waste fiber by weight. According to the given values obtained from the results, samples containing wastepaper as fiber showed up to 14,9% increase in bending strength compared to samples containing sawdust. (Steluva et al., 2016). In the same way, another study conducted to see the effect on physical properties was done by adding two different cellulose-based fibers, wastepaper, and wood chips, to cement mixtures at the rates of 0,2%, 0,3% and 0,5%. Different physical properties (flow, density, thermal heat transfer coefficient and water absorption) were investigated on 28 days old fiber-containing test samples. Adding cellulose-based fiber had a negative effect on the workability of the cement

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mixture, and also negatively affected the water absorption property of the sample on the hardened pulp due to the hydrophilic nature of the fibers. On the other hand, an improvement in density and heat permeability was observed (Haspodarova et al., 2017).

No study has been found in the literature on the use of paper waste as fiber in geopolymer mortars. However, there are studies investigating the mechanical and physical properties of geopolymer mortars by reinforcing them with various fibers. In one study the mechanical properties of fly ash-based polymers reinforced with natural fiber were investigated. Pineapple fibers with a length of 10mm, 20mm, 30mm, as natural fiber, were added to the mortars as 0%, 0,25%, 0,5% by weight. Compressive and flexural strength tests performed on the samples, it was observed that the samples containing 30mm, 0,5% pineapple fiber provided the highest compressive and flexural strength (Zulfiati et al., 2019). In another research the reinforcement of geopolymer mortars with cotton fibers, cotton fibers were used at a rate of 0,3% and 1% by weight, and the mechanical and physical properties of the samples were investigated. According to the data obtained from the study, it was observed that cotton fibers improved the mechanical properties of geopolymer mortars, and the optimum fiber content was determined as 0,5% (Alomayri et al., 2012).

In another line with the problem that the landfills faced by India will be filled in 2020. The study conducted to use wastepaper in concrete mixes, 4 different concrete mixes were created by adding waste at the rate of 0%, 5%, 10%, 15% and 20%. As a result, a relative pressure increase of 3% and 1,4% was achieved in mixtures containing 10% and 15% paper waste, respectively. In the 20% mixture, a compressive strength of 1,9% was experienced compared to the control sample. As a result of the study, it has been shown that mixtures containing 10% wastepaper are suitable for use (Singh et al., 2015).

Materials and Methods

Basaltic pumice (scoria), which is a natural pozzolan in the production of geopolymer mortar used in this study. Artificial pozzolan silica fume was donated to laboratory by Antalya Eti Electrometallurgy Inc. To determine the compatibility of binders with fiber and activator and ensure precise mixing many different binder-fiber-activator ratios have been tried. By examining the data obtained as a result of the trials, the expected workability was obtained. The mixture with the highest fiber content, binder ratios, activator type and amount are determined. Geopolymer mortars cured at 60 ℃ for 24 hours. In order to produce cement-based mortars, CEM I-42.5R type cement and limestone-based crushed sand were used. W/C ratio was set as

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0,7. Paper waste was cut into small pieces and turned into fibers. Bulk densities, void volumes, and water absorption rates of the relevant components were calculated according to TS EN 1097-3 and TS EN 1097-6 standards.



Figure 1. Image of fiber supplement used in the study



Figure 2. Flow table

The flow diameter was determined based on TS EN 1015-3. To determine the spreading diameter, the flow table arrangement seen in (Figure 2.) was used. The mortar, which is filled to the level of about half of the cut cone was spudded 10 times and then the entire cone was filled with mortar and spudded 10 more times. The remaining mortar on the surface of the cone was removed by smoothing with a spatula. Then cone was pulled up vertically. Table arm attached to the table was lowered by turning it 15 times. Mortar was spread on the table. Spread measurements taken perpendicular to each other. The two widest parts of the spread are measured divided by two and the average flow diameter is calculated.

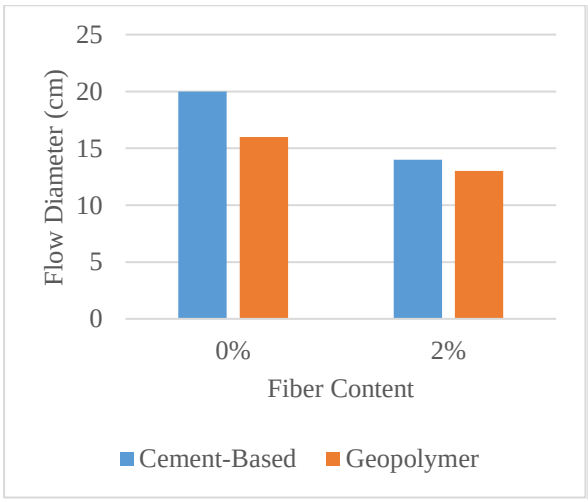
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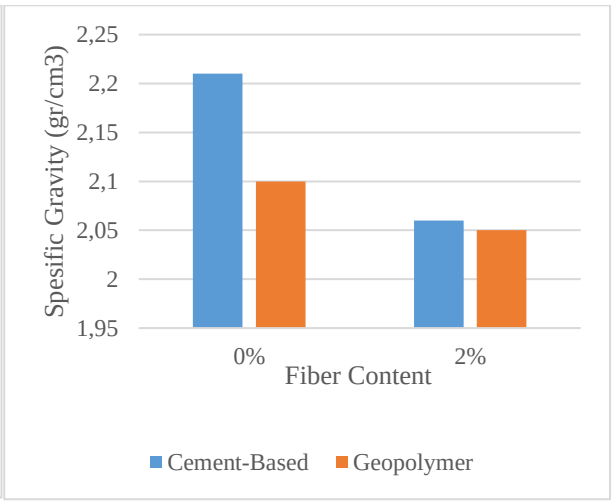


Figure 3. Archimedean weight scale

A cut cylinder of 1 dm^3 was used to determine the unit weight of the fresh mortar. The container was first filled halfway and dropped 10 times on the spreading table with the help of the turning handle. Afterwards, the container was completely filled with mortar and dropped 10 more times. The surface was then leveled, and the container was weighed. The unit weight of the mortar was determined by subtracting the result from the tare of the container and dividing it by its volume.

Findings and Discussion





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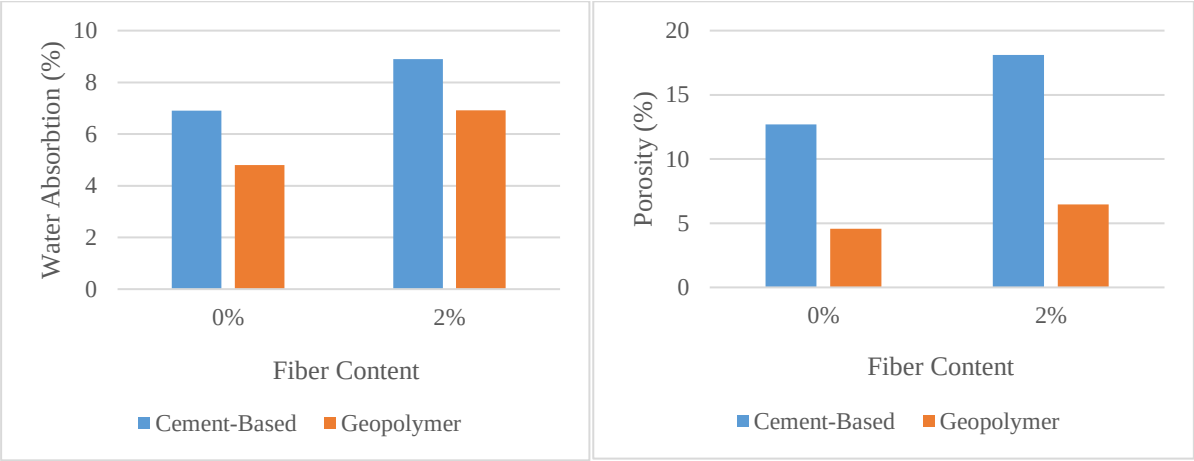


Figure 4. Comparison of the results obtained from the tests on fresh and hardened state

The percentage of fiber reinforcement showed the same effect for both types of mortar, but the magnitude of the effect varied according to the type of binder material. While the effect of reinforcement fiber percentage on the porosity values of cement-based mortars were quite high, it was seen that its effect on geopolymer mortars was minimal. The water absorption values were found to be proportional to the porosity as expected. Water absorption and porosity ratios of the mortars were calculated according to ASTM C 642.

While the fibers caused agglomeration in cement-based mortars, this was not observed in geopolymer mortars. Paper reinforcement could not be increased above 2% due to the negative effect of agglomeration on the workability of cement-based mortars.



Figure 5. View of paper fibers causing agglomeration in cement-based mortars

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Conclusion and Recommendations

The effect of cellulosic fiber reinforcement on the fresh and cured properties of cement-based and geopolymer mortars was observed. When the results were compared, it has been seen that fiber reinforcement was more effective on the properties of cement-based mortars.

- The highest porosity value (18,1%) was observed in cement-based mixtures containing 2% fiber reinforcement, while the lowest porosity value (4,58%) was observed in geopolymer mortars containing 0% fiber reinforcement.
- The highest water absorption ratio (8,9%) was observed in cement-based mixtures containing 2% fiber reinforcement, while the lowest water absorption ratio (4,58%) was observed in geopolymer mortars containing 0% fiber reinforcement.

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Dış Cephe Kaplamasında Kullanılan Bazı Kireçtaşlarının Donma-Çözülme Etkisinde Fiziko-Mekanik Değişimlerinin İncelenmesi

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Öz

Günümüzde doğal taşların deformasyonuna sebep olan donma-çözülme etkisi başta olmak üzere bozunma türleriyle ilgili birçok araştırma yapılmaktadır. Bozunmayla ilgili yapılan çalışmalarda kayaçlarda meydana gelen deformasyonun sebeplerin başında suyun etkisi görülmektedir. Nitekim dış cephe kaplamasında ve mimaride kullanılan mermerlerin uzun yıllar boyunca bütünlüğünü koruması istense de genellikle bozunmalara karşı dayanıklılıkları dikkate alınmadan, renk veya parlaklık gibi görsel çekiciliklerine göre tercih edilmektedir. Bu çalışmada farklı bölgelerden alınmış olan kireçtaşlarının donma-çözülme sonrasında fiziko-mekanik özelliklerinde meydana gelen değişimler incelenmiştir. Çalışmada kullanılan numuneler Antalya-Demre ve Isparta-Şarkikaraağaç Bölgelerinden alınmıştır. Numuneler 5x5x5 cm küp formunda hazırlanmış olup, daha sonra donma-çözülme makinasında 6 saat -20 °C' dondurucuda, 6 saat +20°C suda bekleyecek şekilde çevrime sokulmuştur. 15 çevrim ile 40 çevrim öncesi ve sonrasında tek eksenli basınç dayanımları, ultrasonik p-dalga hızlarındaki değişimleri ve parlaklık değişimleri incelenen numunelerde, Antalya-Demre Bölgesine ait olanların Isparta-Şarkikaraağaç bölgesinden alınan numunelere göre daha az deformasyona uğradıkları görülmüştür.

Anahtar Kelimeler: *Kireçtaşı, bozunma, donma-çözülme, p-dalga hızı.*

Investigation of Physıco-Mechanical Changes of Some Limestones Used in Exterior Cladding Under Freeze-Thaw Effect

Abstract

Today, there are many researches on the types of weathering, especially the freeze-thaw effect that causes the deformation of natural stones. In the studies on weathering, the effect of water is seen at the beginning of the causes of deformation in the rocks. As a matter of fact, it is desired to preserve the integrity of the marbles used in exterior cladding and architecture for many years. On the other hand, marbles are generally preferred according to their visual appeal such as color or gloss, regardless of their resistance to degradation. In this study, changes in the physico-mechanical properties of limestones taken from different regions after freezing-thawing were investigated. The samples used in the study were taken from Antalya-Demre and Isparta-Şarkikaraağaç regions. The samples were prepared in the form of 5x5x5 cm cubes, and then circulated in a freeze-thaw machine for 6 hours in a -20 °C freezer and 6 hours in +20 °C water. Samples, uniaxial compressive strength, changes in ultrasonic p-wave velocities and brightness changes before and after 30 cycles were investigated. As a result, it was observed that those belonging to the Antalya-Demre Region underwent less deformation than the samples taken from the Isparta-Şarkikaraağaç Region.

Keywords: Limestone, weathering, freeze-thaw, p-wave velocity.

Giriş

Doğal taşlar geçmişten günümüze yapı sektörü, heykel, sanat gibi alanlarda kullanılan en önemli malzeme olmuştur. Doğal taşlar günümüzde genellikle zemin döşeme (%36), mezarcılıkta (%11) ve süs eşyası (%8) yapımında, iç (%14) ve dış cephe (%10) kaplama malzemesi olarak inşaat sektöründe kullanılmaktadır (Yılmaz & Safel, 2004).

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Doğal taşlar kullanıldıkları yere göre uzun süre rüzgâr, nem, yağmur, donma-çözülme ve gece gündüz sıcaklık farklılıkları gibi atmosferik olaylara maruz kalmaktadır (Şengün vd., 2008). Doğal taşın bu koşullar karşısında görünümünde bir kötüleşme olabileceği gibi hem fiziksel hem de mekanik özelliklerinde değişimler meydana gelmektedir. Doğal taşların yapısında meydana gelen bozunmalar onarım yapılmasını zorunlu kılmaktadır. Bu onarım hem farklı mermerlerin kullanılmasına hem de ekstra işçilik giderlerinin ortaya çıkmasına sebep olmaktadır. Bütün bu işlemler doğal olarak yapı maliyetini arttırmaktadır (Erdoğan & Yaşar, 2001).

Yeryüzündeki hemen hemen bütün kayaçlar, donma-çözülme gibi etkenlerden sürekli olarak etkilenirler. Bu etkenlerin zararlı etkileri her bölgede aynı değildir. İklim, kayacın yapısı ve aşınma tipi, kayacın maruz kalacağı bozunmayı da etkiler. Sonuç olarak yapıda kullanılan kayaç yüzeyleri üzerinde bu zararlı etkiler gözlemlenebilmektedir. Atmosferle doğrudan etkileşimde olan doğal taşlara donma çözülme ve termal şok gibi atmosferik koşullar etki etmektedir. Bu etkiler zamanla artar, meydana gelen bozunma çok daha ileri boyutlarda olur ve daha görünür bir hal alır. İnşaat sektöründe kullanılan yapı ve kaplama taşlarının, donma-çözülme periyotlarından etkilenme derecelerinin daha önceden fark edilmesi ve bu olaylara daha mukavemetli doğal taşların seçimi sektörel kullanımda önemlidir. (Akbay vd., 2012). Broms & Yao (1964) yaptığı araştırmada zeminlerin, donma-çözülme süreçlerindeki fiziko-mekanik özelliklerindeki değişimleri incelenmiştir.

Binal (1996) ve Binal vd. (1997; 1998), Eskişehir-Yazılıkaya bölgesinde donma-çözülme etkisi altındaki yüzeylenen volkano-sedimanter kayaçların fiziksel ve mekanik özelliklerinin değişimlerini incelemişlerdir. Simonsen ve Isacsson (1999) ise soğuk bölgelerde kullanılan parke taşlarının çözülme zayıflığı üzerine araştırma yapmıştır.

Altındağ vd. (2003) Isparta andezitinin 50 periyotluk bir donma-çözülme çevrimi sonunda fiziko-mekanik özelliklerinin azaldığını gözlemlemişlerdir. Alyıldız (2003) ve Altındağ vd. (2004), Isparta'nın güney-doğusunda yer alan Dereboğazı bölgesinde yataklanan tüf (tras) örnekleri üzerinde donma-çözülme periyotlarının sonunda tüfün fiziko-mekanik özelliklerinin nasıl değiştiğini laboratuvar ortamında incelemişlerdir.

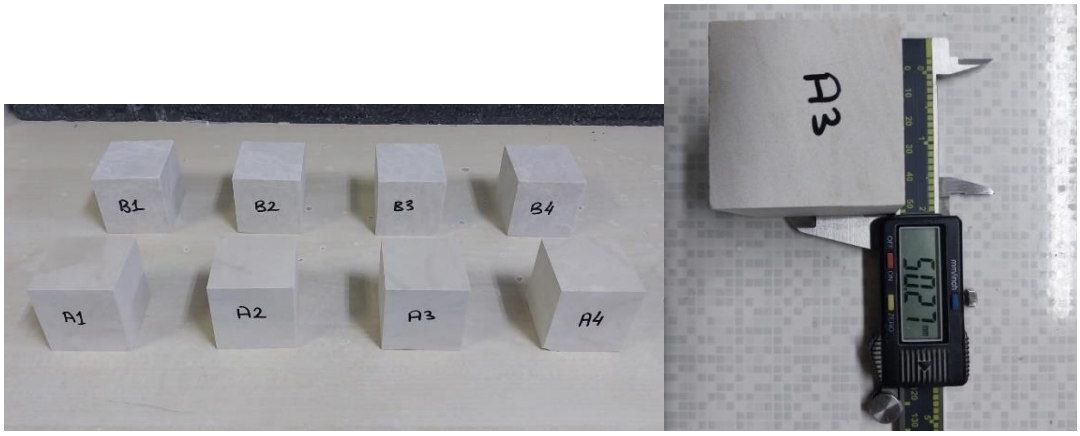
Khooshroo vd. (2017)'nin yaptığı çalışmada Süleymaniye Camii'nin taş yüzeylerinde meydana gelen bozunmaları incelemiştir. 2007-2011 tarihleri arasında Camii'nin kapsamlı bir restorasyon ve onarım geçirdiği, bakımlı bir yapı olmasına rağmen yapıda kullanılan doğal taş yüzeylerinde oluşan bozunmalar ve hasarlar açısından bakıldığında pek çok sorun içerdiğini

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belirtmiştir. Süleymaniye Camii'ndeki bu etkenlerin yapıdaki doğal taşları en çok etkileyen türünün sudan kaynaklı etki olduğunu belirtmiştir. Suyun, kimyasal ve biyolojik bozunmayı arttırırken su ile ısı değişikliği sonucu donma olayı gerçekleştiğinde bu noktadaki suyun genleşmesi ile doğal taşlarda çatlama ve kırılmalar şeklinde hasarlarla sonuçlandığını ifade etmiştir. Yapılan çalışmada bozunma çeşitleri ve sebepleri incelendiğinde bozunmadaki en büyük etkinin sudan kaynaklandığını fiziksel deformasyonun en büyük etkisinin ise donma-çözülme sürecinin olduğunu ifade etmiştir.

Materyal-Yöntem

Çalışmada kullanılan kireçtaşlarının donma-çözülme etkilerinin meydana getireceği değişikliğin belirlenmesi için Antalya-Demre bölgesinden limra taşı örnekleri (LS) ve Isparta Şarkikaraağaç bölgesinden bej örnekleri (BG) temin edilmiştir. İki farklı bölgeden temin edilen özellikleri benzer olmayan doğal taşlar üzerinde donma-çözülme testleri yapılmış ve çevrim sayısına bağlı olarak ağırlık değişimleri, P dalga hızı değişimleri ve mukavemet değişimleri incelenmiştir. Öncelikle her kireçtaşı için 50x50x50 mm ebatlarında iki test grubu oluşturulmuştur. Hazırlanan numunelerin yüzey alanları kumpas yardımı ile ölçülmüştür. Hazırlanan numunelerin suya doygun ve kuru ağırlıklarının belirlenmesi için donma-çözülme çevrimi öncesi ± 0,01gr hassasiyette tartı ile tartımları yapılmıştır (Şekil 1).



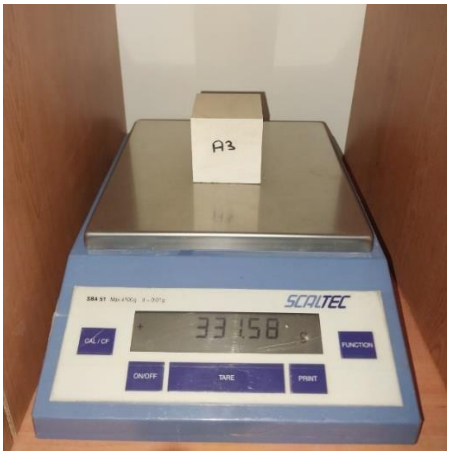
Şekil 1. Hazırlanan numuneler ve kumpas ile ölçüm

Birinci test grubuna donma-çözülme çevrimleri uygulanmış ikinci grupta ise kayaçların test öncesindeki tek eksenli basınç dayanımları tespit edilmiştir. Her iki gruptaki numunelerin orijinal ağırlıkları ölçülmüş ve 15 çevrim donma-çözülme ile 40 çevrim donma-çözülmede bu ölçümler tekrarlanmıştır. Toplamda 40 donma-çözülme çevrimleri TS EN 12371 6 standardında uygulanmıştır.

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Fiziksel ve Mekanik Özelliklerin Belirlenmesi

TS EN 1936 standardında belirtilen esaslara göre, deneyde kullanılacak doğal taşların kuru birim hacim ağırlık değerleri, görünür gözeneklilik değerleri kenar uzunluğu 50 mm olan küp numuneler üzerinde yapılan deneyler sonucunda belirlenmiştir (Şekil 2).



Şekil 2. Hassas terazi ölçümleri

TS EN 1926 standardında belirtilen esaslara göre, tek eksenli basınç dayanım deneyleri kenar uzunluğu 50 mm olan küp numuneler hazırlanarak gerçekleştirilmiştir. Deneylerde en az 4'er numune kullanılmış ve deney sonucunda ölçülen değerlerin aritmetik ortalamaları Çizelge 1'de gösterilmiştir.

Çizelge 1. Çalışmada kullanılan mermerlerin fiziksel ve mekanik özellikleri

Numune	BHA gr/cm^3	GG %	Vp m/sn	TEBD Mpa
LS	2,58	5,54	4232,85	82,8
BG	2,78	1,29	5977,10	101,6

BHA: Kuru birim hacim ağırlık; GG: Görünür gözeneklilik; Vp: P Dalga hızı; TEBD: Tek eksenli basınç dayanımı

P Dalga Hızı Ölçümleri

Sismik hız deneyleri her bir kenar uzunluğu 50 mm olan küp numuneler hazırlanarak TS EN 14579'da belirtilen esaslara göre gerçekleştirilmiştir. (Şekil 3).



Şekil 3. P dalga hızı ölçümü

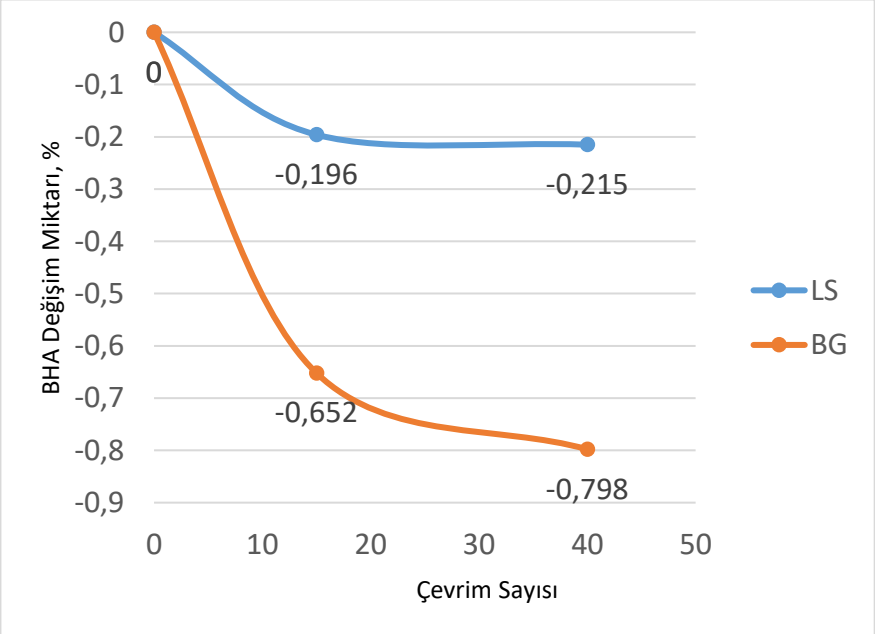
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Donma-Çözülme Çevrimleri

Donma-çözülme çevrimleri TS EN 12371 standartına uygun olarak yapılmıştır. Donma-çözülme çevrimleri deneyinde hazırlanan numuneler suya doygun hale getirilmiştir. Numuneler doygun hale geldikten sonra önceden -20°C'ye ayarlanmış dondurucuya yerleştirilmiştir. Numuneler 6 saat dondurucuda bekletilmiştir. Numuneler daha sonra aynı makinede +20°C'ye ayarlanmış su içerisinde 6 saat bekletilmiştir. Bu şekilde 15. periyot ve 40. periyot tamamlanınca numuneler kurutulmuş ve ağırlık ölçümleri tekrarlanmıştır. Hazırlanan numunelere 40 periyot donma-çözülme testi uygulanmıştır. Deneylerden elde edilen sonuçlar Çizelge 2, 3, 4'te gösterilmiştir. (Şekil 4, 5, 6).

Çizelge 2. Donma-çözülme sonrası birim hacim ağırlıklarındaki yüzde (%) değişimleri

		Çevrim Sayısı		
		0	15	40
BHA % Değişimi	LS	0	-0,196	-0,215
	BG	0	-0,625	-0,798

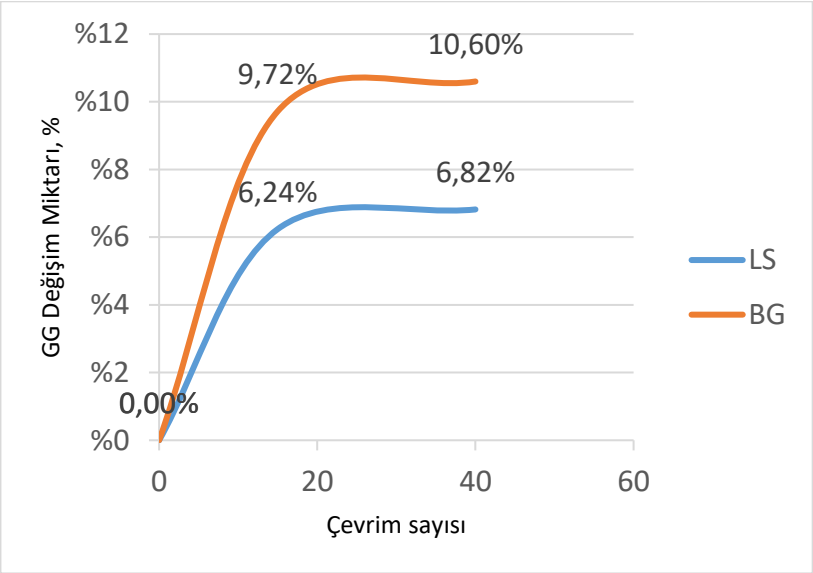


Şekil 4. Donma-çözülme sonrası birim hacim ağırlıklarındaki yüzde (%) değişimleri grafiği

Çizelge 3. Donma-çözülme sonrası görünür gözeneklilikteki yüzde (%) değişimleri tablosu

		Çevrim Sayısı		
		0	15	40
GG % Değişimi	LS	0	-0,196	-0,215
	BG	0	-0,625	-0,798

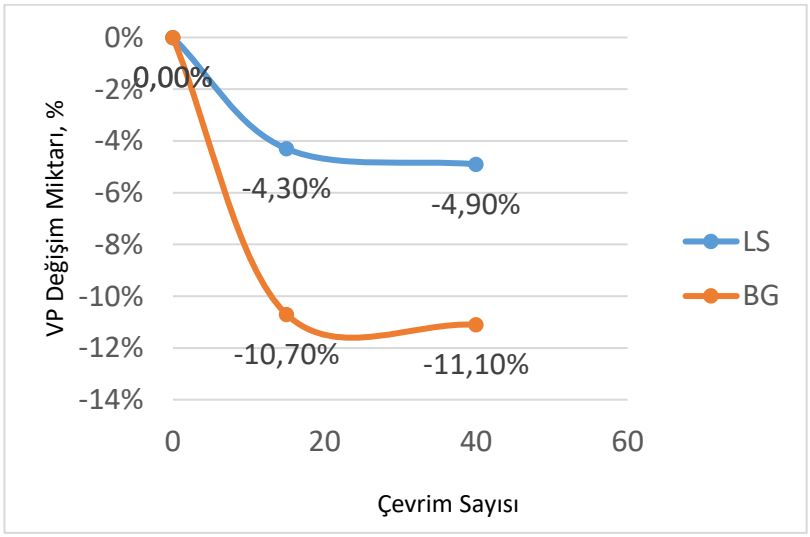
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Şekil 5. Donma-çözülme sonrası görünür gözeneklilikteki yüzde (%) değişimleri grafiği

Çizelge 4.Donma-çözülme sonrası P-Dalga hızlarındaki yüzde (%) değişimleri

		Çevrim Sayısı		
		0	15	40
GG % Değişimi	LS	0	-0,196	-0,215
	BG	0	-0,625	-0,798



Şekil 6. Donma-çözülme sonrası P-Dalga hızlarındaki yüzde (%) değişimleri grafiği

Değerlendirme

Bu çalışmada elde edilen sonuçlar incelendiğinde binalarda dış cephe kaplama malzemesi olarak kullanılabilecek mermerlerin dış etkenlere maruz kaldığı durumlardaki bütünlük kaybı, mermerin mukavemet değerlerinin incelenmesi amacıyla yapılan donma çözülme, çevrim sayılarına bağlı olarak ağırlık ve mukavemet kaybı belirlenmiştir. Bu çalışmada kullanılan iki

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farklı bölgeye ait mermerlerini donma-çözülme durumunda hangisinin diğerine göre daha çok etkilendiğini belirlemek amacıyla Şekil 4,5,6 'da ki eğrilere bakılmıştır. Bu eğim değerleri incelendiğinde, ağırlık kaybının en fazla donma-çözülme etkisi altında Şarkikaraağaç mermerinde olduğu görülmüştür. Bunun nedeni Şarkikaraağaç mermerinin kristal boyunun diğer mermere göre daha küçük olduğundan ötürü bu duruma sebep olduğu düşünülmektedir.

Sonuç

Bu çalışmada 2 farklı bölgeye ait kireçtaşının donma-çözülme çevrimleri sonrası birim hacim ağırlıkları, görünür gözeneklilikleri, p-dalga hızları ve tek eksenli basınç dayanımlarındaki değişimleri belirlenmiştir. Yukarıdaki parametreler dikkate alındığında don hasarından meydana gelen fiziksel ve mekanik değişimlerin kayaçların oluşum türleri ve bölgelerine göre değişiklik gösterdiği görülmüştür. Antalya bölgesine ait limra taşının, Isparta bölgesine ait kireç taşlarına göre don hasarına karşı daha az deforme olduğu, dış cephe kaplamasında kullanılmasının daha uygun olduğu görülmüştür. Bu çalışma neticesindeki çıkan sonuçların, doğal taşlarda meydana gelen don hasarının daha iyi anlaşılmasına ve dış cephe kaplamasında hangi taşın tercih edilmesi hususuna ışık tutacağı düşünülmektedir.

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Comparison of The Calculation Methods Recommended in Ts En 17037 Standard For All Provinces in Turkey

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Abstract

Many studies today reveal daylight's effects on human health, especially the circadian cycle, and its potential regarding energy efficiency. In this aspect, the importance of studies in the field of daylight in terms of sustainable architectural design is increasing day by day. Only cloudy sky conditions can be evaluated with the daylight factor method, which has been used for many years to determine the daylight performance of the room. It is considered appropriate to use this method in regions where cloudy sky conditions prevail for most of the year, such as Northern European countries. On the other hand, where different sky conditions occur throughout the year, it is recommended to use dynamic calculation methods using climate data generated at one-hour steps or shorter time intervals. Both methods are included in EN17037: 2018 Daylight in Buildings Standard published in 2018. Turkey consists of regions with different annual sunshine duration and radiation intensities. To choose the appropriate method for computational daylight studies that would be carried out in these regions, the two methods' effect on the room's daylight performance should be evaluated. In this study, a theoretical living space, which is frequently used in architectural applications, is designed and via the Grasshopper, the plugin of the Rhinoceros program, the daylight provision performance of the room is calculated for both calculation methods. The results are visualised on the Turkey map, and the expression for comparison is strengthened. This study aims to contribute to the determination of the appropriate calculation method and the selection of the appropriate simulation tool (dynamic/static) in computational daylight studies to be carried out in different regions of Turkey.

Keywords: Daylight provision, EN 17037 daylight in buildings standard, climate-based calculation method, daylight factor.

Ts En 17037 Günışığı Standardı'nda Önerilen Hesap Yöntemlerinin Türkiye'deki Tüm İller İçin Karşılaştırılması

Öz

Günümüzde yapılan pek çok çalışma günışığının başta sirkadyen döngü olmak üzere insan sağlığı üzerindeki etkilerini ve enerji verimliliğine yönelik potansiyelini ortaya koymaktadır. Bu yönüyle; sürdürülebilir mimari tasarım açısından günışığı alanındaki çalışmaların önemi her geçen gün artmaktadır. Hacmin günışığı performansının belirlenmesinde uzun yıllardır kullanılan günışığı çarpanı yöntemi ile sadece kapalı gök koşulları değerlendirilebilmektedir. Kuzey Avrupa ülkeleri gibi yılın büyük bölümünde kapalı gök koşullarının hakim olduğu bölgelerde bu yöntemin kullanılması uygun görülmektedir. Buna karşın yıl içinde farklı gök koşullarının oluştuğu ülkelerde, bir saatlik ya da kısa zaman aralıklarıyla oluşturulan iklim datalarının kullanıldığı dinamik hesap yöntemlerinin kullanılması önerilmektedir. 2018 yılında yayımlanan EN 17037:2018 Binalarda Günışığı Standardı'nda her iki yönteme de yer verilmiştir. Türkiye farklı yıllık güneşlenme süresi ve ışınım şiddetine sahip bölgelerden oluşmaktadır. Bu bölgelerde yapılacak hesaplamalı günışığı çalışmalarında uygun yöntemin

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seçilebilmesi için iki yöntemin hacmin günışığı performansına etkisinin değerlendirilmesi gerekmektedir. Bu çalışmada mimari uygulamalarda sıklıkla kullanılan kuramsal bir yaşama hacmi tasarlanmış, Rhinoceros programının eklentisi Grasshopper ile her iki hesap yöntemi de kullanılarak hacmin "yeterli günışığı aydınlığının sağlanması performansı" hesaplanmıştır. Elde edilen bulgular Türkiye haritası üzerinde görselleştirilerek karşılaştırmaya yönelik anlatım güçlendirilmiştir. Yapılan çalışma ile, Türkiye'nin farklı bölgelerinde yapılacak hesaplamalı günışığı çalışmalarında uygun hesap yönteminin belirlenmesi ve bu yönde uygun simülasyon aracının (dinamik/statik) seçilmesine katkı sağlanması hedeflenmiştir.

Anahtar Kelimeler: Günışığı aydınlığının sağlanması, EN 17037 binalarda günışığı standardı, iklim verilene dayalı hesap yöntemi, günışığı çarpanı.

Introduction

The effective use of daylight in buildings is an issue that directly affects human health and energy efficiency. It has been a considerable subject of governments and the population for many years. Different calculation methods are used to evaluate the daylight performance of buildings. In the daylight factor model, which has been used for many years, only CIE overcast sky model is used to evaluate the daylight performance of the room, and the contribution to the illuminance level of the direct radiation from the sun is neglected. Studies of the last 25 years show that direct sunlight should be considered when determining a room's daylight performance by simulation method, especially in regions where different sky models occur throughout the year (Mardaljevic, 1995, 2000). For this purpose, calculation methods have been developed using climate data, prepared with one-hour or less time intervals. (Nabil & Mardaljevic, 2005). In parallel with these researches, the building certification systems such as LEED, BREEAM, and various standards for daylighting are updated. For CEN (European Committee for Standardization) members, EN 17037:2018-Daylight in Buildings Standard was published in 2018. In this standard, two alternative calculation methods are suggested to evaluate the "daylight provision performance" of the room. In the first method, the calculation steps of the daylight factor model, and in the second method, the calculation model based on the climate data are explained.

Turkey has regions with different sunlight exposure durations and radiation intensity, and different cloudiness conditions (Figure 1.). So, it is necessary to determine which of the methods recommended in the standard is appropriate for daylight simulation studies that would be carried out in different regions of Turkey.

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Figure 1. Sunlight Exposure Durations of Turkey Provinces (T.C. Çevre Şehircilik ve İklim Değişikliği Bakanlığı Meteoroloji Genel Müdürlüğü, 2022).

In the literature review, it is seen that researchers who worked in the same region (e.g. Istanbul) preferred different calculation methods (Atmaca, Zoroğlu Çağlar, Ünver, & Zorer Gedik, 2022; Şener Yılmaz, 2019). However, there wasn't any study that determined which of the methods recommended in the standard is appropriate for the studied region (Kılıç & Köknel Yener, 2018; Uç & Dokuzer Öztürk, 2022; Zahmacıoğlu, 2019). In those studies, it is seen that the calculations are made by choosing one of the methods recommended in the standard. Still, the effect of selecting the methods on "daylight provision performance" is not mentioned.

In this study, a theoretical, residential-living room is created, and the "daylight provision performance" of the room is evaluated using both methods recommended in the standard. Calculations are made for all provinces in Turkey, so the effects of the two methods on the calculation results are determined for provinces with different sunlight exposure duration and radiation intensities.

This study aims to contribute to determining the appropriate calculation method in daylight simulation studies to be carried out in Turkey.

Materials and Methods

In this study, a theoretical living room, based on the dimensions commonly preferred in architectural applications, with a south façade is created. Following the directives in the standard, the reference plane is assumed to be 0,85 m above the ground and 0,50 m away from the walls. According to the equation suggested in the standard, grid intervals between

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calculation points must be at most 0,62 m. In the study, 48 calculation points are determined with 0,5 m grid intervals. Table 1 shows the general properties of the room; Figure 2 shows the 3D image of the room.

Table 1. General properties of the room

Location	81 Province of Turkey
Orientation	South
Dimentions (m)	4 x 5 x 3.5
Opening Size (m)	2 x 2.2
Parapet height (m)	0,85
Window-to-wall ratio	0,31
Light transmittance coefficiency of the	0,85
Light reflectance coefficiency	ceiling: 0,80; wall: 0,60; floor: 0,40
Shadings	No
Sunlight control systems	No

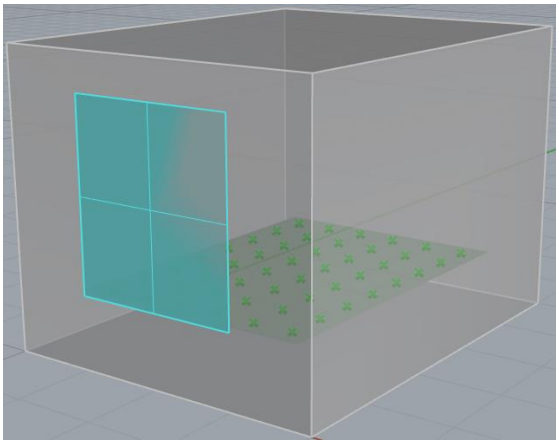


Figure 2. The 3D image of the room

Daylight simulations are made using Grasshopper, the plug-in of the Rhinoceros program. The database on the website "https://climate.onebuilding.org/" is used for climate data (Onebuilding, 2022). According to the standard, the target illuminance level is the illuminance level that should be achieved in at least 50% of the reference plane in half of the daylight hours. The minimum target illuminance level is the illuminance level that should be achieved at least 95% of the reference plane in half of the daylight hours (European Committee for Standardization, 2018).

To calculate the parameters recommended in the standard, a workflow is created in Grasshopper, and the obtained data are transferred to the Excel program. In order to see the difference of calculation methods according to provinces in a practical way, the following cartogram Turkey maps are constituted:

ISBN: 978-625-8246-12-4

- The "daylight provision performance" of the room according to the 1st calculation method
- The "daylight provision performance" of the room according to the 2nd calculation method
- The "daylight provision performance" difference between the two calculation methods

Findings and Discussion

According to the standard, "minimum", "medium", and high" performance limit values are recommended for "daylight provision performance". To process the data mathematically in the Excel program more quickly; the highest performance is indicated as "3", medium performance as "2", minimum performance as "1", inadequate performance as "0". The difference level of the two calculation method is determined by subtracting these levels in difference maps (Table 2).

Table 2. The daylight provision performance of the room according to the provinces

Daylight Provision Performance (Not Adequate=0; Minimum=1; Medium=2; High=3)							
Province	**Method 1** (Daylight factor)	**Method 2** (Using climate data)	**Difference level**	**Province**	**Method 1** (Daylight factor)	**Method 2** (Using climate data)	**Difference level**
Adana	**2**	**3**	**1**	**Kahramanmaraş**	**2**	**3**	**1**
Adıyaman	**2**	**3**	**1**	**Karabük**	**2**	**3**	**1**
Afyonkarahisar	**2**	**3**	**1**	**Karaman**	**2**	**3**	**1**
Ağrı	**2**	**3**	**1**	**Kars**	**2**	**3**	**1**
Aksaray	**2**	**3**	**1**	**Kastamonu**	**2**	**3**	**1**
Amasya	**2**	**3**	**1**	**Kayseri**	**2**	**3**	**1**
Ankara	**2**	**3**	**1**	**Kırıkkale**	**2**	**3**	**1**
Antalya	**2**	**3**	**1**	**Kırklareli**	**2**	**3**	**1**
Ardahan	**1**	**3**	**2**	**Kırşehir**	**2**	**3**	**1**
Artvin	**1**	**2**	**1**	**Kilis**	**2**	**3**	**1**
Aydın	**2**	**3**	**1**	**Kocaeli**	**2**	**3**	**1**
Balıkesir	**2**	**3**	**1**	**Konya**	**2**	**3**	**1**
Bartın	**1**	**2**	**1**	**Kütahya**	**2**	**3**	**1**
Batman	**2**	**3**	**1**	**Malatya**	**2**	**3**	**1**
Bayburt	**2**	**3**	**1**	**Manisa**	**2**	**3**	**1**
Bilecik	**2**	**3**	**1**	**Mardin**	**2**	**3**	**1**
Bingöl	**2**	**3**	**1**	**Mersin**	**2**	**3**	**1**
Bitlis	**2**	**3**	**1**	**Muğla**	**2**	**3**	**1**
Bolu	**2**	**3**	**1**	**Muş**	**2**	**3**	**1**
Burdur	**2**	**3**	**1**	**Nevşehir**	**2**	**3**	**1**
Bursa	**2**	**3**	**1**	**Niğde**	**2**	**3**	**1**
Çanakkale	**2**	**3**	**1**	**Ordu**	**1**	**2**	**1**
Çankırı	**2**	**3**	**1**	**Osmaniye**	**2**	**3**	**1**
Çorum	**2**	**3**	**1**	**Rize**	**1**	**2**	**1**

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Denizli	2	3	1	Sakarya	2	3	1
Diyarbakır	2	3	1	Samsun	2	3	1
Düzce	2	3	1	Siirt	2	3	1
Edirne	2	3	1	Sinop	2	3	1
Elazığ	1	3	2	Sivas	2	3	1
Erzincan	2	3	1	Şanlıurfa	2	3	1
Erzurum	2	3	1	Şırnak	2	3	1
Eskişehir	2	3	1	Tekirdağ	2	2	0
Gaziantep	2	3	1	Tokat	2	3	1
Giresun	1	2	1	Trabzon	1	2	1
Gümüşhane	2	3	1	Tunceli	2	3	1
Hakkari	2	3	1	Uşak	2	3	1
Hatay	2	3	1	Van	2	3	1
Iğdır	1	3	2	Yalova	2	2	0
Isparta	2	3	1	Yozgat	2	3	1
İstanbul	2	3	1	Zonguldak	2	3	1
İzmir	2	3	1				

The "daylight provision performance" of the room according to the 1st method (daylight factor) is "minimum" in the provinces, Bartın, Ordu, Giresun, Trabzon, Rize, Artvin Ardahan; and is "medium" in all other provinces (Figure 3).

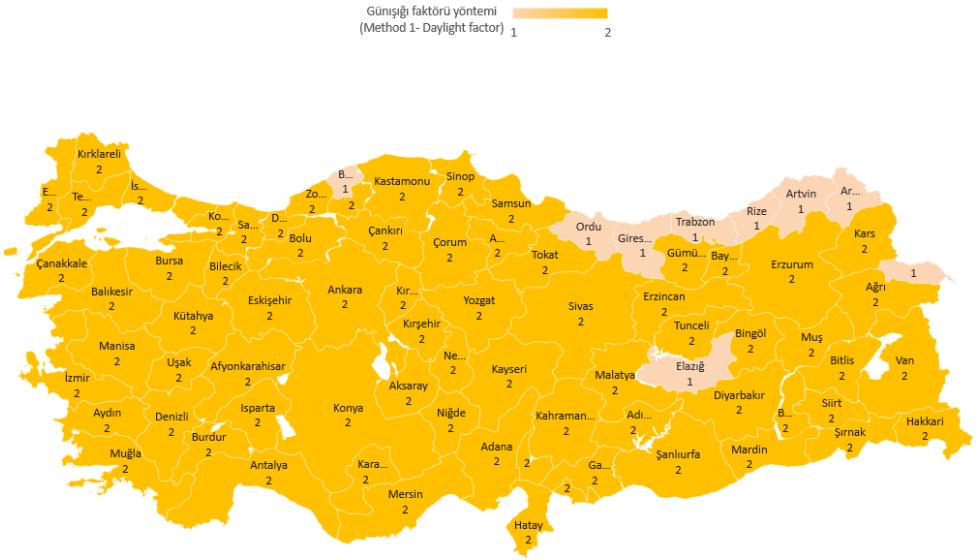


Figure 3. The "daylight provision performance" of the room according to the 1st calculation method

The "daylight provision performance" of the room according to the 2nd method is "medium" in the provinces, Tekirdağ, Bartın, Ordu, Giresun, Trabzon, Rize, Artvin; and is "high" in other provinces (Figure 4).

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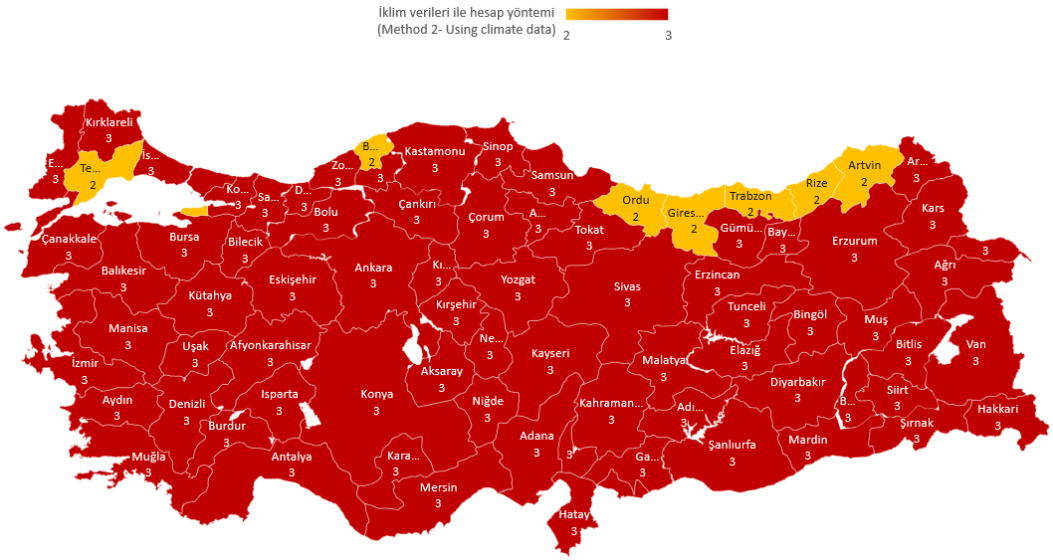


Figure 4. The "daylight provision performance" of the room according to the 2nd calculation method

In all provinces of Turkey except Tekirdağ, between the two methods, there are differences in the "daylight provision performance" of the room. There is two level difference in Ardahan, Iğdır, Elazığ, and one level difference in other provinces (Figure 5).

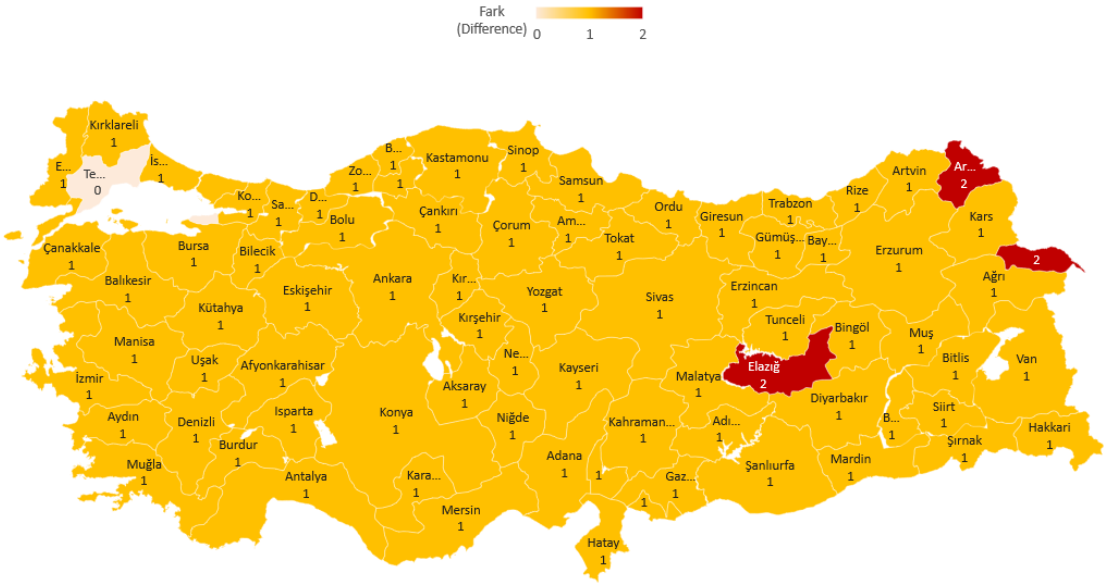


Figure 5. The "daylight provision performance" difference between the two calculation methods

Conclusion and Recommendations

Daylighting is essential for people's psychological and biological health, as well as reducing energy consumption. Therefore, each room should use daylight as much as possible regardless of function. The daylight level in the room depends on various parameters, such as the latitude of the building, sky conditions, orientation, and the shape of the building.

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In this study, the two calculation methods recommended for "daylight provision performance" in the EN 17037 Daylight Standard, published in 2018, are considered. Illuminance level calculations are made for each province of Turkey for a theoretical room. The first method is the "daylight factor method", which is calculated using just the CIE overcast sky conditions. In the second method annual climate data are used for calculations. The results obtained using both methods are compared and shown through a cartogram map of Turkey.

According to the findings in all provinces of Turkey, significant differences are observed between the two calculation methods. Higher illuminance levels are obtained with the second method, which uses dynamic climate data. This value difference affects the "daylight provision performance" of the room in all provinces. In Turkey, even including the Northern provinces, there occur different sky types over a year, so using overcast sky model affects the "daylight availability performance" of the room all over Turkey. It is concluded that using the second method would be more appropriate in daylight calculations and simulation studies. To expand the study with different window-to-wall ratios, room depth and orientation parameters would support more comprehensive evaluations.

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Study the Effect of Chemical Activators on Mortars Based on Granulated Slag

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Abstract

In the context of sustainable development, the possibility of recovering industrial waste through activation methods is a better solution for countries, as in recent years the world has faced serious environmental problems due to the increase of carbon dioxide in the air, so it has been thought to make environmentally friendly solid materials. For this reason, we discussed in this study the methods of reactive chemical activation with Sodium hydroxide (NaOH) and Sodium silicate (Na_2SiO_3) to produce an environmentally friendly mortar with the lowest percentage of carbon dioxide. The mineral residue granulated slag has been activated in order to create a new material that appears as a potential alternative to binders conventional hydraulic and compared with others research mixed with certain proportions of granulated slag in previous studies. For this purpose, the powder of granulated slag which is rich in silica and aluminates mixed with (2.5 ratio) of sodium silicates and 10 Mol of NaOH in order to formulated mortars activated. The result shows the good solubility of the minerals with the activators, the increase in the mechanical resistance to compression and flexural in the first days which can exceed 30 MPa and 8 MPa, respectivly. The decrease in the porosity which characterized the physical behavior has been observed compared the others researchers Which opens new horizons towards a competition in the future of construction.

Keywords: Alkaline activated mortars (AAM), granulated slag, compressive strength, porosity.

Introduction

Portland cement, a binding material widely used in the construction industry, accounts for about 1.5 billion/tones of CO_2 emissions per year and 36% of global energy consumption [1]. To overcome a large amount of energy consumption and carbon dioxide emissions, serious environmental and economic problems, researchers tried to look for several alternatives instead of using ordinary Portland cement such as geopolymer or alkalis activated binders (AAB), zero-cement materials [2]. In recent years, mortars/mixtures of geopolymers have been studied as a new structural material in the construction sector. These mortars not only improve durability, high early resistance and non-combustible properties, but also reduce the environmental sustainability and cost of reusing by-products such as "fly ash, slag, etc" [3-4], the term geopolymer is generally used to describe the new inorganic polymer formed from a mixture of aluminosilicate and alkaline solutions [5-6].

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Geopolymers are produced by the chemical reaction between sources of aluminosilicate such as metakaolin or industrial waste such as "fly ash, granulated slag, glass, ceramic waste" and alkaline activator such as NaOH, KOH, Na_2SiO_3 [7-8]. Alkaline solutions form the structure of the three-dimensional polymer chains of Si–O–Al [2]. According to Davidovits [8], these materials have a three-dimensional aluminosilicate network, in which the tetrahedral $[SiO_4]^{-4}$ and $[AlO_4]^{-5}$ are connected, and the electrical charge is balanced by the alkaline cations. Although the production of geopolymer mortars with materials such as fly ash has become quite possible, it is necessary to make the production of mortar much more sustainable and economical by local waste that can cause environmental hazards. Over the past decades, various industrial wastes such as "ceramic tiles, glass…etc" have become an important part of alkali-activated mortars due to stability, toughness, high in biological resistance, chemical and physical degradation factors [7-9]. As a result, these wastes occupy a large portion of the landfill and create significant environmental problems due to their non-recyclability in the largest proportion. Using this waste helps solve the problem of industrial waste and makes it possible to manufacture good quality building materials [2-10-11]. On the other hand, granulated blast furnace slag is a by-product of the iron manufacturing process and is tempered from its molten state to form an amorphous material consisting mainly of a calcium-magnesium aluminosilicate glass [12]. Ground granulated slag is also widely used as an additional cement material in Portland cement-based systems to reduce moisturizing heat and improve the chemical durability of concrete, especially in acid exposures [13]. The use of alkaline activated slag binders to produce mortar, concrete has reduced the carbon footprint by up to 75% compared to ordinary Portland cement [14].

The mechanical properties of the activated alkaline materials are controlled by the physical properties and chemical composition of the slag precursor used, the type of activator and its dose, the curing temperature but also a number of other parameters [15- 16- 17]. The most commonly used alkaline activators are sodium hydroxide, sodium silicate, sodium sulphate and sodium carbonate [18, 17]. The materials based on activated alkaline slags showed good resistance to acid attack, fire exposure and corrosion [19-20]. Most alkaline slag-activated materials with sodium silicate or sodium hydroxide showed higher early strength and bending [21] but are more sensitive to curing temperature than Portland cement [22, 23].

The aim of this work is to try to exploit our local quality materials in the form of industrial waste in the formation of cement which is cement substitutes and resistant to climatic conditions

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as well as the environment and can be used in many areas of construction. We selected the waste of granulated slag, standardized sand. Also, two types of alkaline activators are sodium hydroxide (NaOH) in a concentration of 10 mol/l and sodium silicates with a molar ratio of 2.5. To make mortars and then curing them in an oven at 60°C and 40°C for 24 hours, after these steps, mechanical and physical tests are performed to characterize the type of materials obtained.

Materials and Methods

- **Materials**

Granulated slag

As part of this study, the granulated slag (LG) was supplied by the El-Hadjar factory in Annaba (Algeria) granular format, and it was ball-milled in the cement factory of Ain E-Kebira (Setif) to transform into powder (Figure 1), with a density of 2.73 g/cm^3 and a specific surface of 3000 cm^2/g. The chemical composition determined by X-ray fluorescence (XRF) is shown in (Tab. 1). The CaO, Na_2O content value is approximately 46.4% and 0.37%, respectively, while the SiO_2+Al_2O_3+Fe_2O_3 value exceeds 43%.



Figure 1. The powder of granulated slag.

Table 1. The chemical Composition of slag powder by (XRF).

Components	SiO_2	CaO	Al_2O_3	Na_2O	MgO	Fe_2O_3	K_2O	SO_3
(%)	32.3	46.4	9.57	0.37	7.44	0.97	0.45	2.02

Sand

In our study we chose standardized sand to formulate samples of standardized mortar.

Alkalis activators

Sodium silicate and sodium hydroxide, which is an alkaline activator, were used as binding materials, where the sodium silicate Na_2SiO_3/NaOH module is equal to 2.5 and characterized

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by a density of 1.4 g/ml at 25°C (liquid form), the sodium hydroxide concentration is 10M (molarity) forming pellets, with a molar mass of 40 g/mol and purity between 98-100%.

Preparation of mixtures

For the preparation protocol, we have the following points according to the standard:

• Placed in a blender the solution ($NaOH + Na_2SiO_3$) prepared in the first step is poured slowly over it with a displacement in the same direction for two minutes to avoid the survival of solid particles and ensure interaction between the components of the mixture;

• Then increase the speed and continue to mix for a maximum of one or two minutes, until you get semi-elastic dough. On the basis of the above, it is prohibited to use chemical mixtures with alkaline activators to avoid any interaction during the mixing process [24];

• Subsequently, the mixtures are placed in special silicone semi-plastic moulds. The mussels vibrated by hand for only one minute to extract air bubbles from inside the pastes of mortars;

• Samples were deposited in a 40°C and 60°C oven for 24 hours.

Findings and Discussions

- **Compressive strength of mortars**

The results of the mechanical behavior by crushing three separate cubic samples of dimensions (2.5 cm*2.5 cm*2.5cm) (Figure 2.), according to NF EN 196-1 [25], to calculate the average of the individual results, (Fig. 3) shows the average compression force of the geopolymer mortars produced in 7d, 28 days, after mixing with two sodium silicate (SS) and sodium hydroxide (SH) activators. In addition to curing at 40°C and 60°C for 24 hours to accelerate the geopolymerization reaction and force development [26, 27]. All of these steps yielded better results for 100% (MS 60) slag mortar, reaching 55.2 MPa at 60 °C after 7 days of treatment compared to the rest of the mixtures.



Figure 2. The shapes samples of alkalis activated mortars.

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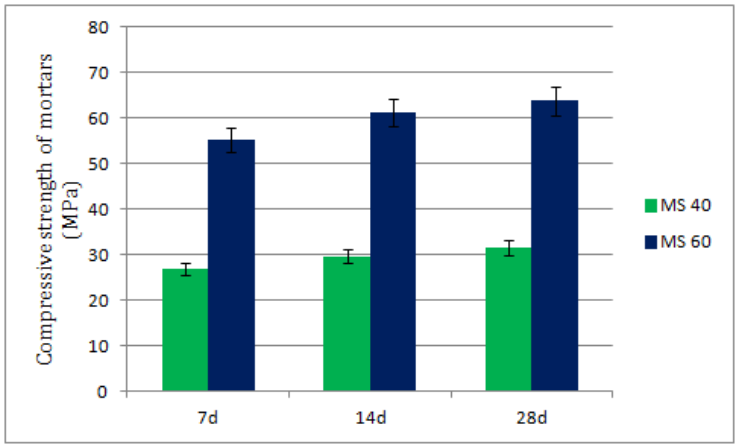


Figure 3. The results of compressive strength of slag mortars cured in 40 °C and 60 °C at 7d, 14d and 28d

- **Bending strength of mortars**

On the other hand, for the bending resistance (Figure 4.) the mortar with slag base treated at 60°C gave the best result after 28 days 11 MPa, due to its containment of silicate and calcium which formed strong binders after dissolution with alkaline solutions. However, mortar containing the slag and treated at 40°C gave poor results after 28 days up to 9.38 MPa because it contained a high percentage of calcium which caused its rapid crushing of the (Figure 5.).



Figure 4. The principle of bending resistance on activated slag mortar

An increase in temperature helps link chemical bonds by 11.7 % at 60 °C and 10 % at 40 °C, respectively.

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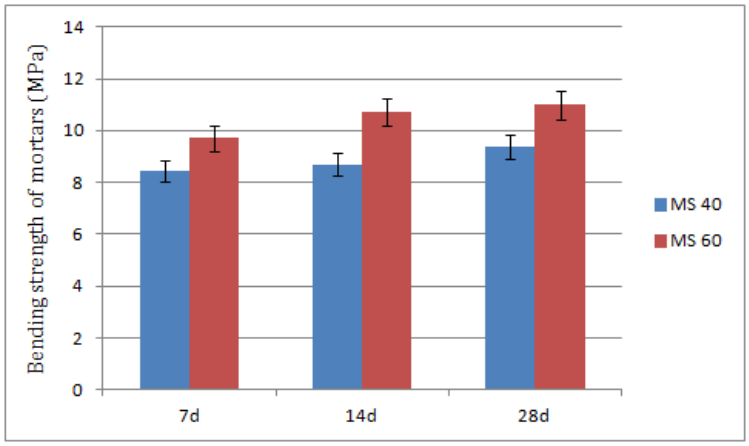


Figure 5. The results of bending strength of slag mortars cured in 40 °C and 60 °C at 7d, 14d and 28d.

- **Absorption**

According to NF P 18-555, the absorption of three cubic samples was determined to measure the percentage of water absorption according to the relationship (1). And know the physical behavior of each material.

$$(A)\% = \left[\frac{M2-M1}{M1}\right] \times 100 \qquad (1)$$

(MS 40) mortar containing 100% slag and treated at 40°C, given a high absorption value of 12.2% to 7d due to its chemical composition, it contains silicon, calcium and poor interaction between them and alkaline solutions can cause voids to emerge at a granular matrix. For (MS 60) with positive results for slag mortar also and treated at 60°C plus the use of standardized sand, It helped fill spaces of a microstructural level without engaging with them in interaction with granulated slag particles and increasing the dissolution rate to form solid bonds and solid structure that caused good mechanical strength in (Figure 6).

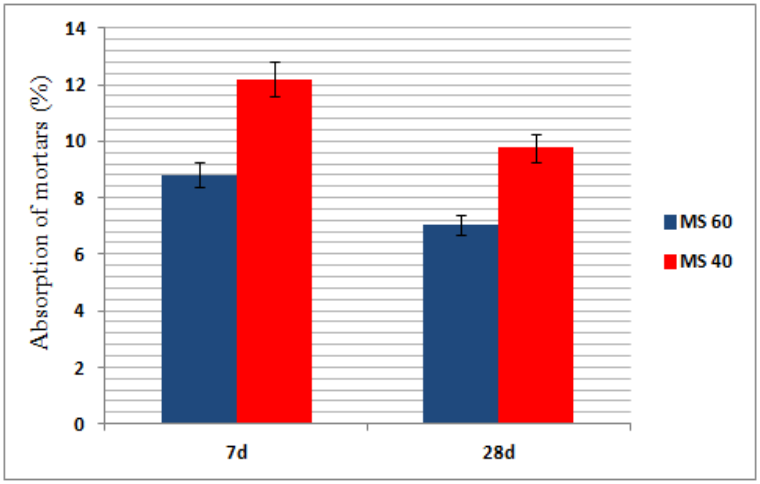


Figure 6. The absorption of alkali activated mortars of slag at 60 °C and 40 °C.

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Conclusion

After conducting theoretical research on the alkaline activation process and linking it to an applied aspect to determine its effectiveness, the following results were finally achieved:

The alkaline activation process greatly improves the structure of the materials and becomes more powerful, especially calcium aluminosilicates such as granulated slag. Slag that is cured at 60°C gives good compressive strength up to 63.8 MPa at 28d compared to other samples of mortars.

The use of slag powder has greatly improved the quality of the particularly mechanical appearance of cement materials and is therefore suitable to be environmentally friendly. The levels of quartz or silicon (SiO_2) and other minerals gradually decrease with the increase in the curing temperature, for alkalis activated mortars which are treated in 60 C.

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Investigation of Interior Architecture Projects within the Frame of National and International Regulations Against the Risks that May Occur During Earthquake

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Abstract

One of the countries where active plate movement is frequently experienced is Turkey. In addition to the disasters caused by the earthquake, it is necessary to take into account the physical and moral effects. When seven regulations (1947, 1953, 1961, 1968, 1975, 1998, and 2007) on earthquakes in our country are examined, the issues that should be applied to structural elements are mentioned in detail. However, there is no detailed and systematic study on the risks of non-structural elements (doors, windows, interior walls, suspended ceilings, coatings, interior stairs, furniture, accessories, lighting elements, elevators, equipment) other than the load-bearing elements of the building. The deterioration of non-structural elements due to the shaking of the buildings causes material damage, bodily harm, hindering the use of buildings, and temporary cessation of activities. In this context, deaths, and injuries are largely due to non-structural elements. And the financial losses experienced by those who continue their lives after the earthquake are mainly due to non-structural elements. However, despite this available data, there are deficiencies in inspection and regulations for interior design projects. When the 2018 Turkish Building Earthquake Code is examined, it is seen that it is not possible to inspect interior design projects in a certain systematic way. At the same time, there is no definite sanction for the risks posed by non-structural elements. Within the scope of this study, the sources of earthquake regulations and standards in Turkey and in the world were researched, and national and international legislations on the inspection of non-structural elements in interior design projects against earthquake risk were examined. As a result of the study, an evaluation has been made to ensure the safety of life and property by reducing future earthquake risks for non-structural elements.

Keywords: Non-structural elements, ınterior architecture, ınterior space, earthquake regulation, ınterior architecture project audit.

Introduction

An earthquake is an occurrence that results from the rupture of the earth's crust and has significant global and environmental effects. It is difficult to prevent the predictable and destructive effects of an earthquake (Işıltan, 2010). Turkey is one of the most seismically active nations in the world due to the movement of the earth's crust. Many disastrous earthquakes have also been caused by the faults that cross this area (Atalay, 1987). In the last 58 years, 58,202 people have lost their lives in earthquakes in our country; 122,096 people have been injured; and 411,465 structures have been severely damaged or destroyed (Karamanoğlu & Ulay, 2017). Given the closeness and frequency of the earthquake, it is imperative that immediate action be

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taken. If steps aren't taken, it's likely that things that have happened in the past will happen again.

An earthquake may cause three different kinds of damage; on people's life safety, on the economy, and on buildings. We can divide the elements belonging to a structure into structural and non-structural elements. According to the 2012 FEMA-74 handbook, structural components include the columns, beams, slabs, load-bearing walls, and foundations that make up the building's load-bearing system. Non-structural elements are described in the following three sections:

• **Architectural Components:** Walls, ceilings, showcases, glass, cladding, roof, chimney, fences, and architectural embellishments...

• **Mechanical, Electrical, and Plumbing (MEP) Components:** Pumps, chillers, fans, air handling units, motor control centers, distribution boards, transformers, and distribution systems consisting of pipelines, ducts, and tubing.

• **Furniture, Fixtures, and Equipment:** Shelves and bookcases, industrial storage racks, retail products, books, medical records, computers and desktop equipment, wall and ceiling mounted TVs and monitors, filing cabinets, kitchens, machine shops, or other special content including equipment, industrial chemicals or hazardous materials, museum artifacts and collectibles…(FEMA-74, 2012).

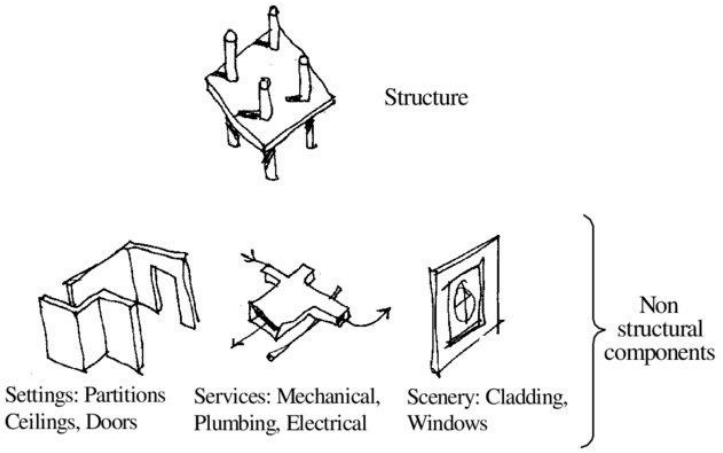


Figure 6. Structural and non-structural elements (Colin F. Duffield)

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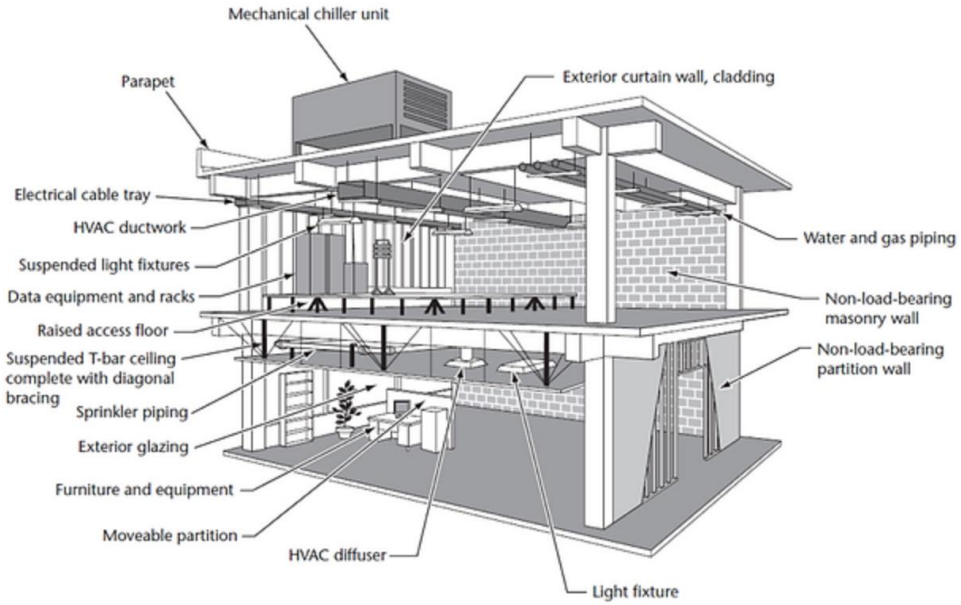


Figure 7. Non-Structural Components (CSA-S832) (https://www.sensequake.com/blog-non-structural-components)

There are many cases of non-structural elements damage all over the world, including Turkey. One of them was the 1995 Great Hanshin-Awaji Earthquake, which affected Kobe City and the surrounding areas, in which 104,906 buildings collapsed, 6,148 buildings were seriously damaged, and 6,433 people died. It is estimated that 80% of the deaths that take place here are caused by falling buildings or furniture (Tomohiro, 2013).



(a) (b)

Figure 3. (a) Failure of office partitions, ceilings, and lighting fixtures in the 1994 Northridge Earthquake (FEMA 74, 1994). (b) Damage to overloaded shelves during the magnitude 6.7 Northridge Earthquake of 1994 (FEMA 460, 2005).

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The 1989 Loma Prieta Earthquake in San Francisco caused a lot of damage to the library. It cost a lot to rebuild, fix broken books and shelves, organize, and reshelve everything (Wong, 1993; Dobb, 1993).



(a) (b)

Figure 4. (a) Damage to library interiors (Dr. Vasudha A. Gökhale). (b) Blocked exit routes (Dr. Vasudha A. Gökhale).



(a) (b)

Figure 5. (a) Overturning of furniture (Dr. Vasudha A. Gökhale). (b) Overturned Hospital Imaging Equipment (NEHRP, 2015)

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(a) (b)

Figure 6. (a) Falling ceiling tiles and furniture, a library office at the U. of Canterbury in Christchurch, New Zealand. (Source: 2 Universities in New Zealand Cope With Earthquake Damage (chronicle.com) (b) Damage to interior walls during the earthquake in Nepal (indiatimes.com)



Figure 7. In-plane and out-of-plane infill wall damages (TMMOB, 2020).

In terms of non-structural components, according to Birinci (2004), 30% of the financial damage incurred by those affected by the Izmit earthquake of 1999 was attributable to the loss of furniture, white goods, electronic equipment, and valuables. In the context of today's earthquake standards, even a building design that conforms to the regulations to the extent will not give clear and comprehensive security because there are still inadequacies in the non-structural element regulation (Aytöre, 2005).

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(a) (b)

Figure 8. (a) Earthquake damage situations of non-structural components (b) Cost ratio to recover earthquake damage (Sang-Moon Lee & Woo-Young Jung)

Damages caused by non-structural elements during earthquakes and their consequences and cost rates indicate the need for greater awareness of the seismic design of interior spaces. In some instances, the shaking, overturning, breaking, or collapse of non-structural materials during an earthquake can result in human injury, death, property damage, suspension of function, and even structural element failure. Therefore, it is of the utmost importance to identify and reduce the seismic risk associated with non-structural components. Thus, it is crucial to look into the national and international regulations that disregard the earthquake safety of non-structural materials. When examining earthquake rules in this context, it has been found that the earthquake safety of non-structural elements in the World and the 2018 Turkey Building Earthquake Code, the assessment of interior design projects for seismic risk are unsatisfactory. In this study, it was determined how much Turkish and international law refers to the seismic design of non-structural elements. In this context, it is crucial to collect data about the general status of the earthquake-resistant design of non-structural materials in regulations and to determine the necessary measures for seismic design of interior design projects. The goal of this study is to find out how and by what criteria national and international seismic regulations handle interior design projects. As a result of this study, the goal is to learn about the rules in the earthquake regulations and the seismic risks that could happen in the interior, as well as to take the proper steps to reduce the loss of life and property. Furthermore, by identifying the issues that ought to be incorporated in the legislation, it will be proposed that more studies be conducted on non-structural aspects and that these elements incorporate more provisions for earthquake risk.

Overview of Earthquake Regulations for Non-Structural Elements

3 to 4 percent of our annual gross domestic product is lost due to natural disasters (Gökçe, Özden & Demir, 2008). In 1947, 1953, 1961, 1968, 1975, 1998, and 2007, seven revisions were made to our country's earthquake legislation. (Table 1) The minimal standards for the design

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and construction of earthquake-resistant structures, the earthquake zone, and the features of the ground were considered in the formulation of these regulations. Justifications for amending and updating the regulations According to AFAD (Disaster And Emergency Management Presidency) (2018), developing technology, developing world, material diversity, increasing building models and the need for them, inadequate earthquake resistance of a large portion of the existing building stock, risk reduction and urban transformation studies for buildings to reevaluate and strengthen the need to make various updates. In this context, when these requirements are considered, the ever-changing needs in tandem with the ever-changing world compelled significant adjustments to the legislation. However, it is unknown whether these altering events are accompanied by a similar alteration in the Earth. In this research, the present situation of earthquake legislation in Turkey and the rest of the world will be explored.

Table 1. Earthquake regulations in Turkey up to the present day

1940- Zelzele Mıntıkalarında Yapılacak İnşaata Ait İtalyan Yapı Talimatnamesi
1944- Zelzele Mıntıkaları Muvakkat Yapı Talimatnamesi
1949- Türkiye Yersarsıntısı Bölgeleri Yapı Yönetmeliği
1953- Yersarsıntısı Bölgelerinde Yapılacak Yapılar Hakkında Yönetmelik
1962- Afet Bölgelerinde Yapılacak Yapılar Hakkında Yönetmelik
1968- Afet Bölgelerinde Yapılacak Yapılar Hakkında Yönetmelik
1975- Afet Bölgelerinde Yapılacak Yapılar Hakkında Yönetmelik
1999- Afet Bölgelerinde Yapılacak Yapılar Hakkında Yönetmelik
2007- Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik
2018- Türkiye Bina Deprem Yönetmeliği

Table 2. Change of UBC in terms of non-structural elements by year and event

Olay (Deprem)	Meydana Gelen Durum	Kanun	Bulunduğu Bölüm
San Francisco Earthquake (1906) / Santa Barbara Earthquake (1925) / Long Beach Earthquake (1933)	Brick railings and exterior wallr damage (Source: Historical UBC Cd-Rom)	First Non-Structural Element Provisions - Uniform Building Code (UBC, 1927)	Addition
-	-	(Ubc, 1935) (1997'e Kadar Değişmeden Kaldı.) (Kaynak:: Historical Ubc Cd-Rom : The Early Years (1927-1964))	Addition
-	-	(UBC, 1961)	Main Body (First) (Source: Mondal & Jain, 2005)
Alaska (1964) Earthquake San Fernando (1971) Earthquake	It made the importance of non-structural elements the focus of attention. (Source: Mondal & Jain, 2005)	(UBC, 1967)	-
San Fernando (1971) Earthquake	The failure of suspended ceiling systems, metal book shelves in libraries and	(UBC, 1973)	-

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	mechanical equipment (Source: Mondal & Jain, 2005)		
	For the first time, the "Importance Factor" has been mentioned. (Source: Mondal & Jain, 2005)	(UBC, 1976)	-

In the last 40 years, a substantial amount of research effort has been committed to the development of reasonable seismic analysis methodologies for non-structural materials. Nevertheless, earlier attempts have concentrated on the safety of more crucial and critical equipment (Mondal & Jain, 2005). However, even if it is minor, each building component has the potential to directly or indirectly compromise earthquake safety. As a result of each event's negative outcomes, precautions were taken and regulations were modified in this manner. Important examples of this are the San Francisco (1906), Santa Barbara (1925), and Long Beach (1933) earthquakes, which raised awareness of the fragility of brick railings and exterior walls. In 1927, the provisions on non-structural elements were first introduced in the Uniform Building Code (UBC) as follows:

"(b) bonding and tying. All buildings shall be firmly bonded and tied together as to their parts and each one as a whole in such manner that the structure will act as a unit. All veneer finish, cornices and ornamental details shall be bonded in the structure so as to form an integral part of it. This applies to the interior as well as the exterior of the building (Historical UBC CD-ROM: The Early Years (1927-1964)''

However, these clauses were not mandatory because they were included in the annex section of the law (Mondal & Jain, 2005). As a result of the earthquakes and the lessons acquired, the non-structural elements' place in the rules gradually grew, but could not as focused as structural elements.

Materials and Methods

This study, which is based on a literature review, was carried out in four steps. First of all, the seismic design provisions of the non-structural elements in the sources were examined. Then, it has been examined whether the most frequently used elements in the designs are mentioned among the non-structural elements in these provisions. With the data obtained as a result of the research, an examination of the characteristics of the sources and their status according to the years was conducted. On the other hand, information regarding the status of the non-structural elements in these sources was collected, examined, and conclusions were drawn from it.

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In the study, the existing standards, regulations, guides, and guidelines were examined and analyzed by considering and evaluating the literature findings and legal regulations. With the criteria that can be an indicator of the inspection of interior design projects against the risks that may occur during an earthquake and the literature findings related to them, both the world's situation on this issue and the situation of Turkey in the world have been evaluated. In this context, the regulations, standarts, guides, countries, states, and non-structural elements researched in the sources are given in Table 3.

Table 3. Source, country, state, and non-structural elements investigated

Researched resources:
International construction provisions
Provisions published by international associations and councils
International Standards
International Regulations
Recommendations published by International Professional Chambers
International Guides and Handbooks
International norms
Turkey Building Earthquake Code
Researched Countries and States
America
California
India
Japan
New Zeland
Chile
Canada
Turkey
Investigated Non-Structural Elements
Windows
Doors
Interior Walls
Interior Coatings
Suspended Ceilings
Lighting Elements
Interior Stairs
Furniture and Accessories
Equipment (Electrical and Mechanical)
Elevators

International building provisions for earthquake safety, provisions published by international associations and councils, international standards, international regulations, recommendations published by international professional chambers, international guides and handbooks, international norms, and the 2018 Turkey Building Earthquake Regulation are among the sources investigated for this study. These resources address the design of the building and its components in terms of earthquake resistance. With the findings gleaned from these materials, it is intended to acquire current and trustworthy knowledge. The analyzed sources were especially chosen among those published between 1991 and 2022, which are generally current and still in use. At the same time, objects frequently used in interior design, such as windows, doors, interior walls, internal coatings, suspended ceilings, lighting components, interior stairs, furniture and accessories, electrical and mechanical equipment, and elevators, were chosen for

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resource research. Because they are significant use in the interior, these are the elements that may contribute to earthquake-related damage. During an earthquake, these elements can sustain damage such as breaking, cracking, falling, disintegration, dislocation, collapse, falling, overturning, and shaking, resulting in loss of life, economic loss, and suspension of activity.

Findings and Discussion

In this study, one of the important research criteria is which country and year the legislation, standards, or guidelines belong to. The level of reliability in this study will be determined by how risky the region of the country where the research is being conducted is or how current the source examined is. The regions with the most intense earthquake belts in the world are the Pacific Seismic Belt, the Alpine-Himalayan Seismic Belt, and the Atlantic Region. The Pacific seismic belt is responsible for approximately 81 percent of all earthquakes. Starting from Chile, this belt includes the coast of South America, the west coast of the United States, Central America, Mexico, the Aleutian Islands south of Alaska, Japan, the Philippines, New Guinea, the South Pacific islands, and New Zealand. The Alpine-Himalayan Seismic Belt is responsible for approximately 17% of all earthquakes. Starting from Indonesia, it encompasses the Atlantic Ocean through the Himalayas and the Mediterranean. The Atlantic zone belt is also along the Atlantic ridge (URL 1, 2007). In this context, the countries considered for the research are those where earthquakes are frequently experienced, and high-level precautions should be taken in this regard. As can be seen in Table 4, the majority of the sources examined are from the United States. There are 25 resources, including 12 standards, 3 recommendations, 4 laws, 4 guidelines, 1 accreditation council report, and 1 provision. 1 official report and 1 regulation, belonging to Japan; 1 report (bulletin) and 1 standard from Canada; 1 standard from New Zealand; 2 laws from Chile; 1 standard from India; and 1 regulation from Turkey were examined as sources. Among these sources, the ones that cover the seismic design of non-structural elements the most are those in the USA.

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Table 4. Sources examined, their types, and the countries to which the resources belong

Document number /Source	Description	Type	Year	Country
BCJ	Building Control in Japan	Regulation	2015	Japan
CISCA	Ceilings and Interior Systems Construction Association	Recommendation	1991	USA
NCh 433.Of96	Norma Chilena Oficial	Code	1996	Chilean
UBC 1997	1997 Uniform Building Code	Code	1997	USA
DIN-V-ENV-1998-1-1	Design Provisions for Earthquake Resistance of Structures	Provision	1998	
ATC-38	ATC-38 Postearthquake Buildıng Performance Assessment Form Applied Technology Council	Standard	2001	USA
ASHRAE /SMACNA	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. and the Sheet Metal and Air Conditioning Contractors' National Association.	Standard	2002	USA
IS:1893 (Part 1)	Criteria For Earthquake Resistant Design Of Structures published by Bureau of Indian Standards	Guide	2002	India
NCh 2369.Of2003	Norma Chilena Oficial	Code	2003	Chilean
NZS-1170.5 SUPP1	New Zealand Standard	Standard	2004	New Zealand
Bulletin 2004-014-BU		Bulletin	2004	Canada
Oregon Emergency Management	Earthquake Preparedness and Mitigation Guidance for Oregon State Agency Offices and Warehouses	Guide	2004	USA
DSA-IR 25-3	Division of the State Architect	Standard	2005	USA
CSA S832-06		Standard	2006	
ASCE/SOU 41-06	American Society of Civil Engineers	Standard	2007	USA
NFPA 13	The National Fire Protection Association	Standard	2007	USA
VISCMA 102-07	Vibration Isolation and Seismic Control Manufacturers Association.	Guide	2007	USA
ATC-69	Applied Technology Council - Practical Guide	Guide	2008	USA
ASCE/SEI 7-10	American Society of Civil Engineers	Standard	2010	USA
ASCE/SEI 41-06	American Society of Civil Engineers	Standard	2010	USA
CBC	California Building Code	Code	2010	USA
TMS402-11	2011 Building Code Requirements and Specification for Masonry Structures published by The Masonry Society	Standard	2011	USA
IBC-2012	2012 International Building Code developed by International Code Council	Code	2012	USA
ASCE/SEI 7-05	American Society of Civil Engineers	Standard	2015	USA
ASCE / SEI 7-16	American Society of Civil Engineers	Standard	2017	USA
2018 Turkiye Building Earthquake Regulation	Afet ve Acil Durum Yönetimi Başkanlığı tarafından 18 Mart 2018 Pazar 30364 sayılı resmi gazete	Guide	2018	Türkiye
FEMA E-74	Federal Emergency Management Agency	Guide	2019	USA
White Paper-MLIT-2019	White Paper On Land, Infrastructure, Transport And Tourism published by MLIT (Ministry of Land, Infrastructure, Transport and Tourism)	White Paper - Policies	2019	Japan
NEHRP - 2020 provision	National Earthquake Hazards Reduction Program	Provision	2020	USA
Council for Interior Design Accreditation (CIDA)	Council for Interior Design Accreditation		2020	USA
ASTM E580	American Society for Testing and Materials	Standard	2022	USA
Council for Interior Design Accreditation (CIDA)	Council for Interior Design Accreditation	Recommendation	2022	USA
California Seismic Elevator Code		Code		USA
ASTM STANDARDS	American Society for Testing and Materials	Standard		USA
American Society of Interior Designers (ASID)	American Society of Interior Designers	Recommendation		USA

The presence of 10 distinct non-structural features in standards, rules, and guides was assessed based on the sources studied. The status of 10 non-structural items included in the provisions was shown in Table 5 after a search of 34 distinct documents from 8 nations. During the research, it was determined whether these elements were mentioned and, if so, for what situations and about what. On this basis, the usefulness of the seismic design standards in terms of auditing interior designs will be established. Using the determined data, it will be decided if it is adequate for the control of an interior design project. The number of non-structural elements (windows, doors, interior walls, suspended ceilings, interior coatings, interior stairs, furniture and accessories, lighting elements, equipment, elevators (10) considered in terms of earthquake safety in the sources; the United States ranks first (10 items), followed by Turkey (6 items), Japan (5 items), the European Standardization Committee (4 items), India (3 items), Canada (2 items), and Chile (1 unit). Because these statistics represent the number of non-structural elements discussed, they do not indicate which subject is contained in the sources or

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whether or not it is elaborate. To determine definitively whether these materials cover everything, need to do a thorough subject search and look at what is covered by which subject.

Table 5. Determination of non-structural elements in the researched legislation, standards, regulations, and guidelines

Document number /Source	WINDOW	DOOR	INTERIOR WALL	CEILING	INTERIOR CLADDING	INTERNAL STAIRS	FURNITURE AND ACCESSORIES	LIGHTING ELEMENT	EQUIPMENT	ELEVATORS
BCI	✓	✓	✓	X	✓	X	✓	X	X	X
CISCA	X	X	X	✓	X	X	X	X	X	X
NCh 433.Of96	X	X	✓	X	X	X	X	X	X	X
UBC 1997	✓	✓	✓	✓	✓	✓	X	X	✓	X
DIN-V-ENV-1998-1-1	✓	✓	✓	X	X	X	X	X	✓	X
ATC-38	✓	X	✓	✓	✓	X	X	✓	✓	✓
ASHRAE /SMACNA	X	X	X	X	X	X	X	X	✓	X
IS:1893 (Part 1)	X	X	✓	X	✓	X	X	X	✓	X
NCh 2369.Of2003	X	X	X	X	X	X	X	X	✓	X
NZS-1170.5 SUPP1	X	X	X	X	✓	X	X	X	X	X
Bulletin 2004-014-BU	X	X	✓	✓	X	X	X	X	X	X
Oregon Emergency Management	X	X	X	X	X	X	✓	X	✓	X
DSA-IR 25-3	X	X	X	✓	X	X	X	X	X	X
CSA S832-06	X	X	✓	✓	✓	X	X	✓	✓	X
ASCE/SOU 41-06	X	X	X	✓	X	X	X	X	X	X
NFPA 13	X	X	X	X	X	X	X	X	✓	X
VISCMA 102-07	X	X	X	X	X	X	X	X	✓	X
ATC-69	X	X	X	X	X	X	X	X	X	X
ASCE/SEI 7-10	✓	X	✓	✓	✓	✓	✓	✓	✓	✓
ASCE/SEI 41-06	✓	X	✓	✓	✓	✓	✓	✓	✓	✓
CBC	✓	✓	✓	✓	✓	✓	✓	X	✓	✓
TMS402-11	X	X	X	X	✓	X	X	X	X	X
IBC-2012	X	X	✓	✓	✓	X	X	X	✓	X
ASCE/SEI 7-05	X	X	X	X	X	X	X	X	✓	X
ASCE / SEI 7-16	✓	✓	✓	✓	X	✓	X	✓	✓	✓
2018 Turkiye Building Earthquake Regulation	✓	✓	X	X	✓	✓	X	X	✓	✓
FEMA E-74	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
White Paper-MLIT-2019	X	✓	X	X	X	X	X	X	X	X
NEHRP - 2020 provision	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Council for Interior Design Accreditation (CIDA)	X	X	X	X	X	X	X	X	X	X
ASTM E580	X	X	X	✓	X	X	X	X	X	X
Council for Interior Design Accreditation (CIDA)	X	X	X	X	X	X	X	X	X	X
California Seismic Elevator Code	X	X	X	X	X	X	X	X	X	✓
ASTM STANDARDS	✓	X	X	✓	✓	X	X	X	X	X
American Society of Interior Designers (ASID)	X	X	X	X	X	X	X	X	X	X

When the sources acquired in the research were analyzed, seven different types of sources were determined. Of these, 43% were created by standards, 17% by law, 17% by guidelines, guides or handbooks, 11% by recommendations, 6% by predictions, 3% by regulations, and 3% by the accreditation council report (Figure 9).

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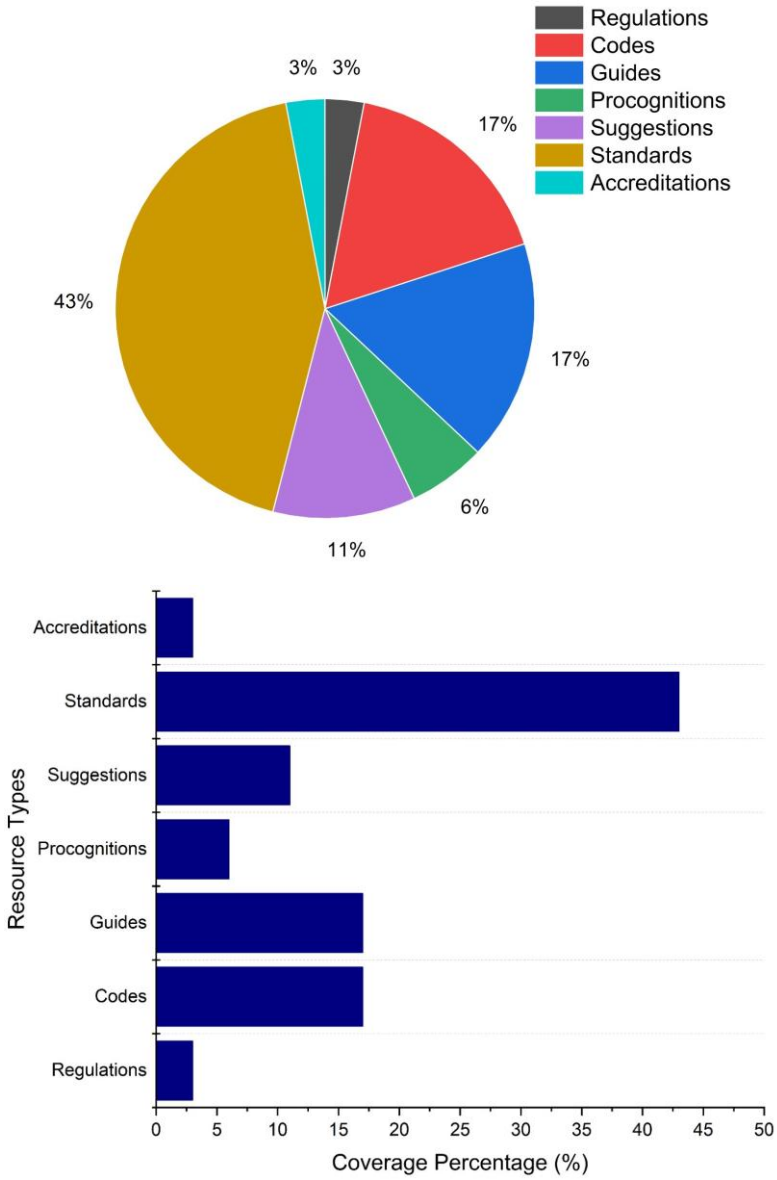


Figure 9. Graph of the resource type being investigated

When conducting the study, it is necessary to take into consideration the years that the sources have been used to ascertain whether or not the investigation is based on current sources. Figure 10 provides the years that the sources that were researched were involved, as well as their distribution by years. It can be observed that the majority of these sources are for the years 2004, 2007 and 2010 (three for each), while the sources for the years 2002, 2019 and 2020 (two for each) come in second. This graphic shows that most of the research for the study was done by looking at publications that came out between 2002 and 2022. And shows that the research is based on current sources.

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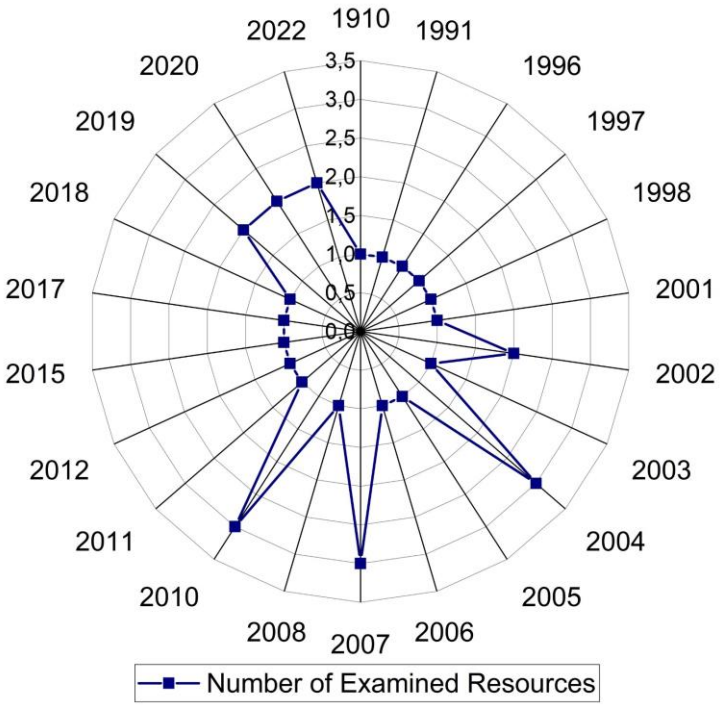


Figure 10. Number of sources under consideration-source publication year chart

Considering the sources that were examined, the situations of 10 different non-structural elements in the provisions were examined. It is important that the requirementsof the design criteria are included in the resources of the countries examined in order to audit interior design projects. However, there is more data on "bracing and system details," which is considered more critical than other criteria observed during the review. The sources that contain only the data for the bracing and support components are not sufficient for examining and supervising a project.

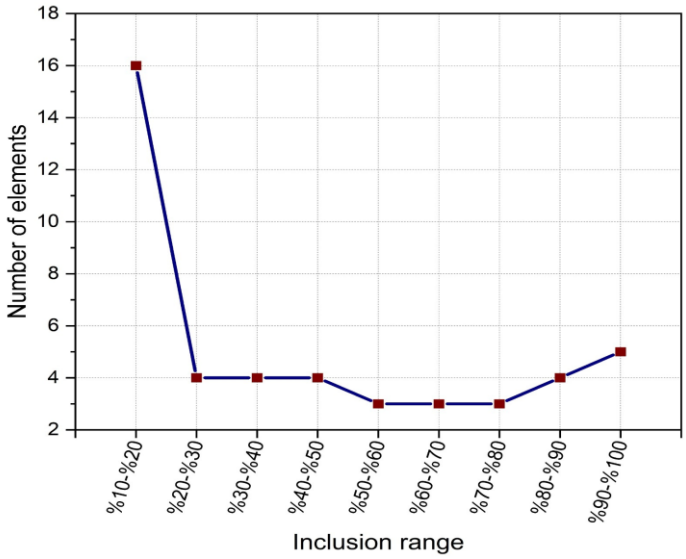


Figure 11. Inclusion range of non-structural elements of the investigated sources

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In the table in which the source research was conducted, how much and to what extent the examined documents contain the issues related to non-structural elements is examined in figure 11. According to this graph, while most of the sources contain non-structural elements in the range of 10-20%, resources with 90%-100% coverage of non-structural elements are at a low rate. If we make an inference from this graph, we can say that the information contained in the sources for the seismic design of nonstructural elements is limited.



Figure 12. Rate of inclusion of non-structural elements in welds

In this graphic, it is seen to what extent non-structural elements are mentioned relative to each other in national and international sources. Figure 12 shows the findings of the non-structural elements in the table where the sources are examined. The most mentioned element is Equipment with 16.2%, Suspended ceilings with 13.7%, interior cladding and interior walls with 12.8%, windows with 10.3%, Doors and elevators were mentioned with a ratio of %7, interior stairs with a ratio of 6.8%, Furniture - accessories and lighting elements with a ratio of 6%. According to this graphic, equipment is mainly mentioned among the non-structural elements in the sources, followed by suspended ceilings, interior claddings and interior walls. Components such as furniture and accessories, lighting elements are included very little. As a conclusion, it is possible to say that the most critical issues in the design for the earthquake risk in the interior space have been concerned and other elements have been neglected a little more.

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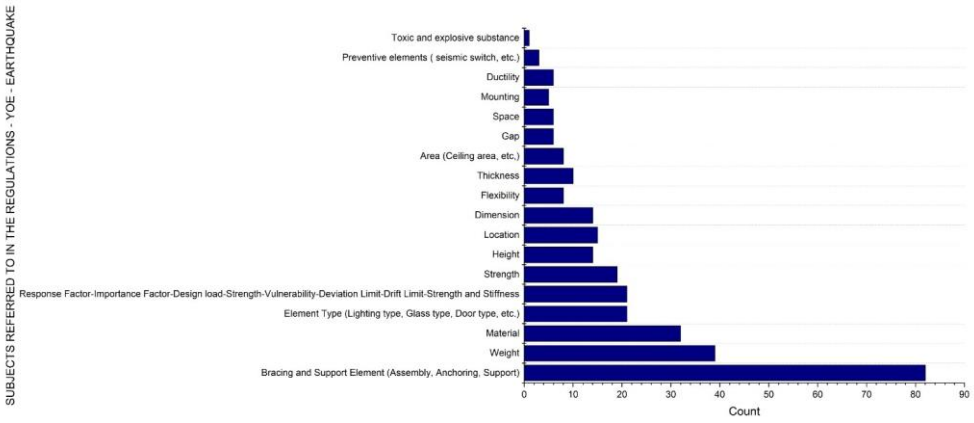


Figure 13. Distribution of the issues mentioned in the legislation regarding non-structural elements

In the sources scrutinized, internal space elements were mentioned, but in order to determine which subject was mentioned and to what extent, the distribution of the subjects mentioned in the legislation involving non-structural elements is given in Figure 13. This chart is usually; shows that criteria such as bracing detail, support element, anchorage and mounting are considered too much. Then, weight, material, element type, response factor-importance factor-design load- durability- fragility- deviation limit- drift limit- strength and stiffness, height, location, size, flexibility, thickness, Area/m² (Ceiling) areas), openings, ductility, preventive elements (seismic controller) and toxic-explosive materials are discussed. When designing an interior design project according to this graphic, these sources are consulted in terms of seismic safety; There is no holistic seismic design guide that also include issues such as the placement, shape, form, ratio, and texture of interior space elements, and it is seen that mostly focuses on the technical detailing, durability and safety of the non-structural element in question.

Conclusion

As a result of the research, the features of the sources were examined by scanning the legislation. Guidelines and standards that have been published so far have revealed which features of non-structural elements are mainly discussed and which elements are more important or which elements are ignored.

In terms of resources in the world, in the FEMA E-74 and NEHRP resources published in the USA, the earthquake safety of non-structural elements is mentioned and discussed in a comprehensive way. Again, in the standards in the USA, ASCE/SEI 7-10 and ASCE/SEI 41-06, the seismic safety issue of other categories other than "doors" is discussed. In the 2010 CBC (California Building Code), provisions related to elements other than lighting elements are

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included. In the United States, information on the seismic design of the element is found in the standards specially organized for the issues that are not covered in the laws. For example, the 2004 Oregon Emergency Management furniture and accessories, the 2007 VISCMA 102-07, the 2007 NFPA 13, the 2015 ASCE/SEI 7-05 standard, the 2002 ASHRAE/SMACNA standard on equipment, the 1991 CISCA (Ceilings and Interior Systems Construction Association), the 2007 ASCE/SOU 41-06 standard, and the 2005 DSA-IR 25-3 standard contain special provisions for suspended ceilings, the 2011 TMS402-11 standard for interior cladding, and the California Seismic Elevator Code for elevators. It is necessary to look to special standards for earthquake-safe designs for these elements. Therefore, in the USA, which has the most comprehensive resources, the details of the earthquake-safe design of interior design projects cannot be reached from holistic and systematic source completely. According to the sources accessed in Japan, which is one of the riskiest countries for earthquakes, in a technical report in 2019 (White Paper On Land, Infrastructure, Transport, And Tourism published by MLIT (Ministry of Land, Infrastructure, Transport, and Tourism), there were provisions related to doors and some equipment, but no information was found about other elements. In the source of Building Control in Japan (Ver.1910) prepared by Hasegawa Tomohiro, one of the Japanese building standards, the subjects of doors, windows, interior walls, interior claddings, furniture, and accessories were not found. While the subject of interior walls and suspended ceilings were discussed in Bulletin 2004-014-BU, from the sources examined in Canada, the subject of interior walls, suspended ceilings, lighting elements, equipment, and interior claddings was discussed in the 2006 CSA S832-06 standard. In Chile, the 1996 NCh 433.Of96 law addressed the interior walls, while the 2003 NCh 2369.Of2003 law dealt with the equipment issue. In the New Zealand NZS-1170.5 SUPP1 2004 standard, only provisions for interior linings were found.

Fixing the non-structural elements to the structure in the 2018 Turkish Building Earthquake Code, the strength of the fixing element, their inclusion in the building load-bearing system in case the ratio of the non-structural element weight to the total floor weight exceeds 10%, the equivalent earthquake load calculation on the element, the total acceleration calculation on the element, mechanical and electrical response coefficients for equipments, architectural elements, steel window and door frames, dowels, connection plates, installation elements, door and window openings and the lintels to be found on it, the reinforcement features, the determination of whether the coatings have bearing properties, the rules regarding panel design, the floor

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coverings, the facade coverings, the interior walls, the parapets, the elevator, the escalator and the interior stairs. It has been found that it has been mentioned to a limited extent. According to these analyses, although it does not seem possible to examine interior design projects in a certain systematic way, it is also seen that there is no definite sanction for the risks posed by the mentioned elements. Therefore, an inspection system should be established by taking international standards as an example for the supervision of interior design projects, the risks of non-structural elements should be determined, and then the measures to be taken against these risks should be put forward.

In general, more detailed information is available on the seismic restraint of non-structural components, such as seismic restraint guidelines and guidelines for mechanical systems. In regulations related to non-structural elements, mostly bracing and support elements, weight, material, element type, etc. are specified. While the criteria are mainly mentioned, it is not sufficient to provide a systematic arrangement for interior architectural seismic design and project control. At the same time, when the sources are examined, there is a limited number of comprehensive studies involving interior design elements. There is a need for studies at national and international level on this subject. And the number of studies needs to go up by addressing and explaining more criteria. Architects do not have access to information on how to accomplish the provisions on the seismic design of the non-structural component of the project in the current regulations in the world and in Turkey. Clarification is required on how to design a non-structural component against earthquake risk. As a result of this study, designers need a systematized guide for designing non-structural elements and a regulation with clear rules about how inspections should be done.

Information Notes

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User Evaluation of Indoor Comfort Conditions in Reused Bathrooms

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Abstract

In the period they were built, the baths were not only used as a place for washing, but also for socializing. As a result of changing needs and urban life over time, the bath culture has begun to disappear in many cities. When the baths, which had a significant financial return in the period they were used, started to become idle over time, most of them were rented or sold by foundations to individuals or institutions. The buildings that remained idle for many years were out of control, served warehouses and businesses, and were devastated. As a result of the increase in the importance given to cultural heritage in recent years, many of the historical baths that have taken their places in the social memory have been offered to the public again with new functions. In re-functioning, the structure should be preserved with minimal intervention and transferred to future generations. In addition, in the selection of new functions in buildings, the needs and the architectural features of the building should be taken into consideration. Undoubtedly, baths are one of the most interesting building types in Ottoman architecture, both spatially and structurally. For this reason, physical comfort conditions and user satisfaction are of great importance in the selection of new functions in baths due to their architecture. In Bursa, which is one of the Ottoman cities where the bath culture is still partially continued, many baths have been re-functionalized. Within the scope of the study, the Ördekli and Kayıhan baths in Bursa were discussed. Users in one or both of the mentioned baths were asked to evaluate the physical comfort conditions (acoustic, humidity, air-conditioning, lighting, etc.) with a survey conducted over the Google form, and as a result of the answers given, a descriptive analysis was made and the users were asked primarily from acoustics, then from temperature and lighting, respectively. It was concluded that they were disturbed.

Keywords: Baths, reuse, indoor physical comfort.

Introduction

In the 12th century, that is, after the conquest of Anatolia by the Seljuks, the Turkish baths were built in a different plan from the plans of the ancient baths in Byzantine cities. On the other hand, it is known that long before the Turks settled in Anatolia, they built baths in other countries where they lived. However there is not enough information about private and public baths such as palaces, lodges, inns and bazaar baths that the Turks built in their countries before they came to Anatolia. The bathing tradition brought with them by the Turks who came to Anatolia was partially influenced by the Roman and Byzantine tradition and integrated with the cleaning rules of Islam, paving the way for the emergence of new Turkish bath architecture in Anatolia (Öntuğ, 2013).

During the Seljuk period, there were no pools in the baths except for the hot springs and hot springs. Washing is done by pouring water on the head of the basin. For sweating, instead of a separate indoor space, a bench located in the center of the warmth called the navel stone was preferred. The bath architecture of the Seljuk period was basically based on the building tradition in Central Asia (Eyice, 1997).

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The relationship of the Turks between water and cleanliness in the context of the bath has developed and preserved its existence in the Ottoman period. According to Semavi Eyice, it was the Ottoman Turks who gave the most importance to the hamam. So much so that in this period, large and small baths were built wherever the state borders reached. In addition to this, apart from the bazaar baths, special small-scale masonry baths were built separately from the main building, in mansions and mansions in metropolitan cities, and in notable mansions in Anatolia.

However, as a result of changing needs and living conditions, the bath culture began to disappear. These structures, which have special importance due to their architecture, ceased to be a financial resource in time and were transferred to private ownership. They have been used for various purposes, having undergone interventions for years without any supervision. Bath structures, which are a living document of cultural heritage, should be reconsidered and taken under protection in line with user demands and satisfaction, taking into account the urban texture, community needs and architecture.

Materials and Methods

The work progressed as follows;

- First of all, a literature review was conducted on the development of bathing culture and bath architecture in Anatolia. Then, he gave brief information about the general architectural formations of the baths in Bursa, which had an important place for the Turks after the conquest of the Ottoman Empire, and the historical baths that were re-functioned. Information was given about the architecture of the Ördekli and Kayhan baths, the restoration processes they underwent, and their new functions.
- Then, the users in one or both of the mentioned baths were asked to evaluate the physical comfort conditions (acoustic, humidity, air-conditioning, lighting, etc.) with the questionnaire organized through the Google form, and a descriptive analysis was made as a result of the answers given.
- As a result, the points to be considered in the selection of new functions in the baths are emphasized.

Findings and Discussion

Baths in Anatolia, according to their usage; are divided into private and general, according to the fact that the public baths are built separately for men and women; classified as single and double baths.

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- Private Baths:

These are the baths located inside the houses, mansions and palaces, which have smaller dimensions than the general baths. Dressing and warm rooms are generally absent. Such baths are sometimes thought of as detached structures, and sometimes they are planned as volumes within a large building mass. Like the examples where the dressing and the warm room consist of a single section, there are also examples with only temperature and heating spaces without these sections (Urak, 1995).

- General baths:

These baths, also called public baths or bazaar baths, are the baths that form part of an architectural complex or small structures as well as being built as foundations.

Single baths: These are the baths built for men and allocated to women at certain times of the day. However, it is also used alternately in the morning or afternoon for the benefit of women. These baths are also called "bird baths" because they are allocated to women at 10 or 11 am in the morning, when it is called "bird hour" (Ünver, 1973). There are single or double entry examples.

Double baths: These are baths consisting of two sections, one for men and the other for women, in a single building. Depending on the parcel used for men and women and the power of the owner; designed in symmetrical, asymmetrical, equal or different scales. In double baths, the entrance doors of the men's section are usually opened to a square or the main road, while the entrance doors of the women's section are opened to the secondary road. However, sometimes it is seen that the entrance doors open to the same street (Eyice, 1960).

The layout of the space in the baths is basically based on the sections that meet the needs of the bath, consisting of dressing room, warm room and heat. However, the water tank, furnace and inferno, which make up the installation part, appear as parts that complete the main fiction.

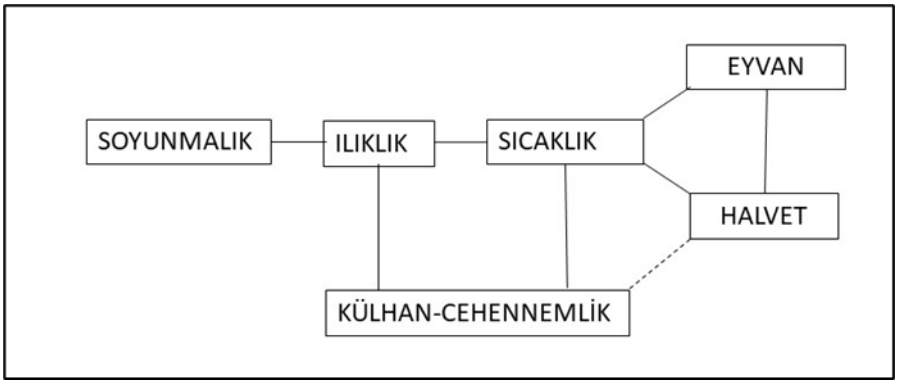


Figure 1. Formation of space in baths

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Locker; It is one of the three main sections that make up the interior of the bath and take place sequentially. This section is reached after passing the section called windbreaker. This is the section where those entering the bath take off their clothes to wash, put on their loincloths and rest after washing. Since there was no washing in the dressing room, this section could have been made of wood. The dressing room is larger and more ostentatious than the other sections (Erden, 2015).

This section could be cold in winter because there were no hell channels under the dressing room. There are niches for barbecues to both heat the space and dry the towels.

Tepidity; located between the locker and the warmth. There is a toilet and shaving unit in this section.

Heat; Since it is the closest part to the furnace, it is the hottest part of the bath. There is also a steam window in this section. Steam window: It is called the part of the water boiler that opens into the bath. This window not only allows the bath to heat up more, but also allows the person who runs the bath to control the hot water. The steam window opens to one of the private rooms in this section. The ancients also call the temperature "the square place of the bath".

The temperature is usually square in plan. There is a large dome in the middle and half domes or vaults on the iwans on the sides. Elephant eyes on the dome take in the daylight during the day and decoratively reflect the light inside at night. Just below the dome, in the center of the warmth, is the navel stone (Tascioglu, 1998).

Kulhan; It is the section where the fire that heats the bath and bath water is burned. This section is independent of the interior spaces of the bath. This section leaning on the heat has a separate door from the outside. The fire burning here comes out from the chimneys inside the walls after circulating the air channels called hellhole under the bath. Hell canals are located under the hot and warm sections of the bath (Erden, 2015).

Semavi Eyice (1997), Turkish baths have different temperature plans. Six different plans were applied in the bath architecture of the Ottoman period.

Type A is the type with four iwans and cells in the corners.

Type B temperature is stellar type.

There are private rooms arranged around a square temperature at type C temperature.

Type D temperature is a multi-dome type. In this, the temperature was divided into equal sections with the help of arches and each of these sections was covered with domes in equal dimensions.

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In the E type temperature, the temperature is domed and rectangular and has a double private room. In such baths, the temperature is narrow and has a rectangular form extending transversely.

In the F-type temperature, the tepid-temperature and private rooms are in the form of identical rooms. All spaces of this type are rooms of almost the same size, covered with domes, and each of them is connected with the others.

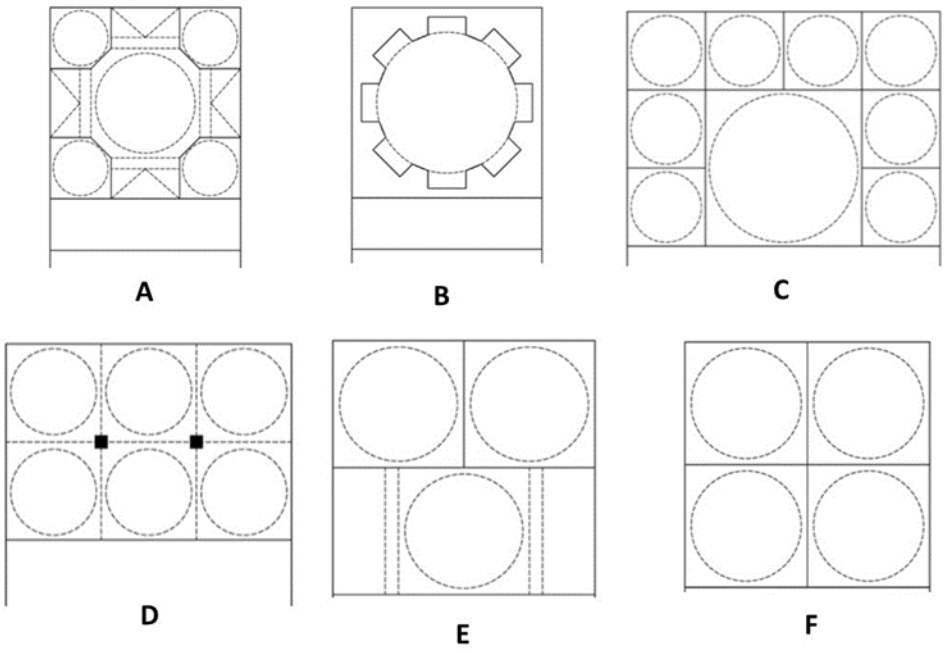


Figure 2. Plan types in baths according to their temperatures

The importance given to cleanliness by Islam has been effective in the development of the bath culture. The state elders and the wealthy people who wanted to do charity had a bath built and donated to earn rewards. After the conquest of Bursa by the Muslims, many baths were built throughout history. Although most of them were idle and destroyed over time, some of the baths that have survived until today have been re-functionalized.

Table 1. Repurposed baths in bursa (Prepared by the author in 2018)

First Name	History	Type	New Function
Nanalcilar Bath	1360-1389	double cunt	Shopping centre
Thursday Bath	1451-1481	Single Bath	Bazaar
Chicken Market Bath	15th century	Double Bath	Bazaar
Sengul Bath	1389-1402	Single Bath	Silversmiths' Bazaar
Court Bath	1451	Double Bath	Cultural Center-Turkish Bath
Kayihan Bath	15th century	Double Bath	Restaurant
İncirli Turkish Bath	1497	Single Bath	Cultural Center
Emir Sultan Bath	1426	Single Bath	Masjid
Duckling Bath	1389-1402	Double Bath	Cultural Center
Murat I Bath	14.-16. YY	Double Bath	Cultural Center

ISBN: 978-625-8246-12-4

Hasanbey Bath	1652	Double Bath	art Center
Teacher's Bath	1572	Double Bath	Cultural Center
Umur Bey Hamam	1432	Single Bath	Tofas Art gallery
Orhangazi Turkish Bath	1339	Double Bath	Bazaar
Muradiye (Bekçiyan) Bath	1425	Single Bath	Society
Inebey Bath	1485	Single Bath	Showroom
Reyhan Pasha Bath	1431	Single Bath	green crescent
Basci Ibrahim Pasha Turkish Bath	1472	Single Bath	Sufi Foundation
Ibrahimpasa Turkish Bath	1485	Single Bath	Museum
Green Bath	1480	Single Bath	Shopping centre
Flea Market Bath	1485	Single Bath	Warehouse
Hançerli Hamam	1524	Single Bath	Culture and Art Center

Given the changing habits of the society and the needs of the environment as a result of developing technology, giving new functions to historical buildings in order to save them from being idle is the most preferred method for the protection of cultural heritage and architectural heritage. The only purpose in refunctioning is not only the preservation of the building, but also the most accurate transfer of the structure to the next generations.

In refunctioning, the needs of the society, the environment in which the building is located, as well as the architecture of the building and user satisfaction play an important role in the selection of functions. The baths discussed in the study are quite different structures due to their architecture. Considering the physical comfort conditions, spatial configurations and dimensions, and the materials used, the choice of function should be a sensitive issue.

In the study, a user satisfaction survey was conducted for the Ördekli Bath, which is given the function of a cultural center, and the Kayhan Bath, which is given the function of a restaurant, among the baths in Bursa. Users were asked to evaluate the physical comfort conditions for the new function of the buildings. In short, we can say that the physical comfort conditions are the air conditioning, humidity, acoustic, lighting ratios of the buildings that meet the optimum level required for their functions.

- Field Study

The commercial center that developed around the first social complex of the city built by Orhan Gazi became even stronger with the covered bazaar, inns and the Grand Bazaar built later. Baths are concentrated in the Hanlar Region and the commercial center around it as places that provide financial support to structures such as mosques, madrasahs and soup kitchens. This region; It is within the area bounded by Cumhuriyet Street in the north, Atatürk Street in the south, Gökdere in the east and the skirts of Hisar in the west. Many bazaar baths built in this

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area in the 15th and 16th centuries are profitable businesses that provide high income for foundations (Şehitoğlu, 2008).

Bursa baths are rectangular planned structures, generally positioned in the north-south direction. Built on the slopes of Uludağ, the baths are generally located on a sloping land, and therefore the entrance is generally given from the north, which is on the lower level.

The dressing areas are square in plan and their sizes are close to the sum of the rest of the baths in many examples. Mostly 14th century. Considering the planning in the hot sections of the baths built at the end of the 15th century, it is generally seen that they are of "dome in the middle, transverse temperature and double- secluded type". The temperature of the "cross-like four iwans and corner cells" is mostly 15th century. It is seen in large-scale bath structures built at the beginning of the year (Hırka, 2019).

While the heating section of the large-sized baths of the city is covered with a dome, this space is covered with a wooden roof in the smaller ones. According to the plan scheme, the warm and hot sections are either covered with a dome or the main dome; supported by half domes, vaults or arches. Small spaces such as private rooms, toilets and shaving facilities are covered with domes or vaults. Domes covered with Byzantine tiles, which were previously filled with mortar and can be used in every slope; During the rising empire, the tops of the domes were covered with lead. In later times, the bullets were also removed and the Turkish style tiles, which can be covered in a certain slope, were taken. For this reason, one or two levels of pulleys were added to the domes (Tayla, 1999).

- Ördekli Hamamı

Ördekli Hamam, referred to as the neighborhood bath, is in the Abdal District, to the north of Haşim İşcan Street. The construction of the bath, also known as the "Old New Bath", was started during the reign of Yıldırım Bayezid, and its construction remained unfinished due to the occupation of the city by the Timurid army. The Hamam was completed during the reign of Çelebi Mehmed.

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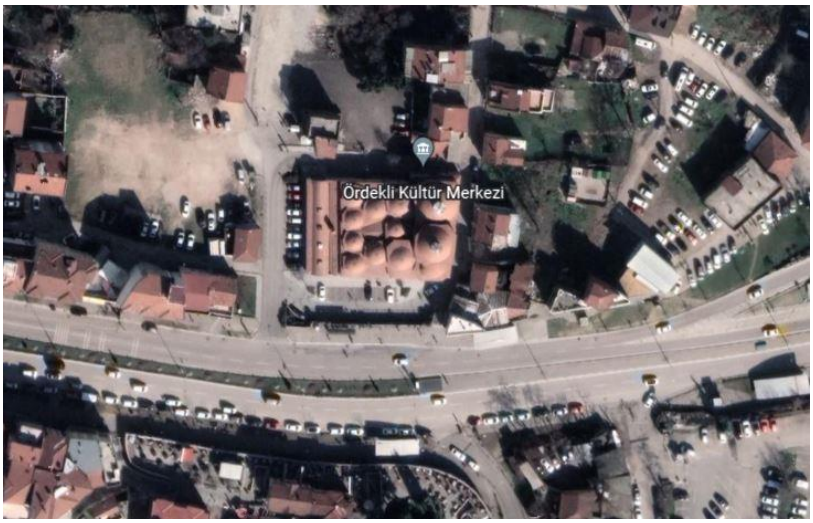


Figure 3. Ördekli Hamam satellite image

The reason why the bath is known as the "Old New Bath" is that when a new inn or bath is built in the city, it is called new ham or bath, and when another new inn or bath is built, the previously built one is called "old new" inn or bath.

The Ördekli Bath is quite large and has a double bath plan typology. The bath resembles a bright and spacious sultan's bath. Its walls are built with three rows of bricks and one row of cut stones. The dressing room of the women's section is covered with a 10.50 m diameter dome placed on an octagonal pulley, and the warm room is covered with a 7.00 m diameter dome. There are two private rooms in the warm room, which is expanded with iwans on both sides. The men's section also has a similar plan scheme with the women's section. Differently, there is a toilet and a private room in the warm room.

The warm room, which is passed through the warm room, has a rectangular plan and is enlarged with iwans on both sides. There is a domed navel stone space as in the women's section in the warm room.

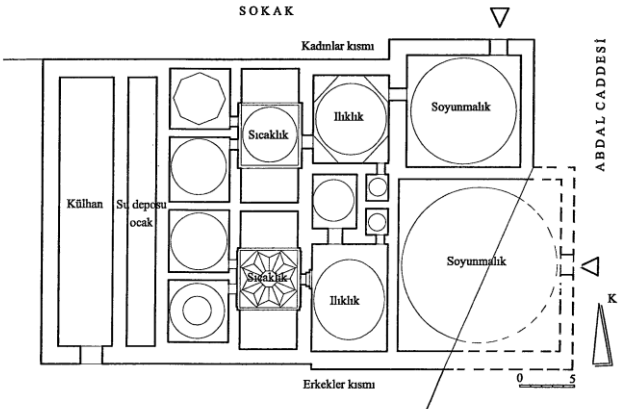


Figure 4. Ördekli bath plan (Bursa Chamber of Architects)

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The Ördekli Hamam, which was in ruins for a long time, was restored between 2006 and 2008 and used as a cultural center. Today, within its body; There are two seminar halls, one large and one small, a foyer, cafeteria, exhibition halls, traditional arts course and practice halls, and sections where Turkish cuisine can be served.

While the warmth and private rooms of the men's part of the building and the warmth and privates of the women's part serve as the exhibition halls of the cultural center, the dressing room of the men's part is used as a conference hall. The warm room and dressing room of the women's section serve as a cafeteria.



Figure 5. Ördekli Cultural Center Entrance - Women and Men Warmth Section

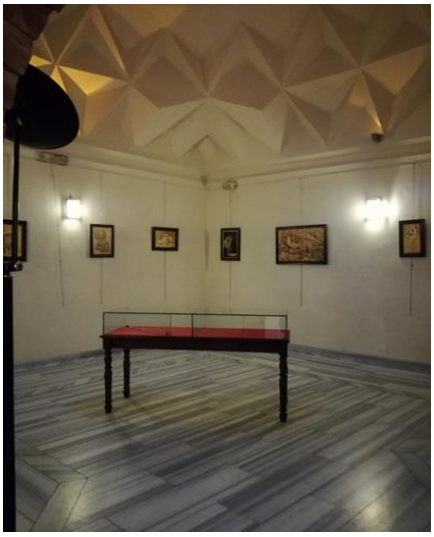


Figure 6. Ördekli Cultural Center Exhibition Halls - Men's and Women's Section Halvets

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Figure 7. Cafeteria of Ördekli Cultural Center-Women's Section Warmth and Undressing



Figure 8. Duckli Cultural Center Conference Hall - Men's Section Undressing

- Kayhan Bath

Kayhan Bath Sultan II. It was built by Grand Vizier Koca Mehmed Pasha during the reign of Murad I at the beginning of the 15th century to generate income for the Kayhan Mosque located in the north. He was also known by the names of "Dülgerler", "Woodmen", "Mehmed Ağa" in various periods. Kayhan Bath, which is a bazaar bath, is located in Kayhan district.

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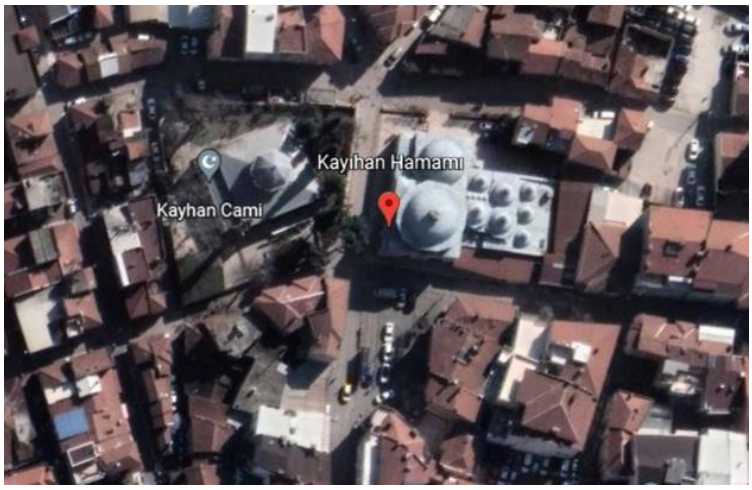


Figure 9. Kayhan Hamam Satellite Image

Having a double bath plan typology, the bath is quite large in scale. The entrance to the men's dressing room is provided by a large crown door. The square planned dressing room measures 13.00 x 13.00 m. There is a toilet in the warm room with dimensions of 7.40 x 5.20 m, which is passed through the dressing room. There are two small private rooms and a domed navel stone space in the warm space, which is enlarged with an iwan.

The dressing room of the women's section, which is arranged adjacent to the men's section, measures 12.85 x 9.80 m and is accessed from the side. While it opens to the warm room in the northwest through two doors in the dressing room, it opens to a small transition space that connects to three domed cells in the southeast direction. The temperature is expanded with an arch and there is a private room inside. In the original plan of the bath, there are five shops in the west direction.

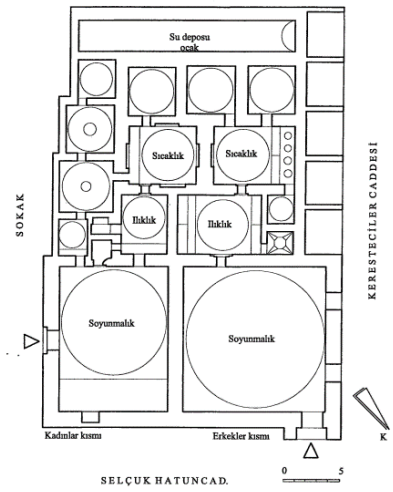


Figure 10. Kayhan Bath Plan (Şehitoğlu, 2000)

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The dome and floors of the bath were repaired in 1561, and the waterways were repaired in 1657. In the 1950s, a part of it was used as a woodworker's warehouse and a part as a weaving factory. The building, which was started to be restored by Bursa Metropolitan Municipality in 2010, is used as a restaurant reflecting the traditional cuisine of Bursa today.



Figure 11. Kayhan Bath Dining Hall – Men's and Women's Section Undressing

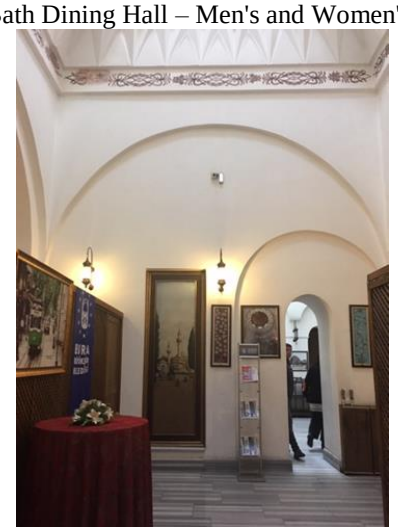


Figure 12. Kayhan Restaurant Wc - Warm Men's Section



Figure 13. Kayhan Restaurant Kitchen Service Hall- Men's Part Warmth

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- Survey data

Due to the pandemic conditions, the questionnaire prepared for the study was made through the Google form. The questionnaire consists of two parts, the first part includes questions about demographic infrastructure. In the second part, users were asked to evaluate the physical conditions of the baths, provided that they were present in at least one of the baths covered in the study.

Of the 157 people participating in the study, 55.1% were female, 44.9% were male, 33.8% were between the ages of 41-60 and 33.1% were in the range of 26-41 years. 58% of the participants are in the working group.

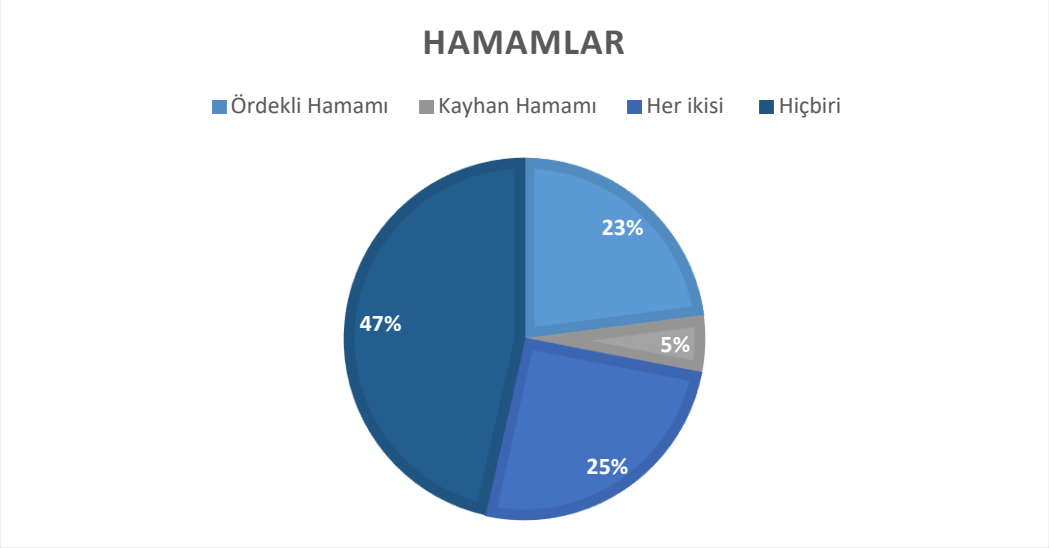


Figure 14. Number of Participants Using the Baths

Approximately 84 of the users who answered the questionnaire were found in at least one of the baths. 6 pieces of 5 for these people Likert scale questions were asked.

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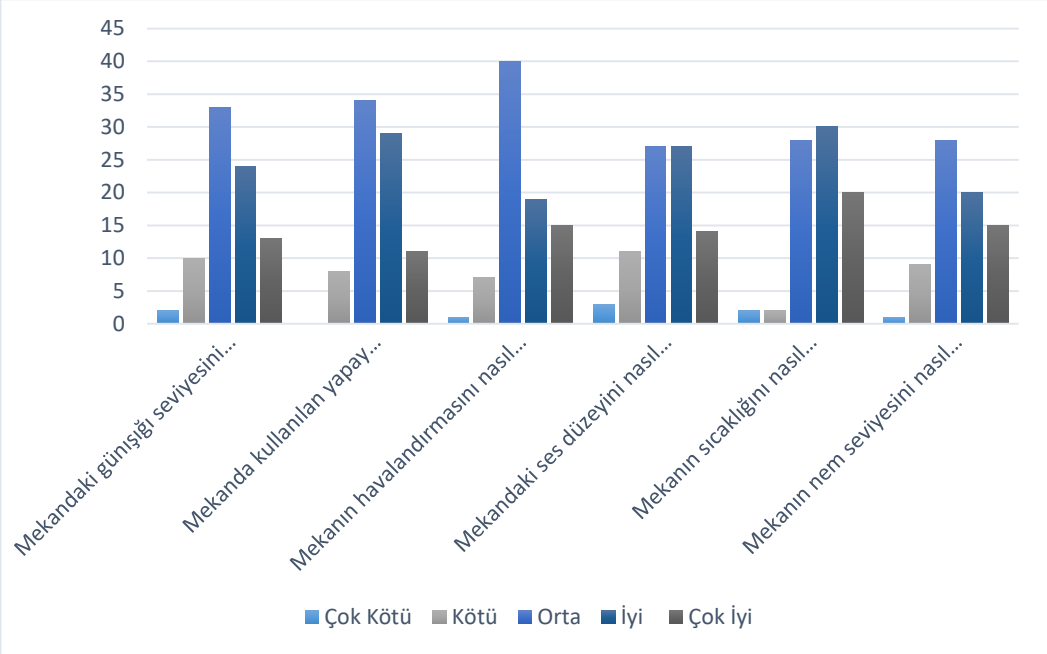


Figure 15. Questions Regarding Physical Comfort Conditions in Turkish Baths

At the same time, multiple-choice and open-ended questions were asked about the physical comfort conditions (lighting, humidity, temperature, sound level and ventilation) that disturbed the users during their stay in the space.

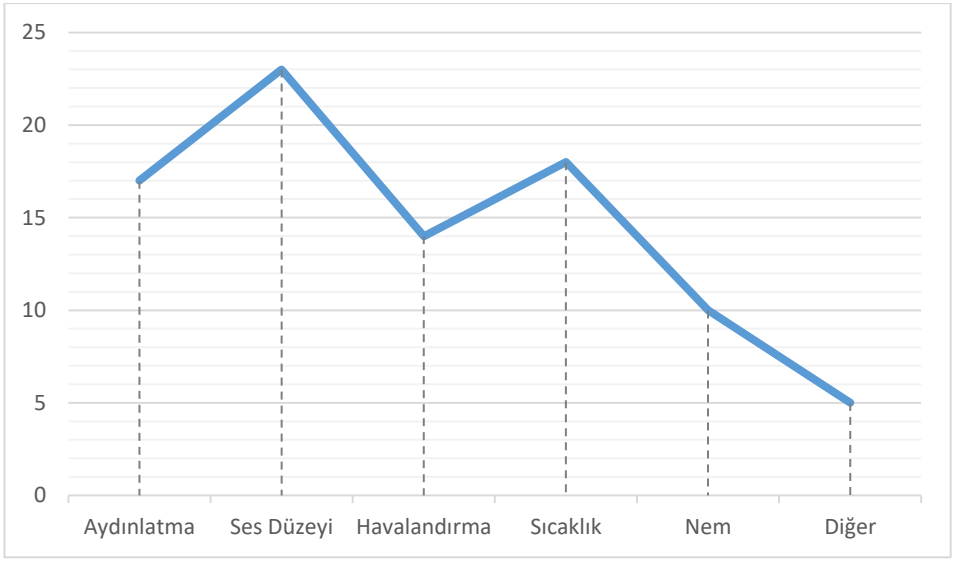


Figure 16. Situation(s) where users are uncomfortable during their stay

Conclusion and Recommendations

According to the results of the survey, we see that 84 people using the buildings evaluated the ventilation and humidity level of the space as medium within the scope of the Likert scale, they found the artificial and natural lighting level to be moderate, the temperature good and the sound level good-moderate. When we ask about the comfort conditions that they are

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uncomfortable with during their stay in the place, we see that the sound level is high. Apart from acoustic comfort, it can be said that the lighting level and temperature of the space are also effective.

There is not enough natural lighting in the baths, which do not have sufficient window and door openings due to their original function, due to privacy, and which are mostly high and have small openings in certain areas. While giving a new function to these structures, which we cannot interfere much with due to their historical values, artificial lighting types that are close to natural lighting should be chosen so as not to disturb people during the day.

In addition, the echo levels of the buildings are quite high due to their architecture and the materials used. The sound level, which is the most disturbing situation for the users during their time in the building, can be optimized by using sound absorbing surfaces, furniture and acoustic panels. Or, with the right function selection, this feature can evolve into a positive direction.

The room temperatures in the baths are provided by the places we call the furnace-hell and the pipes that are distributed from there to the building. If the mentioned spaces continue to be used with the same function while re-functioning, the temperature level of the space can be balanced in a careful and controlled manner.

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September 09-10-11, 2022, Baku, Azerbaijan
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Investigation of the Exterior Architecture of Traditional Housing in the Villages of Akcakaya, Resadiye and Zıncidere of Kayseri/Talas District

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Abstract

The town of Talas, which dates back to ancient history, is also the name of an old Turkish city, and it is thought that the region got this name when one of the tribes living in that city came and settled in this region during the Selçuk period. The living conditions, cultures, geographical features and climatic conditions of these civilizations have led to the formation of residential architecture. In this study, Kayseri province Talas district; It is aimed to examine the exterior architecture of traditional houses in the villages of Akçakaya, Reşadiye and Zincidere. The distance to Talas district and population density were taken into account as the reason for choosing these villages. In this context, it is aimed to examine the exterior of three traditional houses in total by selecting one sample from Akçakaya, Reşadiye and Zincidere villages. In this study, which was planned as a field study, a method was used to determine the main materials that make up the exterior of the traditional houses selected from the selected villages, as well as to determine the other materials used as complementary and to document the exteriors of these structures with photographs. As a result; It has been observed that the use of stone materials in the exterior architecture of traditional houses in the villages of Akçakaya, Reşadiye and Zincidere in Talas district is quite intense. It has been determined that rubble stone is mostly used as a stone type, as well as it is used in cut and face stones. In addition, it has been observed that the construction of the houses, which have an important place in human life, with natural stone has a very important value for the people of the region.

Keywords: Stone, traditional house, Kayseri, Talas.

1.Introduction

Kayseri is a very important center in terms of cultural artifacts located in the Central Anatolia Region of Turkey (Ulvi & Yiğit, 2020).

Kayseri, which is one of the important cities of Anatolia with its historical and cultural equipment, is located in an important region that creates local architectural features due to its stratification and local materials, construction techniques and topography. The traditional houses, which are an important part of cultural continuity, have managed to survive in Talas district. One of the most dominant features of Talas traditional houses is that the building material used is stone. The stone used in the houses has changed form and shape over time (Büyükmıhçı, Bakır & Eldek, 2007).

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In this region, the changing human population and material form changes from past to present have led to the use of different stone materials (İmamoğlu, 2001).

Natural stones gain a unique appearance over time and their durability increases. The separator is easy to clean. It has been one of the most preferred building materials in terms of being earthquake and fire resistant. The sustainability of natural stone is also very important in terms of its use (Korkmaz, 2001).

Traditional houses are built in similar forms. Although each house is similar to each other, the houses have their own identity and a different language. The reason for this was the human factor that made that structure unique (İncesakal, 1991).

In Talas district, rubble stone, cut stone and cut stone were generally preferred. Rubble; It is the direct use of stones extracted from quarries without any processing. The way stone; It is a large stone used in construction and easy to be chipped. Their surfaces are rectangular stone. cut stone; These are the stones cut in accordance with the required dimensions (Mutlu, 2005).

Talas is also the name of an old Turkish city in Central Asia, and it is thought that the region got this name when one of the tribes living in that city came and settled in this region during the Seljuk period. It is stated in the sources that Talas was a Turkish village of 500 households in 1180 (Url-1)

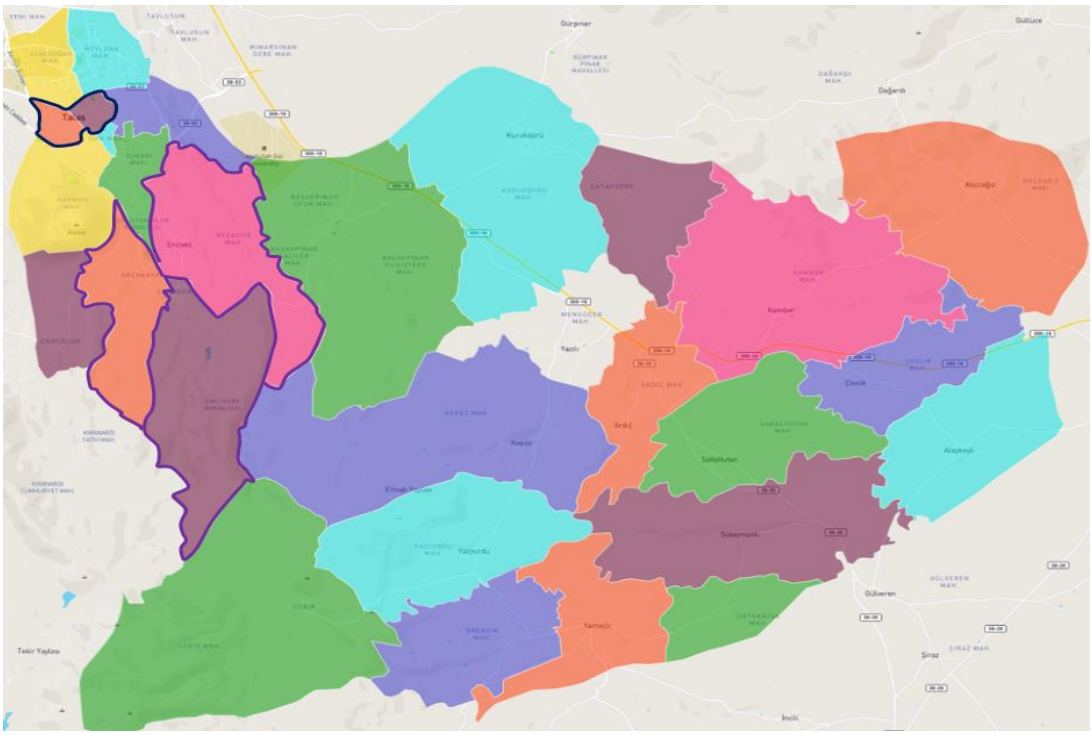


Figure 1. (Url-2)

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While it was a sub-district of Kayseri in 1911, it became a district in 1987 with the Law No. 3392. While there is 1 Central Municipality and 12 villages in the district, 12 of our villages have turned into neighborhoods after the local elections on March 30, 2014, and our district has a total of 33 neighborhoods (Url-1).

Three different villages from Talas villages are discussed. These villages are Akçakaya, Reşadiye and Zincidere as I mentioned on the map.

According to the information obtained, Armenians and Greeks lived in Zincidere, Greeks in Reşadiye, and Muslims in Akçakaya in ancient times. This life is also reflected in the residential architecture.

2. Materials and Methods

At the beginning of this study, the houses in the villages were selected by making a rigorous field trip. First of all, three different villages with population density and known for their proximity to Talas district were selected. Field work was started by visiting these villages at different times.

The residences identified during the fieldwork were archived with a camera. Then, it was determined that the natural stone was an important point for the village people by contacting the village people. It was understood that this choice changed many factors in their lives. Based on these documents and observations, one house from each village was selected and the building materials on the exterior and the identity of the house were examined. In this selection, the situation in the selected house was examined, and the integrity of the building with natural stone was examined. While examining the houses, the building materials on the exterior were discussed. The identity that these building materials add to the villages has been investigated in detail.

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3. Findings and Discussion

The selected residences in Reşadiye, Akçakaya and Zincidere villages have a very important place in this area. All of the traditional houses discussed are registered buildings. The traditional houses in Reşadiye and Akçakaya are in the protected area. The traditional residence in Zincidere is located in the church protection area.

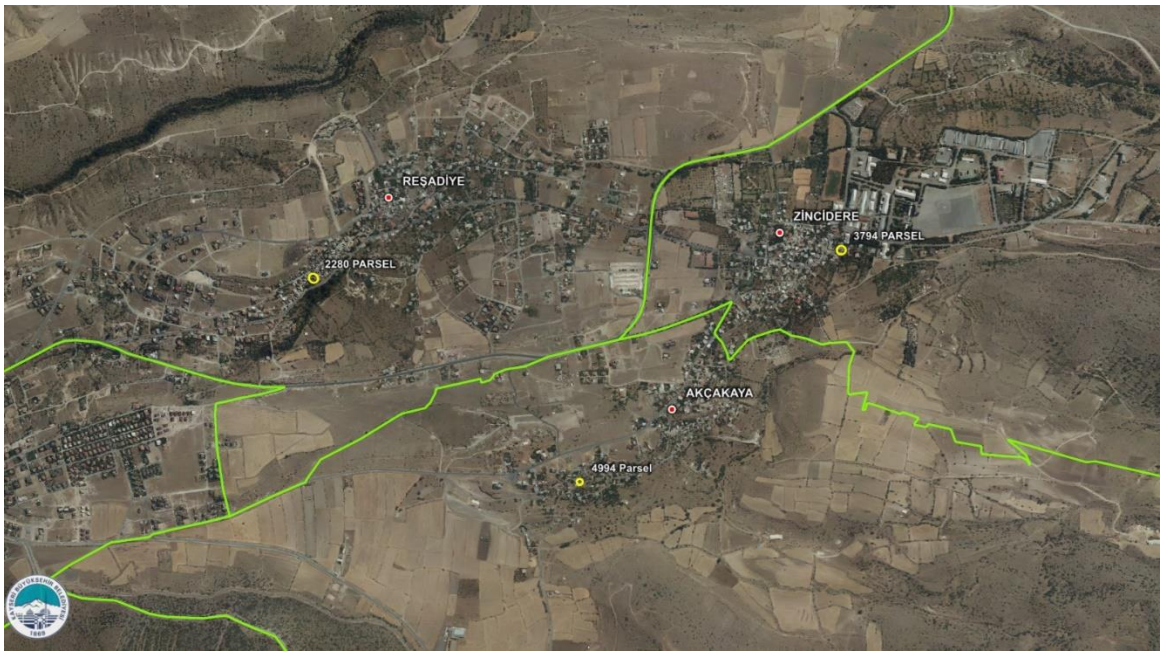
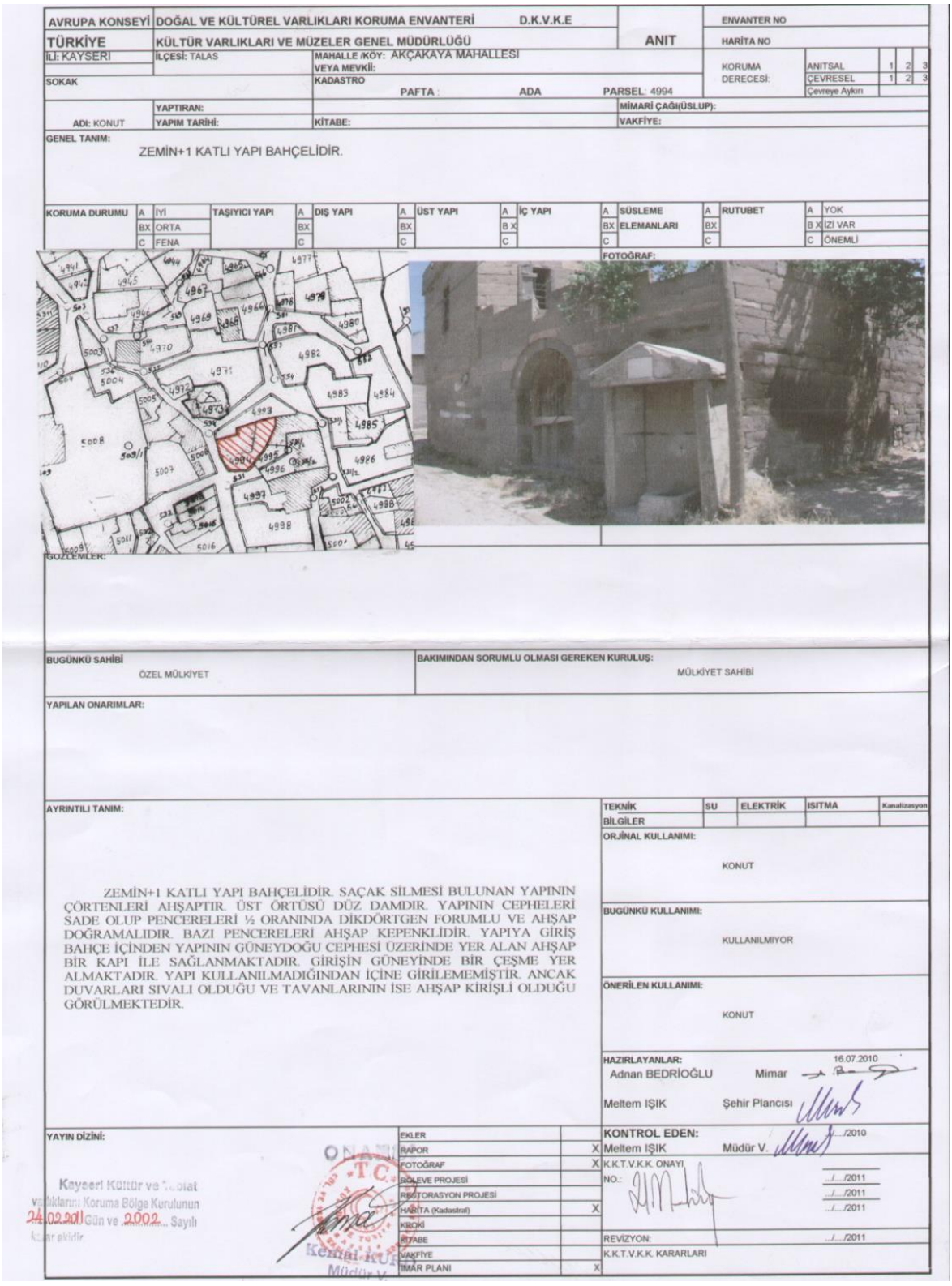


Figure 2. Talas Municipality Archive

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Akçakaya



AVRUPA KONSEYİ | DOĞAL VE KÜLTÜREL VARLIKLARI KORUMA ENVANTERİ D.K.V.K.E | ANIT | ENVANTER NO
TÜRKİYE | KÜLTÜR VARLIKLARI VE MÜZELER GENEL MÜDÜRLÜĞÜ | HARİTA NO
İLİ: KAYSERİ | İLÇESİ: TALAS | MAHALLE /KÖY: AKÇAKAYA MAHALLESİ VEYA MEVKİİ: | KORUMA DERECESİ: ANITSAL 1 2 3 / ÇEVRESEL 1 2 3 / Çevreye Aykırı
SOKAK | KADASTRO PAFTA: ADA PARSEL: 4994
ADI: KONUT | YAPTIRAN: | YAPIM TARİHİ: | KİTABE: | MİMARİ ÇAĞI(ÜSLUP): | VAKFİYE:

GENEL TANIM:
ZEMİN+1 KATLI YAPI BAHÇELİDİR.

KORUMA DURUMU	TAŞIYICI YAPI	DIŞ YAPI	ÜST YAPI	İÇ YAPI	SÜSLEME ELEMANLARI	RUTUBET
A İYİ						YOK
BX ORTA				BX		İZİ VAR
C FENA						ÖNEMLİ

FOTOĞRAF:

GÖZLEMLER:

BUGÜNKÜ SAHİBİ: ÖZEL MÜLKİYET
BAKIMINDAN SORUMLU OLMASI GEREKEN KURULUŞ: MÜLKİYET SAHİBİ

YAPILAN ONARIMLAR:

AYRINTILI TANIM:

ZEMİN+1 KATLI YAPI BAHÇELİDİR. SAÇAK SİLMESİ BULUNAN YAPININ ÇÖRTENLERİ AHŞAPTIR. ÜST ÖRTÜSÜ DÜZ DAMDIR. YAPININ CEPHELERİ SADE OLUP PENCERELERİ ½ ORANINDA DİKDÖRTGEN FORUMLU VE AHŞAP DOĞRAMALIDIR. BAZI PENCERELERİ AHŞAP KEPENKLİDİR. YAPIYA GİRİŞ BAHÇE İÇİNDEN YAPININ GÜNEYDOĞU CEPHESİ ÜZERİNDE YER ALAN AHŞAP BİR KAPI İLE SAĞLANMAKTADIR. GİRİŞİN GÜNEYİNDE BİR ÇEŞME YER ALMAKTADIR. YAPI KULLANILMADIĞINDAN İÇİNE GİRİLEMEMİŞTİR. ANCAK DUVARLARI SIVALI OLDUĞU VE TAVANLARININ İSE AHŞAP KİRİŞLİ OLDUĞU GÖRÜLMEKTEDİR.

TEKNİK BİLGİLER | SU | ELEKTRİK | ISITMA | Kanalizasyon

ORJİNAL KULLANIMI: KONUT
BUGÜNKÜ KULLANIMI: KULLANILMIYOR
ÖNERİLEN KULLANIMI: KONUT

HAZIRLAYANLAR: 16.07.2010
Adnan BEDRİOĞLU Mimar
Meltem IŞIK Şehir Plancısı

YAYIN DİZİNİ:
Kayseri Kültür ve Tabiat Varlıkları Koruma Bölge Kurulunun 24.02.2011 Gün ve 2002 Sayılı kararı gereği

EKLER	
RAPOR	X
FOTOĞRAF	X
RÖLEVE PROJESİ	
RESTORASYON PROJESİ	
HARİTA (Kadastral)	X
KROKİ	
KİTABE	
VAKFİYE	
İMAR PLANI	X

KONTROL EDEN: Meltem IŞIK Müdür V. .../.../2010
K.K.T.V.K.K. ONAYI NO.: .../.../2011 / .../.../2011 / .../.../2011
REVİZYON: .../.../2011
K.K.T.V.K.K. KARARLARI

Different building materials were used together on the exterior of the examined building. Cut stone was used on the walls of the building. Wooden windows used together with natural stone

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as the main element in the building completed the integrity of the building. The windows in the building are made in rectangular form. The opening in the arched form of the garden also referred to the life of that period (Figure 3).



Figure 3. One of the traditional houses in Akçakaya village

Natural stones used in buildings as stone wall elements are processed according to the surface shapes required by architectural projects. It can be embroidered on the stone surface according to a certain pattern, shape or template, or it can be applied in different ways, for example, curved, according to the edges, joints or places of use (Çelik, 2003).

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Reşadiye

Ion stone and rubble stone were used on the exterior of the structure studied. Wooden windows used together with natural stone in the building ensure the integrity of the building. At the same time, stone water troughs were made in this structure, which helps to export water.

This building consists of two floors, the ground floor and the first floor. On the ground floor, as in most buildings, only small windows are preferred (Figure 4).

The arched part on the ground floor is said to have been used for many purposes. It is stated that it was used as a barn by the village people in the past. At the same time, because it is a barn, the windows on the ground floor are preferred to be small.



Figure 4. One of the traditional houses in Reşadiye village

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ZincİDere

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TÜRKİYE | KÜLTÜR VARLIKLARI VE MÜZELER GENEL MÜDÜRLÜĞÜ | HARİTA NO

İLİ: KAYSERİ | İLÇESİ: TALAS | MAHALLE /KÖY: ZİNCİDERE ~~KABABAĞIMAN~~ VEYA MEVKİİ: (Eğciyes)

SOKAK: ~~İSTİKLAL CADDESİ NO:4~~ HACI MEHMET SAĞANCI CAD. NO: 23 | KADASTRO: PAFTA: ADA: PARSEL: 3794-3795

KORUMA DERECESİ: ANITSAL 1 2 3 | ÇEVRESEL 1 2 3 | Çevreye Aykırı

ADI: KONUT | YAPTIRAN: | YAPAN: | MİMARİ ÇAĞI(ÜSLUP): | YAPIM TARİHİ: | KİTABE: | VAKFİYE:

GENEL TANIM:

ZEMİN+TEK KATLI OLAN YAPI KESME TAŞTAN İNŞA EDİLMİŞTİR.

KORUMA DURUMU	TAŞIYICI YAPI	DIŞ YAPI	ÜST YAPI	İÇ YAPI	SÜSLEME ELEMANLARI	RUTUBET	
A İYİ							A YOK
Bx ORTA							BX İZİ VAR
C FENA							C ÖNEMLİ

VAZİYET PLANI:



FOTOĞRAF:



GÖZLEMLER:

BUGÜNKİ SAHİBİ: ÖZEL MÜLKİYET

BAKIMINDAN SORUMLU OLMASI GEREKEN KURULUŞ: MÜLKİYET SAHİBİ

YAPILAN ONARIMLAR:

Kayseri Kültür ve Tabiat Varlıklarını Koruma Bölge Kurulunun 15.08.91 Gün ve ...890... Sayılı kararı gereğidir.

AYRINTILI TANIM:

YAPI ZEMİN+TEK KATLIDIR. ÜST ÖRTÜSÜ DÜZ TOPRAK DAM OLUP BİR KISMI BETONLA KAPATILMIŞTIR. İKİ KONUT OLARAK KULLANILAN YAPININ ARKA CEPHESİNDE BİR GİRİŞİ DAHA MEVCUTTUR. ÖN CEPHESİNDEKİ GİRİŞİN HER İKİ T ARAFINDA İKİ KAT BOYUNCA DEVAM EDEN ÇIKMALAR BULUNMAKTADIR. KESME TAŞTAN İNŞA EDİLEN YAPININ PENCERELERİ ½ ORANINDA TAŞ SÖVELİ OLUP DEMİR PARMAKLIKLIDIR. GİRİŞ KAPISI TAŞ KEMERLİDİR. ÜZERİNDEKİ AYDINLATMA PENCERESİNİN TAŞ DENİZLİĞİ BULUNMAKTADIR. YAPININ ALT KATINDA OTURULMADIĞINDAN OLDUKÇA BAKIMSIZ DURUMDADIR. İÇERİSİNDE NİŞ VE ŞERBETLİKLER BULUNMAKTADIR. AHŞAP TAVANINDA YER YER BOZULMALAR GÖRÜLMÜŞTÜR. ÜST KATA ULAŞILAN TAŞ MERDİVENLERİN AHŞAP KORKULUKLARI BULUNMAKTADIR. BU KISIMDAN ÜST KATTA TEK ODAYA GEÇİLMEKTE OLUP, ÜST KATA ASIL GİRİŞ YAPININ ARKA CEPHESİNDEN SAĞLANMAKTADIR. YAPININ ÜST KATI KULLANILMAKLA BİRLİKTE OLDUKÇA YIPRANMIŞ DURUMDADIR. BU BÖLÜMDE BİR NİŞ VE KEMERLİ BİR KAPI VARDIR.

TEKNİK BİLGİLER	SU	ELEKTRİK	ISITMA	Kanalizasyon

ORJİNAL KULLANIMI: KONUT

BUGÜNKÜ KULLANIMI: KONUT

ÖNERİLEN KULLANIMI: KONUT

HAZIRLAYANLAR: Zeynep AKDAĞ, Arkeolog; Meltem IŞIK, Şehir Plancısı — 12.06.2007

YAYIN DİZİNİ: ONANDI — Ekrem ANAÇ, Müdür

EKLER	
RAPOR	X
FOTOĞRAF	X
RÖLEVE PROJESİ	
RESTORASYON PROJESİ	
HARİTA (Kadastral)	X
KROKİ	
KİTABE	
VAKFİYE	
İMAR PLANI	

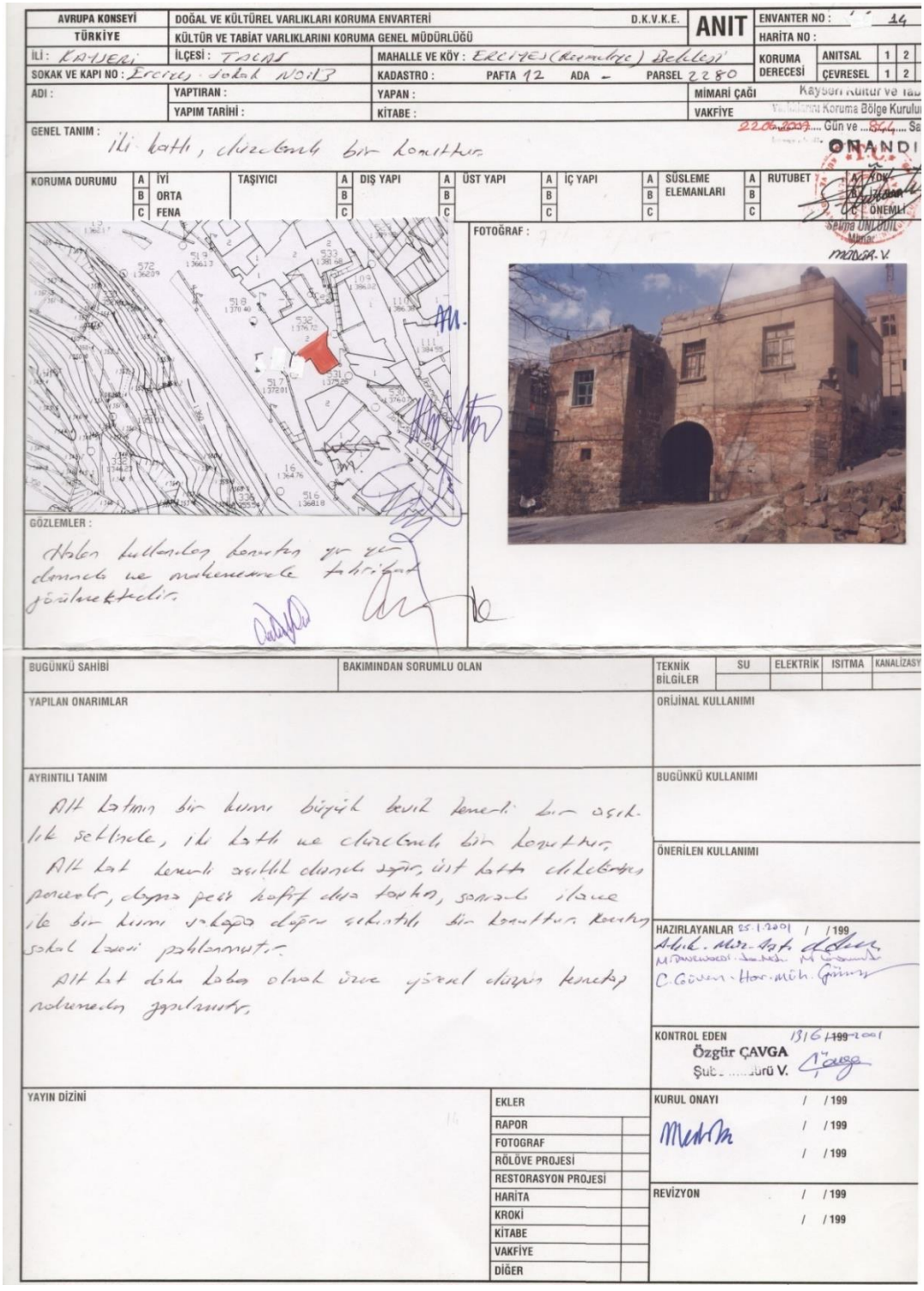
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K.K.T.V.K.B.K. KARARLARI

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AVRUPA KONSEYİ
TÜRKİYE
DOĞAL VE KÜLTÜREL VARLIKLARI KORUMA ENVARTERİ
KÜLTÜR VE TABİAT VARLIKLARINI KORUMA GENEL MÜDÜRLÜĞÜ
D.K.V.K.E.
ANIT
ENVANTER NO : 14
HARİTA NO :
İLİ : KAYSERİ
İLÇESİ : TALAS
MAHALLE VE KÖY : ERCİYES (Reşadiye) Beldesi
SOKAK VE KAPI NO : Erciyes Sokak No:13
KADASTRO : PAFTA 12 ADA – PARSEL 2280
KORUMA DERECESİ ANITSAL 1 2 ÇEVRESEL 1 2
ADI :
YAPTIRAN :
YAPIM TARİHİ :
YAPAN :
KİTABE :
MİMARİ ÇAĞI
VAKFİYE
Kayseri Kültür ve Tabiat Varlıklarını Koruma Bölge Kurulu
22.06.2007 Gün ve ...844... Sa
ONANDI
GENEL TANIM : ili batı, dikdörtgen bir konuttur.
KORUMA DURUMU A İYİ B ORTA C FENA
TAŞIYICI
DIŞ YAPI
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SÜSLEME ELEMANLARI
RUTUBET
A ADİ B ÖNEMLİ C ÖNEMLİ
Selma ÜNLÜTÜRK Mimar
FOTOĞRAF :
GÖZLEMLER :
Halen kullanılan konutun yer yer donuk ve makemsale tahribat görülmektedir.
BUGÜNKÜ SAHİBİ
BAKIMINDAN SORUMLU OLAN
TEKNİK BİLGİLER SU ELEKTRİK ISITMA KANALİZASYON
YAPILAN ONARIMLAR
ORİJİNAL KULLANIMI
AYRINTILI TANIM
Alt katının bir kısmı büyük kesik kemerli bir açıklık sekiziyle, iki katlı ve dikdörtgen bir konuttur.
Alt kat kemerli açıklıklı dikdörtgen sağır, üst katta dikdörtgen pencereler, dışa pek belirgin olmayan taşlık, sonradan ilave ile bir kısmı sokağa doğru çıkıntılı bir konuttur. Konutun sokak cephesi pabuçlanmıştır.
Alt kat daha taşlık olmak üzere yüksek duvarı kesme taş malzemeden yapılmıştır.
BUGÜNKÜ KULLANIMI
ÖNERİLEN KULLANIMI
HAZIRLAYANLAR 25.1.2001 / /199
Mimar. Müh. Mimar.
C. Güven - Har. Müh. Güven
KONTROL EDEN 13/6/1999-2001
Özgür ÇAVGA
Şube Müdürü V.
YAYIN DİZİNİ
EKLER
RAPOR
FOTOĞRAF
RÖLÖVE PROJESİ
RESTORASYON PROJESİ
HARİTA
KROKİ
KİTABE
VAKFİYE
DİĞER
KURUL ONAYI / /199
/ /199
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REVİZYON / /199
/ /199

Different building materials were used together on the exterior of the examined building. The stonework applied at the entrance and the retreat added a characteristic feature to this structure. Cut stone was used on the facade walls. The wooden windows and doors felt on the façade completed the integrity of the building.

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Fewer windows were used on the lower floor of the building than on the upper floor. The reason for this is that the street is directly related to that building. The window positioned at the top of the door, on the other hand, brings daylight to the living area inside (Figure 5).

It is thought that the cut stone used in the building was brought from a different region. It was stated by the villagers that the mortar used as a binder for the stones was also egg white (Figure 5).



Figure 5. One of the traditional houses in Zincidere village

4. Conclusion and Recommendations

In the villages of Akçakaya, Reşadiye and Zincidere in Kayseri Talas, the building union material has become unique to this place. No matter how similar each residence is to each other, it has been revealed that each residence has its own identity and a different language.

The stone walls on the facades of the houses in the villages have a characteristic feature by combining with different building materials. We see that the most distinctive feature of

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traditional houses is natural stone. Wooden windows, shutters and doors, which support this natural stone and allow the building to be seen as a whole, are abundantly available in this region. It has been understood that it is a building material that is resistant to natural disasters. The traditional houses in Talas are generally formed by the combination of rectangular or square prisms. While the houses that make up the street texture are mostly built adjacent to each other, sometimes they continue the linearity with the garden wall of the house. Traditional houses built with a holistic design approach have led to the formation of original spaces and environment together. The residences in the area are usually two-storey and attract attention with their overhangs. The reason for this is that people do not want to go up more floors because they are built with the masonry construction system. No coating material was used on the facades built with natural stone. Stone and wood materials were used together on the facades where the construction technique was left open. Based on climatic conditions and privacy, there are deaf walls or small window openings on the ground floors of the buildings, especially on the street facades. On the upper floors, the window ratios are larger and proportional than on the lower floors.

The façade element that stands out in that area is undoubtedly the projections. In general, stone consoles and overhangs carried by wooden consoles are one of the most important elements that make up the facade characteristic of the area. It has caught a certain rhythm with wooden buttresses, windows and doors along with stone on the façade.

In some buildings, they are the gates to the garden. Thus, the fact that the houses are not immediately opened to the street creates a sheltered entrance. In addition, it has become beneficial to welcome the guest in the garden first and to sit in the open air semi-open spaces before entering the house. The people in these houses, which are in contact with the garden, have a closed relationship with the street on the ground floor. This association was only by the windows on the first floor. At the same time, wooden construction material is preferred in the shutters, which are preferred for many reasons.

At the same time, the combination of these buildings in the same direction and the use of the same building materials together created the street texture. Due to this situation of this street texture, the windows on the ground floor have been tried to be made smaller and higher in proportion.

If there is a need for a new building in the settlements where the traditional housing texture is dominant, the deterioration of the texture should not be allowed. Local and cultural identity

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should be interpreted in the need of new buildings and this issue should be taken into account during the design phase.

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Mechanical Properties of Ceramics Containing Zeolite

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Abstract

Zeolites are hydrous alumina silicate minerals containing aluminum, silicon, and oxygen in their natural structure. There are about 50 natural and 150 synthetic types of zeolites. The main chemical and physical properties of zeolites are ion exchange, adsorption and related molecular sieve structure, silica content and pore structure. In this study, brick samples were produced by replacing clay with natural zeolite at different percentages. These samples were sintered at various temperatures. The sintered samples were compared with their equivalents produced in the standards and literature. Investigating mechanical properties of zeolite containing ceramics is crucial to understand its behavior and usability in different fields.

Keywords: Properties, zeolite, ceramic, clay, sintering.

Introduction

This study aims to determine the mechanical properties of the bricks produced by replacing the clay with natural zeolite in different proportions and sintering it at different temperatures. Zeolites are indispensable raw materials of today's industry due to their crystal structures and chemical properties. The main reasons why natural and artificial zeolites find wide usage areas in industry is that their chemical and physical properties are suitable for many usage areas. Features such as high ion exchange capacity, surface absorption and molecular sieve feature, suitability for dehydration without deterioration of the crystal structure, low density, and high silica composition. Although Turkey has rich zeolite deposits, especially in the Western Anatolia Region, the industrial use of zeolite has not been fully developed yet (Sevim et al., 2011).

A study divides the methods of producing bricks from waste materials into three diverse categories: firing, cementing and geopolymerization. Waste materials have been studied to produce bricks with various methods. However, despite a lot of research, commercial production of bricks from waste materials stays limited. Baking and cementing methods to produce bricks from waste materials consume higher energy compared to traditional ways. For the large-scale production and use of bricks from waste material, further research and development is needed, not only in technical, economic, and environmental terms, but also in

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standardization, government policy and public education (Zhang et al., 2013). There are studies that shows the positive contributions of natural zeolite to the properties of ceramics. The porous structure and ignition loss of the zeolite is the reason of the brick porosity. The brick sample with 30% zeolite showed the lowest thermal conductivity value with 0.69 W/mK. The brick sample containing 30% slag additive had the highest thermal conductivity value as 1.26 W/mK. While the thermal conductivity coefficients decreased zeolite containing samples, they increased in slag containing samples. The results showed that brick samples produced with addition of zeolite and slag can be used as thermal insulation material (Gencel et. al., 2013). The porous silica ceramic exhibited a high porosity range (90.59-96.09%), an extremely low thermal conductivity of 0.039 W m-1 K-1, and an improved compressive strength of 0.508 MPa. Such lightweight and low thermal conductivity porous silica ceramics show the potential to have a wide range of uses, especially as insulation material (Li et. al., 2022). The porous clay ceramics behaves similar to brittle materials. Increased porosity reduces compressive, flexural strengths and fracture toughness. The low crack growth resistance observed in porous clay ceramic materials is attributed to shielding by crack bridging (Yakub et. al., 2012). Powder sintering of a high-purity quartz at 1200 °C by the addition (25 wt.%) of clinoptilolite type of natural zeolite enabled the production of a high-cristobalite silica material from which high-porosity (48.5%), microporous (0.5–3.0 mm) ceramic bodies with sufficiently high strength (142.4 kg/cm^2) can be fabricated by press forming and sintering. It is thought that the positive results obtained are due to the pre-sintering process of the mixtures in powder form (Şan et. al., 2003). In a study examining the mechanical planning of CAS (CaO-Al2O3-SiO2) to ceramics, activated powders were shaped and sintered at 1000-1200 °C for 1 and 5 hours. It was observed that the small pores merged into larger pores in the samples sintered at 1200 °C. A high appearance is exhibited by the combination of small pores in the size of the pores in the design at 1200°C. Small pores formed at 1000°C and 1100°C gained a spherical dimension due to excessive sintering at 1200 °C (Merkit et. al., 2018).

There are also studies where zeolite is used by replacing cement. In a study on concrete, zeolite was used by replacing the binder with values varying between 0% and 10% replacement of zeolite with cement increased the compressive strength of the produced concrete by 15% and decreased the water absorption rate by 2.3 times. In addition, the density of the samples decreased, and the ultrasound transmission rate increased. An increase in freeze-thaw resistance was observed with the increase in closed porosity. According to the estimated freeze-thaw

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calculations, samples containing 10% zeolite showed 3.3 times greater freeze-thaw resistance than samples without zeolite (Nagrockiene et. al., 2016).

Materials and Methods

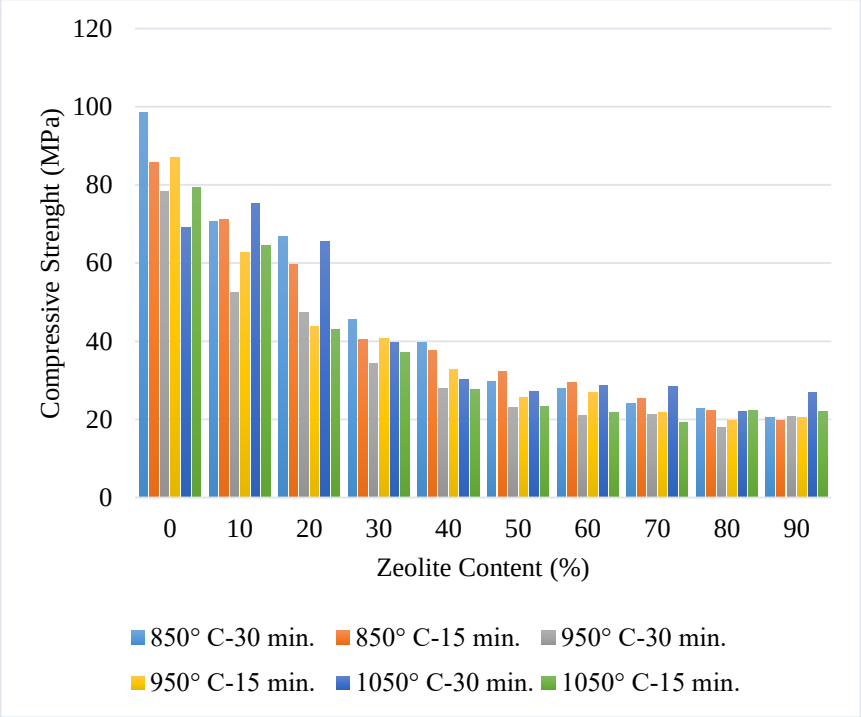
In this research clay from Antalya Elmalı region and natural zeolite from Balıkesir Bigadiç region were used as raw materials. The components were dried in an oven at 110±5 °C until they reach a constant mass. Then, the mixtures with different compositions were kneaded by adding water until they reach a hard plastic consistency according to TS 4790, and they were kept for 24 hours without losing their moisture. The mixtures were put into molds and in these molds, they were pressed with a 15-ton press machine at 110 bar for 10 seconds. Afterwards, lengths and diameters of the fresh samples were measured with a digital micrometer with 0.001 mm precision. In the drying process, the samples were left in an oven at 80±5 °C until they reach a constant mass.

The prism and cylindrical shaped samples in the number prescribed by the standard were sintered at temperatures (850, 950, 1050 °C) in a 1200 °C capacity muffle furnace and left to cool in the furnace. After reaching the target temperature with a rate of temperature increase 5-10 °C/min, the sintering process were be carried out by keeping it at this temperature for half an hour. The samples were kept in room temperature after they were cooled in the furnace. Afterwards, the samples were subjected to flexural and compressive strength tests.

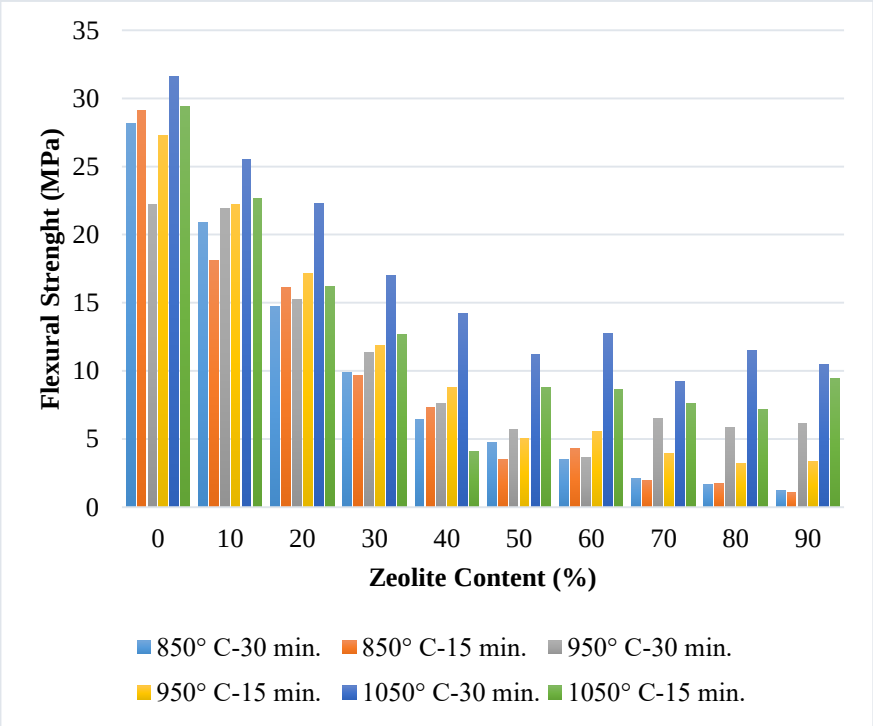
Findings and Discussion

The flexure strength of the samples was obtained by three-point bending test.

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Unlike the flexural strength, the compressive strength didn't increase with the increase of the sintering degree. The highest compressive strength was obtained as 98.56 Mpa from the samples without zeolite sintered for 30 minutes at 850 °C, while the lowest compressive strength was obtained as 17.95 Mpa from the samples containing 90% zeolite that were sintered at 950 °C for 30 minutes.



ISBN: 978-625-8246-12-4

The samples without zeolite content that were cured at 1050 °C for 30 minutes showed the highest flexural strength as 31.63 Mpa. The lowest flexural strength was obtained from the samples containing 90% zeolite that cured at 850 °C for 15 minutes as 1.71 Mpa.

Conclusion and Recommendations

- A decrease in flexural and compressive strengths was observed with the increase of zeolite content of the samples. However, this decrease in strength showed a rapid decrease up to 50% zeolite ratio, while the decrease in zeolite ratios exceeding 50% slowed down relatively.
- Changes in flexural and compressive strengths were affected by temperature and sintering time at different rates. While flexural strength tended to increase with increasing temperature and sintering time, it was not possible to make the same deduction for compressive strength.
- While the effect of sintering temperature and time on flexural strength was increased with the increase of zeolite content, this effect decreased on the compressive strength of samples containing more than 40% zeolite.

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Artificial Intelligence in Financial Services

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Abstract

This paper discusses how artificial intelligence can be utilized in more than a few economic offerings like banking, insurance, credit score rating, etc. The researcher has elaborated on his observations concerning which areas and features can make the use of synthetic Genius and whilst doing so what challenges will be confronted via the banking and monetary offerings industry. Lastly, this paper additionally enlists the blessings and hazards of artificial intelligence implementation. By referring to secondary facts the creator has made a try to discover the opportunity of AI applicability and grant a reference factor for additional research.

Keywords: Artificial Intelligence, Fintech, Financial Services, Banking Technology, Intelligence, Customer Service

Introduction

Artificial Intelligence: According to a research paper by John McCarthy of Sandford University, one of the founders of AI, it is the science and engineering of making intelligent machines, especially intelligent computer programs. Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed Various computer languages are used to write Artificial Intelligence Programmes. The most common of them are Prolog, C/C++, recently Java, and even more recently, Python. AI is a technology of making machines over time learn from actions and take decisions on your behalf. The machine is able to do the job of a human without any manual intervention. Artificial intelligence includes programming computers for certain qualities such as information processing, giving logic, solving problems, studying behavioral patterns, self-learning, strategizing, etc. (Kurode, 2019).

Review of Literature

Meghani, K. (2020), Artificial Intelligence (AI) is rapidly transforming the global financial services industry. Artificial Intelligence studying the thought processes of human beings and it deals with representing those processes via machines (like computers, robots, etc.) On the other side the Block-chain Technology is a technology in which digital information is stored in a public shared data-base. This technology got famous mainly after introducing the first

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cryptocurrency which is the Bitcoin. The study was conducted to know the importance of using Artificial Intelligence and Block Chain especially in the Banks to reduce the dependency on the human element also to understand what can be the possible implications of the use of artificial intelligence and BlockChain.

Vipra (2021), this paper analyses key trends in the deployment of AI in the fintech sector in India. First, it discusses the predominant uses of AI in Indian fintech. Then, it moves on to analyzing the potential risks of the use of AI in financial products and services, particularly focusing on the exclusion and concentration of economic power that it can trigger. It then moves on to take stock of the adequacy of the existing regulatory framework and concludes by offering a set of recommendations to strengthen the same.

Ozili (2021), this paper discusses the benefits and issues associated with big data and artificial intelligence (AI) for financial inclusion. The benefits of artificial intelligence and big data for financial inclusion are: improved efficiency and risk management for financial services providers; the provision of smart financial products and services to banked adults; simplification of the account opening process for unbanked adults and the creation of credit scores for unbanked adults using alternative information. Several issues associated with artificial intelligence and big data for financial inclusion that need to be addressed include: the shortage of skilled AI workers, increase in the level of unemployment in the financial ecosystem, the unconscious bias in the design of artificial intelligence systems, and other barriers caused by strict data privacy laws.

Gensler & Bailey (2020), the financial sector is entering a new era of rapidly advancing data analytics as deep learning models are adopted into its technology stack. A subset of Artificial Intelligence, deep learning represents a fundamental discontinuity from prior analytical techniques, providing previously unseen predictive powers enabling significant opportunities for efficiency, financial inclusion, and risk mitigation. The broad adoption of deep learning, though, may over time increase uniformity, interconnectedness, and regulatory gaps. This paper maps deep learning's key characteristics across five possible transmission pathways exploring how, as it moves to a mature stage of broad adoption, it may lead to financial system fragility and economy-wide risks. Existing financial sector regulatory regimes - built in an earlier era of data analytics technology - are likely to fall short in addressing the systemic risks posed by the broad adoption of deep learning in finance. The authors close by considering policy tools that might mitigate these systemic risks.

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Fernandez (2019), The use of artificial intelligence tools has escalated recently in all sectors of the economy owing, among other factors, to the growing volume of digital data and higher computational capacity. Major benefits may be reaped from applying these tools to the provision of financial services, not only for financial institutions but also for society as a whole. This article describes some of those benefits, and also some of the main uses being made of these tools, both by financial institutions and central banks. It also indicates the main limitations of the technology and its possible implications for the correct functioning of the financial system.

Objectives of The Study

- To explore areas/functions where AI can be implemented in banks and the financial services industry
- To study challenges involved in the implementation of AI
- To analyze the advantages and disadvantages of AI implementation for the banking and financial services industry

Research Design

In this paper, the author attempts to study the secondary data available in the form of published literature like books, websites, newspapers, research papers, etc. After referring to various case studies and observing existing AI implementation practices, the researcher has made their own observations and discussed various challenges, advantages & disadvantages in towards use of artificial intelligence.

AI and Digital Finance

The term AI covers a series of technologies and approaches, ranging from 'if-then' rule-based expert systems, 16 to natural language processing, to the marriage of algorithms and statistics known as machine learning. Machine learning involves pattern recognition and inference trained by data rather than explicit human instructions. It progressively reduces the role of humans as AI systems expand from supervised learning to unsupervised deep learning neural networks (Buckley et al., 2021).

These features come together uniquely in the context of finance. After five decades of digital transformation, encompassing digitization and datafication, finance is the most globalized, digitized, and datafied segment of the world's economy. While financial services have always integrated technical innovation,12 this is particularly true for the latest wave of innovation referred to as financial technology (FinTech). This process can be seen across four major axes:

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the emergence of global wholesale markets, an explosion of FinTech startups particularly since 2008, an unprecedented digital financial transformation in developing countries particularly China, and the increasing role of large technology companies (BigTech) in financial services (TechFin). While finance and technology have always developed in tandem, since the 2008 Global Financial Crisis the changes have been unprecedented, particularly in terms of speed of change and range of new entrants including FinTech and BigTech firms. Speed of change can be seen particularly in the role of new technologies, often summarized under the ABCD framework: AI/analytics, blockchain, cloud, and data, which are coevolving at an increasing rate within finance. Many would also add mobile internet and IoT to these factors. Digital financial transformation combined with certain other aspects of finance make financial services particularly, and perhaps uniquely, fertile for AI development: these aspects include data, financial resources, human resources, and incentives. As we have seen, one major technological pillar of digital financial transformation is the large-scale use of data: the financial sector has thus cultivated, over a long period, the extensive structured collection of many forms of data (e.g. stock prices). Such data have been standardized and digitized since the 1970s, with new forms of capture and collection constantly emerging. As a result, data in finance provides particularly fertile ground for AI, and finance provides the incentives and resources for the application of ever more sophisticated forms of analytics to ever wider ranges of data. Furthermore, AI tends to perform best in rule-constrained environments, such as games like chess or Go, where there are a finite – although perhaps very large – number of possibilities to achieve specified objectives. This is the environment in which AI seems to outperform humans with increasing rapidity. This environment exists in many aspects of finance, for instance, stock market investment, where there are specific objectives (maximizing profit) and set parameters of action (the trading rules and regulatory system) combined with massive amounts of data. Add technological possibility, in terms of computing power and analytics, to the financial and human resources and incentives to use them and it is apparent why finance is already transforming so rapidly as a result of digitization and datafication, and why this is likely to increase with further development of AI. (Zetzsche et al., 2020).

Applications of AI in Finance

❖ **Commercial Lending Operations**

Likewise, suitable data can be captured by financial organizations via cash flow statements and other financial documents of the borrower companies. The extracted data allows banks to offer

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speedy services for their lending operations, while also enabling more accurate handling of credit evaluation.

- **Retail Credit Scoring**

Credit applications can be leveraged swiftly and precisely by Financial companies by making use of AI. Predictive models are leveraged by AI tools for examining the credit scores of applicants and allow for minimal regulatory expenses and compliance and improved decision making.

- **Commercial Credit Scoring**

Suitable financial information can be examined through AI and insights regarding financials can be offered to make use of techniques such as machine learning. Rather than indulging in the tedious process of executing numerous calculations using spreadsheets or financial documents, all these massive volumes of documents can be handled and insights can be derived without anything being missed out. This allows for improved commercial loan decisions.

- **Debt Collection**

Banks and other financial institutions make use of AI for resolving the issue of delinquency and offer a proper and efficient procedure for debt collection.

- **Insurance Pricing**

Similar to credit applications, AI is capable of assessing the risk profile of consumers and determining the best possible prices to accompany the appropriate insurance plan. This cuts down on costs, minimizes the business operation workflow and also boosts customer satisfaction.

- **Fraud Detection**

Cyber and data breaches are one of the primary challenges faced by banks in today's times according to KPMG. As per its survey, over half the respondents reveal that they are able to reclaim below 25% of fraud losses, making fraud prevention an indispensable task.

- **Regulatory Compliance**

Abiding by the regulatory specifications is integral for all financial institutions. NLP tech can be adopted by AI for scanning regulatory and legal documents to detect any compliance issues. This makes it a broad and effective solution in terms of cost since it allows AI to browse through numerous documents swiftly to oversee non-compliant issues in the absence of any manual involvement.

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❖ **Travel & Expense Management**

The travel receipt checks are required by expenditure reports for a range of purposes ranging from income tax laws, compliance, as well as VAT deduction regulations. This poses many compliance risks in relation to fraud and payroll taxation. AI can make use of deep learning algorithms and document capture technologies for preventing non-compliant spending and minimizing approval workflows.

❖ **Know Your Customers (KYC) Processes**

With the adoption of AI technologies such as NLP, it becomes possible for banks to detect any irregular patterns and determine risk areas in their KYC processes in the absence of human involvement.

Conclusion

With the above observations, it can be concluded that artificial intelligence can be successfully implemented in a variety of indispensable as properly as complicated operations in banking and economic services, proper from day-to-day banking operations to hazard management's Implementing Artificial Intelligence has its benefits like cost cutting, environment-friendly carrier delivery, fine interplay with customers, etc., and risks like disruptions in commercial enterprise models, adaptability of the older populace to new technology, etc. Definitely, benefits will bemore as a long way as the use of AI in banking and economic offerings is concerned. Lastly, the economic offerings industry in India will have to cope with the challenges in enforcing synthetic brain-like investment involved, coming up with beneficial techniques, and uplifting the degree of technological infrastructure and its awareness to cease user.

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Participatory Management Plans on Protected Area Management

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Abstract

Participation is increasingly seen as a tool to promote integration of protected areas and local stakeholders, minimizing existing conflicts and negative impacts on the areas. Until now, research has been conducted mostly to demonstrate that lack of involvement promotes conflict, or that participation does not result in long term changes. Today, protected areas are one of the most important elements of international and national nature conservation efforts. Thanks to legal-administrative tools and restrictions on human use, protected areas are natural and It plays a vital role in the protection of cultural resources and biological diversity. protected areas are the same At the same time, its functions such as providing opportunities for tourism-recreational activities and supporting rural development also fulfills. In addition, in many parts of the world, pollution, hunting, settlement, mining, intensive tourism uses, illegal logging and removal of vegetation cover, infrastructure investments pose a threat to protected area resources. This situation, instead of classical and centralized conservation approaches for protected areas; has brought the necessity of new, more effective and local protection and planning tools to the agenda. This approach requires a planning, that is, participatory management plans where management decisions are made with the support and sharing of all interest groups. Participatory management plans introduced with this new approach. They are tools that define the policy, strategy and management programs of protected areas with the dimension of sustainable development and ensure rational use. In this study a theoretical framework is developed to characterize different levels of participation in protected area management.

Keywords: Participatory management plan, protected areas, management.

Introduction

Turkey is the richest country in Europe and the Middle East in terms of biodiversity. More importantly, it has ecosystems that contain habitats that are vital for the survival of many endemic, rare and endangered plant and animal species. Some of these important areas have been given various protection statuses within the scope of the relevant legal regulations, and various practices are being carried out for protection and use in this direction.

One of the most effective ways to protect biodiversity is to protect the determined natural habitats with legal statuses such as national parks and nature conservation areas. These important and valuable areas, which are generally defined as protected areas, are the most effective means of managing the natural heritage in situ and are the cornerstones of national and international nature conservation strategies (Dudley et al., 2005; Dudley, 2008). Addressing the establishment of policies, legislation and institutions for the protection of biological diversity, which is considered a very important natural resource, is a fairly new

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process that has accelerated in Turkey, especially since the early 1990s (Hamamcı & Emre, 1992).

A modern understanding of conservation began to emerge in the early 1800s, and in the 1900s, nature conservation was accepted as a discipline (Ülgen & Zeydanlı, 2008). The theme of the unity of people and land and that people are a part of the concept at least as much as soil, nature and cultural resources have been effective in the protected areas throughout the historical process (Eagles et al., 2002). Because the results arising from the poor management of the protected areas established for the sustainable use and protection of ecosystems and biological diversity have begun to be accepted as an indicator that traditional resource management models do not provide sustainability (Güneş, 2011).

Observations and assessments show that the existing scientific and technical approaches to site conservation are not always functional in the management of protected areas, and sometimes even worsen the current situation. These approaches, which can be described as usual today, can be defined as strong central institutions and working methods with a sectoral perspective. It is seen that the ongoing political and economic policies accompanying the aforementioned approaches also make it difficult to realize the reforms that will be made with a management approach based on the cooperation of the central and local, with a social perspective as necessary (Demirayak, 2006).

Along with that; The concept of "sustainable development" for the management of protected areas where environmental resources in general, and biological diversity, which is a natural resource in particular, has settled into the literature; It is seen that the search and efforts on management models that attach importance to the local, tried with participatory and applicable small-scale projects have increased.

It is necessary to change the current dominant management approach, which looks at conservation areas from a different perspective and isolates these areas from individuals/society with a prohibitive approach, and sees each protected area as an institutional power. A contemporary management model which includes the responsibilities and rights of the individual on nature and natural resources and is mutually supported by the harmony of policies in practice is inevitable for the conservation areas to survive.

There is practical experience in the management of protected areas to recognize that a healthy ecosystem and a well-functioning management system are interdependent. In this context, it is

ISBN: 978-625-8246-12-4

necessary to develop and establish a co-management approach that can associate ecosystem features with all social factors and enable the partnership of the parties.

1. Concepts Regarding to Protected Areas

Over time, many debates have developed over the concept of sustainable development, which was started to be expressed in the 1980s. As of today, it cannot be said that a complete consensus has been reached in the discussion on the views against the philosophy of sustainable development, the correctness of the concept and its applicability. Engaging in a conceptual discussion on sustainable development falls outside the scope of this study. However, what should be considered here; sustainability of natural resources and biodiversity should be. Because the purpose of the study; It is about how the management of protected areas can be made more effective with the experience gained. The high-level goal to be achieved within this framework is the sustainability of ecosystems, biodiversity, all assets and therefore human life. The World Conservation Strategy, published in 1980, emphasized that humanity exists as a part of nature, and that there is no future without protecting nature itself and natural resources. A similar message was given in both the World Conservation Strategy and the Report of Our Common Future (1987), and the inevitability of conservation and sustainable use of natural resources in development processes was justified as much as possible. Here, the concept of conservation includes both the protection of nature (species and ecosystems) and the rational use of natural resources. If people want to ensure the welfare of present and future generations while improving the quality of life of today, then the implementation of the sustainability approach is inevitable. All these perspectives emphasize the impossibility of protection without targeted development to reduce the poverty of hundreds of millions of people (Demirayak, 2006).

At this point, it would be useful to point out the three basic principles of this movement, which emphasizes the interdependence between development and conservation:

- Characteristic/important ecological processes and life-support systems must be protected,
- Genetic diversity must be protected,
- The use of species and ecosystems should be sustainable.

National parks and other protection statuses that emerged with the spread of policies for the improvement and protection of the natural environment throughout the world in the 20th century have had an important share in the conservation approaches of countries. Especially in

ISBN: 978-625-8246-12-4

recent years, an increase has been observed in the number of protected areas all over the world, and while the protected areas in the world's terrestrial area covered approximately 1.78% in 1962, this figure increased to 15.4% by 2020 (Protected Planet, 2021).

In line with the increasing number of protected areas and the emerging need, the International Union for Conservation of Nature (IUCN = International Union for Conservation of Nature) was established in Switzerland in 1948. IUCN has developed an international protected area system guide to reduce diversity and disparities in protected areas, to establish an international monitoring, cooperation and monitoring system, to establish the conceptual framework and to carry out the protection function in practice. Regarding the classification of protected areas, IUCN created a standardization in the management of international protected areas by creating 6 different management classes for protected areas in 1994. In this classification, the basic approach for the management purposes of protected areas and the grading of human uses or activities in relation to these has been introduced (Gül & Metin, 2021).

Protected areas in different countries have a wide variety of management goals and approaches, and forms of administration. In terms of management objectives, protected areas have diversity range from strict non-human protection to cultural areas such as farms or managed forests (Dudley et al., 2005). Depending on the IUCN (World Union for Conservation of Nature) management objectives, protected areas; It has been divided into six categories: absolute nature reserve, wildlife area, national park, natural monument or feature, habitat/species management area, protected landscape/sea area, and protected areas managed for the sustainable use of natural resources. (Dudley, 2008).

2. Strategy and Policies on Protection in Turkey

Protected areas are protected for different purposes and used for different functions (Akyol & Akbulut, 2017). According to Eren & Bayrak (2021), protection of biological and cultural diversity, protection of water basins, protection of soil and coasts, ensuring the sustainability of natural resources, providing socio-economic contribution, and carrying out and supporting tourism, recreation and education activities, etc. functions create the purpose of protecting the protected area. Integration with social development processes is also envisaged in the conservation approach, policies and strategies. Protecting these areas requires deliberate efforts and planned action. All relationships, actions and services in protected areas should operate completely or under natural conditions as far as possible without human intervention (WWF-Turkey, 2020).

ISBN: 978-625-8246-12-4

It is a public service and duty to define, plan and control protected areas and assets that provide history, culture and ecosystem services. For this reason, the fact of protection is the primary duty, authority and responsibility of supranational and international institutions and national public administrations, as well as social responsibility. Raising awareness and education of the public on protection is also a part of this service and duty.

There are two dimensions of the concept of protection regarding protected areas: First; Protection of natural resources by international organizations and non-governmental organizations with strategies, policies and actions developed with the contributions of supranational, international institutions and non-governmental organizations (NGOs) and contracts, secondly; benefiting from protected areas on the basis of sectors or by their users for the purpose of sustainable development. The horizon of protection; Today, innovative corporate culture requires protecting it by using scientific methods and technically correct, effective, timely and appropriate interventions (Eren & Bayrak, 2021).

With the 1992 Rio Summit, it is seen that the studies in the area of nature protection and biodiversity conservation in Turkey with gaine momentum in the world. For this reason, 1992 can be selected as the starting time for Turkey in terms of general assessment in this area. Actually, it is meaningful to make such an assessment when looking at what has been done in Turkey in terms of international commitments after 1992. It is seen that the steps taken in 1992 and after are important in the area of protection. By accepting the final documents at the Rio Summit, Turkey has become a side to the agreements opened for signature in Rio of today and has made many international commitments in this context, especially on protected areas.

In addition to international conventions, many national level strategy and policy documents have been produced directly or indirectly related to the protection areas in Turkey, and permanent or temporary units have also been established in order to carry out the implementations in a healthy way. These contracts and documents are:

- National Environmental Strategy and Action Plan (NEAP)
- National Agenda 21 Document
- National Biodiversity Strategy and Action Plan
- National Action Plan to Combat Desertification
- National Plan for Conservation of Plant Genetic Diversity in Turkey (In-situ)
- Biodiversity Convention National Coordination Unit
- Black Sea National Action Plan

ISBN: 978-625-8246-12-4

- Black Sea Commission
- Mediterranean Strategic Action Program
- National Forest Program

Protected areas; It is governed by the duties, powers and responsibilities of the institutions defined in the legislation and by administrative procedures and methods (Sezen, 2017). The mentioned areas are; it is under the control of public institutions and organizations in many countries. In some countries; Conservation management can also be carried out by local governments, communities, NGOs, and in some countries, in partnership with public institutions and organizations with other actors. Protected areas in Turkey are managed by different public institutions.

3. New Management Approach in Protected Areas

It's a priority issue to make effective management plans for protected areas all over the world. The process of creating managements plans; It helps protected area managers to identify natural and cultural resources in the area, to identify threats to these resources, and to develop strategies and implementation plans for long-term conservation (Ervin et al., 2010). The management plan shows the desired future state of the protected area and the most effective and equitable way to achieve that future. It provides interpretation and integration of other plans and documents such as policies, treaties, strategies, investment plans and legal requirements. According to Eagles et al. (2002), management plans detail the specific goals and objectives established fort his area within the scope of the laws, regulations or government policies to which they are affiliated, and describe the objectives for an effective management and describe the management activities, the budget and financial management, the zoning of the protected area necessary to achieve these goals (Güneş, 2011).

In the traditional management forms applied in the process from the establishment of the National Parks, which is one of the first protection statuses, until the recent past; protected areas were protected in an approach where human activities were prohibited or strictly limited. Today, this approach has changed; It doesn't seem to be applicable in areas far from human settlements, where there is no population movement, where economic activity is low and/or where species need to be protected.

The results arising from the poor management of protected areas created for the sustainable use and protection of ecosystems and biological diversity have begun to be accepted as an indicator that traditional resource management models do not provide sustainability. Thus, especially

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since the 20th century, the destruction of natural resources and ecosystems has reached a much larger scale than seen in history. In this context, it has emerged that only legal protection status is not sufficient in areas where protection is required, and the necessity of using new protection and planning tools apart from traditional conservation approaches has emerged (Demirayak, 2006).

In recent years, the necessity of new protection and planning tools has come to the fore in nature conservation studies, instead of classical conservation approaches for protected areas. These new models are based on the management concepts of protected areas. Because it has been perceived that it is not possible to successfully manage protected areas in an approach that includes only protection and ignores the local people (Table 1). From the preparation process of the plans, which is defended as a requirement in the European Union Habitats Directives and the Convention on Biological Diversity, to the management of protected areas, the participation of stakeholders has now become the basic approach in nature protection. (Çevre & Orman Bakanlığı, 2007).

While determining a new approach, the emergence of past and present perspectives on protected areas in Turkey will contribute to the new approach. Changes in this perspective; it will give an idea about why a new approach is needed and how a new approach is created.

Table 1. New approach in protected areas (Phillips, 2002).

Protected areas in the past	New approach in protected areas
Opinion not to involve local people in planning and management system (people living in and around the protected area) (planning and non- involvement)	Participatory planning and management
Central management	Together with local government
Pure protection opinion	Managing social and economic goals
Self-improvement	Planning as part of national, regional and international systems
Management "like a separate island"	An intra-network development (strictly protected areas connected by green corridors and surrounded by buffer zones)
Protection due to its more visual, landscape-related features	Protection for scientific, economic and cultural reasons.
Management for visitors and tourists	Management with thinking more about local people
Insensitive management due to short-term approaches	Harmonious management in line with long-term approaches
Protection applications	In addition to protection; restoration and rehabilitation applications should be done
First of all, it's a national value	It is also seen as a social value

ISBN: 978-625-8246-12-4

Only areas of national interest	At the same time, areas of international interest

With a participatory approach; It is possible to evaluate the different characteristics of each protected area as an important opportunity that strengthen the practices, and by this means, it is possible to produce acceptable and applicable solutions to the problems of the protected area. In this context, participatory management plans, which are an indispensable element of effective protected area management, have gained importance as documents that harmonize the needs of interest groups with nature protection requirements. (Çevre & Orman Bakanlığı, 2007).

The decisions taken while creating the implementations to be put forward in line with the goals and targets of the management plan should have 3 important principles: sustainability, partnership-participation and scientificity (Özbay, 2008).

According to Geray & Küçükkaya (2011); Participation, and therefore reconciliation, which is vital for achieving sustainable development in areas including protected areas, should be secured as a continuous process. Participation, which is a requirement of a principled watershed management, is an important element that ensures the success of the planning committee and practitioners. However, for this;

- To successfully determine of sides and their representatives,
- Having a clear will and determination to discuss and solve problems,
- Preparing sufficient information about the problems,
- Ensuring that an institution or person does not have a sole role in solutions,
- There should be a setting in which specific issues of disagreement will be identified.

4. Discussion

Today, the increasing importance and contribution of natural ecosystem services within the framework of climate change and adaptation, and the spatial and numerical increase of protected areas reveal a more effective and rational planning and management that should be considered as a priority. Although protected areas in our country are declareted as protected areas by law, they generally do not have effective management and control mechanisms when considered with a completely traditional protectionist approacha and a central approach. In this sense, even the expression "paper parks" is used for natural parks. This situation causes conflict between the concept and status of protection and local communities in Turkey. For example, in the studies conducted on national parks, the deprivationof rights such as construction, grazing

ISBN: 978-625-8246-12-4

and forest cutting of the people living in the park and the surrounding villages, and the inability to provide alternative livelihoods fort he villagers, increase these conflicts (Tektaş, 2011). In line with the experience gained, most of the protected areas are integrated with the people and/or users living in that area or its immediate surroundings; It is seems that it is almost impossible to achieve success in protection without the participation of these persons/sides in the planning, implementation and management stages (Demirayak, 2006).

Although important steps have been taken in the preparation of national strategies and inter-institutional cooperation and coordination in internationally financed projects in Turkey, the absence of integrated regulations reduces the impact of many important steps taken towards protection and slows down the expected development.

The sustainability of processes such as the protection, conservation, planning/design, management etc. of natural and cultural areas primarily depends on the existence of holistic, harmonious, detailed and applicable legislation and the creation of a state policy. For this reason, it is of great importance to handle and revise the increasingly complex legislation in our country, to adopt and implement nature protection policies (ecological policies). On the other hand, Turkey has experienced a change that cannot be ignored, especially in the management and planning approaches of protected areas. Although there are well-intentioned and positive studies on this subject, the preparation of participatory management plans and the adoption of local management is a fairly new experience for protected areas in our country. The participatory management plans put forward with this new approach will be tools that define the policy, strategy and management programs of protected areas with dimension of sustainable development and ensure rational use. A successful management plan must also be acceptable to the community, thereby increasing its implementation potential. Disagreement prevention and reconciliation with interest groups, including local people, will depend on how the disagreement is managed, and disagreement resolution with a participatory approach will be possible.

Management plans prepared with a focus on communication with interest groups show them ways to benefit in harmony with nature. When the participatory approach is supported by training and awareness raising, information sharing and cooperation is ensured between interest groups and protected area management. In this direction, for a successful management in protected areas; It is inevitable to adopt a "participatory approach" that will ensure the cooperation and coordination of the local people and other stakeholders living in the region and

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its surroundings at every stage from the planning to the implementation of the management (Güneş, 2011).

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Current Situation and Evaluation of Tire (İzmir) Region in Terms of Gastronomy Tourism

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Abstract

Today, the tourism sector is considered the most important sector in the economic and social development of countries and regions with its many components and increasing experiential types and activities. In the process of tourism activities, meeting basic needs such as food and beverage and accommodation is considered the most important and compulsory service area of the destination areas. One of the popular and interesting elements in the tourism process is eating and drinking experiences. In this context, the increase in awareness of local and traditional foods and the fact that they started to attract more attention have brought gastronomic tourism to the fore. It can even be said that traditional local cuisine is considered to be effective on its own in the preference of tourism destination areas and ensuring mobility. Local cuisine certainly strengthens the statement that tourist destination areas are one of the important factors in determining the quality of tourism activities. Eating and drinking is no longer just basic need, it has become an important tool to understand and learn about the identity and culture of a destination. Gastronomy tourism has great potential in developing the local economy and promoting environmental sustainability, as well as in efforts to preserve local culture. Tire has rich potential for cultural tourism, rural tourism, agrotourism, and gastronomic tourism in terms of historical and cultural artifacts, handicrafts, various agricultural products, and rich cuisine. Tire's historical background has been reflected in its cuisine. Tire's traditional food and beverages show themselves as important cultural heritage values. The fact that Tire's. open street market, which is set up on Tuesdays, is considered the largest market in the Aegean region, is an indicator of diversity and wealth. The basis of Tire Cuisine is olive oil, herb dishes, red meat, and milk products. Tire is a weed paradise with its fertile plain watered by the Kaystros (Küçük Menderes) river for thousands of years and the Aydın Mountains on which it leans. In addition, the cultivation of all kinds of agricultural products and the development of milk and dairy products reveal its richness in terms of gastronomy. In this study, the traditional cuisine of the Tire Region, which is the pearl of the Aegean Region, was evaluated in terms of gastronomy tourism and holistic strategic actions were foreseen.

Keywords: Tire (Izmir), gastronomy, traditional cuisine, cultural tourism, strategic action

1. Introduction

Today, the tourism sector, with its many components and increasing types of experience and activities, is considered the most important sector in the economic and social development of countries and regions.

The concept of tourism is the experience and process of traveling from one's place of residence as a tourist to another. The changes in many areas such as the recent global epidemic (Covid19), the spread of digital and internet, and environmental problems have led to serious changes in the supply and demand relationship of the 21st century tourism industry. As a result, it has

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popularized new trends such as shorter and more frequent mobility to tourism destinations, and the desire to visit, explore and experience authentic and more exotic natural and cultural sites (López-Guzmán & Sánchez-Cañizares, 2012). In the process of tourism activities, meeting basic needs such as food and beverage and accommodation are the most important and compulsory service areas of the destination regions. One of the popular and interesting elements in the tourism process is eating and drinking experiences. In this context, the increase in the awareness of local and traditional dishes and the fact that they started to attract more attention have brought gastronomic tourism to the fore. Traditional local cuisine is very effective in choosing tourism destinations, determining the quality of tourism activities, and ensuring mobility. Eating and drinking is no longer just basic need, it has become an important tool for understanding and learning about a destination's identity and culture.

Eating is no longer just a basic need, it has become an important tool to understand and learn about the identity and culture of a destination. Tourism benefits from the attraction of gastronomy to create a destination area and increase its diversity (Göker, 2011, p.1-3; Küçükaltan, 2009, p.3; Selwood, 2003, p.179). Gastronomy tourism has great potential in developing the local economy and promoting environmental sustainability and efforts to preserve local culture.

Tire has rich potential in terms of cultural tourism, rural tourism, agrotourism, and gastronomy tourism in terms of historical and cultural artifacts, handicrafts, various agricultural products, and rich cuisine. Tire's historical past is also reflected in its cuisine. Tire's traditional food and beverages have significant cultural heritage value. The fact that Tire's open street market, which is held on Tuesdays, is considered the largest market in the Aegean region is an indicator of diversity and wealth. The basis of Tire Cuisine is olive oil, herb dishes, red meat, and dairy products. In addition, the cultivation of all kinds of agricultural products and the development of milk and dairy products reveal its richness in terms of gastronomy.

In this study, the traditional gastronomy values of the Tire Region, which is the pearl of the Aegean Region, were determined, evaluated in terms of integrative tourism, and future gastronomic tourism strategic actions were predicted

1.1. Gastronomy Tourism

It comes from the Greek words "Gastro" (stomach) and "Gnomos" (law and science). Conceptually, concepts are used such as; gastronomic tourism, culinary tourism, nutritional tourism, gourmet tourism, gastronomic tourism, and food tourism. Gastronomy is the science

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and art of eating and drinking that examines the relationship between culture and food (Kivela & Crotts, 2006; Güzel & Apaydın, 2016).

It is a form of appreciation for the process of cooking and serving food, gastronomy, and cuisine. Gastronomy reveals a common understanding of food and beverage consumption and food culture, especially when delicious food is consumed as a fine art form that is part of a superior lifestyle (Horn & Tsai, 2008).

Concepts such as 'gastronomy tourism', 'culinary tourism', 'nutritional tourism', 'gourmet tourism', 'gastronomic tourism', and 'food tourism' are used to describe the use of food for tourism purposes (Doğdubay & Giritoğlu, 2008; Kivela & Crotts, 2008; Lin et al., 2011; Mrkrecher et al., 2008; Tikkanen, 2007; Surenkok et al., 2010; Yüncü, 2010).

Gastronomy tourism is a type of tourism that supports other types of tourism, increases the preservation and sustainability of local cuisine and culture, increases sensory experiences, develops the local economy, and supports environmental sustainability.

- It is an important tool for understanding and learning about a destination's local identity and culture.
- They are cultural heritage values shaped by local lifestyles throughout history.
- It has tourist attractions for sensory (taste, smell, touch, sight, and hearing) experiences.
- It provides multifaceted added value that promotes the local economy, socio-culture, and environmental protection.

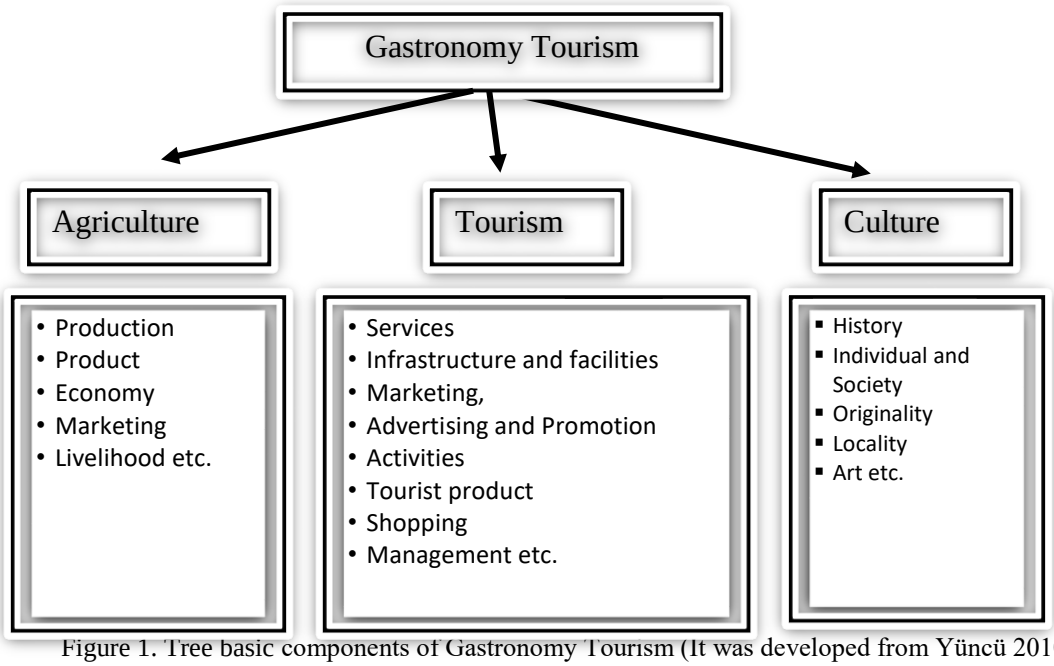


Figure 1. Tree basic components of Gastronomy Tourism (It was developed from Yüncü 2010)

ISBN: 978-625-8246-12-4

2. Materials and Methods

Tire has a variety of tourism potential (cultural tourism, rural tourism, agrotourism, ecotourism, gastronomic tourism, etc.) in terms of historical and cultural artifacts, handicrafts, various agricultural and animal products, natural beauty, climatic conditions, and rich local cuisine. To date, none of these types of tourism have been able to develop on their own and have not been evaluated.

3. Findings and Discussion

3.1. General Information of Tire

A Tire is approximately 80 km southeast of Izmir. Its altitude is 96m. There are Küçük Menderes Plain and Bayındır District in the north, Ödemiş District in the east, Selçuk and Torbalı Districts in the west, and Aydın Province in the South of Tire. The area of the Tire district is 792 km^2. The Tire has 66 villages. The population of the district is 84,457. The soil structure is sandy, and clayey and has a prairie floor appearance, and is very productive and suitable for growing a wide variety of crops. The Küçük Menderes river (175 m) plays a major role in the diversity of agricultural products. In terms of climate, summers are hot and dry, and winters are warm and rainy. The economy of the district is based on agriculture, trade, and industry. Among agricultural products, silage corn, wheat, barley, tobacco, sesame, and all kinds of fruits and vegetables are grown. Beekeeping is advanced. Fattening and dairy farming are very developed. Average daily milk production reaches 250 tons. A part of this production is offered for consumption as cheese, butter, yogurt, and ayran. In particular, it has 7,711 ha of meadows and pastures. Modern and technical methods are used in the agricultural sector. The majority of livestock enterprises in Tire are located in lowland villages and central district plains (Tire Belediyesi, 2020).

3.2.Tire Cultural Heritage Values

A Tire is one of the 30 districts of İzmir. It is the oldest settlement in Western Anatolia. The Tire region has hosted many civilizations in the past, including the Hittite, Phrygian, Lydian, Persian, Hellenic, Roman, and Byzantine periods.

- The name of the Tire is mentioned as Thira, Thyeira, Tyrha, Apeteira, or Teira in various sources.
- "The Neighborhood of the Monks" by the famous historian Pachmeres,
- The Byzantine historians "City of Monks"*
- 14. Century Ibn Battuta's "Ahi City",

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- "The Famous City of Rum" in the Şerafeddin Zafername,*
- "The City of Great Tire" in Evliya Çelebi's Travel Book,
- "Old Throne City" by Katip Çelebi (1608-1656),
- In the 1908 Aydın Province Yearbook, names were given as "Ulemas Bed".

Tire's tourism potential key components

- Cultural (Historical and architectural structures) values
- Local cuisine values
- Craft values
- Local Tuesday Market value
- Agricultural products (fruits and vegetables)
- Livestock products (meat, milk, and milk products)

Cultural (Historical and architectural structures) values: 14-15 century tombs (Balım Sultan, Rum Mehmet Pasha, Lütfü Pasha, Molla Mehmet Çelebi), 41 Mosques and Masjids (Green Imaret Mosque (1441), Yeni Mosque (16th century), Tahtakale Mosque (1401), Lütfü Pasha Mosque (16th century), Gazhane Mosque), There are many Mevlevihanes, Kutu Han and Arasta (1426-1444), Bedesten (15th century), 5 archaeological sites and 1 urban site, 418 immovable cultural assets, 1 Tire City museum, 2 libraries, 1 cultural center, 1 cultural event venue, 2 exhibition halls, 1 movie theater, 65 associations dealing with culture and arts, There are 4 foundations. Tire is on the Silk Road and the King's Road and is the gateway for the old clergy to Ephesus and the Virgin Mary Church.

Handicraft Tradition of the Tire: Ropery, municipal weaving, needle lace, quilting, horseshoeing, felting, saddlery, hot glass art with mandrelle in flame, pumpkin violin making, wickerwork, basketry, bellows boots, wood carving, tinsmithing.

Local Tuesday Market value: Tire Tuesday Market is the largest open-air market in the Aegean region and Turkey. It is the largest open-air market in the Aegean and even in Turkey, where the local producer and the local consumer meet, and has gained a touristic identity, albeit partially. Every week, more than 2 thousand tradesmen set up stalls in the Tuesday Market and it is spread over an area of approximately 3.5 km^2.

Agricultural products (fruits and vegetables): The total area of the district is 58,800 Ha. 46.4% of this area is cultural land. 55.2% of agricultural lands are irrigable lands. All kinds of agricultural products (figs, olives, chestnuts, pomegranates, walnuts, cherries, peaches, black mulberries, etc.) are grown. Tire, with its fertile plain irrigated by the Kaystros (Küçük

ISBN: 978-625-8246-12-4

Menderes) river for thousands of years, and the Aydın Mountains, is a herb and plant production paradise.

Livestock products (Meat, milk, and milk products): Ovine and bovine breeding, milk, and dairy products have a very high capacity in terms of production and diversity. The number of cattle is 127,627, small cattle (sheep and goat) is 63,992 pieces, poultry is 1.900 000 units, and annual milk production is 214,331 tons.

Tire is one of the most beautiful cities that attract attention with its history, culture, and natural beauty. It has rich touristic values with hundreds of historical buildings, museums, handicrafts, houses, bazaars, and food varieties.

As a result, the Tire region resembles an open-air museum with its deep-rooted past, unique cultural values, hosting holy places of different faiths, and aesthetic architectural texture (especially religious architectural structures) away from pretensions (Ataberk, 2017). It has a privileged location with its mountains, restaurants, and picnic areas where the ecological balance has not yet deteriorated.

To date, none of these types of tourism have been able to develop on their own and have not been evaluated. Tire's Tuesday Market, which has only daily visitor density, has gained fame.

3.3. Tire Local Cuisine

Tire's traditional food and beverages show themselves as important cultural heritage values. Tire's historical background is also reflected in its cuisine. Culinary culture based on natural herbs, vegetables, and animal products has created a great attraction for rural tourism with the opening of restaurants in some villages.

The basis of Tire Cuisine is olive oil, herbs, red meat, and dairy products. Tire is a grass paradise with its fertile plain irrigated by the Kaystros (Küçük Menderes) river for thousands of years and the Aydın Mountains on which it rests. In addition, all kinds of agricultural products (figs, olives, chestnuts, pomegranates, walnuts, cherries, peaches, black mulberries, etc.) are grown. Ovine and bovine breeding, milk, and dairy products have a very high capacity in terms of production and diversity. The basis of Tire Local Cuisine is olive oil, herbs, red meat, and milk products.

Types of Tire's Local Cuisine

- Meals
- Salad Types
- Soups

ISBN: 978-625-8246-12-4

- Beverages (Non-Alcoholic)
- Desserts
- Dairy Products

a. Meals

- **Tire Meatballs (Tire Köfte):** Meatballs prepared only from veal without any seasoning are passed on thin skewers and a slight pre-cooking is done. Meatballs taken out of skewers during service are cooked in copper pans with plenty of butter. Add peeled tomatoes into it. Yogurt is served on the serving plate first, and meatballs with tomato butter on it, and then chopped parsley is added and served. Yogurt can also be purchased separately upon request.
- **Kuyu Tandir Kebab (Tak Tak Kebab**): It is prepared by slowly cooking lambs under one year old in a tandoori well. Before the meat is shaken, the pot of the good soup to be prepared is placed in the well. While the kebab is cooking, the fat and water of the meat drip into the rice mixture in this pot, thus cooking the good soup. Tak tak kebab is named after the sound made when the cooked meat coming out of the tandoor is shredded on the cutting board.
- **Stuffed Bread (Ekmek Dolması):** The top cover of the bread is cut, the inside is hollowed out and the crumbs are separated and stuffed. Roast the minced meat, onion, spicy stuffing and add breadcrumbs and mix. The cooked stuffing is carefully filled into the bread. The lid is closed. Sauce with tomato paste and butter is poured on it and carefully steamed. Served by slicing.
- **Lamb Meat Sevketi Bostan (Kuzuetli Şevketi Bostan**): Şevketi Bostan is a delicious dish made with the root of this plant, which is a close relative of lamb meat, chickpeas, and kenger at the beginning of spring. The root of the Şevketi garden is removed from the soil, the bark is peeled and chopped. It is cooked with olive oil, onion, and tomato paste. It is cooked by adding selected and chopped Şevketi Bostan herb and water to cubed lamb meat that is roasted in olive oil in a pan. The dressing consisting of lemon juice and flour mixture is added to the dish close to the service.
- **Roasting Pulp (Posalı Kavurma):** It is a dish served by roasting in olive oil, ground beef, cut into cubes, with thyme, red pepper, and dried black mulberry.
- **Gylangı (Eggplant Fish) (Gıylangı -Patlıcan Balığı)**: It is an eggplant dish and takes place in Homer's epics as Lalegia or Lalagia. It is known as "Beyza-i Egg Lalengede-i Hassa" in the Ottoman Palace Cuisine in the 15th century. It is prepared by completely peeling and slicing aubergines, dipped in juicy yeast dough, and fried in hot oil.

ISBN: 978-625-8246-12-4

- **Lamb Kapama (Kuzu Kapama):** After the lamb meat in the casserole, which is covered in the middle of a large tray, is cooked in the oven, rice is added to the oil and water that accumulates on the sides and then baked again. After the rice is cooked, the casserole is carefully removed and served on the tray with the meat in the middle and the rice on the side.
- **Keskek (Keşkek):** It is cooked again with wheat that has been boiled separately and softened before, and lamb meat. After cooking, it is beaten with a wooden spoon for a long time until it becomes a paste. While serving, butter with tomato paste is also drizzled on it.
- **Stuffed Zucchini Flowers (Kabak Çiçeği Dolması**): It is prepared by carefully stuffing the olive oil stuffing mortar prepared with rice into the extracted pumpkin flowers and cooking them. It is served by drizzling yogurt and butter with powdered pepper on it.
- **Sinkonta Pumpkin Dish (Sinkonta Bal Kabağı**): Thinly sliced pumpkins are baked in the oven with a mixture of olive oil, garlic, onion, tomato paste, and spices. It is served with garlic yogurt and butter, sprinkled with ground pepper.
- **Herb Roasting (Ot Kavurma):** Midwife mulberry, nettle, chard, spinach, crow's feet, tangle, labada, poppy, goatee, radica (dandelion), coriander, etc. It is prepared by washing and chopping herbs and frying them with onions and olive oil. Since the herbs used in roasting change according to the season, roasting herbs are prepared differently in different seasons.
- **Spring Rolls (Kolböreği):** A soft dough is kneaded from flour, water, and salt. The meringues that are buttered and opened are placed on top of each other. For the stuffing, boiled potatoes are crushed and mixed with finely chopped parsley and other ingredients. The rolled dough is folded in a "D" shape, the inner material is placed and a roll is made. Brush with a mixture of egg yolk and olive oil and sprinkle with sesame and black cumin seeds. 35-40 minutes in the oven at 180 degrees is cooked.
- **Gazel Vaccine (Gazel Aşı):** It is prepared by frying the vine leaves with onion and tomato paste, and olive oil, and then adding chopped vine leaves, bulgur, rice, salt, and water.

b. Soups

- **Heybeli Soup(Heybeli Çorba):** It is a soup prepared with a mixture of bulgur, black-eyed peas, red lentils, shallots, garlic, tomato paste, spices, and olive oil. It is served with dried red pepper on top.
- **Tandir Soup (Tandır Çorbası):** A pot of rice tandoori soup to be prepared is placed in the tandoor well before the meat is shaken. While the meat is cooking, the oil and water drip into the rice mixture in this pot, and thus the tandoori soup is cooked.

ISBN: 978-625-8246-12-4

c. Salads

In Tire cuisine, salad is like an auxiliary dish. There are always salad varieties in Tire cuisine. The vegetables put in the salad are very diverse. Many plants growing in Tire (e.g. ivy, foxglove, mallow, pincushion, jingle, nettle, cibez, radish grass, kenger, Şevketi Bostan, halvacık, honey, radica, labada, rope, locust, stinging nettle, tangerine, chicory, mustard, vinegar, nightshade, cauliflower flower, gaymecik, chard, donkey halva, melange, a bell can, purslane, rocket, cress, dill, straining, cabbage sprouts, green onions, tomatoes, peppers, red cabbage, carrots, cucumbers, Leek, white cabbage, etc. are used for salad purposes.

Sometimes these herb mixtures are also roasted using olive oil and tomato paste. Sometimes these salads are mixed with onion, leek, radish, lemon, garlic, and salt.

Black mulberry and lemon are widely used in salads for sourness. Some of the vegetables and fruits included in the salad are lettuce, arugula, cress, dill, green onions, tomatoes, red cabbage, carrots, cucumbers, leeks, white cabbage, green apples, quince, vine sprouts, etc. In the spring, acacia or redbud flowers are also added to the salad.

- **Okma Salad Meal (Okma Salatası Yemeği):** It is a type of salad prepared with tomatoes, peppers, cucumbers, fresh mint, spring onions, parsley, dill, cottage cheese, and olive oil. It is another indispensable part of Tire cuisine as it is prepared in a short time and consumed fresh. Okma is a perfect summer food. The ancients of Tire say that the tomato to be put in Okma is rubbed by hand to extract its juice, and the curd should be crushed with a spoon. Olive oil, onion, mint, thyme, lemon juice, parsley, cucumber, and salt are added to this mixture and eaten by dipping.

d. Desserts

- **Black Mulberry Curd Dessert (Karadutlu Lor Tatlısı):** Black mulberry jam is placed on unsalted curd cheese. It is placed in walnuts on the base.
- **Keppat (Citrus) Jam (Keppat (Turunç) Reçeli):** The peel of the citrus fruit is thinly peeled, sliced, and boiled. The bitter water is poured and water is added to it. Sherbet is made with sugar and poured over it. Squeeze lemon juice on it.
- **Fig, Black mulberry, etc. Jams (İncir, Karadut vb. Reçelleri):** Jams are made from some fruits grown in Tire.

ISBN: 978-625-8246-12-4

e. Drinks

- **Subye Drink (Subye):** It is a drink obtained by thoroughly squeezing the dried melon seeds with the addition of water and granulated sugar and then straining. Rose water is added during the service. It is consumed cold.
- **Somata (Almond) Drink (Somata (Badem) İçeceği):** It is a drink obtained by boiling peeled bitter almonds with sugar and water. The dense mixture obtained from the almonds that release their milk is filled to about one-fifth of the glass and hot water is added to it. Served sprinkled with cinnamon.
- **Koruk Sherbet (Koruk Şerbeti):** The groves obtained from the Yediveren grove are cleaned, washed, and juiced. The pulp and seeds are separated by carefully filtering. By adding enough granulated sugar and water to the obtained verjuice juice, the verjuice sherbet is consumed cold.
- **Compote Juice (Hoşaf Suyu):** It is consumed as a beverage after fruits (e.g. grapes, plums, apricots, peaches, sour cherries) are boiled with sugar and water and cooled.
- **Pomegranate Juice and Syrup (Nar Suyu ve Ekşisi):** The juice is drunk by squeezing the pomegranate fruit. At the same time, pomegranate juice is boiled by squeezing, filtered and cooled in a jar and used as pomegranate sour sauce.

Dairy Products: It is generally consumed by making cheese (Tire cheese, Curd cheese, Mud cheese, etc.) and yogurt varieties from cow's milk.

ISBN: 978-625-8246-12-4

		
Lamb Kapama (Kuzu Kapama)	**Tire Meatballs (Tire Köfte)**	**Kuyu Tandir Kebab (Tak Tak Kebab**
		
Roasting Pulp (Posalı Kavurma)	**Stuffed Zucchini Flowers (Kabak Çiçeği Dolması**	**Keskek (Keşkek)**
		
Salad varieties	**Salad varieties**	**Lamb Meat Sevketi Bostan (Kuzuetli Şevketi Bostan**
		
Subye drink (Subye):	**Black Mulberry Curd Dessert (Karadutlu Lor Tatlısı):**	**Salad varieties**

Figure 2. Some types of Tire's local cuisine

ISBN: 978-625-8246-12-4

3.4. SWOT Analysis of Tire Gastronomy

Within the scope of the SWOT analysis of Tire Gastronomy, its strengths and weaknesses and external threats and opportunities are given in Table 1

Table 1. SWOT Analysis of Tire Gastronomy

Strength	Weaknesses
• It is a historical ancient city. • It has a rich tangible and intangible cultural heritage. • Local handicrafts are very rich• It has nearly 80 restaurants and restaurants. • "Tire Tuesday Market" is the biggest market in the Aegean region. • It has the attraction of attracting domestic and foreign tourism. • The villages of Tire are especially rich in historical and natural beauties, cuisine, and agricultural products. • District economy is based on agriculture, trade, and industry. • Modern techniques and agricultural methods are used in the agricultural sector. • Tire Organized Industrial Zone (has been operating since 1993. • Agriculture and animal husbandry are advantageous in terms of production • The quality of many agricultural products (figs, olives, chestnuts, pomegranates, walnuts, black mulberries, etc.) is high. • Climatic conditions are suitable for multicultural (polyculture) agriculture. • Beekeeping is advanced. • Fattening and dairy farming is very developed.-Has Turkey's largest Tire Dairy Cooperative In addition, other large milk production companies have facilities • There are 65 culture and art associations and 4 foundations in Tire. • A geographical indication registration certificate for Tire shish meatballs was obtained.	• Rich cultural tourism potential is not evaluated. • Tire has no integrated strategic tourism planning. • It is out of the İzmir and Aegean Tourism routes and has only a one-day tourism capacity. ▪ Gastronomy tourism is not integrated with other types of tourism. • The number of restaurants with the concept of local cuisine is very few and the variety of local cuisine is very limited. • Accommodation and transportation facilities are insufficient. • Tourism revenues are very low. Local product production and sales stands are insufficient. • Villages and farms are not used in any way for agrotourism and rural tourism purposes. • Tire's history and culture are not adequately promoted. • Employment for young people is very limited. This situation increases immigration. • There is a lack of social capital. •The dash local identity values have not been determined. •Cultural tourism inventory and database are insufficient. •There is no WEB-based cultural tourism and heritage information system. •Tire's tourism promotion and marketing are insufficient. • There are no programs such as Cultural Heritage, Cultural tourism, and Gastronomy tourism in Tire Vocational School. • The inventory of agricultural products is not up-to-date and adequate. • The number of Rural Agricultural Development Cooperatives is insufficient. • Agri-industry infrastructure, facilities, cold air, and packaging are insufficient. • Efficient agricultural lands in urban and rural areas are being developed. • There is insufficient trained and qualified personnel in the local cuisine. • Gastronomy vocational training and training of qualified personnel are insufficient. • The number of foreign tourists is almost negligible. • Tourism income is very low. • There are no tourism activities (farm tourism, agrotourism, ecotourism, etc.) in rural areas. There is no Caravan campground.

ISBN: 978-625-8246-12-4

Opportunities	Threats
•Tire is very close to İzmir City Centre, Kuşadası, and Selçuk tourism centers. •Tire is close to Birgi (Pyrgion) village and other historical villages, which are popular for cultural tourism and have historical value and civil architecture. • The interest in agricultural support programs and organic agricultural products has increased in Turkey. • The Ministry of Agriculture and Forestry provides financial support to farmers for agriculture. • İzmir's country-wide food production has an important place for policies. • Interest and support for agro-tourism, farm tourism, and ecotourism are increasing. • Turkey Tourism 2023 Vision has guiding principles for the development of Tire tourism. • It is very close to Izmir Adnan Menderes Airport (60 km away) • Metro transportation is available from Izmir city center to Tire. • Selçuk Tire double road works continue. E.U. There is a Tire Vocational School. etc.	• Constructions in and around agricultural areas may damage fertile agricultural lands in this region. • The possible effects of global climate change may damage agricultural and animal products. • Urbanization, high cost of living, food scarcity, production and consumption trends, increase in production costs, etc. may adversely affect the local cuisine. • Increasing migration from Tire to urban areas may reduce the young workforce. • The opening of fast food establishments can negatively affect local cuisine. • It can reduce the local economy by seizing gastronomic tourism of non-regional investors.

3.3 Tire Gastronomy Tourisim Strategic Action Plan

"Preserving the local and authentic culinary values of Tire, evaluating it in terms of gastronomic tourism, and ensuring sustainability" has been envisaged as a strategic target as a result of observations and investigations with SWOT data for Tire Gastronomy Tourism. To achieve this strategic goal, 7 goals and actions/programs for these goals have been proposed (Table 2).

Table 2. Strategic Action Plan for Tire Gastronomy Tourism

Strategic Target: Preserving the local and authentic culinary values of Tire, evaluating it in terms of gastronomic tourism, and ensuring sustainability	
Purpose 1: Making a holistic cultural tourism action plan for Tire and integrating it with gastronomy tourism and other types of tourism	
Actions/Programs•	• A detailed inventory of cultural tourism (especially gastronomy and other) values should be made, • The digital database should be created in the GIS environment• Gastronomy tourism routes should be created for the Tire region and associated with Izmir and the Aegean Region. • The local identity values of Tire should be determined.
Purpose 2: Production and cultivation of local cuisine and products	
Actions/Programs	• The cultivation of local products in the agricultural areas in and around the city center should be encouraged. • Financial support should be given to domestic producers. • The supply and use of local plant seeds and materials should be encouraged. • A local seed bank should be established. • Organic farming techniques should be expanded in agricultural areas. • Quality and safe food production should be encouraged and food certification should be initiated.

ISBN: 978-625-8246-12-4

	• Local product pattern planning should be done for each village in the Tire region according to the current conditions (climate, soil, topography, etc.). • A geographical indication registration certificate of Tire shish meatballs has been obtained and initiatives should be taken in other local foods. • Agroforestry systems production techniques should be preferred in marginal and vacant lands in rural areas. • Support should be given to sheep and cattle farms. • Pasture areas should be improved and their quality and yield should be increased. • The production of forage crops should be encouraged. • Local product branding efforts should be expanded.
Purpose 3: Processing, storage, shopping, and distribution organization of local food products	
Actions/Programs	• Agricultural and food raw materials should be converted into value-added products ready for the market or sale. • Infrastructure and facility needs must be met to process the products. • The number of Rural Agricultural Development Cooperatives should be increased and a family business union should be established. • It should be ensured that the products produced are made through cooperatives and family businesses for retail and wholesale sales. • Local product sales stands should be established. • The number of restaurants with the concept of eating local products should be increased.
Purpose 4: Recovery and conversion of organic waste and residues that may arise before and after production, consumption of local foods, and their conversion into added value	
Actions/Programs	• Food-borne organic waste and residues should be converted into compost fertilizer. • Organic compost fertilizer facilities and warehouses should be established. Municipalities and official institutions should take the necessary initiatives in this regard. • Waste and residues should be used to provide food for street animals.
Purpose 5: Making a holistic cultural tourism action plan for Tire and integrating it with gastronomy tourism and other types of tourism	
Actions/Programs	• Courses for local culinary masters should be organized • Educational activities on different subjects should be organized for restaurant owners and employees. • • By associating the gastronomic tourism activities of Tire Tuesday Market, the tourists should be provided with sensory experiences. • • Gastronomy-related competitions, scientific congresses, panels, workshops, festivals, etc. events should be organized by universities, municipalities, district governorships, official institutions, local producers, restaurant managers, NGOs, and all relevant stakeholders. •
Purpose 6: Promotion and information marketing for gastronomic tourism	
Actions/Programs	• Visual and written materials should be prepared. • A web design should be made for Tire's local cuisine values and it should be shared with social media accounts. • Gastronomic societies should be established within the scope of the slow food concept. • Tourism agencies and guides should be invited to Tire and promoted. • Documentaries about the local cuisine of Tire should be prepared.

ISBN: 978-625-8246-12-4

	• It should be promoted by participating in national and international exhibitions and festivals. • It should be ensured that movies and TV series are made for the culture and gastronomy tourism of Tire.• •
Purpose 7: Organizing governance within the scope of Tire holistic culture tourism (all types of tourism)	
Actions/Programs	• Tire's Culture and Tourism Management/Governance organization should be established and Tire District Culture and Tourism Directorate should be in the position of Coordinator. • The governance organization must be effective, broadly participatory, sustainable, have authority and responsibility, and comply with the legislation. • Tire tourism advisory board should be formed, which consists of relevant stakeholder representatives affiliated with these coordinators. • Tire Tourism Directive should be established within the framework of current legislation. • Gastronomic tour programs should be organized with the coordinator and relevant stakeholders.

4. Conclusion and Recommendations

The tangible and intangible cultural heritage values of Tire will add multifaceted added value to the region in terms of protection and sustainability as a result of its evaluation within the scope of tourism.

In terms of the resource values of the Tire region, each of the tourism types such as cultural tourism, gastronomic tourism, agrotourism, ecotourism, and rural tourism, according to their realities; space, products, services, and activities should be integrated and associated and planned.

Gastronomy tourism provides an important advantage in competitiveness in touristic destination areas. For this reason, strategic actions and policies should be developed for the gastronomic tour of the Tire region by considering tourism, agriculture, and cultural values as a whole. The strategic targets/purposes and actions for Gastronomy tourism mentioned above are guiding. In fact, with the participation of relevant stakeholders, strategic actions and decisions should be developed, and authorities and responsibilities should be defined and put into practice.

For the Tire region to become a tourism destination area, there is a need for an authorized and responsible governance organization.

Thus, a holistic tourism framework should be created and planning, design project, implementation, monitoring, control, promotion, marketing, and coordination activities should be carried out from a single source.

The above-mentioned strategic goals/objectives and actions should be considered and developed and implemented.

ISBN: 978-625-8246-12-4

A geographical indication registration certificate must be obtained for unique products related to the local identity of Tire. Training activities promoting Tire cuisine should be organized for relevant stakeholders. Strategic actions for the promotional activities of Tire gastronomy should be implemented. As a result, the sustainable tourism policy of the Tire region should create a brand and add value within the framework of the goals of protecting, keeping alive, using by preserving, saving, sustainable, income generation, and employment.

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Evaluation of the National Park Concept and Management in the Context of Rural Settlements

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Abstract

The concept of national park emerged in the 19th century with the idea of protecting nature and natural resources. After the first national park announcement in America, many natural areas were declared as national parks in Australia, Canada, New Zealand and European countries. In these protected areas, scientific research and the use of these areas for touristic purposes are allowed. The development of protected areas on a national scale started in almost similar periods, although not with an advanced system as in the international arena. With the Forest Regulation issued in 1870, it was aimed to use forests in a controlled manner. In the Republican period, the concept of national park was officially used for the first time in Article 25 of the Forest Law No. 6831 enacted in 1956, and many areas were declared as national parks in the following years. In 1983, the National Parks Law No. 2873 was declared and and with this law, national park areas were defined and conservation principles were determined. National Parks do not only contain natural areas, but also rural settlement areas can be found within the borders of national parks. In this context, the activities of those living in rural settlements within the boundaries of protection are restricted within the framework of the law. Recently, some legal changes and regulations have been made, taking into account the demands of the people living in these regions. Within the scope of the study, evaluations will be made on the rural settlements within the borders of the national park through the legal regulations and the news reflected in the press. Finally, solutions will be offered to establish the balance of protection of rural settlements in the national park and to be an alternative to the problems experienced.

Keywords: National Park, rural settlement, rural heritage, conservation of rural heritage.

1. Formation of The National Park Concept

It is known that certain areas have been protected for religious and traditional reasons in various parts of the world since prehistory. However, the development of the concept of nature protection, as it is known today, emerged as a means of protection against the rapid depletion of forests in the post-industrial era. Today, the protected area; It is defined as a geographical area defined and managed by legislation in order to ensure the long-term protection and continuity of ecosystem services and cultural values with nature (URL1).

Yellowstone National Park (Figure 1) in the USA, which was declared a national park in 1872, is the first example of the use of a protected area as a national park. After the first national park declared in America, Royal National Park in Australia in 1879, Banff National Park in Canada in 1885, Tongariro and Mexico National Park in New Zealand in 1897 were declared (Sıvalıoğlu, 2012). In Europe, 11 national parks were declared until World War I. Until World War II, this number reached 31 in Europe and 300 in the world. While national parks in the USA have the idea of protecting large natural areas by closing them to visitors, scientific research and the use of these areas for touristic purposes have been allowed in Europe by prioritizing the human-nature relationship (Yücel & Babuş, 2005).

ISBN: 978-625-8246-12-4



Figure 8. Yellowstone National Park, USA
https://www.nationalgeographic.com/yellowstone-national-park/

Although national regulations were made in the name of nature protection in different parts of the world in the 19th century, systematic nature protection studies were carried out in the international arena in the middle of the 20th century. In this context, the International Union for Conservation of Nature (IUCN) was established in 1948 in order to coordinate, classify and promote nature conservation at the international level. The Union brings together governments, non-governmental organizations, scientists and experts under the umbrella of protecting natural life. On behalf of Turkey, the Ministry of Agriculture and Forestry officially became a member of IUCN in 2004, and various non-governmental organizations from Turkey are also members of the union (URL2) (Figure 2).

ISBN: 978-625-8246-12-4

Doga Dernegi (BirdLife Turkey) *Nature Society (BirdLife Turkey)* (DD)	National non-governmental organization	*West Europe* **Turkey** Izmir
Doga Koruma Merkezi Vakfi *Nature Conservation Centre Foundation* (DKM)	National non-governmental organization	*West Europe* **Turkey** Ankara
Dogal Hayati Koruma Vakfi - WWF Türkiye *World Wide Fund for Nature - WWF Turkey* (WWF Turkey)	National non-governmental organization	*West Europe* **Turkey** Istanbul
Ege ve Marmara Çevre Belediyeler Birligi *Union of Municipalities for Aegean and Marmara Environment*	National non-governmental organization	*West Europe* **Turkey** Edremit
KuzeyDoga Dernegi *KuzeyDoga Society* (KuzeyDoga)	National non-governmental organization	*West Europe* **Turkey** Kars
Ministry of Agriculture and Forestry	State	*West Europe* **Turkey** Ankara
Türkiye Erozyonla Mücadele, Agaçlandirma ve Dogal Varliklari Koruma Vakfi (Tema Vakfi) *Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats (Tema Foundation)*	National non-governmental organization	*West Europe* **Turkey** Istanbul
Türkiye Tabiatini Koruma Dernegi *Turkish Association for Conservation of Nature and Natural Resources* (TTKD)	National non-governmental organization	*West Europe* **Turkey** Ankara

Figure 9. Member institutions and organizations from Turkey to the World Union for Conservation of Nature and Natural Resources
https://www.iucn.org/about/members/iucn-members

The World Union for Conservation of Nature and Natural Resources works on a wide variety of themes related to conservation, environmental and ecological issues, one of which is protected areas. Protected areas are divided into six categories and the second category is national parks. Under the Union, a national park commission was established in 1958, and the definition of the concept of national park was adopted internationally in 1960. Accordingly, the national park; are parts of nature reserved for the purposes of preserving the ecological integrity of one or more ecosystems for present and future generations, preventing the invasion and exploitation of the natural environment, and establishing the development of science, education, recreation and visitor activities in harmony with the environment (URL2).

According to The World Union for Conservation of Nature and Natural Resources, the purposes of national parks are:

ISBN: 978-625-8246-12-4

• Ensuring that areas representing physiogeographic regions, including biotic communities, genetic resources and undisturbed natural processes, remain as natural as possible,

• Contribute to the conservation of large-scale species, regional ecological processes and migration routes,

• To carry out visitor management in order to organize cultural, educational and recreational activities at a level that will not cause biological and ecological deterioration of natural resources,

• To regulate the needs of local and local people in a way that does not conflict with the basic management objectives,

• To contribute to the local economy through tourism.

According to The World Union for Conservation of Nature and Natural Resources, the national park criteria are as follows:

• The area should be rare in terms of natural, cultural or recreational resource values.

• The area must need protection.

• The area must be protected (suitable for protection – the source values are not destroyed).

1.1. The Formation of the Concept of National Park in Turkey

The development of protected areas on a national scale started in almost similar periods, although not with an advanced system as in the international arena. With the Forest Regulations issued in 1870 during the Ottoman period, it was aimed to use forests in a controlled manner. The regulations made according to the regulation are as follows (Koç, 2005):

• Preventing indiscriminate use of state-owned forests

• Legal and controlled regulation of uses

• Making forests serve the commercial goals of the state

• To discourage the use of forests as pasture

• Instilling an awareness of evaluation as a whole with all the assets above and below the forests.

• Introducing a penal system for exploitation in forests

In the Republican period, Forest Law No. 3116 was enacted in 1937.[1] In the fifth part of the law, there are articles on the protection of forests.

The concept of national park was mentioned for the first time in 1949 in the work titled "We versus Nature Conservation and Our Forestry" by Istanbul University Faculty of Forestry Professor Selahattin İnal. In 1956, the Forest Law published in 1937 was repealed and the Forest

[1] Forest Law No. 3116 dated 8/2/1937

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Law No. 6831[2], which is still used today, was published. The concept of national park was used officially for the first time in Article 25 of the Law. According to Article 25, the forest areas deemed necessary by the General Directorate of Forestry can be arranged as national parks in order to allocate them for the benefit of science, to preserve the nature, to ensure the beauty of the country, to meet the various sports and recreational needs of the society, and to allow touristic activities. Accordingly, in 1958, Yozgat Çamlığı National Park was declared as the first national park of the country, and in 1959, the 'Regulation on Separation, Administration and Operations of National Parks' numbered 6885, which regulates the operation, was published. The National Parks Department was established in 1965, and the General Directorate of National Parks and Hunting was established in 1976, which forms the infrastructure of today's General Directorate of Nature Conservation and National Parks.

From 1958, when the first national park was declared, until 1983, when the National Parks Law was enacted, 14 more national parks were declared. These areas are different types of protection areas that include archaeological sites, natural sites and historical sites. In 1983, the National Parks Law No. 2873[3] was proclaimed, the purpose of the law was explained in the 1st article of the law, and the national park was defined in the 2nd article. Accordingly, the purpose of the Law is to regulate the principles regarding the selection and determination of national parks, nature parks, nature monuments and nature protection areas with national and international values in our country, their protection, development and management without deteriorating their characteristics and characteristics.

A national park, on the other hand, refers to natural and cultural resources, which are rare nationally and internationally, and natural parts with protection, recreation and tourism areas in terms of scientific and aesthetics.

In the 6th article of the National Parks Regulation[4] published in 1986, the National Park and Nature Park Criteria are defined as follows:

1 - Natural and cultural resource value and recreational potential should have characteristics and importance at national and international level.

2 - Resource values must be of such importance that future generations will inherit and be proud to own.

[2] Forest Law No. 6831 dated 31/8/1956
[3] National Parks Law No. 2873 dated 9/8/1983
[4] National Parks Regulation dated 12/12/1986 published in the Official Gazette No. 19309

ISBN: 978-625-8246-12-4

3 - Resource values must not be destroyed or be in a condition that can be improved by technical and administrative interventions.

4 - In terms of the size of the field and the concentration of the resource values, excluding special cases and islands, it should be at least 1000 hectares and this area should consist of protection-weighted zones. Administrative and touristic development areas are excluded from this minimum site size.

National park areas can also contain protected areas. Among the national parks in our country, there are also protection areas such as natural sites, archaeological sites, urban sites, historical sites, registered cultural assets and protection areas, tourism development zones, historical site protection areas, martyrdom and bastion protection areas, and special environmental protection areas. Within the national parks, there are also rural protected settlement areas and cultural landscape areas where natural and cultural elements are located together, but these concepts are not yet defined in our conservation legislation. The management of national park areas, which contain protected areas of different nature, has also been undertaken by different institutions. Regarding natural areas, natural protected areas and special environmental protection areas are under the authority of the Ministry of Environment and Urbanization, while protected areas covering cultural assets are under the authority of the Ministry of Culture and Tourism; The nature protection area, national park, nature park and nature monuments declared in accordance with the law numbered 2873 are under the authority of the Ministry of Agriculture and Forestry.

2. Planning and Management of National Park Areas

The National Parks Department under the General Directorate of Nature Conservation and National Parks conducts and supervises the works related to the identification, protection, development, promotion, management, operation and operation of national parks, nature parks, natural monuments, nature protection areas and wetlands (URL 3). General Directorate of Nature Conservation and National Parks also carries out the obligations of projects such as UNESCO, RAMSAR and Barcelona conventions and the Global Environment Facility (GEF) to which Turkey is a party in nature conservation on behalf of Turkey.

According to Article 3 of the Law, while national park areas were determined by the decision of the Council of Ministers, these areas are determined by the decree of the President of the Republic with the decree law numbered 700 published in 2018. According to the planning principles in Article 4, the development plan covering the establishment, development and operation of the places determined as national parks, considering the characteristics and

ISBN: 978-625-8246-12-4

qualities of the places determined as national parks, with the positive opinions of the relevant ministries and their actual contributions when necessary, Agriculture and Forestry. It is prepared and put into effect by the Ministry of Environment and Urbanization.' According to this plan, for the places that will be subject to settlement and construction, zoning implementation plans are prepared in accordance with the provisions and decisions of the development plan and enter into force with the approval of the Ministry of Environment and Urbanization.

According to the law, long-term development plans should be prepared in national park areas. It is an ecosystem approach plan in which technical, social, economic, action and management models are determined and relations are established in order to protect and develop the resource values and ensure their long-term sustainability, taking into account the characteristics and qualities of the protected areas. (URL 4). The objectives of the plan are to ensure the continuity and development of resource values, to develop land use decisions that will ensure the balance of protection and use, to observe the socio-economic development of the local people, to establish the technical, administrative and legal basis for the applicable plan. Long-term development plans consists of three stages: analytical study, synthesis and planning (Öztürk). The analytical study phase includes a detailed examination of the natural, historical, cultural and socio-economic structure of the area, its administrative and legal situation, its technical and social infrastructure and environmental problems. In the synthesis part, the data obtained is evaluated and planning is made in the light of the data obtained finally.

3. Recent Legal Changes in National Park Areas

There have been many legal arrangements made and planned to be made, especially in the last period, regarding the national park areas. Some of these regulations were made as a result of the demand from the public, and some of them were realized as a result of the decisions from the top despite the objections of the people.

One of the mentioned legal regulations is the sentence added to Article 5 of the National Parks regulation in 2014. The additional sentence is as follows: "The condition of a long-term development plan is not required for the facilities whose construction is urgent in terms of drinking water supply and which is indispensable and a definite necessity in terms of public interest. These facilities, which are built after the opinions of the relevant institutions are taken, are included in the long-term development plans." The phrase "…and in terms of public interest…" in this sentence, which was added later to the regulation, has been found open to

ISBN: 978-625-8246-12-4

abuse because it has a very wide scope (URL 5). In addition, since it is stated in Article 4 of the National Parks Law that no investment in park areas will be allowed unless there is a long-term development plan in national parks, it is seen that this phrase added to the regulation is also against the law**.**

Another legal regulation that has not been approved yet but is planned to be made is related to institutional functioning. According to the draft Presidential Decree issued in 2019, it was proposed to close the General Directorate of Nature Conservation and National Parks and distribute them as departments within the General Directorate of Forestry. A situation similar to the planned change was experienced in 1982. The General Directorate of Nature Conservation and National Parks was closed due to the merger of the Ministry of Agriculture and the Ministry of Forestry and was organized as the National Parks Department under the General Directorate of Forestry. This period, when the institution was reduced from the level of the General Directorate to the level of the head of the department, became one of the most ineffective periods in terms of nature protection in the country, and in 1991, this institution was raised to the level of the general directorate again (URL 6). The repetition of this decision, which was implemented in the past and with negative results, cannot be considered a positive development in terms of ensuring the effective protection of the areas that need protection in our country.

Another issue regarding legal regulations is the abolition of national park status. With a law enacted in 2014[5], the national park status of the Gallipoli Peninsula Historical National Park was abolished, and this area was connected to the Gallipoli Historical Site Presidency[6] of the Gallipoli Wars. In 2019, with the Presidential Decree, Göreme Valley National Park was removed from the status of a national park and the area was connected to the Cappadocia Historical Site Presidency. With the definition of the presidency of the historical site, which had no legal equivalent before, the protected areas under the common authority of different ministries were gathered in one hand. This situation has the potential to have positive or negative effects depending on the operation. While the decisions to be taken in these areas were concluded with the opinions of different ministries, in the current situation, they will be finalized as a result of the decision of the presidency of the area. It can be seen as a positive

[5] Law No. 6546 dated 19/6/2014 on Making Some Arrangements Regarding the Gallipoli Historical Site of the Gallipoli Wars
[6] With the Law on the Cappadocia Area dated 23/5/2019 and numbered 7174, the issues regarding the protection of this area are regulated.

ISBN: 978-625-8246-12-4

development that the current situation shortens the decision processes, so that conservation practices are started in a short time regarding the areas to be protected. However, there are also concerns that the sole discretion of the decision could lead to abuse.

4. Rural Settlements within the Boundaries of the National Park

The following statement is included in Article 5 of the National Parks Regulation: '...If the regular agriculture and existing settlement areas and the rural landscape texture surrounding them do not conflict with the protection and evaluation of cultural and natural resources, these land uses are required in their plans to ensure their continuity. provisions are introduced and private property dispositions may be allowed according to these provisions.' In the 14th article of the relevant law, there is the phrase "...the settlements cannot be made outside the existing settlement areas in these areas." According to the legislation, the continuity of the settlements formed within the borders of the park before the national park announcement date was decided and the formation of new settlement areas was prohibited.

Although the legislation allows the continuity of these settlements, living according to the national park restrictions causes some difficulties for the local people living in these areas. In particular, the people living within the borders of the national park, which was declared in relatively old times, are demanding that the boundaries of these areas be changed and their settlement areas removed from the borders of the national park through the local government. In this context, the borders of the Başkomutan Historical National Park, which was declared a national park in 1981, were narrowed with the decision of the Council of Ministers[7] dated 2016, and many settlements were deported. According to the decision, Kütahya Dumlupınar district and Zafertepe Çalköy and Afyon's Büyükkalecik Town, Kışlacık District, Küçükkalecik Village and Kayadibi Village settlements were removed from the borders of the national park. Point focal points such as Şehitlik, Atatürkevi and Müzepark located in Dumlupınar district are left within the border (URL 7). A similar situation in the Başkomutan Historical National Park was experienced in the Beyşehir Lake National Park, which was declared a national park in 1993. 21 settlements and agricultural areas around Beyşehir Lake have been removed from the borders of the national park (Figure 3). According to the news in the press, this situation is welcomed both by the local government and by the people living in these areas (URL 8). This situation arises as a result of the fact that the protected areas are not managed well and therefore

[7] Decision on Changing the Borders of the Başkomutan Historical National Park dated 28/11/2016 and numbered 2016/9591

ISBN: 978-625-8246-12-4

the local people see these areas as a problem and do not adopt them. There are many settlements with qualified building stock among the places removed from the borders of the Başkomutan National Park and Beyşehir Lake Historical National Park. Currently, the protection status of these areas has been lifted and these areas are faced with threats such as deterioration of the traditional texture, new and unqualified construction.

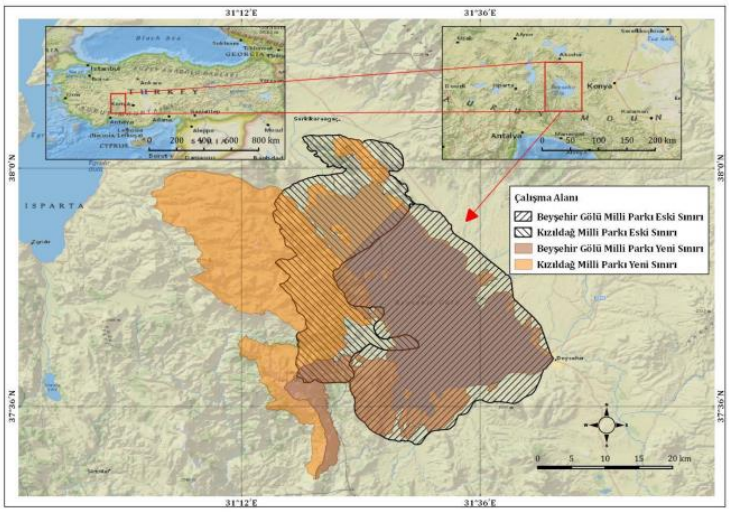


Figure 10. Beyşehir Lake National Park old and new borders (Örücü&Arslan, 2020)

The examples mentioned above are the national park areas that were declared close to 1983, when the National Parks Law was adopted. The Sakarya Meydan Muharebesi Historical National Park, which was announced in 2014, has been declared in 14 parts and has been the most fragmented national park area to date (Figure 4).[8] Although there is no restriction on the existence of privately owned settlements in the national park areas according to the legislation, due to the problems experienced in practice, an arrangement was made in such a way that the settlement areas were excluded while this area was announced. However, this multi-part structure, which is spread over a wide geography, is expected to create management problems (Serter, 2020). In addition, some regions that are outside the national park and constitute a resource value for this area are excluded from the national park boundary. These areas are Alagöz Village and Headquarters Museum, Malıköy Station, Sakarya (Tırnaksız) Village, where Halide Edip Adıvar Museum is located, and Ahırlıkuyu Village.

[8] Sakarya Meydan Muharebesi Historical National Park decision dated 29/12/2014 and numbered 2014/7152

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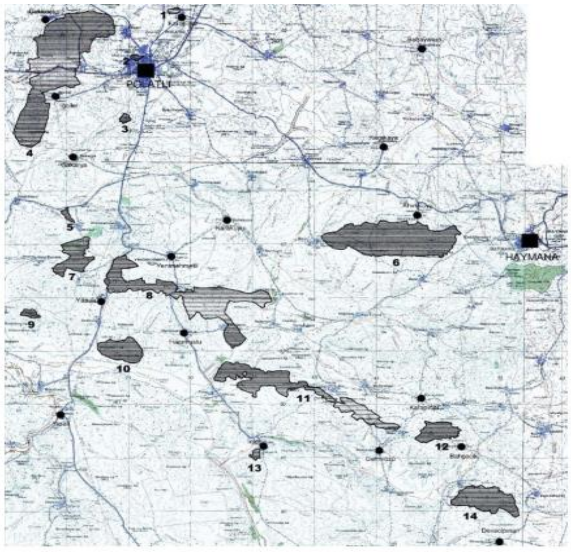


Figure 11. Sakarya Meydan Muharebesi Historical National Park Borders

The paragraph added to the 16th article of the law in 2005 is as follows: '…in order to ensure the effective implementation of the visitor management plans and to inform the visitors coming to the protected areas correctly and to minimize the losses of the local people who are adversely affected by the protected area management, Ministry of Forestry and Water Affairs does the necessary work in cooperation with the relevant institutions and organizations for the training of local people as field guides.' Accordingly, a step has been taken to address the victimization of the local people, but this well-intentioned approach is not sufficient.

Based on the examples mentioned, the problems experienced by the residents living within the borders of the national park are as follows: Repairs and renovations in their homes are subject to permission; the construction of houses or service structures such as barns for the shelter of animals is prohibited due to the new building ban; infrastructure problems experienced by settlements, especially in the archaeological site; limited job opportunities within the park boundaries; The problems encountered with the national park management while doing animal husbandry or agriculture are the economic problems experienced and the young population having to migrate. Depending on these problems, the threats waiting for the settlements within the national park area; dehumanization, the removal of legal protection of residential areas as a result of pressure, the opening of agricultural areas and pastures for construction over time, the deterioration of qualified rural settlements and cultural landscape, and the local people seeing the protection of natural and cultural assets as a problem.

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5. Conclusion and Recommendations

Protected areas are also areas where human activities are restricted. It is essential to establish a balance between the activities of the inhabitants of the settlements in these areas and the conservation efforts. Otherwise, in the context of the problems and threats mentioned in the previous section, there is a possibility that these areas will lose their protection status over time and that there will be situations such as the loss of qualified areas. In this context, it is important that the local people living in these areas embrace the area they live in and raise awareness about the protection of this area. For this, the public should be active in the planning processes and participatory planning[9] strategies should be adopted.

While ensuring the protection of natural and culturally qualified areas, it is the responsibility of the institutions responsible for the planning and management of these areas, at the same time considering the socio-economic status of the people living in these areas, addressing all their needs in integrity. Alternative livelihoods for people living in these areas should be put forward and sustainable development approaches should be adopted. Sustainable development is possible with the sustainable use of ecological, social and cultural resources. In this context, tourism can be adopted as a tool in sustainable development to meet the needs of the protected area.[10] However, the important point here is that tourism provides equal socio-economic benefits to the stakeholders. In addition, it is important that these rural settlements within the national park areas continue their basic economic activities such as agriculture and animal husbandry as well as tourism. The fact that tourism becomes the only source of income will cause these areas to lose their rural characteristics. In this context, ensuring the protection of intangible heritage is another important issue.

It is important to provide a balance between protection and use in national parks and other protected areas and needs to be well planned and managed. However, another issue as important as this is to explain this balance well to the local people. It is important for the public to understand, raise awareness, and transfer this awareness to future generations, that protected areas are a universal heritage and are not an obstacle to development.

[9] T.R. The Ministry of Environment and Forestry and the General Directorate of Nature Conservation and National Parks prepared a Guide for Protected Areas Management Planning in Turkey in 2006.
[10] T.R. The Ministry of Environment and Forestry and the General Directorate of Nature Conservation and National Parks prepared a Sustainable Tourism Development Strategy Guide in and Around Protected Areas in Turkey in 2007.

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URL 3. https://www.tarimorman.gov.tr/DKMP/Menu/16/Teskilat-Yapisi

URL 4. https://www.tarimorman.gov.tr/

URL 5. https://www.arkitera.com/haber/milli-parklar-da-elden-gidiyor/

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Nature Walk (Hiking) Route Action Planning; Isparta Example

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Abstract

Nature walks are activities that are suitable for age groups and organized according to certain distances in natural conditions. There are different types of walking in nature. Hiking means a nature trip and is a daily walk in nature that starts in the morning and ends in the evening. Trekking, on the other hand, is an activity with camping, that is, a boarding trekking and accommodation activity in nature. The expedition, on the other hand, is a long-term trekking and accommodation activity, usually boarding in difficult conditions in nature. Nature walk is the most preferred activity among nature sports. This activity is held in natural areas; In addition to discovering and feeling nature, it also contributes to the recognition of local culture and the strengthening of its economy. It is accepted by experts that this activity has very positive effects on people's physical, intellectual and mental health. With this; Being the most harmful recreational activity to nature, being at peace with nature, not requiring high condition or technical procedure, injury, etc. It is an activity that attracts the most attention due to its low risks, low cost of activity, and increasing social solidarity. Nature walks take place individually or in groups. It is especially preferred that it be organized by non-governmental organizations and carried out in groups. In our country, it usually takes place in publicly owned forest areas or green areas in and out of the city.

Keywords: Hiking, trekking, action plan, Isparta city.

1. Introduction

A result of the multifaceted changes and developments experienced today, especially the negativities experienced during the global epidemic process have increased the demands and tendencies of urban people for urban tourism activities (Akkuş & Gül, 2020). Hiking is one of the most preferred, light, and effortless physical activities among recreational activities. Walking is considered a recreational activity or a hobby that is based on pleasure but requires a certain amount of knowledge and skill, to get from one point to another in the open air in the natural and cultural area.

Today, nature walks are a sports activity that is generally carried out in and around the city, in the form of short-distance day trips, outside the city and in the form of tours in natural areas, accompanied by a long-distance and professional guide, for those who want to get rid of the stress of the city. For this reason, hiking trails can take a few hours or a few weeks. The walking time varies according to the difficulty level of the track. Walking activity in natural and cultural areas provides many contributions such as the discovery of nature, socialization, recognition of local culture, and active use of free time. (Yavuz, 1996; İsak, 2008; Ankara Valiliği İl Kültür & Turizm Müdürlüğü, 2017).

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Observation and experience in the hiking and trekking activity are fundamental tools for discovering, understanding and making sense of nature. In this context, activities of wondering, being aware, associating, and enjoying everything observed during the trekking process are carried out. In this context, nature walking routes are needed to integrate urban people with nature.

The city of Isparta forms a unity with its natural environment. In this study, general strategies for the hiking trail action plan approach and the implementation of the activity were developed as a result of field studies and inventory analyses on the hiking trail determined in and around the city center of Isparta.

1.1. Nature walks (Hiking) Concept

Nature walks; It is the most preferred activity of ecotourism. This activity is held in natural areas; It also contributes to the recognition of the local culture and the strengthening of the local economy. However, this activity is in harmony with nature as no instruments that can harm nature are used. Many people who want to get away from the stressful business life and city life for a short time, when they find the opportunity, prefer the closest natural environments to their places of residence for travel and sports purposes. It is accepted by experts that this activity has very positive effects on the human body and mental health.

Recent studies have emphasized the positive effects of nature-based sports activities on human physiology and psychology. For this reason, people preferred sports activities that can be carried out in areas whose natural features are largely preserved, and thus, alternative tourism types such as trekking, which includes sports and tourism together, have started to become widespread (Açıksöz et al., 2006). For this reason, trekking is an important activity among the components of ecotourism.

Trekking in English is the general name given to walks in nature. However, there are different types of walking in nature. Hiking is a daily walk in nature that starts in the morning and ends in the evening. It means a nature trip. Trekking is expressed as the general name of boarding walks in nature, which has various features according to their difficulty levels, and appeals to different age groups in line with natural conditions (Yalçın, 2007; Eskiyörük, 2013). Expedition, on the other hand, is a long-term trekking and accommodation activity, usually in harsh conditions in nature (İsak, 2008).

Benefits of Hiking

- It provides calming and resting by getting away from the city stress,

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- It provides integration with nature,
- Keeps the body vigorous
- It has positive effects on human health (regulates the circulatory system, strengthens the body muscles, including the heart muscle, enables them to work more effectively, regulates blood pressure, reduces the risk of obesity, facilitates digestion, increases the oxygen flow to the brain, increases respiratory capacity, provides hardening and strengthening of the bones, releases endorphins, the natural happiness hormone, increases mental acuity and creative thinking potential, etc.)
- It does not require high fitness or technique.
- Injury, accident, etc. the risks are very low compared to other activities,
- It has the lowest cost for the event.
- It provides the opportunity to get to know and discover new places and cultures,
- It contributes to the local economy

The hiking trail action planning objectives are to increase the satisfaction level of the walker for leisure/free time, protect and recognize natural and cultural values, increase the level of urban and rural recreational activity, bring local identity values to the fore, and contribute to urban and rural tourism. To provide information, awareness, and responsibility to the locals and its users about nature and environmental protection, etc. The main goals for the hiking trail design are **s**afety, connectivity, context, diversity, and accessibility.

The Hiking or Trekking Difficulty Levels

Many different scales are used to define the difficulty levels of hiking trails. Six scaled difficulty rating systems have been defined, taking into account the climbing distance, total walking time, and the type of path walked in the publication. **(**Şahin, 2010; Kiracıoğlu, et al., 2010).

- Difficulty Level (1): Walking slope, ascent and elevation are very low. Wide paths. Includes a 2-hour event. It is suitable for beginners.
- Difficulty Level (2): The walking slope is low. It includes exits not exceeding 300 meters in total. The difference is time. It does not exceed 3.5 hours. Recommended for anyone involved in light hiking.
- Difficulty Level (3): The walking slope is increasing. There are exits not exceeding 500 meters. It may be necessary to traverse narrower paths, sometimes through dense woodland and

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mixed areas. Wet transitions are intensifying. The total walk is around 5 hours. Suitable for anyone with high fitness and walking experience.

- Difficulty Level (4): The walking slope begins to increase. Exits reach 700 meters. The paths are very bad, in some places they are absent. The road is made on more rocky and mixed terrain. The duration of the walk is 6.5 hours. It is suitable for people who are sporty and in good condition.
- Difficulty Level (5): The walking slope is now challenging and high. The exits begin to exceed 1000 meters. It is reached from hard structured, rocky, and unpaved areas. Woodlands are pretty tough- stop. Wet passes are also available. The guide must be experienced. The walking time reaches 8 hours. Although it does not include technical ascents, it is suitable for high-difficulty, sporty, experienced, and well-conditioned hikers.
- Level of Difficulty (6): These are the treks with plenty of slopes, with many ups and downs, whose ascents can reach 1500 meters, which require long-term route tracking, and which progress in difficult terrain conditions. Camping and accommodation can be made. It is 8 hours or more. It requires experience, attention, fitness, knowledge, and discipline.

2. Materials and Methods

The city of Isparta has a landscape where rural and urban elements meet/integrate. The city of Isparta is the center of a medium-sized city consisting of 13 districts, including the central region, in the region known as the "Lake Region" in the Mediterranean region (Gül & Küçük, 2001). Isparta Province is located in the Lakes region in the north of the Mediterranean Region. The city, which has a surface area of 8,933 km^2, has an average altitude of 1050 meters. 68.4% of the province consists of mountains, 16.8% plains, and 14.8% plateaus. There are very high mountains in Isparta, which are the extension of the Western Taurus Mountains and reach 3000 meters in height. Dedegöl, Barla, Davraz, and Akdağ are the most important mountains of the province. Egirdir Lake, Beyşehir Lake, Kovada Lake, and Gölcük Crater Lake are the most important lakes known. Isparta, which has many lakes, ponds, mountains, plateaus, canyons, caves, forests, rivers, and national and nature parks, offers all kinds of alternative tourism opportunities to tourists and nature lovers with these riches (Isparta Valiliği, 2022).

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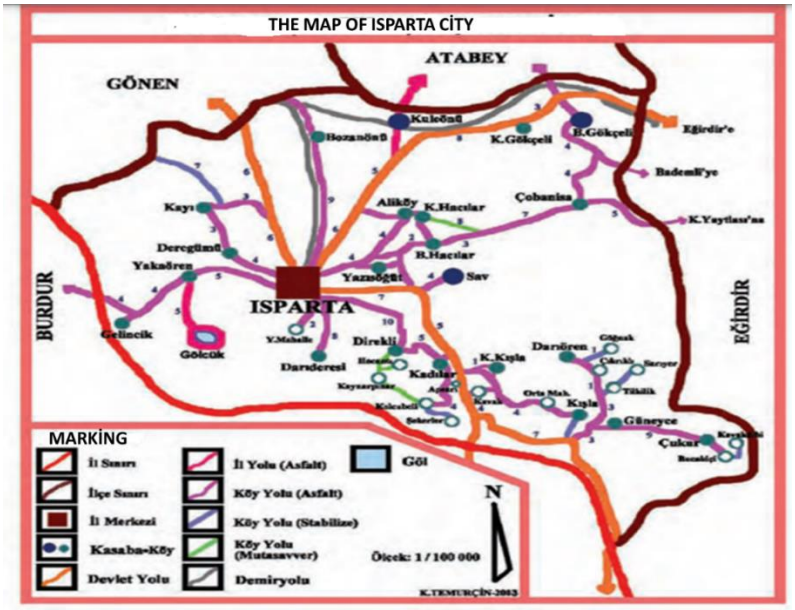


Figure 1. The Map of Isparta City (Isparta Valiliği İl Kültür Turizm Müdürlüğü, 2009).

In this study, the method used to create the hiking trail action program for the City of Isparta is 4-stage (a. Hiking trail site selection, b. User demands and tendencies towards the hiking trail, c. Hiking trail design process, d. Implementation and management process).

3. Findings

3.1. Isparta City Hiking Trail Action Program and Processes

3.1.1. Site Selection Analysis;

The criteria taken into account for the hiking trail: proximity to the city center, relationship with existing urban green areas, slope status of the route, landscape value, vegetation density, topographic structure, etc. factors are taken into account. It has been determined by taking into account the existing pathways that can reach Isparta City Center in the shortest distance between the Muharrem Dede Tomb and Recreation Area, which is adjacent to the natural area and at a close distance, and Gökçay Park. The hiking trail is located within the borders of Gölcük Nature Park.

3.1.2. Survey Study to Determine Stakeholder Demands and Trends;

The general profile of the respondents: 68% female; 32% are male, 58% are in the 31-65 age group, and 42% are in the 18-30 age group. 54% are civil servants, 18% are students, 12% are tradesmen, 12% are academicians, and 4% are workers. 58% are undergraduate, 24% graduate, 10% high school, 6% associate degree, 2% primary school graduate. 98% of them live in the center of Isparta and 2% in the districts of Isparta.

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Conceptual Approaches: What does nature evoke in you? 22% peace, 20% natural beauty, 18% healthy life, 12% fresh air, 10% joy of life, 8% freedom, 6% simplicity, and 2% stated it as everything the participants. What does hiking mean to you? 32% answered as healthy life, 28% peace, 18% fresh air, 8% doing sports, 8% sightseeing-observation, and 6% excitement. Reasons for doing trekking activities? 40% of the participants stated to live healthily, 24% relax, etc.

Trends and Demands: 100% of the participants want a nature hiking trail around the city of Isparta. What is the ideal daily distance of the hiking activity? 24% between 5km, 24% between 3-4km, 20% between 4-5km, 16% between 2-3km, 6% between 1-2 km, 4% between 10km, %2 of them answered as 0-1 km. What should be the ideal day duration of the walking path? 38% did not respond for 1 day, 28% for 2 days, 24% for 3 days, 2% for 15 days, 8% did not respond. What functions should be on the route? 21% are scenic spots, 19% are fountains, 16% are resting stations, 12% are information boards, 12% are trash cans, etc. they have requested. What should be the distance between the rest stations on the daily trail? 37% 2 km, 20% 3 km, 18% 1 km, 25% did not express an opinion.

What should be the criteria to be considered when choosing a place? landscape potential, slope, vegetation/density/type, presence of wildlife, soil structure, sunbathing duration, wind direction/intensity, etc.

• Would you like to contribute ecologically during the event? 82% yes (planting, hoeing, seed planting, animal shelter, production activities of wild animals, weed cleaning, etc.)

• What is your frequency of hiking? Weekends (34%), Once a week (22%), Once every six months (13%), Once a month (10%), etc. Preferred days: Sunday (40%), Saturday (36%), Friday (16%), and others. Preferred months: June (18%), May (116), July (11%), August (10%), April (8%), and September (9%). Which areas are the most suitable for hiking trail? Gölcük Nature Park (20%), Gökçay Park (20%) and its surroundings, Recreation areas (18%), etc. What should be the ground material of hiking trail? Soil (47%), It should be left in its natural state (33%), plant bark (8%) and red brick dust (5%).

3.1.3. Design Process

a. Starting and Ending Notes of the Hiking Trail: It starts from Muharrem Dede Tomb and reaches the border of Gökçay Park (Peace House Building). The total length is 5 km. The difficulty level is 1. It is a hiking trail that can be easily walked by everyone.

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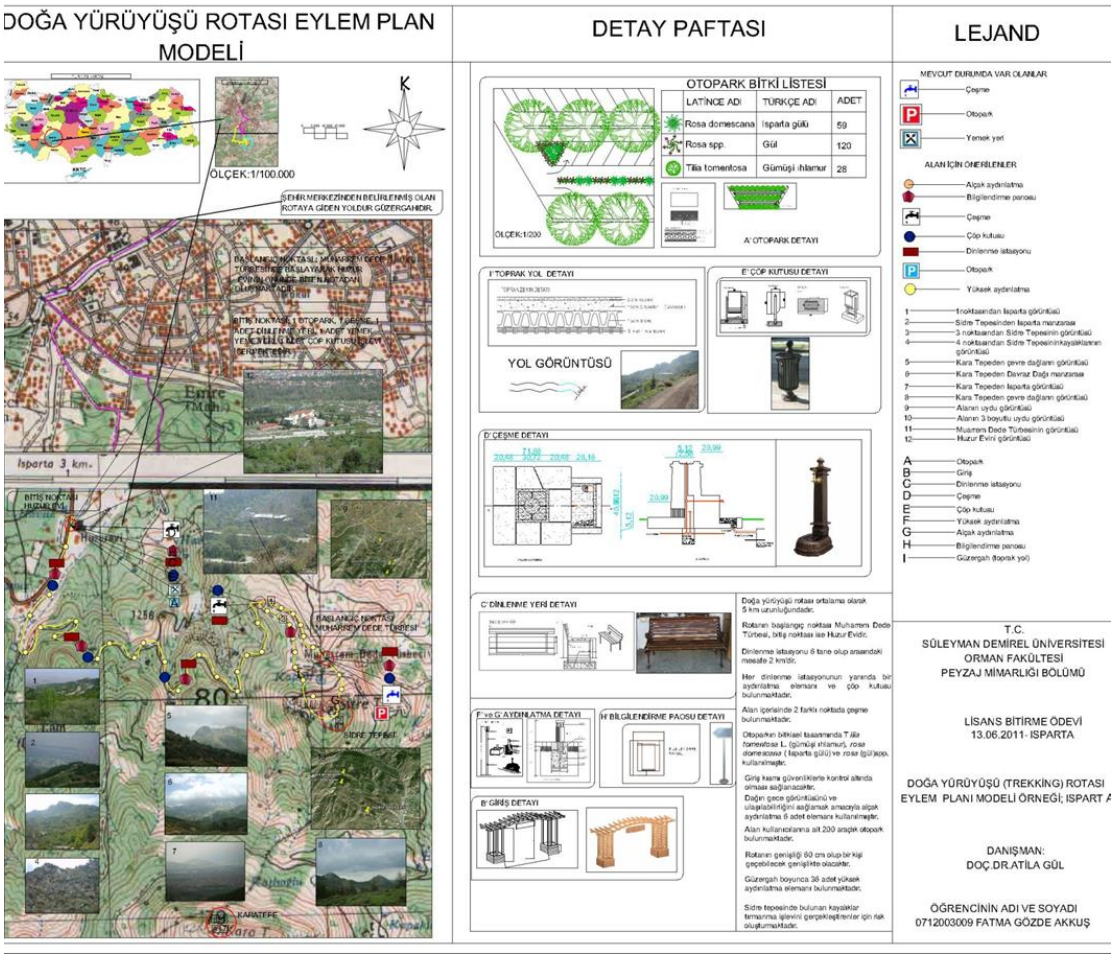


Figure 1. Hiking trail design project

b. Walking Path Goals and Objectives: It is the realization of walking activity as a pleasant, easy and reliable way to go and return between two urban green areas visited by urban people.

c. Design Project: Landscape design (Scales: 1/500) and detail projects (between 1/50 and 1/1) for application in point and spatial scales were drawn considering the route and its immediate surroundings.

The hiking route starts from Muarrem Dede Tomb and ends at the Nursing Home in Gökçay Park. The hiking trail length is approximately 5 km. The hiking trail width can vary between 1,5 and 2,5 meters. There are rest stations every 2 km along the route. Vegetative arrangements consisting of natural tree and shrub species are envisaged along the route.

On the hiking trail, 3 fountains, 36 solar and led lighting systems, 6 gazebos, 3 trash cans, 4 information boards, and 15 guidance and warning boards are foreseen. Parking is foreseen at the start and end points. In the design project, there are many designs and details such as parking lot, trash can, lighting elements, wooden entrance jewelry, road section, information board, etc.

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In terms of visitor carrying capacity, the maximum number of group users is 15 people. Monitoring and observation will be made every 3 months with the observation forms foreseen by the relevant Administration on the visitor effects, ground conditions, and environmental adverse events. Visual materials were proposed for promotional activities and programs were created. To contribute economically to the local people at the entrance of the route, local sales stands where the products of the Isparta region are exhibited are suggested. Suggestions for product design, production, and marketing have been developed for Isparta's local identity values.

d. Ecological and Social Risk Analysis: The impact levels should be determined by making observations and examinations (Observation Review Forms) for the ecological components (soil, vegetation, and wild animals) and social components (hikers' expectations, tendencies, and interactions with the environment) on the hiking trail and its surroundings. Necessary measures should be taken.

e. Stakeholder Coordination and Responsibilities: The duties and responsibilities of primary and support stakeholders in the management of the walkway should be defined. The establishment of NGOs focused on nature and tourism should be encouraged.

Stakeholders	Responsibility	Authority	Partnership
• Isparta Provincial Directorate of Agriculture and Forestry.Isparta MunicipalityNational Parks and Nature Conservation Department.	Security,- Maintenance and repair- Maintaining the current situation in the field,-Monitoring, control and supervision	-To ensure the legal and administrative regulation of the field	-It cooperates with all stakeholders.
University	Scientific research and project production related to the field, monitoring the activity, training	providing data,- Education (informing and raising awareness)	Isparta Provincial Directorate of Agriculture and Forestry, STO, Users
Tour Agencies	-Organization,- Promotion,- Realization of the event-Sponsorship	Realization of the event	-Isparta Provincial Directorate of Agriculture and Forestry, STO, Users
NGO	-To protect,- Educational activities-Project productionMaintenance and repair	—	-Isparta Provincial Directorate of Agriculture and Forestry, STO, Users
local people	ProtectionMaintenance and repair	—	-Isparta Provincial Directorate of Agriculture and Forestry, STO, Users
Visitor/user	ProtectionMaintenance and repair	—	-Isparta Provincial Directorate of Agriculture and Forestry, STO, Users

Figure 2. Stakeholder Coordination and Responsibilities

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f. Visitor Carrying Capacity: Methods for monitoring the impact of users should be put forward by the site management. A group walking capacity of at most 15 people at the same time should be foreseen on the walking path.

g. Promotional Activities: Written and visual materials of the walking path should be prepared. All kinds of information should be provided by designing web pages, videos, brochures, etc. for the area. Daily programs and events should be announced to the people of the city. Necessary equipment and materials should be provided.

h. Product Development and Marketing Strategies: Strategies for income-generating product development and marketing should be established for the Isparta nature trail. For example, T-shirts, hats, backpacks, key chains, etc. product designs and sales can be made. To provide an economic contribution to the local people at the entrance of the area, the sales stands where the products belonging to the Isparta region are exhibited can be evaluated for this purpose.

i. Finance and Budget: Short and long-term management and implementation costs for the area should be revealed. Income-generating fund options should be created. 25% of the income to be obtained from the sales stands can be taken and contributed to the budget allocated for the maintenance and repair of the area.

j. Scientific and Educational Strategies: Scientific research and educational activities on nature and environmental protection, sports, tourism, recreation, etc. should be encouraged in and around the hiking trail. In particular, educational activities for students should be foreseen.

k. Time Calendar: An annual work and time calendar should be created for walking track activities, maintenance, and repair, etc.

3.3. Implementation and Management Process

• Since the ownership of the area is within the area of Gölcük Nature Park and the Municipality, a governance organization should be established under the coordination of two units.

• In the Governance Chart, responsible technical staff and auxiliary staff, and working commissions should be included.

• Promotion, spatial application, educational and cultural activities, environmental maintenance, repair, and improvement, etc. by the relevant administration. Programs should be created.

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• Governance organization: Responsibilities and scope of stakeholders (such as managers, tour operators, NGOs, academicians, visitors/users, local governments, and local people) are determined.

• Programs for maintenance, repair, and improvement of the hiking trail should be established. (Erosion, flood risk areas, drainage, etc. measures)

• It should be integrated with general legal and administrative regulation studies.

4. Conclusion and Recommendations

The city of Isparta is rich in natural and cultural riches. The presence of natural areas close to the city of Isparta (forests, plateaus, agricultural areas, mountains, streams, etc.) provides an advantage, especially for hiking and trekking.

The results and recommendations obtained in this study are as follows;

- The hiking trail envisaged in the city center of Isparta is in a position to allow the urban people to move away from the urban environment and integrate with nature.
- The proposed route will create an organic link between urban green spaces and natural areas.
- Creating an organized, effective, and reliable route environment will further increase the user's satisfaction level and sense of discovery.
- Increasing the number of hiking trail around the city will increase the interest of urban people in nature, and the number and variety of urban recreational activities.
- Rest stations, seating units, and wooden sales stands must be foreseen to meet the food and beverage needs of the hikers on the hiking trail.
- Nature walk routes should be associated with the tourism strategic planning and vision of the city. Organizing the routes for the nature walks most preferred by the urban people and ensuring effective governance will provide important contributions (e.g, the city will bring people together with nature, discover nature, provide positive contributions in terms of health and generate income, etc.).
- It should be aimed to plan the trekking activity as a whole, together with urban ecotourism activities (Bird watching (ornithology), cycling, horseback riding, plant watching, wildlife watching, etc.) (Gül & Özaltın, 2007; Kiracıoğlu et al., 2010; Akkuş & Gül, 2020).
- New short and long-distance walking routes should be organized in different places around the city of Isparta.

ISBN: 978-625-8246-12-4

Last word, to make the city of Isparta tourism-oriented city and to act together with all relevant stakeholders to bring the people of the city together with nature, define the natural and cultural resource values well, to create an effective promotion and advertising campaign, to organize effective and competent governance, to make an environmentalist, rational and versatile realization of tourism investments, etc. should be targeted. In this context, tourism competitiveness and visitor satisfaction level of Isparta city should be increased compared to other cities.

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Global Trends in Nature-Inspired Architectural Design

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Abstract

Bio-inspired design, as an innovative design approach, sees nature as a source of knowledge and inspiration, while imitating nature's best ideas to find innovative and sustainable solutions. The number of research on the bio-inspired design approach, the environments in which these researches are carried out (laboratory, institute, etc.) and the platforms (articles, journals, books, theses, etc.) are increasing day by day. In this context, comprehensive research is needed not only to understand bio-inspired design and the increasing interest on it, but also to see the limits of current knowledge on the subject, and to emphasize the importance of it. In this study, it is aimed to create a background about the areas where the inspired approach is used, what it promises and its interdisciplinary use, and to contribute to the development of research in the field by determining the current situation of the literature. For this purpose, a "bibliometric analysis" which is frequently used in literature reviews, was preferred, and the results were discussed by mapping the gathered knowledge. The data used in the study were taken from the Web of Science (WoS) database, considering the range of sources and the speed of indexing them. Bibliometric indicators such as research area analysis, author analysis, organization analysis, citation according to sources, annual publication analysis, combination of keywords was created for the articles published between 2000-2021. Vosviewer software was used to display the analysis results graphically. As a result, the usage areas and frequency of the biomimicry approach in architecture are emphasized. This review highlights research gaps and sheds light on future work for researchers who use nature as a reference to solve design problems.

Keywords: Bio-Inspired architectural design, biomimicry, bibliometric analysis, vosviewer.

1. Introduction

The "bio-imitation" approach, which comes across with various terminologies such as bio-inspired, biomimetic, bionic, bio-informed, biomimesis and biomimicry, aims to create innovative solutions that learn from nature by taking nature as a reference. The bio-inspired design approach is a multidisciplinary field of research where researchers from fields as diverse as architecture, engineering, philosophy, computer science, physics, and chemistry work together to design innovative products (Jamei & Vrcelj, 2021). The bio-inspired design approach has attracted attention by researchers from different disciplines and has become a popular research topic. The increasing interest in this approach is due to its potential to be an inspirational source for new innovations and to create a more sustainable built environment (Zari, 2007).

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Increasing interest creates a complex research area while increasing the number of studies on this subject. In this context, an effective literature analysis contributes to establishing a solid foundation for furthering knowledge. Moreover, literature analysis facilitates theory development and reveals gaps in areas of high research (Webster & Watson, 2002). Due to the increase in the number of publications, conducting scientific analyzes in a traditional way makes the analysis of data difficult and limited. It is important to use an analytical analysis method to eliminate this limitation(Varshabi, Arslan Selçuk & Mutlu Avinç, 2022). Recent advances in data collection, analytics and graphical mapping with bibliometric networks enable the systematic analysis of a large number of scientific publications (Abduljabbar, Liyanage & Dia, 2021). In this context, in this study, the "bibliometric analysis" method, which is an approach frequently used in literature reviews, was preferred.

Within the scope of the study, bibliometric analysis was made and the results were mapped and discussed. Bibliometric indicators such as annual publication analysis, research area analysis, organization analysis, citation according to sources, association of keywords were created for the articles taken from the Web of Science database. Data visualization was done using VOSviewer software. As a result, the usage areas and frequency of the bio-inspired approach in architecture are emphasized. The methodology is summarized in the table given in Figure 1.

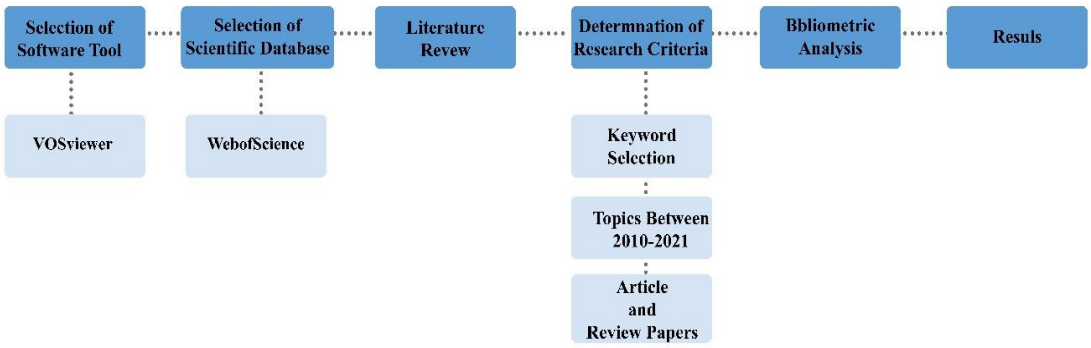


Figure 1. Methodology

2. Materials and Methods

"Bibliometrics: a branch of scientific research that deals with the systematic examination of various aspects of the available literature" (Meena, D'Costa, Bhavsar, Kshirsagar & Kulkarni, 2021). In this context, bibliometric analysis is a quantitative evaluation technique that classifies academic literature, publications, journals or authors' academic quality, citation rates, number of publications by years, regions, organizations, publication types depending on statistical methods. In studies using bibliometric analysis, certain features of documents or publications

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are analyzed and various findings related to scientific communication are obtained (Al & Coştur, 2007) . Also, this method is a statistical tool that quantitatively displays the analysis of written publications. Analyzes visualize a literature review showing the number, rating and key trends of publications on a particular topic.

Various software tools such as CiteSpace, Voswiever, Gelphi, Kumu, iMapBuilder have been developed to visualize scientific networks within the bibliometric analysis method. Within the scope of this study, Voswiever software was used to systematically examine the bio-inspired design literature. For this, the data obtained from the Web of Science database were evaluated by visualizing in the Voswiever software.

In the study, the data obtained from the search made in the Web of Science database with the keywords "biomimetic(s), biomimicry, biomimesis, bio-inspired, bio-based, bio-driven, biotechnology" and the "Architecture, Construction & Building Technology" research area limitation were used. Information on the details of the search performed in WOS is shown in Table 1.

Table 1. Literature review

Database	Search Query	Number
Web of Science	**Fields and keywords:** ((TS=biomimicry OR TS=biomimesis OR TS=biomimetic OR TS=bio-inspired OR TS=bio-driven OR TS=biotechnology)) AND (SU=architecture OR SU=Construction & Building Technology)) **Indexes:** SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI **Language:** English **Date:** 21.11.2021	**Article:** 143 **Conference Paper:** 113 **Book Chapter:** 22

The titles of 253 sources obtained from the search query made with the determined keywords and criteria were examined, and the sources that could not be associated with the subject were excluded. As a result of the examinations and exclusions, 77 articles and 50 papers were included in the analysis. The identified studies were analyzed in the context of the questions prepared in line with the aims and objectives of the study. These questions are as follows:

- What are the usage areas and frequency of use of biomimicry in architecture?
- What is bio-inspired in architecture, with which concepts is it expressed?
- What are the studies carried out in this field, and what are the issues focused on?
- What are the prevailing trends around the theme of biomimicry globally, and how has the relevant research changed over time?
- Which journals are active in academic research?

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3. Findings and Discussion

As a result of the literature review, the data obtained before the limitation was visualized and the disciplines in which biomimicry were frequently used were revealed (Figure 2). Afterwards, it was evaluated with the titles of annual publication analysis, research area analysis, establishment analysis, citation according to sources, combination of keywords, with limitations specific to architecture.

3.1. Biomimetic Practice Trends in Different Disciplines

The data obtained in the search show that the bio-inspired design approach is frequently used in many disciplines (Figure 2).

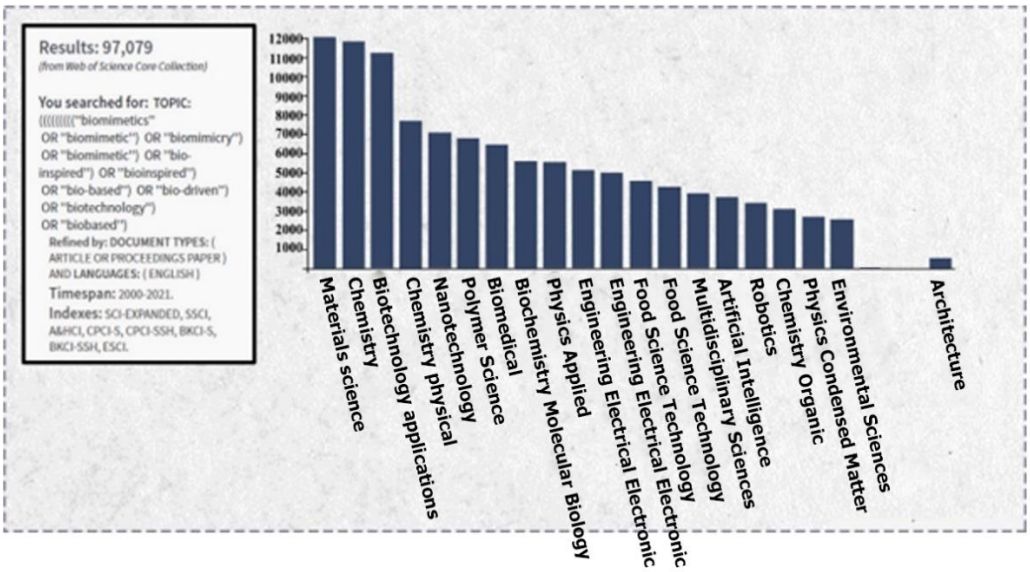


Figure 2. Application areas of biomimetics

As seen in Figure 2, it can be said that materials science, chemistry, biotechnology applications, nanotechnology fields are the fields where biomimetics is used most frequently.

3.2. Number of Publications by Year

The graph of the annual number of publications between 2000-2021 is given in Figure 3. The graph shows that studies on biomimicry have tended to increase over the years. The first publication seems to be made in 2007. According to the graph, 2020 is the year in which the work done in this field is the most intense. It is seen that more studies were carried out in 2015, 2019, 2020 compared to other years. The increase in studies in the field of biomimicry shows the need for research in this field.

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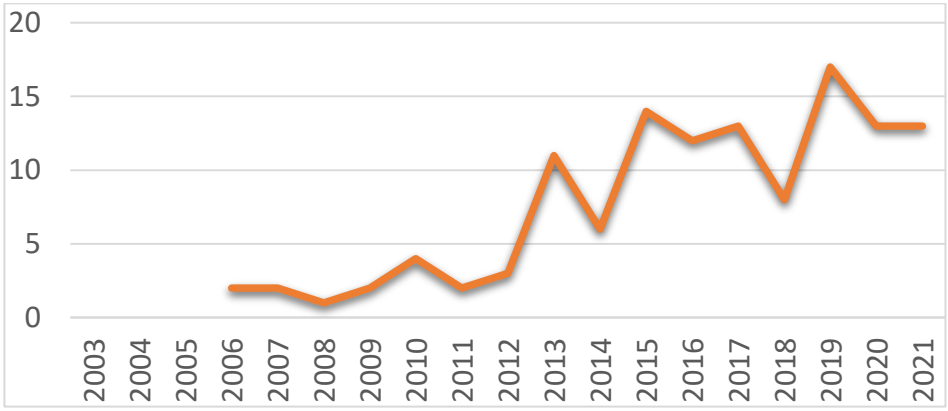


Figure 3. Number of publications by year

3.3. Keyword Analysis

To analyze what the keywords in the examined publications mean together, the keywords were grouped and visualized in Voswiever. The total number of keywords in the selected posts is 380. In the analysis, the keywords used at least twice are shown. In the visual map obtained with 50 keywords, the nodes represent the keywords used in the articles. The size of the nodes shows the frequency of use, and the colors show the intensity of use by years. Keywords give clues about the contents of the publications (Figure 4).

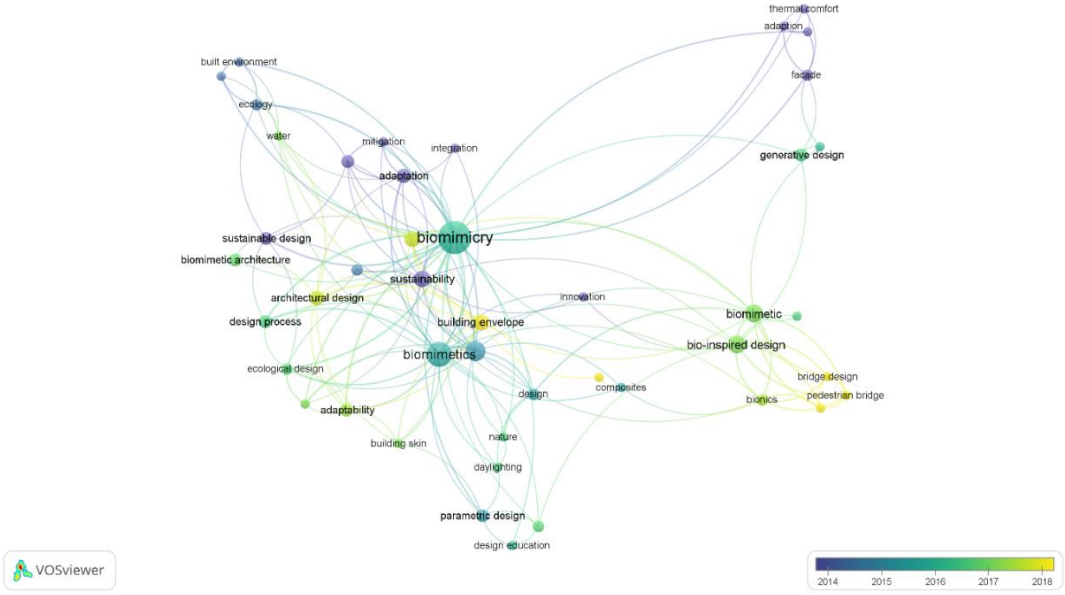


Figure 4. Keyword analysis

The visual map provides an insight into the potential use of the bio-inspired design approach in architecture. As a result of the prominent author keywords, it was observed that studies were conducted on sustainable design, ecology, adaptation, thermal comfort, climate change, structural design, building cladding, building facades, thermoregulation, parametric design, architectural education (Table 2).

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Table 2. Keyword usage frequency

Keyword	Frequency	Link
Biomimicry	30	61
Biomimetics	17	38
Architecture	10	27
Biomimetic	8	18
Bio-inspired design	8	17
Sustainability	7	17
Adaptatiom	5	16
Building Envolope	6	16
Bionics	3	13
Ecological Design	3	12
Climate Change	4	11
Ecology	3	11
Adaptability	4	10
Bridge design	2	10
Structural Design	2	10
Sustainability Design	2	10

3.4. Bibliographic Linkage and Citation Analysis of Countries

A "country citation analysis" was conducted to identify the most influential countries in the studies and to map interoperability (Figure 5). As a result of the search, 36 countries were determined. The clusters in the graph were formed according to the citation rates and collaborative workability in the research areas. The size of the nodes shows the countries that stand out with the studies and have a high citation rate. Inter-node connectivity refers to interoperability. As a result of this analysis, it was seen that America, New Zealand, England, and Austria were among the prominent countries.

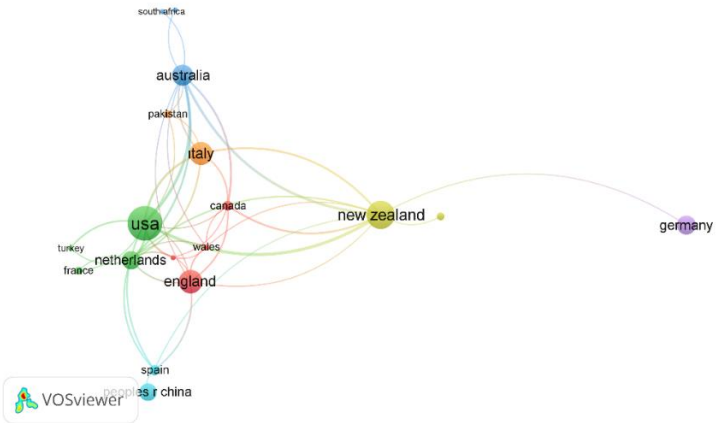


Figure 5. Bibliographic linkage and citation analysis of countries

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3.5. Source Journal Analysis

The relationship between publications and citations is shown through the network map (Figure 6). The size of the node resulting from the analysis is proportional to the number of publications. The distribution of articles classified as biomimicry publications in the field of architecture is shown in Figure 6.

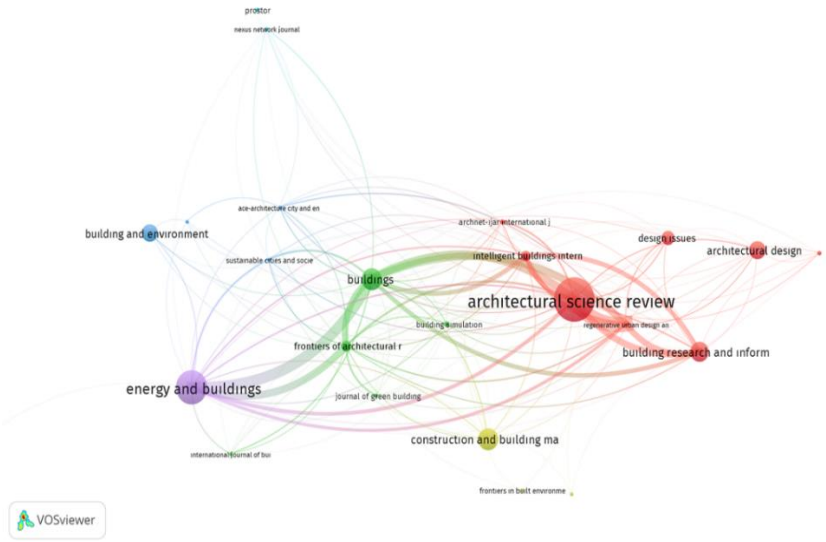


Figure 6. Source journal analysis

Conclusion and Recommendations

Based on the analyzes made in this study, the usage areas and frequency of the bio-inspired design approach in architecture are emphasized. The bio-inspired design approach is of interest to many researchers in different disciplines. The analysis of the WoS database on the bio-inspired design approach within the scope of this research revealed that there has been a significant increase in the number of publications on this subject in recent years. For this reason, this study provided a comprehensive background information for researchers who want to work on this subject so that they can understand the current knowledge and importance of the subject. As a result of the analysis, it has been seen that countries such as America, New Zealand, England, and Austria have the most significant impact on bio-inspired design research. Furthermore, the analysis of the articles provided an overview of the potential use of the bio-inspired design approach in the field of architecture.

It has been also revealed that the bio-inspired design approach in the field of architecture is used in researches carried out on topics such as sustainable design, ecology, adaptation, thermal comfort, building cladding, building facades, thermoregulation, parametric design, architectural education, and economy.

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Investigation of Rural Landscape Features of Yıldızkaya Village and its Surroundings in Olur (Erzurum) District

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Abstract

Olur district of Erzurum province has a very rich potential in terms of rural landscape values. This natural area, located in the Oltu Stream basin, is worth seeing with its topographic structure varying between 850-3000 m, local products, and handicraft richness, local architecture, historical and cultural richness, natural plant diversity, and interesting geological and geomorphological structure. The aim of this study is to reveal the rural landscape features of Yıldızkaya village, which is a mountain village in Olur district, and its surrounding. When Yıldızkaya village settlement is examined, it is seen that it is a traditional mountain village established on the skirts of a mountain in the middle of a lush valley among high mountain ecosystems. In the village, it is possible to come across the Yıldızkaya cave, which stands out with its interesting stalactites and stalagmites, the geological and geomorphological formations we encounter along the way, and unique natural beauties, as well as the traditional residential architecture. With this study, the rural village landscape of Erzurum was examined in the example of Yıldızkaya village, and opinions and suggestions were made for the development and support of such rural areas with observations, examinations, and on-site evaluations.

Keywords: Rural Landscape, Erzurum, Olur, Yıldızkaya village.

1. Introduction

The rural landscape is a peaceful element that adapts to the character and life of the human being, who is a part of nature. With a simple definition, the concept of rural area, which can be described as places outside the urban areas, is actually a space with concrete objective elements. In addition to rural areas, open areas with different activities (agriculture, recreation, tourism, industry, etc.) are also defined as rural areas (Cengiz, 2003).

Rural landscapes are areas shaped by traditional land uses and natural environment. Different definitions have also been made for rural landscapes. The first of these definitions is that rural landscapes are traditional cultural landscapes (Cullotta & Barbera, 2011). On the other hand, the American Federation of Landscape Architects (ASLA, 2006) defines rural landscapes as places where people and nature come together. These areas make strong contributions to human creativity.

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Rural landscapes also include different activities in areas outside the cities. Although these activities are mostly agricultural, they can also be industrial and recreational. These activities can also cause positive or negative results on the landscape (Koç & Şahin, 1999).

All the natural and cultural features of rural landscapes form the identity of those landscapes. At this point, together with its natural features such as topography, vegetation, wildlife, hydrology, geology, cultural habits, information systems, traditions, customs and traditions from the past in that region also shape this identity (Köse & Şahin, 2017). The analysis of landscape characteristics of a rural settlement provides an opportunity to better understand, protect and evaluate that rural settlement.

Yıldızkaya Village and its surroundings (Figure 1), located within the borders of Olur district of Erzurum province, are one of the important attraction points in terms of the resources they have. The rich flora and fauna of the region, its variable topography between approximately 850 and 2400 m altitudes, its richness in local products and handicrafts, its local architecture, historical richness and interesting geological formations create an important potential in terms of rural and cultural landscape features. In the research, the natural and cultural landscape features of Yıldızkaya Village, which has transformed from a village legal entity to a neighborhood status today, will be examined and defined in terms of protecting and sustaining these features that make up the landscape identity at the scale of the local landscape.



Figure 1. A view from Yıldızkaya village of Olur district (original)

*View from a traditional mountain village nestled in the middle of a lush valley among high mountain ecosystems

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2. Material and Method

2.1. Material

Yıldızkaya Village of Olur District of Erzurum and its immediate surroundings were chosen as the research area (Figure 1). Yıldızkaya village is a mountain village located 186 km from Erzurum province and 48 km from Olur district (Figure 2). There are Keçili villages in the east of the village, Beşkaya in the south, Çataksu in the west and Kırazalan in the north (Anonymous, 2022a).



Figure 2. Location of the research area (original)

The arable land of the village, where the people make their living from agriculture and animal husbandry, is 7500 decares. The land where Yıldızkaya village, which also borders to Yusufeli District of Artvin Province, is located, is quite rugged and full of steep cliffs. Yıldızkaya village, which is one of the villages in the region that constantly migrates, is a natural wonder. Among these riches, Yıldızkaya cave, which has very interesting stalagmites and stalactites, traditional housing architecture, traditional handicrafts and local products, interesting geological and geomorphological formations, rich flora and fauna, natural vegetation and all the natural and cultural features of rural landscapes.

2.2. Method

In this research, it was tried to determine the rural landscape values of Yıldızkaya Village and its surroundings, which is connected to the town of Olur (Erzurum). In the first stage of the research, a detailed literature search and on-site observations and examinations were made about the research area, data were collected and evaluated. In this context, the topography, vegetation, wildlife, climate and settlement structure, production characteristics, architectural structure, outdoor components and landscape elements that constitute the natural landscape features of the area were examined. After on-site analysis of the natural and cultural landscape features of the rural settlements of Yıldızkaya Village, the natural landscape features and socio-

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economic structure of the area were evaluated qualitatively, quantitatively and perceptually. The criteria of rural landscapes are important in the research, and the natural landscape value of the area, the cultural landscape value and the perceptual values of the landscapes were examined based on the studies of Işıklı (2010), Erdem (2012), Akpınar Külekçi & Bulut (2012) Köse & Şahin (2017).

3. Research Findings

3.1. Yıldızkaya Village Natural Landscape Features

3.1.1. Topography

Yıldızkaya Village is located in the north-east of Erzurum, in the transition zone between the Eastern Black Sea and Eastern Anatolia. The village of Olur district is surrounded by Yanlızçam Mountains, Akdağ and Dutlu Mountain elevations in the north and south directions, and its altitude varies between 850-2951 m (Anonymous, 2022a; Anonymous, 2022b). The mountain covering the largest area in Olur district is Akdağ and it is located in the southwest of the district, in an area where the altitude differences vary between 2248 and 2374 m. Other mountains within the boundaries of the district are Kılıç Mountain (2951 m), Kotek Mountain (2114 m). There are 94 large and small hills in Olur district with the lowest altitude of 1538 m and the highest altitude of 1807 m. The main mountain ranges in the region are Darıtarla, Tandırlı, Karaburun, Kavaklı, Koyunyatağı, Karagüney, Kuşlukaya, June, Çatalarç, Poson Mountains (Akpınar Külekçi, 2012).

3.2. Geomorphological Structure

The research area is mainly within the "North Anatolian Mountain Belt" and "Alpine Orogenic Belt". In terms of both tectonic and sedimentological conditions, it is possible to see the characteristic features of orogenic belts here as well. As a matter of fact, Yıldızkaya Village and its surroundings show a rough appearance in terms of structure. In the area, there are high mountainous areas extending in the northeast-southwest direction and valleys located between these areas. The elevation differences in these sections are very high (Çil, 1998; Atalay, 1982; Özav, 1991; Tüzemen, 1991; Yılmaz, 1985).

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3.3. Hydrological Structure

There are six lakes of various sizes in Olur district, varying in size from 3125 to 200 m². Especially the natural water resources located on the Çataksu-Salpazarı and Yıldızkaya road route offer unique natural beauties (Akpınar Külekçi, 2012) (Figure 3).



Figure 3. Views from the water elements on the Çataksu-Şalpazarı-Yıldızkaya Village Road Route (original)

*The waters gushing out of the canyons in Olur district in spring and summer contribute to the wildlife living in those regions while creating impressive views.

3.4. Natural Vegetation

Yıldızkaya Village and its surroundings, which constitute the research area, are under the influence of the Black Sea and Eastern Anatolia climates, which are located within the borders of the Eastern Black Sea region of the Black Sea Region. Therefore, the research area contains different phytogeographic elements. These phytogeographic elements; They are Iran-Turan, Euro-Siberian and Mediterranean elements (Özav, 1991; Atalay, 1982; Tüzemen, 1991).

The Iranian Turan elements, which are mostly represented by the phytogeographic element of the research area, are mostly distributed in the north-facing regions and south-facing slopes (Figure 4).

Some major shrubs, shrubs and trees of the research area *Juniperus excelsa* Bieb., *Juniperus oxycedrus* L., *Juniperus feotidissima* Willd., *Rosa dumalis* Bechst., *Cotoneaster nummularia* Fisch. & Mey., *Salix nigra* Marsh., *Salix excelsa* S.G. Gmel., *Acer guinguelobum*, *Acer*

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divergens Pax var. *divergens,* Some main herbaceous plants characteristic of this phytogeographic region in the study area. *Anemone albana* Stev. subsp. *armena* (Biss.) Smirn., *Artemisia sibirica* (L.) Maxim., *Achillea biebersteini* Afan., *Astragalus microcephalus* Willd., *Astragalus galegiformis* L., *Allium rotundum* L., *Anthemis tinctoria* L. var. *pallida.* Dc., *Caltha polypetala* Hochst. Ex Lorent, *Campanula stevenii* M. Bieb., *Muscari commutatum* Guss., *Muscari armeniacum* Leichtlin ex Baker, *Onobrychis cornuta* (L.) Devs., *Papaver dubium* L., *Papaver orientale* L., *Primula veris* L., *Salvia syriaca* L., *Senecio vernalis* Waldst. & Kit., *Taraxacum sp., Tussilago farfara* L., *Verbascum phoeniceum* L., *Verbascum speciosum* Schrader., *Vicia cracca* L. subsp. *cracca, Veronica gentianoides* Vahl. subs. *Gentianoides.* (Anonim, 2022a; Anonim, 2022b; Anonim, 2022c; Anonim, 2022c Atalay, 1982; Altan, 1983; Özav, 1991; Tüzemen, 1991; Irmak, 2008; Anonim, 2010, Akpınar Külekçi, 2012; Akpınar Külekçi Bulut, 2012).

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Figure 4. *Iris iberica Hoffm. subsp.* Elegantissima



Draba rigida Willd.(Sosn.) Takht. Et Fedorov (original)

In the research area, in the Olur district, the forest sounds start from approximately 1300 m and continue up to 2700 m. The dominant tree of the region, which spreads in the north-facing parts of the study area, is Pinus siylvestris. In some grades, together with Pinus siylvestris L., undergrowth shrubs and shrubs are encountered. These are the occasional Cotoneaster nummularia Fisch. & May. and Sorbus umbellata (Desf.) Fritsch. Populus tremula L., together with Pinus siylvestris L., can be seen in the northern regions at 1700 m in Olur district. Quercus petreae Liebl., a Mediterranean element at 1400-1500 m, Juniperus oxycedrus L. subs. oxycedrus reveals itself. Also, Berberis vulgaris L. (Figure 5) is naturally encountered. (Atalay, 1982; Özav, 1991; Tüzemen, 1991; Anonim, 2010).



Figure 5. A general view of Berberis vulgaris L. plant in the study area (original)

6. Wildlife

There are studies on the fauna richness of Yıldızkaya Village and its surroundings in Olur district, which constitutes the research area. Tema Foundation, ODTU and BTC Sti. In the "Low Caucasian Forests Gap Analysis Priority Conservation Areas" project (Anonymous, 2010),

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conducted in cooperation with the "Low Caucasus Forests" project (Anonymous, 2010), among the wild mammal species determined to live in and around Yıldızkaya village of Olur district, there are species that are not in danger of extinction, as well as rare, protected and nonexistent species. It is found in species that are at risk of extinction (Figure 6) (Akpınar Külekçi, 2012; Anonim, 2022b; Anonim, 2022e)



a. **b.**

Figure 6. Of the mammal species identified in the study area

***a.** Hook-Horned Mountain Goat, **b.** Partridge (Bekir, 2009)

3.5. Socio-Economic and Cultural Characteristics of the Research Area

Administrative structure

There are 39 village settlements, 24 of which are forest villages, in Olur district (Anonymous, 2022b).

Table 1. Villages of Olur district in the research area (Anonymous, 2022b)

Village Name				
Akbayır	Coşkunlar	Kaledibi	Ormanağzı	Uzunharman
Aşağıkaracasu	Çataksu	Karakoçlar	Sarıbaşak	Ürünlü
Aşağıçayırlı	Eğlek	Keçili	Soğukgöze	Yaylabaşı
Atlı	Ekinlik	Kekikli	Süngübayır	Yıldızkaya
Beşkaya	Filizli	Köprübaşı	Şalpazarı	Yeşilbağlar
Beğendik	Güngöründü	Olgun	Taşgeçit	Yolgözeler
Bozdoğan	Ilıkkaynak	Oğuzkent	Taşlıköy	Yukarıçayırlı
Boğazgören	Kaban	Olurdere	Tekeli	Yukarıkaracasu

ISBN: 978-625-8246-12-4



Figure 7. Impressions from traditional life in Yıldızkaya village (original)

3.6. Plateau Settlement

Plateau settlements have an important place in the research area. The fact that the area is geographically rugged, the high areas occupy a large area, encouraged the increase in the number of plateau settlements. There are 30 highland settlements in Olur district (Özav, 1991; Tüzemen, 1991).

3.8. Historical development and Recreational Elements

Olur district and its surroundings have been a border between Mesopotamia, Iran, Caucasus and Anatolia since ancient times and have been under the influence of various tribes throughout history and even inhabited by these tribes from time to time.

Happens between the years 1076-1078-1079, the region was under the rule of Byzantium. Since 1087, all Eastern Anatolia and Georgia were connected to the Seljuk Empire (Tüzemen, 1991).

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The Ottoman-Russian War and the First World War caused a decrease in the population in the region. This situation continued until Olur's liberation from the enemy occupation on March 28, 1918. Olur, which was a sub-district center until 1958, became a district with the law numbered 7033, which came into force on 01.04. 1958 during the Republican period (Tüzemen, 1991; Özav, 1991; Anonymous, 2010; Anonymous, 2022f).

Vank Castle (Church)

Vank Castle and its church, which was established on the gently sloping slopes descending from Vank Hill to Vank Stream, near Beşkaya village of Olur district, are in ruins today. "Vank" means church. There is a hall made of limestone for 100 people on the first floor of the church, which was built as two floors (Gündoğdu, 1990).

Pertus (Pirdanus, Eğlek) Castle

It is located in Eğlek village of Olur district. It is estimated that it was built during the time of the Trabzon-Greek Empire. It is known that the Greek Pontus king Dikra founded the castle, which gives the impression of a small outpost and watchtower. Some of the walls in the castle, which was built on a steep rock, have survived. The foundations of structures such as churches and chapels can be seen in the castle, which is one of the ruins of the city of Pertus (Figure 8), (Gündoğdu, 1990; Yıldırım, 2007).



Figure 8. A view from Pertus Castle (Anonymous, 2022g)

Karacasu Castle

Lower Karacasu Castle was established on a dominant hill, east of Olur district center and 12 km away from the district center. On the south side of the castle, there are remains of city walls close to 50 m. The remains of the city wall on the left are made of masonry stone. The ruins of

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walls on the right side of the castle are in ruins. The castle is thought to be a medieval Turkish castle (Yıldırım, 2007; Anonymous, 2022b).

Will Central Castle

Located in the center of Olur district, the castle was built on a dominant hill, approximately 5 km away from the district center. The castle can be reached by the creek road. Since the castle does not have an inscription, there is no definite information about the construction date. The castle, which draws attention with its similarity to other castles, is likely to be a medieval Turkish castle. The walls of the castle were built with rubble stone and only a few of the walls remained standing (Yıldırım, 2007).

Köprübaşı Castle

Köprübaşı Castle was established on a dominant hill near the village of the same name, on the Ardahan-Olur-Artvin road route, in the south of Olur district center and 9 km away from the district. There is a remnant that gives the impression of a tower on the western façade of the castle. Probably the castle was built as a small outpost or watchtower and was built with rubble stone (Yıldırım, 2007).

The Ruins on the Eğlek Village Road

It is approximately 2 km from Eğlek village in the northwest direction of Olur district center. It is as far away as 10 km from the town center. Studies suggest that this place may have been a medieval settlement (Yıldırım, 2007).

Koç Statues Found in Olur District

There are ram statues in five villages of Olur district. The ram statues found in the villages of Ilıkaynak (Arkünis), Yaylabaşı (Kamis), Uzunharman (Haydos), Ekinlik (Oğdadap) and Taşgeçit (Gesmanni) are just a few of the artifacts in the cultural circle of Central Asian Turkish culture extending to Anatolia. The striking ones among these ram statues are the ones in Yaylabaşı village and Uzun Blend village. The sculpture in Yaylabaşı village has a "double-headed eagle" relief, and the one in Uzunharman village has "lion" reliefs. It is estimated that these statues, which are not known exactly at what period they were made, were from the Black sheep or Akkoyunlu (Yıldırım, 2007; Anonymous, 2022f).

Yıldızkaya Cave

It is approximately 350 m walking distance from Yıldızkaya village of Olur district of Erzurum province. Yıldızkaya cave is located on a mountain slope in an area approximately 100 m above the valley floor, at a distance of 186 km from Erzurum and approximately 48 km from the town

ISBN: 978-625-8246-12-4

of Olur. The spring of paradise, which Evliya Çelebi mentions in his "Travel" and says "Its water is good for horses and women", is in this region (Anonymous, 2011b; Anonymous, 2022f).

Yıldızkaya cave has two entrances and the height of these entrances exceeds 1.5 meters. The inner height of the cave is estimated to be 40-50 meters, and the width at the first entrance reaches 100 meters. The length of the cave exceeds 250 meters and its beauty will be noticed better if good lighting is provided (Figure 9).



a. **b.**

Figure 9. Views from Yıldızkaya Cave (original) Entrance of Yıldızkaya cave b. Views from the stalactites and stalagmites located approximately 100 m deep in the cave.

Festivals and festivities

In the study area, under the leadership of the district governorship, municipalities and the Ministry of Culture, Olur Akdağ festivals are held traditionally between July 4-5 every year since 2011. The festivities, attended by thousands of locals, people from all over Turkey and abroad, are colorful with many cultural events such as karakucak wrestling, sax battles with folk poets, concerts, competitions and folkloric shows. Local products are exhibited and cag kebab feasts are given at the stalls set up at the corners of the festival, which takes place in an atmosphere of cohesion, in which thousands of people set up tents. The festivities end with dances and oral activities with saz (Anonymous, 2022b; Anonymous, 2022c).

Agriculture

The main economic activities of Yıldızkaya village of Olur district, which constitutes the research area, are plant production and animal husbandry. However, these activities vary according to the socio-economic, and socio-cultural structure of the population, natural environmental conditions, and geographical structure of the region. Despite the negativities of the soil conditions and sloping land structure in the area, there is a tendency of the people to agricultural activities due to their limited livelihoods.

ISBN: 978-625-8246-12-4

The mountainous and rugged nature of the area and the lack of flat lands suitable for agriculture make it difficult for agriculture to develop in the region. In short, despite the positive effects of climatic conditions, the negative effects of soil conditions and geographical structure attract attention as a factor that reduces productivity in agriculture. Another disadvantage is that agricultural lands are scarce and fragmented, and hundreds of hectares of land are left fallow every year. Vineyard and orchard agriculture (fruit growing) has been carried out in the field for a long time. Vegetable production, on the other hand, is produced and marketed in small businesses on a local basis (Anonymous, 2022d; Özav, 1991, Tüzemen, 1991).

Conclusıon and Recommendatıons

The evaluation of the rural landscape features of Yıldızkaya village and its surroundings, which is connected to the Olur district, which is the study area, is briefly summarized above. In this context, the following activities can be done for the development of the region.

It is recommended to pay attention to the basic elements:

- Yıldızkaya village and its immediate surroundings should be protected in terms of its biological, ecological, and geomorphological features, endemic plant and animal existence, historical, archaeological, and cultural richness, and keeping its biological and ecological features intact and continuity.
- Endemic species in the region should be protected.
- Olur Yıldızkaya Cave contains interesting morphological elements, the size of which has not been determined exactly. Especially the stalactites, stalagmites, and puddles in the cave are worth seeing. Yıldızkaya (Kiwi) Cave, which is uniquely beautiful, and formed by natural factors, should be opened to tourism. For this purpose, a study report should be obtained by MTA (Mining Technical Search) on whether there is any objection to the use of the cave for tourism purposes in terms of ecology and life safety. If there is no problem, roads should be opened for travel purposes in the cave and in the area between the village and the cave, where visitors can walk safely.
- Areas suitable for highland tourism should be identified in the region and tourism studies should be carried out in these areas.
- A "Plant Museum" should be established in order to protect the biodiversity and endemic plant potential in the region.
- Poaching should be prevented and wildlife should be protected.

ISBN: 978-625-8246-12-4

- An appropriate inventory of the region should be created and natural life should be monitored continuously.
- Attention should be paid to the rural landscape characteristics of the region and ecological planning principles suitable for the natural structure.
- A good land use planning should be done in the study area, taking into account the water, soil structure, and landslide risk.
- Illegal removal of endemic and endangered flora and fauna species in the study area should be prevented.
- The rich flora of the region such as bulbous, tuberous, rhizome plants, medicinal and aromatic plants, and alpine plants should be evaluated, and the cultivation, dissemination, protection, and promotion of these plants should be made in the best way and brought to tourism.
- Within the scope of ecological product and agricultural (agro) tourism, organic product production, local foods, and wild fruits should be evaluated.
- The visual beauty of the vegetation, which has rare beauties in every season, in the study area, depending on the seasonal transitions, should be evaluated in terms of photo safari tourism.
- In terms of transportation to the region, the dangerous and broken roads leading to Yıldızkaya village, which is a mountain village located at a high altitude, should be improved as soon as possible.
- Historical artifacts in the study area should be protected in terms of History and Faith Tourism.

In conclusion, we can say that; The development of mountains, plateau, agriculture, and cultural landscape activities in rural settlements in our country, which has an important potential in terms of the rural landscape, will help solve the problems of these regions in the medium or long term.

Note: A part of this study was produced from a doctoral thesis titled "Determination of Tarsus county and recreational landscape potential for tourism".

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Determınation of Ecotourism Potential of Tarsus (Mersin) District

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Abstract

When the tourism potential of the region and all its features are examined together with the facts used for the development of ecotourism and considered as a whole; It is an important phenomenon that reveals which tourism activities can take the region further, and which is considered as a whole with the natural and cultural resource values of an area. For this reason, areas that have preserved their cultural values and natural riches are visited by more people. This ensures that people who want to break away from the monotonous structure of cities tend to these areas. The district of Tarsus (Mersin), which constitutes the research area, and its immediate surroundings have a very deep-rooted historical background, and it is very important for the promotion and preservation of the works left by previous civilizations and accepted as universal. This study was carried out to determine the ecotourism potential of Tarsus district of Mersin province. In the first stage, the purpose of the study and the selection of the area were made and the social, physical and cultural evaluations of the area were made. It has been determined that the province of Tarsus, which was selected in the light of the evaluations, is quite rich in terms of historical, cultural and natural resource values. In the light of the evaluations made in the study area, various suggestions were made for regional tourism.

Keywords: Ecotourism, Tourism, Tarsus (Mersin)

1. Introduction

As a result of the changes in people's work and living conditions with the development of urban life style in the world; A different system has emerged in order to lead a better quality life socially and physically. Tourism is the main basis of this system. People want to get away from these living conditions, which intensify as a result of this differentiation, to relax, take a vacation, learn while traveling, and communicate with different people. This is an important factor in people's own physical and mental differentiation and renewal.

Tourism not only allows people to change places, but also to renew themselves, change and relax by mentality. In addition to these, tourism is a phenomenon that is constantly renewed, developed and developed due to its contributions to the economy and country development.

Tourism itself is a production and consumption activity. Therefore, the productions and consumptions realized in the current time generally have the aim of obtaining an economic income. With the development of technology and mechanization, industrialization and industry have come to a very important point. Tourism is an important resource for countries, especially commercially. However, the resources inherent in tourism; People, natural environment and tangible and intangible cultural heritage are parts of tourism.

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People want to know and communicate with people from different cultures, so tourism acts as an important bridge. Tourism activities should be carried out without harming the natural environment and cultural heritage. While organizing tourism activities, it should be in harmony with the cultural values of the region. If there is no harmony and order, negative effects of tourism on cultural values are inevitable (Uslu & Kiper, 2006).

When the tourism potential of the region and all its features are examined together with the facts used for tourism development and considered as a whole; It is revealed that which tourism activities can take the region further or not. For this reason, areas that have preserved their cultural values and natural riches are visited by more people. This ensures that people who want to break away from the monotonous structure of cities tend to these areas.

At this point, the concept of eco-tourism came to the fore as a result of environmental activity between 1970 and 1980. According to Hector Ceballos-Lascurain in 1983, the concept of eco-tourism was expressed as enjoying nature without harming nature. In this respect, eco-tourism is presented as a travel in touch with nature in undamaged natural areas, which prioritizes environmental awareness based on the protection of the environment. There is a general consensus that eco-tourism includes three main determinants in this respect. These three basic elements are (Erdogan, 2003);

- It is the basis of nature.
- Cultural
- Understanding the value of the resource

In the concept of sustainability, education has an extremely important place in eco tourism. With the development of environmental awareness in eco-tourism, it is ensured that tourism activities are sustainable by not harming natural assets. We can summarize the components that make up eco-tourism as follows (Kılıç Zengin, 2006);

- Natural environment
- Ecological and cultural sustainability
- Education
- Economic benefits at the local level
- Protection of natural areas, education, economic gain, quality tourism and participation of local people are the most basic functions of eco tourism.

Eco-tourism, which is different from mass tourism, adopts an eco-centered approach, protects the environment and spreads tourism to 12 months in a sensitive way to natural areas, aims to

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minimize the damage done on the natural environment, to make economic gains by planning not to correct the damage, but to prevent it is a tourism (Akpınar Külekçi, 2012).

Due to the negative consequences of different tourism activities in biological, cultural and social aspects, tourism activities that have positive effects on people and the environment have begun to be created. Due to the importance of the environmental factor in tourism activities, one of the sustainability approaches shaped as an alternative to the negative effects on the environment and natural resources is eco tourism (Kılıç Parlak, 2006).

Eco tourism factor; As a result of the increase in pressure and negative effects in the environment, the decrease in the demand for mass tourism after environmental awareness, it has developed as an alternative to nature-based and nature-protecting activities.

2.Material and Method

Tarsus district constitutes the main material of the study. Tarsus is a district of Mersin province in the south of Turkey. Mersin is located in the western part of the Mediterranean Region and Çukurova town. The study area covers a large part of the Mediterranean Basin and Mersin province has a surface area of approximately 15,803 km^2 (Figure 1).

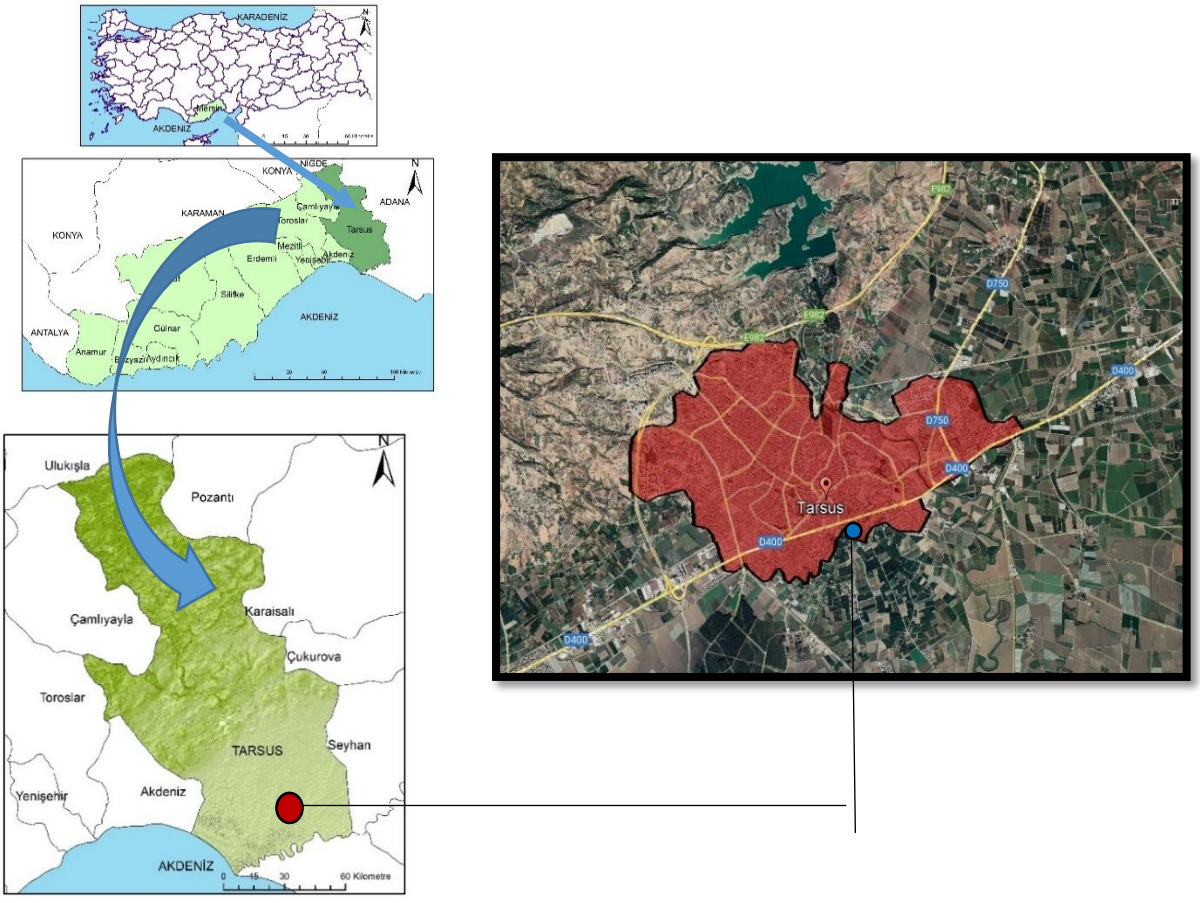


Figure 1. Location of the study area

ISBN: 978-625-8246-12-4

This research was carried out to determine the ecotourism potential of Tarsus district of Mersin province. In the first stage, the purpose of the study and the selection of the area were made and the natural, social, physical and cultural evaluations of the area were made. It has been determined that the province of Tarsus, which was selected in the light of the evaluations, is quite rich in terms of historical, cultural and natural resource values. The topography, vegetation, wildlife, climate and cultural landscape characteristics of the area that constitute the natural landscape features of the area, the settlement structure, production characteristics, landscape characteristics were examined in the literature related to ecotourism, which includes the research subject. In revealing the ecotourism potential value of the area, Akpınar Külekçi and Bulut (2012), Erdoğan and Erdoğan 2005; Arslan 2005; Yucel 2002; Ankaya et al. 2018; Polat and Önder 2006; Fennell 2007; It has been examined on the basis of the studies of Orams 1995.

3. Findings

Ecotourism Based Natural Landscape Features of Tarsus and Its Neighborhood

Below are the natural landscape features of Tarsus district, which are important for ecotourism:

1. Geological features

The west-northwest side of Tarsus and its surroundings consists of structural units belonging to the Bolkar Mountains. The Tarsus plain is located in front of this mass, which is in the form of high mountains, hills and foothills. The section, which constitutes the most important and high relief of Tarsus and its surroundings, contains the structural units of the Bolkar Mountains. Among these structural units, the oldest unit belongs to Paleozoic and is located on Eshab-Kehf Hill and its close vicinity. This hill is located at the highest point of the study site and this Paleozoic-aged area extends to the northeast from the Dedeler-Taşkuyu villages and disappears under the Tertiary sedimentary units. This oldest mass is composed of limestone and schists. The limestones are crystallized as a whole and their colors vary between black and white (Hocaoğlu, 2003).

2. Geomorphological features

Landforms vary within the boundaries of Tarsus district. A large part of the city of Tarsus consists of plains, mountains and plateaus. Bolkar Mountains, which are the high parts of the Central Taurus Mountains, are located in the north of the study area.

After the examinations in the study area, it was classified as mountainous areas, valleys and gorges in the area (Hocaoğlu, 2003; Kelleboz, 2019).

ISBN: 978-625-8246-12-4

a. Mountainous Areas

b. Valleys and Straits

a. Mountainous areas

The average heights of the mountainous areas vary between 1750-3600 m. Mountainous areas of the study area to the north are visible on the map. A large part of the city of Tarsus consists of plains. The information about Bolkar Mountains, Eshab-ı Kehf Hill, Göztepe Hill, which are some important mountains and hills in the study area, are explained in detail below.

Bolkar Mountains

Bolkar Mountains can be seen on the north side of Tarsus city. The height of the Bolkar Mountains, which is a part of the Taurus Mountains, exceeds 3000 meters. Bolkar Mountains are located approximately 90 km north of Tarsus district center and 20 km north of Gülek District. The southern slopes of the Bolkar Mountains, from which some branches of the Berdan (Tarsus) Stream originate, have a steep, rocky and high slope. Bolkar Mountains, which are the highest places of Tarsus and its surroundings, can be seen from the Karboğazı region (Dinç, 2009).

Ashab-i Kahf Hill

It is 14 km northwest of the city of Tarsus. Eshab-ı Kehf (Ziyaret Mountain) hill, at a height of 497 m, is located in the village of Dedeler. South of the Eshab-ı Kehf hill, there are two other large elevations of the study area on the steep slope and asymmetrical ridges facing northwest. These are the 320 m high Maltepe and the 370 m high Kartal Tepe (Figure 2) (Hocaoğlu, 2003).



Figure 2. View from the Eshab-i Kehf Hill (Original)

ISBN: 978-625-8246-12-4

Gözlükule Hill

The lands of the center of the Tarsus district are mostly flat areas. However, the northern part of the city is surrounded by the Taurus Mountains. The district center consists of flat lands in general. There is no elevation in the district center except for the Gözekule hill. The Göztepe Hill is a mound in the southwest of the Tarsus district, used as a park of the district. The Göztepe Hill has a height of 25 meters. The first settlement that forms Tarsus today was built in VII. It is known that it was founded as a village in the 19th century. Göztepe Mound is located in the ancient Cilicia plain, at the exit of the Gülek Strait, which is a natural transition from Central Anatolia to the Mediterranean coast (Figure 3) (Anonymous, 2021a).

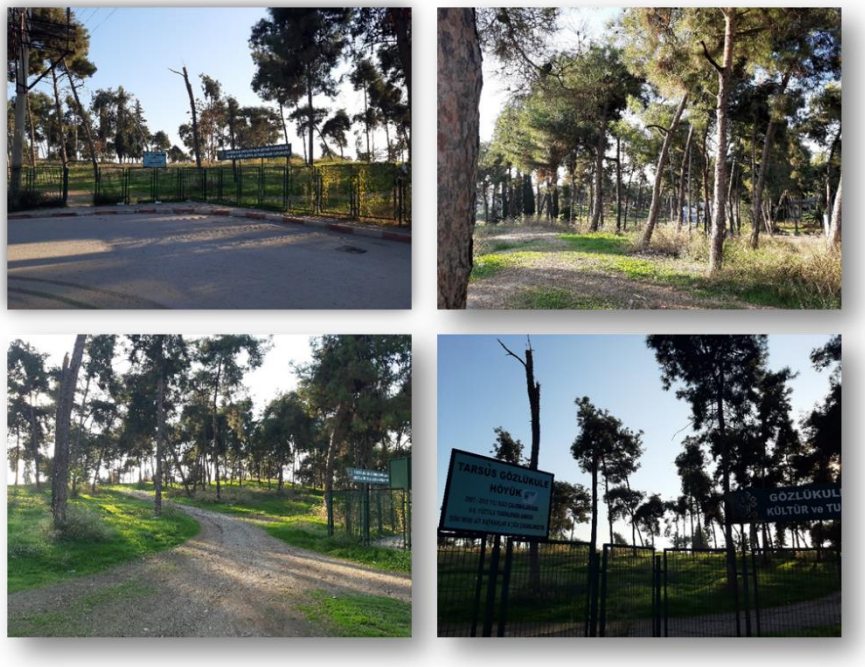


Figure 3. Views from the Tarsus Çubukule Mound (Original)

b. Valleys and Straits

Some important valleys and gorges in the study area, Kadıncık River Valley and Strait, Keşbükü Stream Valley and Bosphorus, Tarsus (Berdan) Stream Valley, Deliçay Stream Valley, Hell Creek Valley and Swamps are explained in detail below.

Kadıncık River Valley and Strait

The Kadıncık River is one of the two important tributaries that make up the Tarsus (Berdan) Stream. It is composed of Kapiz Stream and some seasonal streams connected to this creek. The Valley of the Kadincik River is 40-45 km. has such a length. There are two valleys joining

ISBN: 978-625-8246-12-4

the Kadıncık River Valley as a side branch. The first of these valleys is Kapiz Creek Valley and another valley is Gülek Creek Valley (Dinç, 2009; Kelleboz, 2019).

Keşbükü Stream Valley and Strait

Keşbükü Stream Valley, which forms one of the two important parts of the Tarsus (Berdan) River, originates in the western parts of the Bolkar Mountains, and forms a narrow and steep valley as it passes through the Keşbükü Strait. Keşbükü Stream joins with Kadıncık River near Cevreli District. Çocak Valley, which forms the upper course of the Keşbükü Stream Valley, is in the form of a V profile (notch) valley.

Tarsus (Berdan) Stream Valley

The Tarsus Stream Valley starts from the southeastern slopes of the Bolkar Mountains. Tarsus Stream Valley is very narrow and steep. Tarsus Stream was formed by the merging of Kadıncık River and Keşbükü Stream. In the sections close to the shore, the valley floor expands and merges with the valley floor of the Seyhan River. Tarsus Berdan plains are located on these wide plains. Covering an area of 85,000 hectares, the Tarsus Plain is separated from the coast by sand embankments (Öner et al., 2005).

Tarsus waterfall is located on conglomerate rocks. It flows down from a height of about 4-5 m. The flow rate of Tarsus Stream increases in winter and spring seasons, and its flow value

Cehennemdere Valley

Cehennemdere Valley; It is one of the two most important branches that pass through the Çamlıyayla area and form the Tarsus Stream. The Cehennemdere Valley, which is the continuation of Çocak Creek, is about 20 km long and at a depth of 400-600 meters (Dinç, 2009).

Marshes

The formation of a large delta area such as Tarsus Stream delta-flood plain and Çukurova was shaped by the joint operation of effective processes. The rivers, which were effective in the formation of the Çukurova delta, were effective in different parts of the delta area and enabled the delta to expand in certain directions at various times. Çukurova is the joint work of the Tarsus Stream, Seyhan and Ceyhan rivers and is an interesting area in terms of alluvial geomorphology. As is known, this plain forms the west-northwest part of the Çukurova delta. This section is also a common alluvial delta plain formed by the sediments carried by the Tarsus Stream and Seyhan River. It finds several marshes on the delta-flood plain. These marshes are the Karabucak marsh located in the southwest of Tarsus city, the Aynaz marsh in the east of the

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Kulak village, the Dipsiz lake marsh in the west of the Seyhan river mouth, and the Tuz Gölü marsh in the west of the Tuz Gölü (Hocaoğlu, 2003).

3.Soil properties

In the study area, as a result of the decomposition and fragmentation of rocks and organic materials in various diameters, soil structure was formed after the mixing of organic materials. The soil features of the area are the main reservoir of the main resources from which the vegetation is fed. It has been determined that the Red Brown Mediterranean soils develop from the zonal soils where the climatic conditions are effective in the soil formation of Tarsus and its surroundings, where the average annual temperature in Tarsus and its surroundings exceeds 18 °C and the annual average rainfall is close to 600 mm (Hocaoğlu, 2003).

4. Natural vegetation

The most important factors that determine the characteristics of the natural vegetation of each region are climate, altitude and soil. Therefore, the vegetation varies according to each region. In particular, climate and vegetation are interrelated (Table 1). Therefore, the effect of the Mediterranean climate plays a major role in the main lines of the natural vegetation of Tarsus and its surroundings. The natural vegetation in this area consists of coniferous forests, which are Mediterranean vegetation formations, and shrubs with maquis (Hocaoğlu, 2003).

Tarsus, with the Taurus Mountains in the north and the Mediterranean Sea in the south, has a surface area of approximately 2,026 km^2 *Olea europaea* L. where mountain elevations are up to 500 m. *Olea europaea* L. (Olive Tree), *Lourus nobilis* L. (Mediterranean Laurel), *Ceratonia siliqua* L., *Myrtus communis* L. subsp. communis L. is seen. At 1000 m altitudes, *Quercus coccifera* L. (Kermes Oak) and *Pinus brutia* L. (Red Pine) assemblages are seen, while at 2000 m altitude *Pinus nigra* L. (Larch), *Cedrus Libani* A. Rich. *Abies cilicia* subsp. cilicica (Taurus Fir) and *Juniperus excelsa* subsp. There are large forest areas *Juniperus excelsa* L.) communities are located. On the plains, typical vegetation such as *Citrus aurantim* L. (Citrus), *Chamaerops humilis* L. (Mediterranean Fan Palm), *Phoenix dactylifera* L. (Persimmon) and various fruit trees (Anonymous, 2021b).

Table 1. General Land Presence of the Study Area (2014) (Anonymous, 2021d)

	Coverage Area (da)	Coverage Ratio (%)
Farmland	1.008.986	51
Forest Area	556.847	28
Non-Farm Land	386.677	18
Agricultural but Unused Area	8.995	1
Meadows and Pastures	29.085	2
Total area	1.990.590	100

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Citrus fruit cultivation in and around Tarsus has an important place for the people. Citrus fruits are mainly found in the northern edge of the plain, where the flood hazard is low. Citrus cultivation areas stretch from Huzurkent to Adanalıoğlu village and to the north of the plain. However, in areas other than eucalyptus groves and citrus orchards on the alluvial plain, field agriculture, that is, cotton farming in general, is carried out (Hocaoğlu, 2003).

Since the area is located in the Mediterranean climate zone, the prominent plant species are red pine, maquis and garigue.

Due to the deterioration of the forest formation around Tarsus, it is seen as scattered tree groups in areas such as Eshab-Kehf, Kartaltepe and Maltepe, where the slope and height increase. The dominant bushes among the tree communities here are; *Quercus coccifera* L. (Oak Tree), *Lavandula angustifolia* L. (Lavender Blossom), Thymus Vulgaris L. (Oregano), *Calluna vulgaris* (L.) Hull, *Juniperus oxycedrus* L. (Tarwood) and *Erica arborea* L. (Tree Shrub) are shrubs made up of maquis. Other dominant plant species seen in the area are; Cistus salviifolius (L.), *Sarcopeterium spinosum* (L.) Spach and *Lavandula stoechas* L., *Arbutus unedo* L., *Morus alba* L., *Lourus nobilis* L. species (Hocaoğlu, 2003; Torun, 2014).

Viticulture is carried out on 110 thousand decares in Tarsus district. There are mainly vineyards in the region between the villages of Sayköy, Cinköy, Ulaş, İbrişim, Dedeler and Taşkuyu around Tarsus. There is a eucalyptus afforestation area located in two separate areas in the research area. The first of these is the Karabucak eucalyptus grove, located between 5 and 2.5 m isohipps in the south of the town of Tarsus. The other eucalyptus grove was built in the south of the research area on the coastal dunes to stop the dune progression (Anonymous, 2015).

5. Climate Structure

The Mediterranean climate is seen in Tarsus. Summers are hot and dry, winters are mild and rainy. In the inner parts of the city of Tarsus, continental climate is observed. Climatic conditions, which also differ depending on the landforms, are seen in high places with cool and dry summers, cold and snowfall in winters.

The mountain part of the city of Tarsus is cooler in summer compared to the plain. However, due to the effect of the sea, humid air prevails at the same time.

The annual average temperature of Tarsus and its surroundings varies between 19.2 °C and 14.3 °C (Table 8, Table 9). As the temperature rises, the humidity in the air also increases. Although Tarsus is on the coast, it does not receive much precipitation throughout the year due to the high temperature values. The rainy season is only seen in winter and late autumn (Torun, 2014).

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About 78% of the average annual precipitation is between November and March, and 22% is between April and October. According to the data of the Rural Services Research Institute meteorology station, the 46-year average precipitation in the region is 616.7 mm (Anonymous, 2021d).

6. Hydrographic Structure

Moving water bodies, underground and surface waters determine the natural appearance of the environment. Tarsus stream in the study area has formed a common plain (Çukurova) and a common delta with the sediments carried by the Seyhan and Ceyhan rivers (Hocaoğlu, 2003).

Tarsus Stream (Berdan Stream)

Tarsus Stream is a stream that starts in the Taurus Mountains of the Çamlıyayla region and flows into the Mediterranean after passing through the town of Tarsus as Cennet Creek and Kadıncık River (Figure 4). It is overlain by the Kadıncık 1, Kadıncık 2 and Berdan (Tarsus dam) dams. Kadincik 1 and Kadincik 2 are located in the middle course of the Tarsus Stream. Berdan Dam is located in the north of Tarsus city center between Akçakocalı, Kösebalcı and Kayadibi Neighborhoods. Tarsus Stream is one of the shortest rivers in the world that carries the most water (Anonymous, 2021b).

Tarsus Stream takes its sources from the southern skirts of the Bolkar Mountains. Hell Creek, which originates on the southeast slopes of the Bolkar Mountains, takes the name Keşbükü Creek when it enters the research area. The other second main tributary is the Kadıncık River (Torun, 2014).

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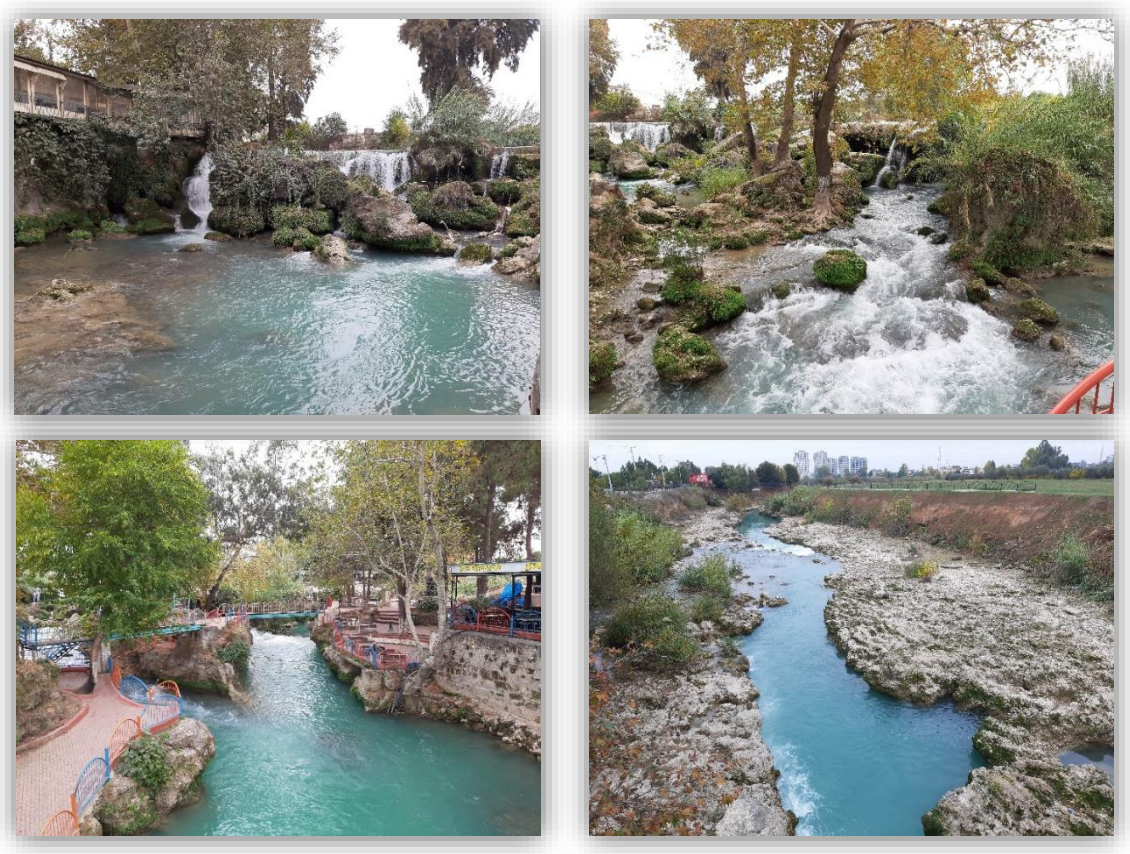


Figure 4. The Waterfall Formed by the Tarsus Stream in the City Center (Original)

The length of the Tarsus Stream is approximately 142-150 km. The Tarsus Stream, which flows in the undulating terrain of the mountains in its upper parts, enters into narrow and deep valleys as it descends, and goes like this to the plain. The water collection area of the Tarsus Stream, which collects the waters of an area of approximately 2,000 km², consists of the high parts of the Central Taurus Mountains that receive abundant rainfall. Therefore, its water is abundant in summer and winter months (Torun, 2014).

Hell Stream

Hell Stream is a stream located in Çamlıyayla locality. Hell Stream starts from the southern slopes of Bolkar Mountains. The river is fed by several streams and abundant springs. It passes through many gorges, collects new spring waters, dives under the ground in a deeper gorge, and flows faster in the future, falling in waterfalls from place to place, again passing through deep and narrow gorges, passing through the cotton area, and the cotton dam is fed with this water and merges with the Kadıncık Stream in the future. Hell Stream is 6 km away from the town of Sebil. The depth of the Hell Stream valley varies between 400-600 meters (Anonymous, 2021b).

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Kadincik River

Kadincik Stream is strengthened by the tributaries it receives from the upper course of the Tarsus Stream, flows through narrow and deep valleys and merges with the Hell Stream near the Muhat Bridge (Bozlak, 2008).

The Kadıncık River takes its source from the Bolkar Mountains. In the high parts of the Bolkar Mountains, snowfall is observed in the winter season. Melting snow in summer feeds the Kadıncık River (Kelleboz, 2019).

The Kadincik River is formed by three major tributaries (Figure 5). Its largest tributary is Gülek Stream. The starting point is the skirts of Gülek Mountain. After crossing the Gülek Strait, Gülek Creek joins the Kadıncık River between Beylice - Kızılçukur Neighborhoods, close to the Çevreli (Muhat) bridge. Gülek Stream collects the waters of Karboğazı and Kocaboğaz Streams, which are two separate branches, and is generally in the shape of a deep valley. The other two branches of the Kadıncık River are the Irmaközü and Kapız Streams. These streams, which flow in the northwest-southeast direction and in places in the valleys of the Bosphorus, converge around Darıpınarı. It forms the Kadıncık River by taking Gülek Creek near Beylice District. There are Kadıncık 1 and Kadıncık 2 dams on the Kadıncık River (Dinç, 2009).

Kesbükü Stream

As it passes Çamlıyayla (Namrun), the Hell Stream takes the name Pamukluk Stream (Figure 6). While passing through the Keşbükü Strait, it takes the name Keşbükü Stream and joins with the Kadıncık River near the Çevreli village before reaching the Muhat bridge (Dinç, 2009).

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Figure 5. Views from the Keşbükü Stream (Original)

Deliçay Stream

Deliçay Stream starts around Böğrüeğri District and has a length of 15 km downstream. Similar to the Kadıncık Stream valley, there are landslide areas on both sides of the valley (Kelleboz, 2019).

7. Socio-Economic Structure of Tarsus and Its Neighborhood

The history of the city of Tarsus

Tarsus is a district of Mersin province located in the Mediterranean region of southern Turkey. The name Tarsus is thought to be derived from the name of Tarhon (Tarkon), the founder of Cilicia and known to be the oldest god of the city. The name of the city of Tarsus was later used as style in Assyrian, style in Aramaic, and Tarsos in Greek. The name Tarsus was later used with the name Taurus, the name Taurus became Tarsus in Latin and has survived to the present day. According to known sources, Tarsus has a history of approximately ten thousand years. Therefore, it has a very different and rich culture thanks to the civilizations it hosts. It was discovered in 1934, after the archeological excavations in Glassule, that Tarsus, the capital of Cilicia, was one of the first settlements in Anatolia. According to the sources, it is known that it started with the Neolithic Period after the excavations in Gözekule and continued until the

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Middle Bronze Age. However, it is not clear exactly when and how Tarsus was founded. The most emphasized information focuses on the fact that the city of Tarsus was founded by the Assyrian ruler Sardanapal. After the rule of the Assyrians, it passed under the rule of Alexander. After the rule of Alexander, the city of Tarsus, along with the whole of Cilicia, was dominated by the Seleucids. Tarsus city BC. It came under Egyptian rule in 246 BC. However, BC. After Cilicia became a Roman province in 66, the city of Tarsus became the center (Figure 10) (Engin, 2004; Çokan, 2017; Sakar, 2019).

Tarsus Stream has brought a historical advantage to the city of Tarsus. The local people of Cilicia gave the Tarsus Stream the name of Cydunus, the name of the river god in mythology. Cleopatra and Roman commander Mark Antony entered the city of Tarsus via the Tarsus Stream passing through Tarsus (Cokan, 2017).

The city of Tarsus, known as the birthplace of St. Paul, the founder of Christianity, has an important place for Christians. After the city of Tarsus was conquered by Muslims in Gregorian 639, 17 Hijri, it passed from the Byzantines to the rule of Muslims (Cokan, 2017; Sakar, 2019; Anonymous, 2021b).

Yavuz Sultan Selim was included in the Ottoman lands in 1516. The city of Tarsus became a sanjak center of the Province of Cyprus in 1571. However, after a while, it was taken to the borders of Adana province. Egyptian Ibrahim Pasha defeated the Ottoman forces in 1832. Then he captured Adana and its surroundings. The city of Tarsus re-entered the Ottoman lands in 1839. In 1867, the province of Aleppo became the sanjak of Adana, and in 1877, the province of Adana became a district of Adana sanjak (Sakar, 2019; Anonymous, 2021a).

8. Trade and Industry in Tarsus

Tarsus has an important place because it is on the trade routes. The city of Tarsus was on the caravan and postal route during the Ottoman Empire. Tarsus has shown significant developments in terms of economic and commercial activities, especially during the Ottoman period (Yılmaz, 2019).

Tarsus is today the commercial and industrial center of Mersin. In terms of industry, its developed district after Mersin is Tarsus. Apart from the industrial establishments that evaluate the agricultural products of the district, there are agricultural tools, machinery spare parts, factories that make machine tools, sugary food factories, brick and ceramic factories, which are important for the country's economy. Turkey's first Chamber of Commerce was established in

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Tarsus in 1879. Agriculture is an important source of income in the economy of Tarsus. 51% of Tarsus district is agricultural land and 28% is forest area (Torun, 2014; Anonymous, 2021b).

9. Agriculture and Animal Husbandry in The City of Tarsus

The most fertile and widest agricultural land of Mersin is the flat plains of Tarsus. In addition, thanks to the climate being suitable for agriculture, all kinds of agriculture are carried out in the lands. In the city of Tarsus, early vegetables and fruits are grown under cover in winter and in the open in spring. Tarsus is one of the important production centers of products such as citrus, grapes and olives throughout the country. In addition to those produced, industrial crops such as corn, soybean, sunflower and cotton are also grown (Torun, 2014; Anonymous, 2021b).

In Tarsus, 77 kinds of agricultural products are grown. Recently, greenhouse banana and lemon cultivation has increased. Tarsus' contribution to the gross domestic product in the agricultural sector is 4.5 Billion TL. According to 2018 TUIK data, Tarsus agricultural area covers 29.7% of Mersin with 1.008.961 decares; It constitutes 0.43% of Turkey (Anonymous, 2020c).

In addition to agricultural products in the research area, another important source of livelihood in rural areas is animal husbandry. In the area where the elevation increases as you go from south to north and the elevation rises from 0 meters to 3000 meters, only 1/5 of the structure of the land is a flat area and the rest is mountainous and hilly. The slope of these areas is also high. For this reason, it has been considered more appropriate to do animal husbandry instead of growing cultural plants in these areas where irrigation is not possible. The number of cattle, ovine and working animals in the study area is approximately 100,000. 17.3% of this number consists of cattle, 81% of small cattle and 2% of work and passenger animals (Bozlak, 2008).

Small cattle breeding has developed due to the rugged and stony terrain. Hair goat is reared in the second place after sheep in the study area. Small cattle make up 81% of the livestock population in Tarsus. Of these animals, 57% are hair goats and 43% are sheep. Due to the topographic structure, climate, flora and hydrographic structure of Tarsus and its surroundings, the profession of beekeeping is also widely practiced. The climatic conditions of the research area are suitable for beekeeping most of the year (Bozlak, 2008).

Discussion and Conclusion

Tarsus, which was determined as the study area, is a district of Mersin province in the south of Turkey. Tarsus district is located in the east of Mersin province. Districts of Mersin province; Mediterranean, Anamur, Aydıncık, Bozyazı, Çamlıyayla, Erdemli, Gülnar, Mezitli, Mut, Silifke, Taurus, Yenişehir and Tarsus. Tarsus district is the largest district of Mersin province.

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The natural assets of the Tarsus district, such as mountains, forests, plateaus and streams, have a topographic structure with differences between the altitudes of 0 m on the Mediterranean coast and up to 3000 m in the northern region. The natural vegetation in and around Tarsus, where the Mediterranean climate is dominant, carries many plant riches. In addition, Tarsus cave is known to have an important ecotourism potential with its historical structures and traditional life and socio-cultural structure. For this reason, it is necessary to use these natural structures with a sustainable understanding in the balance of protection and use for ecotourism activities to be carried out in Tarsus. Natural and cultural resources are the leading factors that play a role in the formation and development of ecotourism.

Throughout history, people from many different cultures have lived in the city of Tarsus. Throughout history, the city of civilizations living in Tarsus has lived in accordance with their own beliefs and cultures and left traces in different cultures today. These traces they have left are also reflected in the Tarsus cuisine. It is recommended to pay attention to the following points in the studies that can be done for the development of the ecotourism potential of the Tarsus district and its immediate surroundings, which constitute the study area, and for the development of the region:

• The proximity of natural resources and historical sites in Tarsus district is an advantage in terms of tourism, with easy transportation. In terms of ecotourism, Tarsus has the potential to lift this vitality. Local people, non-governmental organizations, tour guides and local governments should develop correct planning studies with participatory, protective and rational approaches. As a matter of fact, in the survey study, the development of tourism in the districts is positively approached. This positive approach of the people of the region has an important place in terms of the development of tourism activities to be held in the district. As a matter of fact, Sinkovics & Penz (2009) stated that the local people's positive perspective towards tourists and the relationship between tourists and local people increase the desire of tourists to travel.

• In order to increase tourism activities in Tarsus, fertile agricultural lands in the Tarsus Plain should not be used for construction and the natural beauties of the county should be protected.

• It is necessary to promote the rich natural, historical and cultural beauties well.

• Historical Tarsus houses should be converted into museums or accommodation areas for visiting tourists with the renovation work.

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• Tarsus beach, which has a very important potential for sea tourism, is currently in a neglected state. Thanks to the investments and promotions to be made, it is in a position to be an important resource for the country's economy and an important marine tourism area on a regional and international scale.

• Bolkar Mountains are located in the north of Tarsus city. These areas are an important wealth for various ecotourism activities such as plateau, festival, camping caravan and flora and fauna observation, trekking. In addition, the construction of recreation areas in mountainous areas in a way that will enable the local people to benefit without harming the natural beauties will allow recreational activities. In particular, the transportation problem in these areas should be eliminated and necessary infrastructure works should be provided.

• Paragliding is done in certain areas (Çanaktepe, Kartaltepe and Eshab-ı Keyf hills) in Tarsus district. The development and promotion of these areas will contribute to the development of paragliding in the city of Tarsus. In addition, there is a problem of transportation to the area where paragliding is done to Tarsus Eshab-ı Keyf hill. These problems need to be fixed.

• Medetsiz Hill (3524 m), which is one of the suitable places for trekking activities in the district, should be promoted and the county should be brought to trekking tourism, as well as the foothills of the Taurus Mountains, mountainous and forested areas in the north of the county for trekking activities as well as bicycle tours, camping and caravan tourism in the county.

Tarsus, which has an important cultural mosaic in terms of ecotourism potential, unfortunately does not have the place and importance it deserves in many respects today. In this respect, this precious natural and cultural area should be brought to its rightful place and evaluated in terms of ecotourism with an appropriate planning and sustainable approach.

NOTE: This study was produced from a master's thesis titled *"Determination of Tarsus county and recreational landscape potential for tourism"*.

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Süleyman Demirel University Campus within the Scope of Universal Design Principles

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Abstract
Universities, which are among the institutions where knowledge is produced and shared, have an important role in the development of societies and therefore individuals. With this feature they have, university campuses also contribute to the identity of the city they are located in. The size of this contribution increases with their design, usability and accessibility. University campuses serve the use of students for educational purposes. In terms of social aspects, due to the recreational opportunities it has, it provides opportunities for students, university staff and the public to have leisure activities during extracurricular times as intensive use areas. The most important way for university campuses with intensive use to make the expected contributions from an educational and social point of view is through an understanding of planning and design that appeals to all individuals. A healthy design can only be carried out with compliance with the established design criteria and success criteria in practice. The design approach that ensures the equal use of urban areas, built environments, spaces and products by all individuals regardless of physical, cultural and special qualities is defined as design for everyone or universal design. Design for all, lifetime design, user-centric design, inclusive design, etc. universal design that can be used instead of concepts; It integrates with the terms comfort, safety, adequacy, sustainability, integration and convenience. Within the scope of universal design, making the campus environment and the spaces within the building accessible and understandable for all users, as well as increasing the use of these built environments by disabled individuals are among the main objectives of this approach. The quality of life of the users in university campuses should be increased within the scope of universal design understanding. In this direction, the study aims to analyze and analyze the usage areas determined in the Süleyman Demirel University campus, in accordance with the universal design criteria, with on-site observation and photographing techniques, and to make suggestions in line with the general principles of universal design as a result of the evaluations obtained.

Keywords: Universal Design, landscape design, university campus.

Introduction

Higher education institutions are institutions that increase the quality of society, shape the future of countries, contribute to their development, welfare and development level, trigger the production spirit of individuals, pave the way for the emergence of new ideas, and raise individuals who will be beneficial to the society in every sense with various occupational groups. Universities play an important role in creating a qualified society with the education life they offer.

University campuses also contribute in terms of giving identity to the city they are located with this feature they have. The size of this contribution, increases with their design, usability and accessibility. While university campuses serve the use of students for educational purposes, they also appear as areas of intense use due to the recreational opportunities that students, university employees and the public have in extracurricular activities. The most important way for university campuses with intensive use to make the expected contributions in terms of education and social aspects is through a planning and design approach that appeals to all individuals.

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The fact that the urban environment and the spaces within the building are accessible and understandable for all users and at the same time, increasing the use of these built environments by disabled individuals appears as a universal design (Kavak, 2010). The concept of "Universal Design" was developed by the Center for Universal Design (The Center for Universal Design, 1997) based on the fact that physical and intellectual possibilities are not just a special case of a few people but a common feature of being human and 7 principles were adopted in this context (URL 5, 2022). These design principles;

1-To enable equal use of the environment: It should allow equal use for users with different abilities and characteristics.

2-Flexible use according to personal preferences and abilities: It should be able to offer alternatives for the abilities and preferences of the users.

3-Simple and intuitive use: It should be intuitively understandable and easy to use, regardless of the user's experience, knowledge, skill or current concentration level. Design elements that may cause danger should be clearly stated and warnings should be created.

4-Perceptible information: It must effectively convey necessary information to the user, regardless of environmental conditions or the user's sensory abilities.

5-Low physical effort: It is the ability of the user to use the product and the space comfortably and comfortably by consuming as little power as possible.

6-Tolerance for error: It should be able to minimize the hazards and the negative consequences of undesired actions.

7-Size and space for approach and use

In line with the principles of universal design, ensuring the full and effective participation of persons with disabilities in society, equal opportunity and accessibility, the UN Convention on the Rights of Persons with Disabilities, which was adopted by the United Nations General Assembly on 13 December 2006 and approved by the TBMM on 3 December 2008 and entered into force on 28 October 2009. It also formed the general spirit of Respect for the inherent dignity and individual autonomy of persons, including their freedom to make their own choices and their independence non-discrimination; Full and effective participation and inclusion in society; Respecting differences and accepting disability as part of human diversity and humanity; Opportunity Equality; Accessibility; equality between women and men; Respecting the evolving capacities of children with disabilities and respecting the rights of children with disabilities to preserve their identity are issues that need to be taken to implement the principles.

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In addition, the issue of "accessibility" was regulated in the Law No 5378 on the Disabled, dated 01/07/2005, and it was universally accepted that everything should be accessible for the disabled to be included in social life. The phenomenon that constitutes the spirit of the UN Convention on the Rights of Persons with Disabilities is "Universal Design".

Providing equal conditions for everyone in the built environment with universal design is undoubtedly realized by ensuring accessibility. According to the convention, it has explained to the states parties, including Türkiye, not only the recognition of new rights for the disabled, but also the goal of ensuring that everyone enjoys the rights and freedoms they have. In terms of accessibility, "to enable people with disabilities to live independently and to participate effectively in all areas of life, and to enable disabled people to access the physical environment, transportation, information and communication opportunities, including information and communication technologies and systems, and other public facilities and services in both rural and urban areas, on an equal basis with other individuals to take appropriate measures to ensure access" (URL 4, 2022). In this respect, ensuring the right to education for everyone is directly related to the accessibility of the built environment.

It is extremely important that all areas and elements are accessible and usable for educational areas, especially university campuses, and for all individuals who make up the diversity of users. Under the Education heading of the Convention (ın chap 24); "States Parties recognize the right of persons with disabilities to education. States Parties shall ensure that the education system includes persons with disabilities at all levels in an integrative manner and provides lifelong learning opportunities in order to ensure this right on the basis of equality of opportunity and without discrimination. Individualized effective supportive measures for people with disabilities should be provided in environments that enhance academic and social development, in line with the goal of full participation of people with disabilities. However, in the education articles of the convention, "States Parties shall ensure that persons with disabilities have access to general tertiary education, vocational training, adult education and lifelong education on an equal basis with other individuals without discrimination. To this end, States Parties shall ensure that reasonable accommodation is made in accordance with the needs of persons with disabilities." The expression is emphasized (URL 4, 2022). Thus, the obligation to ensure the accessibility of those with disabilities in education is not limited to the structure and services of the public sector, the states parties are obliged to encourage universal design with special measures to encourage private entrepreneurs serving the public, to ensure that

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reasonable adaptation and other special measures are taken as soon as possible, and to supervise the implementations (Ages, 2012). This study, which focuses on how much this obligation is taken into account in higher education, deals with the subject through university campuses.

One of these goals is to prepare the necessary academic environment for disabled students receiving higher education in order to facilitate their learning lives and to ensure their full participation in educational processes.

University campuses, beyond providing education and training, are residential areas that provide social, cultural, recreational, recreational and research opportunities for their users, including open and green areas where a wide range of daily living conditions are found, from food and beverage to accommodation. Open and green spaces are the areas that have the greatest potential in creating the universal design of the campus and establishing the relationship of various common areas with each other. In addition, open and green spaces on a campus are important points that enable a student to evaluate the campus as a whole (Kuh, 2009). By participating in recreational areas and social activities on the campus, students learn to establish the right relationships with people and the environment, and at the same time, they become ready for social relations (Ertekin & Çorbacı, 2010). Hodson & Sander (2017) suggest that campuses covered with vegetation increase students reading performance and there is a significant relationship between them.

Regardless of whether it is located in or out of the city, an existing or a new campus, campus planning of universities is a management process that includes meeting the needs and developing methods in accordance with the strategic goals of the university / campus future of the university. Planning and design decisions for the campuses are defined and implemented in such a process (Tanyeli, 2004).

Land uses in the campuses and their relations with each other, frequency and density, functionality and quality of the spaces are among the criteria that should be considered during the planning and design phase. In addition to being holistic, sustainable and developable, campus designs must also be accessible.

Accessibility, which is directly related to the spatial characteristics and qualities of university campuses, is the basic condition of being able to participate in all areas of campus life independently and fully, as well as being able to use the rights including education and training. While a well-designed accessible campus will have a design feature that will reduce or eliminate the spatial problems of daily life for its users, it will also include general design

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approaches that will meet the needs of its potential users with its comfortable and easy accessibility, independent and equitable use.

Within the scope of universal design, making the campus environment and the spaces within the building accessible and understandable for all users, as well as increasing the use of these built environments by disabled individuals are among the main objectives of this approach. The quality of life of the users in university campuses should be increased within the scope of universal design understanding. In this direction, the study aims to analyze and analyze the usage areas determined in the Süleyman Demirel University campus, in line with the universal design criteria, with on-site observation and photographing techniques, and to make suggestions in line with the general principles of universal design as a result of the evaluations obtained.

Materials and Methods

The research area is the central campus of Isparta Süleyman Demirel University. Süleyman Demirel University is on the Istanbul-Isparta highway, 8 km from the city center of Isparta. Since the road that divides the university campus into two is the ring road, the university is located in two parts as the East and West campuses (Figure 1). The study was carried out by examining the current situation in the whole campus, the campus plan, the observations made within the study boundaries, the photographs taken and the determinations within the scope of universal design and accessibility principles. In the research, analyzes of campus entrances, building entrances, roads, pavements, stairs and ramps, signs and information signs, parking lots and reinforcement elements were made.



Figure 1. General view of Süleyman Demirel University

ISBN: 978-625-8246-12-4

Method

Scope of work;

First stage; A literature review was made and on the basis of universal accessibility, principles and rules for space design, scientific studies on the subject in Türkiye and in the world, national legal legislation, Law on the Disabled, Zoning Law, Regulations, Universal Design Principles and the Higher Education Institution's Barrier-Free University The standards he prepared within the scope of his flags were examined.

In the second stage; Within the scope of the current situation analysis, campus entrances, building entrances, roads, sidewalks, stairs and ramps, signboards and information signs, parking lots and reinforcement elements were examined and analyzed.

In the third stage; During the examination of the research area, the situations that the standards complied with or did not comply were noted, and visual data were collected regarding the problematic areas and areas that needed improvement. At the same time, the spatial usage problems faced by the users in the area in terms of accessibility were supported by on-site observations and examinations. At the end of the study, university venues were evaluated together with the field research carried out within the scope of the study.

In the last stage; In line with the principles of universal design, suggestions have been made on the basis of ensuring equal use opportunities by everyone regarding the bringing the problematic areas and areas that need improvement to an appropriate level in terms of accessibility.

Findings and Discussion

General Information About Süleyman Demirel University

The law numbered 3837 published in the Official Gazette dated 11.07.1992 and numbered 21281. While its first establishment was a part of Akdeniz University the departments of the State Engineering and Architecture Academy, which was then known as DMMA in Isparta under the name of DMMA, were connected to Süleyman Demirel University, that is, to the new university, with this law (URL 1, 2022) .

Süleyman Demirel University, which continued its education and training activities in different districts of Isparta until the formation of the campus that is used today, was published in the Official Gazette dated 8 May 2018 and numbered 30425 and entered into force with the Law No 7141 on the Amendment of the Higher Education Law and Some Laws and Decrees" and 4 faculties, 2 schools and 17 vocational schools were separated from SDU and joined to the newly

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established Isparta University of Applied Sciences (URL 2, 2022). At the same time, with the division, the use of a closed area of 138,509 m^2 in total was transferred to the newly established university.

Today, Süleyman Demirel University continues its activities with 15 faculties, 2 schools, 1 state conservatory, 4 vocational schools, 6 institutes, 5 departments, 1 directorate, 21 coordinators and 47 research and application centers. The total area of the campus, which is currently in service, is 912,401.19 m^2 on the West Campus, 2.33 1782.86 m^2 on the East Campus. Considering the allocated areas, 732,220,19 m^2 in the West Campus and 90,028,86 m^2 in the East Campus. It is seen that the areas allocated in the western campus of the university are high, the property areas in the eastern campus are large, but the allocation is low. The main reason for this situation is the agricultural lands used by Isparta University of Applied Sciences, located in the eastern campus and allocated for research (URL 3, 2022).

1868 academic staff and 2829 administrative staff work at the university and 40472 students receive associate, undergraduate and graduate education. The academic staff and administrative staff working in the units located in the central campus and connected to the Isparta University of Applied Sciences and the students still continue their education activities in the existing buildings.

The total closed area of the university is 369,671.52 m^2. There are active and passive recreation areas, sports areas, walking areas, social-cultural activity areas on the university campus. Images of the university campus are given in Figure 2.



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Figure 2. Images of the university campus

Determining Current Uses of the Campus and Availability Suitability

Apart from education and research, which are the basic functions of universities, there should be places to meet the needs and wishes of individuals on campus and they should meet both the social and physical expectations of their users. The areas on the campus are suitable for work, nutrition, shopping, entertainment, sports, recreation etc. required by today's education system. should be planned in response to functions. In the execution of the relations between these functions, it should be handled in a multi-faceted manner, both functionally and aesthetically sustainable. The most basic way to achieve this is to act in line with universal design principles. Accessibility to the campus, building entrances, pedestrian paths and crossings, ramps, stairs and sidewalks, reinforcement elements (seating units, trash cans, etc.), signboards and information signs, stops and many structural elements are within the scope of universal design (Erkovan, 2013).

Campus accessibility is the accessibility of users to structures, vehicles or services within the campus or within walking distance from the places to the campus or campus structures. It is the accessibility of the person's travel starting from the location (residence, lodging, dormitory, etc.) to the campus borders. Roads, sidewalks, campus entrances, stops, parking areas, transportation vehicles, common areas and building entrances, etc. are the basic components of this journey and it is not possible to talk about a continuity unless these components are accessible as a whole.

On-campus accessibility, on the other hand, refers to the accessibility of on-campus structures, vehicles and services depending on the vehicles used by the users for transportation. In a sense, it is the accessibility of the buildings from the exterior to the interior, with inter-functional mobility/ circulation for those inside the campus (campus users), starting from the campus entrance for those coming from outside the campus. Roads, sidewalks, stops, transportation

ISBN: 978-625-8246-12-4

vehicles, parking lots, building entrance routes, entrances, horizontal and vertical accessibility of spaces constitute the components of this journey. It is inevitable that accessibility up to or within the campus takes into account the diversity of users and is as inclusive as possible for its potential users (Tutal, 2018).

The aims and objectives included in accessibility should be to improve the transportation facilities within the campus, to increase the time students spend in the campus, to organize the public transportation areas and parking lots within the campus, and to implement the disabled and environmentally friendly campus.

Suleyman Demirel University can be accessed from a total of four entrances. Staff and students are allowed to enter the campus by vehicles and buses. There is no service facility within the university. With a project on the campus, the planning of which started in 2019, the bus stops in the campus were moved to the newly built areas at the entrance of the campus and turnstiles were placed at the entrance of the campus. As the second phase of this project, an automation system was established in order to control and record the private vehicles entering the campus. With this system, license plate and person-based records of all personnel and students' vehicles were taken into the system and automatic access doors were created. In this way, the records of all guests who want to come to the campus from outside will be taken before they enter the campus, and at the same time, it is aimed to provide secure access to these areas with the QR code to be provided to them in line with the information he has given about the areas to be accessed within the campus (Figure 3). Vehicles on the campus have direct access to all building entrances. Parking services are located in the immediate vicinity for each building.



Figure 3. University entrances

Pedestrian and bicycle paths; Relationships between all functions on campus should be provided by a well-designed transportation system. The university campus is used in an

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appropriate east-west direction with pedestrian circulation. The cafeteria services provided for academic staff, administrative staff and students within the university provide service in a central building in the Eastern campus. Central classrooms were opened in 2020 and are actively available to students and faculty members in the 2021 fall semester. KYK dormitories located in the eastern campus provide accommodation for students studying at the university. In addition, there is a Social Life Center established on the Eastern campus with the aim of socializing university students and meeting their specific needs and is in the position of being a meeting center for students. On the western campus, the rectorate building, open sports fields and KYK dormitory serve.

A transportation system has been arranged within the boundaries of walking distance within the university, giving weight to pedestrian and bicycle transportation, and providing access to the whole area by bicycle. Regulations for pedestrian and bicycle priority access (separation of bicycle paths, definition of prohibited areas for vehicle entry) have been implemented by the university administration (Figure 4).



Figure 4. Bicycle paths in the university

The inadequacy of crossing areas on the pedestrian roads connecting buildings, social areas and other built environments in the campus, and the absence of ramps used to bridge the gap between pedestrian paths and sidewalks make it difficult for wheelchair users to use existing roads (Figure 5).

ISBN: 978-625-8246-12-4



Figure 5. Pedestrian roads in the university

Building entrances; The entrance and exit doors of the building should be prominent, there should be a ramp at the entrances and exits with stairs, the entrance and exit doors should be easily opened-closed or automatic. In addition, regarding emergency exits, there should be an emergency exit door on each floor, the emergency exit door should require minimum force when opening, embossed guides should be used for emergency exits, emergency exit signs should be emphasized with visual and written lighting and positioned at prominent points (Küçük, 2020).

Attention should be paid to the design of stairs and ramps for disabled users to access buildings, an unobstructed area should be created in areas with level differences, and entrance landings that will create maneuvering areas for disabled users should be defined. The entrance and exit points should be easily perceived when looking from the outside or inside. In addition, it should be ensured that the floors are rough and not slippery in order not to limit the movements of the disabled people (especially those who use crutches) at the building entrances, and to avoid the problems such as slipping and falling.

The lack of routers at the entrance to some buildings in the university and the unclear entrances and exits cause problems in perception (Figure 6). When the entrances to the buildings on the campus were examined, it was seen that in some faculties with more than one door, the disabled individual could only access through a single door.

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Figure 6. Examples of building entrances in the campus

Stairs and Ramps; Wheelchair users should be able to maneuver at the start and end areas of the ramps used to eliminate the difference between pedestrian paths and sidewalks. Safe areas should be obtained by using handrails on the edge surfaces of the ramps (Kavak, 2010). Most of the departments in the university are accessible by ramps or stairs. However, the length and slope of the ramps are generally not suitable according to international standards. There should be stimulating surfaces at the beginning and end of the stairs that will support the equal use of disabled people. In addition, in order to reduce possible dangers at the ends of stairs and ramps for disabled individuals, the areas should be illuminated to increase their perceptibility (Erkovan, 2013).

The campus is located on a very sloping land and the campus design was made by solving the elevations with stairs in general (Figure 7).



Figure 7. Examples of stairs at university building entrances

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The solution of access to common areas with stairs causes usage and access problems for everyone. The fact that the existing material is not smooth, does not comply with the standards, restricts the movement of disabled people (Figure 8).

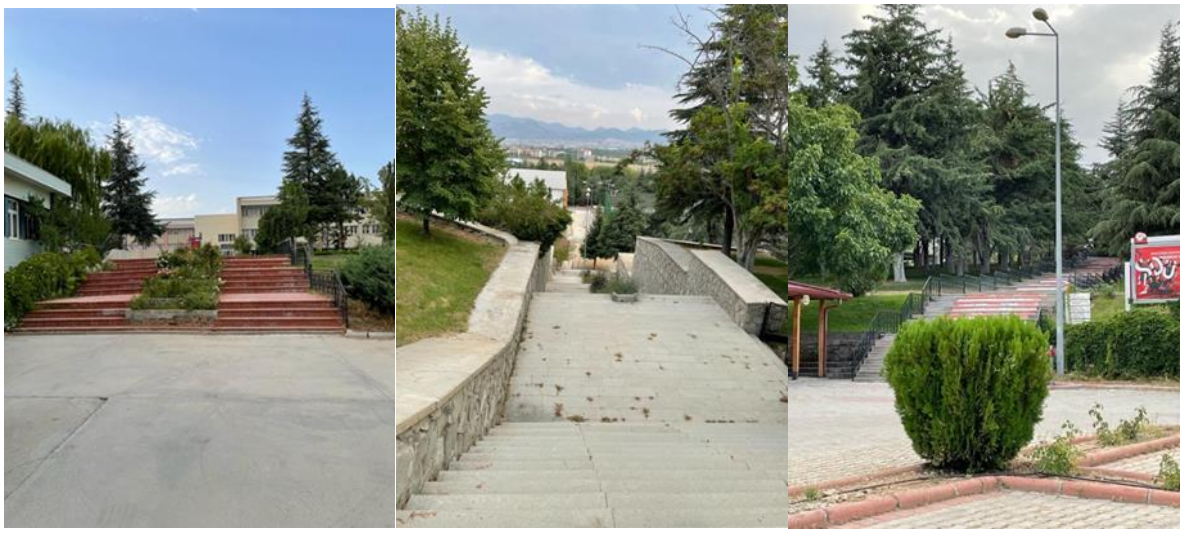


Figure 8. Examples of stairs used to reach common areas

Elevator analysis has been made as an alternative to stairs in reaching areas with elevation difference within the campus (Figure 9). However, there are no floor differences and trace marks on the floor.



Figure 9. The elevator in the university

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It was determined that there were no warning signs at the start and end points of the ramps (Figure 10).

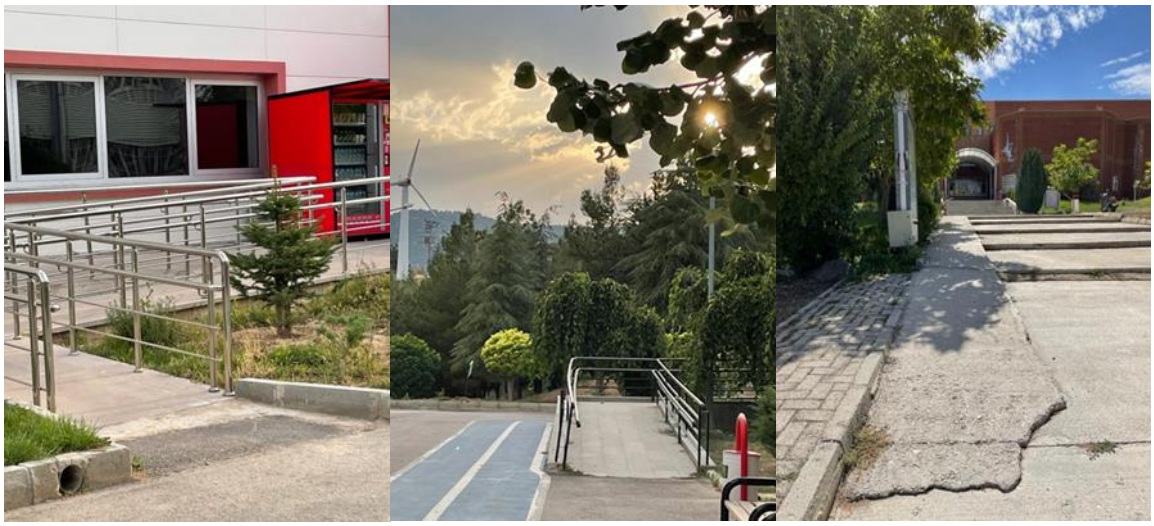


Figure 10. Examples of ramps in the university

Reinforcement elements; The campus is not only an educational area, but also an area that contributes to the social and cultural development of students and positively affects their behavior and communication skills in the society. In order for disabled students to feel normal and comfortable on campuses, they should be able to easily access and freely use all common areas (Yılmaz et al., 2012). For this purpose, different designs of seating elements are placed in the campus area in order to meet the needs of the users to sit, rest, wait for someone, chat and work. Spatial reinforcement elements should allow the approach and access of different users with their posture and movement characteristics and should be ergonomic. Necessary distances for wheelchair access should be left for seating elements that can be used by the disabled in the common rest areas. It has been determined that the equipment in the university is not suitable for the use of the disabled (Figure 11).

Considering the positions of the lighting, trash cans and benches positioned on the main and secondary axles for resting purposes, it was seen that they prevented the passage at some points. This is especially true at the points where benches are positioned on the pavement. The positioning of benches in the area narrowed the passages.

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Figure 11. Examples of reinforcement elements in the university

When the physical accessibility of the ATMs on the campus is examined, it has been determined that they are not usable and accessible, and that there are no necessary guidelines for the visually impaired to reach this area (Figure 12).



Figure 12. ATMs in the university

Signs and information boards; Information and sign elements should be easily perceptible for all users. At the entrances, there should be embossed directions in accessible places for the visually impaired, and written direction signs for the hearing impaired. Signage and direction signs are frequently encountered as there is no legibility in the campus. The lack of routers at the building entrances in the university and the height of the information signs from the ground cause the building entrances to not be perceived clearly. Signage and direction signs are frequently encountered in the campus, as there is no legibility of the space (Figure 13).

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Figure 13. Signs and information boards

Parking lots; One of the requirements of Universal Design principles is to create a car park environment that is as level-free as possible for easy access inside and outside the building. Roads should be planned by taking into account the different needs and preferences that use them, there should be no barriers, and the car parks should be well organized so that people can use them efficiently, and pedestrian safety should be at the forefront. Parking spaces should be reserved in the nearest place to the disabled parking lot, elevator, entrance/exit or building entrance. Parking lots for disabled vehicles are not marked with a special sign in the areas designated as car parks within the university. The parking area is within easy reach of the routes to be taken after parking the vehicles. In most of the parking areas, there are no disabled signs, directional disabled signs, or disabled parking signs on the ground (Figure 14).

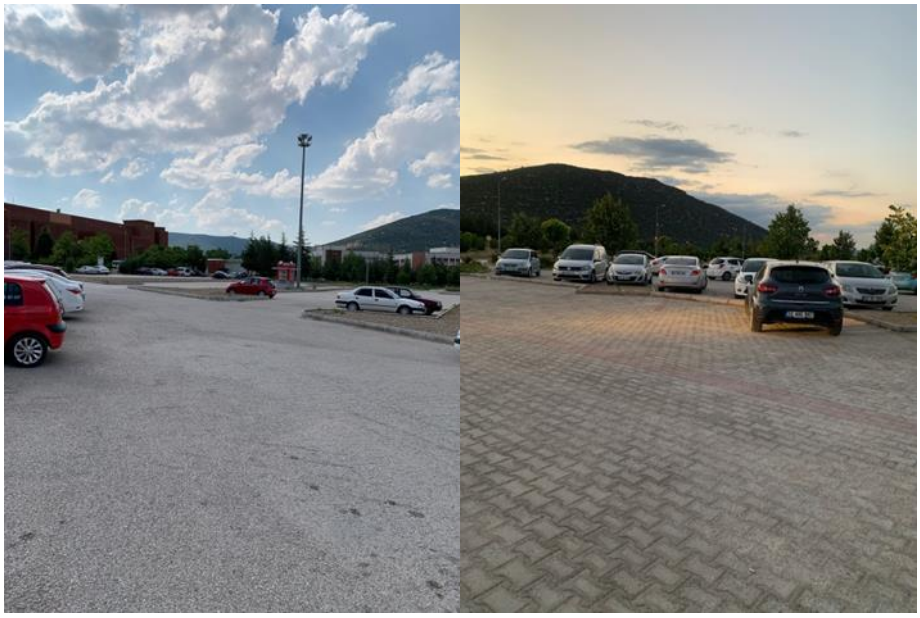


Figure 14. Parking lots in the university

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Conclusion and Recommendations

Accessibility is mostly perceived as spatial accessibility. For this reason, instead of concentrating on certain focal points in the built environment, inclusive design should be expanded spatially so that users can benefit equally and fairly from the services provided. As a result of the evaluations made within the scope of universal design principles at Süleyman Demirel University;

***Findings on the principle of equality:** There are mostly ramps and trails in the university. However, it is not at a level to meet the needs of every disability situation. Most of the university does not have handicapped parking. Access to the building entrances is provided by both ramps and stairs, and the principle of equal use for individuals with mobility impairments such as wheelchair users has been complied with. However, with the absence of guide lines, the criteria of the equitable use principle for users with different abilities are not respected. There are no tactile surfaces for the visually impaired, auditory panels and tactile surfaces for the hearing impaired in the campus. Sports fields are not suitable enough for the access and use of disabled people. As a result, design elements that appeal to all users with the same appeal are not included in the university campus and do not provide the same ease of use for users.

***Findings related to the principle of flexibility:** There are no equipment for those with limited mobility and loss of perception and sensation in the university. There are ramps that allow descending to the road level from the pavement and pedestrian roads. Designs that allow users to make different choices by offering multiple usage options and allow the use of individuals with different characteristics are not sufficient in the work area.

***Findings on the principle of simple and intuitive use:** There are no appropriate referrals for users with different language and reading/understanding abilities or disabilities.

***Findings regarding the principle of perceptible/understandable information:** It is not sufficient to explain the stimuli and stimuli in simple and plain language by the physically disabled individual. Bicycle paths in the campus are understandable, but information boards and direction signs are insufficient in the campus. In addition, it has been determined that there are deficiencies such as the absence of disabled parking areas in the area or not being perceptible and the inadequacy of directional signs.

***Findings on the tolerance:** Hazardous factors were not removed or protected by the physically disabled individual. There are no warnings against dangers. The biggest shortcomings in circulation and wayfinding are the lack of guide tracks, the interruption of the

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entry guide tracks. In addition, there are grids, various reinforcement elements (benches, trash cans, etc.) that prevent passages on the sidewalks and walkways.

***Findings on the principle of low physical effort:** The equipment elements are not ergonomic for the users and the approaches to reduce long-term physical effort are not suitable for individuals with physical disabilities. There are deficiencies in approach and usability at ATMs and bus stops.

***Findings on the principle of sıze and space for approach and use:** The appropriate size and space required in the design was not provided. In particular, ramps and roads are not at a level to facilitate access by providing freedom of movement. The height of the reinforcement elements used in the common areas is not in accordance with the standards. ATMs on campus are not suitable for wheelchair users.

In this direction, throughout the campus;

- In order to facilitate access to the area to be reached, it is necessary to have guide lines on the pedestrian roads. In this direction, guide track circulation should be created and the campus should be made accessible by providing uninterrupted orientation with the arrangement made.
- There should be warning surfaces at the start and end points of the stairs in the campus.
- Appropriate width should be provided for the use of auxiliary vehicles on pedestrian roads.
- Ramped and stepped roads should be clearly visible and well marked.
- existing information signs and plates should be increased in order to enable them to be used more functionally. For this purpose, attention should also be paid to the positioning of the elements at the appropriate height and legibility level.
- Accessibility should be increased by planning handicapped parking areas or arranging the existing ones more clearly.
- Accessible routes should be created for the places used by creating the accessibility map of the university.
- In the designs made, open and green spaces have an important place in the perception of a space both physically and by interpreting it. Plant designs made by using existing and different types of plants throughout the campus will contribute positively to the environmental perception and awareness of the users. For this reason, plant designs should also be included in the perception and definition of space and designs that appeal to the senses. Moreover;

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- Awareness-raising training on accessibility within the campus, etc. activities should be carried out
- Socio -cultural activities that will contribute to the meeting of students with disabilities with other students and social integration should be carried out and increased,
- Problems encountered during the education life of students with disabilities should be resolved quickly and effectively,
- Disabled individuals should be made active elements of the process,
- Existing uses on the campus should also be revised and made available and accessible to everyone.

Inclusive design in accordance with lifelong learning principles in higher education institutions is possible with the direct participation of disabled students studying in these institutions in the design processes. Disabled individuals not only receive academic education at the university, but also improve their social skills and express themselves much more in different scientific and social issues. In order to create a qualified campus in planning-design integrity, campuses must be accessible within the framework of universal values and sustainability understanding. In this direction, in order to eliminate prejudiced attitudes and behaviors towards the disabled, disability awareness should be created in the social order and awareness studies should be focused on.

As a result, when a general evaluation of the campus is made, Persons with disabilities in higher education institutions; In line with the "Barrier-Free University Awards" given by the Higher Education Council (YÖK) in order to raise awareness about their access to places, educational opportunities and socio -cultural activities and to disseminate good practices, Süleyman Demirel University was the first to receive the Barrier-Free Oral and Dental Health Hospital and the Orange Flag given by YÖK within the scope of accessibility. deserved the award. In 2022, Faculties of Medicine and Law, " Accessibility" in Space in 2022 Awarded the "Orange Flag". It has been determined that the majority of the goals and objectives in the universal design studies have been realized or the studies for improvements are continued.

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Landscape Visual Quality Assessment in the Proteced Areas

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Abstract

Landscape is a concept that has a dynamic structure and changes over time. This change can occur naturally or by human influence. Over the past centuries mining, settlement, agriculture, transportation in infrastructure, etc. human activities have caused an increasingly negative change on the natural structure of the landscape. This change has become more and more problematic with each passing day and has reduced the quality and quantity of green areas. These problems reveal the importance of natural resources in today's conditions more seriously. This situation has revealed that landscape can not only be considered as an economic issue, but also an aesthetic issue that should be evaluated and discussed. Landscape image and identity on the one hand, and its natural or cultural diversity on the other, are the most important criteria for assessment, classification and protection against potential impacts on the local and regional landscape. Special methods of analysis and representation of landscape structure and image are required to achieve the objectives of preserving and promoting a high quality of natural and cultural beauty. When landscape is considered as an aesthetic asset, "visual quality assessment" becomes an indispensable research topic. Together with European landscape convention, it is required that studies related to landscape planning should be integrated with the sectors such as industry, agriculture - forestry. Visual landscape analysis has an important position in landscape planning. Visual landscape analysis has an important place in landscape planning, and with this study, it is aimed to make an analysis of visual landscape quality in terms of management models of protected areas. The methodological steps put forward for this purpose should be in accordance with the goal of maintaining and developing a sustainable nature and landscape at the level of aesthetic landscape planning, as well as guidelines and auxiliary data on the principles of impact assessment and intervention.

Keywords: Visual landscape quality, protected areas, management.

Introduction

Landscape is a whole formed by the ecological, socio-economic and aesthetic values of natural and cultural assets, which are revealed from the interaction of human and nature, within a field of view. According to Habron (1998); Landscape is an important concept that activates people's joy and emotions, keeps them away from the stress of daily life and renews them psychologically. Humans have been a part of the landscape for thousands of years and a great force in its change.

The interaction of a series of biotic, abiotic, visual and cultural components creates the visual landscape (Bulut & Yılmaz, 2007). Landscape; It is not only the visual perception of the land form, vegetation and structures formed together, but also refers to a more comprehensive structure that includes historical land uses, other cultural features, wildlife and the seasonal change of an area. The combination of these components determines how the landscape will gain value (Anonymous, 2002).

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The concept of "visual quality" plays an important role in planning and design studies in defining the elements of the landscape or the structure they have. Therefore, determining the visual quality in an area determining the possibilities of the existing landscape structure, It is important in terms of determining the potentials of the elements and components that creates the landscape in that area (Ak, 2010). As a result of the visual quality assessment made in the landscape unit, in line with the information and data provided about the visual characteristics and condition of the area; space use plans and visual resources are taken into account.

Visual landscape quality studies carried out in line with the purposes of planning, design and management, contribute to the aesthetic development of cities and improve the quality of life of the urban people and their perspective on the urban landscape. There may be inadequacies in the decision-making process of planning and applications in visual landscape and conservation areas. These; there are uncertainties in the criteria for defining quality landscapes worth preserving and lack of scientific tools to provide sufficient accuracy, efficiency, reliability and validity to visualize data related to analysis (Asur & Alphan, 2008).

The increasing interest in environmental quality in recent years has also increased the importance of landscape quality. Today, landscape is considered as one of the natural resources that is important not only in terms of environmental but also in economic terms. Landscape quality can be crucial in recreational and residential areas, tourism and even healthcare. Moreover, high-quality landscape generally corresponds to areas rich in water, oxygen, geomorphological formation, animal and plant species and/or related to educational and scientific purposes (Real et al., 2000). The visual landscape character of the area plays a major role among the reasons for the preference of recreational areas, especially outdoor recreation areas. As long as the visual features of a landscape are natural, open, diverse, mysterious, offering harmonious perspective, orderly and reassuring, the scenic beauty of the area increases to that extent. Considering the importance of landscape aesthetic quality in environmental management, it is necessary to include the visual aesthetic structure of the landscape in planning decisions in studies to be conducted in this sense (Özhancı & Yılmaz, 2011). In order not to lose these resources, which are needed both physically and psychologically for a healthy life, in a way that they can never be obtained again, it should be aimed to use natural resources in the balance of protection and use, knowing our place and responsibility in the ecosystem.

ISBN: 978-625-8246-12-4

1. Visual Quality and Landscape Quality

Quality comes from the Latin word "Qualitas" meaning "state and doing". It is used in the determination, explanation and determination of entities and facts. (Çerçi, 1997; Tüfekçioğlu, 2008).

Quality in general ranges from basic useful needs (food, water, shelter, recreation, etc.) to spiritual needs (a sense of oneness with nature, high power) and encompasses everything from essential natural values (Daniel, 2000; Tüfekçioğlu, 2008).

Visual quality is synonymous with beauty in the context of objective values; On the other hand, landscape value is rather determined as a subjective and personal evaluation of aesthetic satisfaction arising from a landscape, a product of the interaction of human and landscape (Acar et al, 2003; Ercan, 2014).

Visual criteria are important in the concept of visual quality. (shape, line, color, brightness, harmony, unity etc.) The organization, positioning, proportions, especially physical structures and associations of these visual criteria are the main elements of the visual quality.

Visual quality depends on four physical variables. These are listed below:

- Organizing Variables: Regularity, uniqueness, suitability, sharpness are visual quality variables.
- Psychophysical Variables: They are variables such as size, brightness, color, and contrast.
- Ecological / Satisfaction Variables: They are variables such as naturalness, architecture, style, environmental effects.
- Spatial Variables: They include variables such as openness and mystery.

The most important variable that concerns visual quality, especially visual landscape quality; is natural (Atabek, 2002).

Landscape is defined not as what it contains, but as the whole of what it contains and the perceptual effects they create. Perception is an active event in which people interact with their environment and constantly acquire information from their environment through their senses, and it emerges in two directions with the environment. However, perception is not just a physiological fact. At the same time, the past experiences of the individual, social and cultural factors are also effective on perception.

Visual landscape is the composition of natural and cultural elements. The way the visual landscape values come together and their interactions with each other reveal the visual

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landscape character of the area. The visual quality of the area determines the positive and negative aspects of the visual landscape values.

Visual aesthetic quality is very important in terms of psychological and physical health of people in living spaces. While the value of visual quality in terms of tourism and recreation is undeniable (Ewald, 2001; Miller et al., 2010), it is a component in the use of space in planning and design studies in both urban and rural landscapes.

The visual components of the landscape not only offer an aesthetic value, but also show the relationship of cultural, economic and biological fact. In fact, it is possible to establish a relationship between the beauty and richness of the landscape in terms of bio-ecological factors. (Table 1).

Table 1. Components of Landscape Character (Anonymous, 1977; Ürüşan, 2010)

ABIOTIC/PHYSICAL COMPONENT	BIOTIC COMPONENT	CULTURAL COMPONENT	VISUAL COMPONENT	
			OBJECTIVE	SUBJECTIVE
Topography	Flora	Archeology	Topography	Traditional Culture
Soil	Biodiversity	Space Usage	Flora	Local Identity
Climate	Wildlife	Landscape History	Presence of Water	Sense of Place
Hydrology		Traditional Culture	Archeology	Sound
		Local Identity	Human Made Elements	Smell
		Sense of Place	Naturalness	Taste
			Texture	Color (ex.soil)

2. Visual Landscape Quality of Protected Areas

One of the most effective ways to protect biodiversity is to protect the determined natural habitats with legal statuses such as national parks and nature conservation areas. These important and valuable areas, which are generally defined as protected areas, are the most effective means of managing the natural heritage in situ and are the cornerstones of national and international nature protection strategies (Dudley et al., 2005).

These areas, which offer a calm and peaceful option to local and foreign visitors; In addition, it has an important role in protecting natural resources for nature, maintaining biodiversity, protecting against natural disasters, protecting living conditions and natural scenery.

With the emergence of alternative tourism, people have started to turn to protected areas, which have especially visually interesting features. In addition to the natural, cultural and historical resource values of the protected areas, visually rich landscape areas have an important place for

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both visitors and local people and economic development. Therefore, it is extremely important to preserve the aesthetics of the landscape in such areas. National parks, which are one of these areas, are the focus of attention of the visitors with their resource values. Vegetation diversity, interesting geological formations, historical buildings, water resources and landscape areas are some of these resource values. According to the results of the research, it can be expressed as an indicator of this situation that the main theme in tourism in the 21st century will be towards natural and cultural resources (Düzgüneş & Demirel, 2015).

The preference of national parks is directly proportional to the high quality of the landscape in that area. Therefore, it is the primary condition to ensure the sustainability of the resource values and landscape structures by means of planning that includes effective and applicable methods. One of these methods is visual landscape quality assessment.

As the orientation towards rural and protected areas increases, these regions may also experience intensity and pressures may occur on natural and cultural landscape components.

In recent years, protected areas in our country have been in the most important place among our country's conservation program strategies with their high biological diversity resources and different aesthetic taste and recreational potentials they have.

According to Ervin et al. (2010), making effective management plans for protected areas all over the world is a matter of priority. The process of establishing management plans; It helps protected area managers to identify natural and cultural resources in the area, to identify threats to these resources, and to develop strategies and implementation plans for long-term conservation (Güneş, 2011).

When the previous studies on the subject are examined, it has been found that there are positive relations between the visual landscape value, which is the visible face of ecosystems, and especially between the natural structure of the landscape and its visual structure in the evaluations of these landscapes, therefore, visual quality values can be an important indicator in the planning studies of these areas by making use of these relationships, seems to be.

3. Reasons for Visual Landscape Quality Assessment Required

The visual aesthetic quality of the landscape is seen as a resource worthy of protection in today's conditions. The landscape, which consists of human and environment relations, is expressed by people's perception. However, this is not just about visual perception or how we see our environment; In addition, the emotions and memories we hear, smell, make us feel and evoke in the environment form the perception of landscape.

ISBN: 978-625-8246-12-4

Today, evaluating and revealing the quality of visual landscape units; In the management of visual resources, it is needed for preserving, repair, strengthening, concealment decision-making and development stages during space use planning and design studies. In the context of tourism and recreation, the essential component of the natural environment is the landscape or visual quality. Landscapes that are important are not beneficial to the individuals who live in them only in terms of landscape. Their important contribution is to ensure the attractiveness of the area. Therefore, it can be associated with the economic benefits of the region. The reason is that the visual character affects the whole quality of a touristic/recreational experience (Clay & Daniel, 2000). For this reason, landscape planners around the world should evaluate the aesthetic beauty of the environment and the visual impact of projects that cause changes in the environment. According to Ak (2010); Visual quality should be used as an important tool in revised product design, good design in terms of design and design in environmental design, and management maintenance design. The purpose of visual landscape analysis is to determine the degree of sensitivity to possible changes by providing information about its current visual characteristics and situation. This information will guide the decision-making and strategy development phases in land use planning and resource management studies (Çakcı, 2007).

Reasons for visual quality analysis (Gültürk, 2013):

- Contributing to the identification and listing of priority protection areas in areas that need to be protected, which are part of the cultural heritage,
- To determine a method comparing research areas in terms of aesthetics,
- To reveal the monitoring of the negative changes in the landscape qualities of private areas with periodic assessment methods,
- To provide a method for determining the actions to be taken before and after the work to detect changes in the landscape and the effects of certain human activities,
- To classify and identify perceptible factors and physical landscape components that are important in terms of environmental preferences; if possible, to be able to write in detail the reason why a particular landscape is aesthetically attractive or not,
- It is collecting findings to determine landscape preferences from different cultures and different subgroups (young/old, visitor/indigenous, male/female, etc.) in order to better understand the theory of technique, the workings of our understandings, and the various educational variations within different social groups.

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4. Visual Landscape Quality Assessment Methods

The purpose of landscape evaluation studies; to define landscape features and to measure the elements that add value to the landscape. Landscape assessments question how well technical and social expectations in a landscape are met.

Since the human-landscape relationship is a cycle that needs to be constantly fed continuously, whether the value of the landscape depends on human perception is among the ongoing debates. While talking about the value of the landscape, the perception of the environment or space of the people observing the landscape should be examined.

Psychological and physical processes are effective in environmental perception. Individuals determine the quality of the environment in line with the needs and wishes coming from their environment. These requirements and demands; It can be expressed as changing the old environment, comprehending the features of the environment, being aesthetically satisfied and determining the activities to be done in the environment (Kalın, 2004).

It is extremely important to explain what the concept of "landscape" means in order to better analyze the visual quality assessment studies in the discipline of landscape architecture. From the point of view of tourism and the course of our environment, it can be said that it is a visual quality or quality (Clay & Daniel, 2000). While the quality of the landscape contributes greatly to the attractiveness of the area, it also closely affects the usage preferences of the individuals. A healthy environment and high living standards are the basic demands in modern societies.

In this context, the protection and improvement of landscapes is an important step for the sustainability of the environment, as well as for human health. This situation necessitates a systematic evaluation of the visual quality of the landscape such as determining the landscape value, protecting the areas, determining the user group and their needs.

Landscape quality is a term that encompasses environmental, sociocultural and psychological factors, and it refers to the comparison of the idealized landscape in mind with the landscape in front of one's eyes. "Visual quality" is an objective expression synonymous with beauty.

Terms such as "natural beauty", "landscape aesthetics", "landscape source" can be used in the same sense (Çakcı, 2007). In the book "Design with Nature" written by Ian McHarg in 1969, McHarg; He popularized the topological landscape approach, which identifies and analyzes the vertical relationships between many factors that occur in a particular area, such as a forest, wetland or residential neighborhood. Kevin Lynch laid the foundation for today's visual quality assessment studies with his book "The Image of the City" in 1960.

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Visual landscape quality can be expressed as the aesthetic perfection of the landscape. The visual quality of an environment has a remarkable variety of perceptual and objective structures because it contains many variables. Due to this feature, visual quality is one of the most difficult fact that can be analyzed and measured in an environment (Ak, 2010).

However, while determining the criteria affecting the visual quality of a landscape, it is not possible to come across predetermined rules. According to the literature, it has been proven by many studies that a collaboration in which users' ideas are discussed using photographic presentation and simulation techniques positively affects the decision-making process in environmental design. Visual landscape assessment is carried out in order to determine the changes in the building function and change mechanisms that form the character of the landscape over the years.

Opinions and contributions from many professional disciplines (forestry, geography, landscape architecture, psychology, etc.) can be obtained for both perceptual and expert-based landscape aesthetics assessment approaches (Asur & Alphan, 2018).

As a result of these studies carried out by different experts, different named models such as visual quality, visual assessment and visual perception have emerged.

Visual landscape quality assessment can be done in 3 different ways in a landscape area. These are the physical model (expert model), psychological model (folk model) and psychophysical model (Table 2).

Table 2. Models used in visual landscape quality assessment (Düzgüneş & Demirel, 2015)

Models	Explanation
Physical Model (Expert Model)	• Assessments are made by experts on the subject. • It takes into account the landscape features and elements such as "line", "form", "color" and "texture" that affect the landscape beauty and creates a land inventory. • It is generally used in environmental management applications.
Psychological Model (Folk's Model)	• The data are mostly obtained with the help of questionnaires. • Statistical methods are used because the questionnaires are used as a tool.
Psychophysical Model	• It determines the mathematical relationship between the physical characteristics of the landscape and the perceptual reflections of the observers. • The purpose of the model is to measure the preferences of the society by eliminating personal preferences.

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Although the methods used in the quality assessment process vary, when we look at the literature, only objectivist or subjectivist approaches are used to reach the result, It is seen that the psychophysical method resulting from the combination of the two methods is also preferred. The fact that the Objectivist approach does not need user opinions can be seen as a disadvantage of this approach. Presenting only aesthetic criteria to the assessment of experts and ignoring the opinions of the public in this approach may negatively affect the reliability of the study. The fact that preferences are of no importance in the objectivist approach makes this method a short-lived model in which definite results cannot be obtained.

The subjectivist approach, which measures the quality from the observer's point of view, is more advantageous in terms of generalizing the results and therefore it can be said that it is more permanent. It is a method that can be developed through the participation of human preferences related to landscape quality in the evaluation process.

Visual quality analysis and assessment are more reliable and useful in studies where both approaches are combined. Measuring the quality of a landscape only with its physical features shows that this assessment method does not reflect reality and community needs. Likewise, studies in which only the folk model is applied without resorting to aesthetic criteria and expert opinions are also technically inadequate. In this context, the importance of the psychophysical approach model emerges.

Visual perception may differ from person to person or from society to society depending on the perception ability of the person. Therefore, different results may emerge in the assessment made by different people on the same area. From this perspective, visual landscape quality assessment can be considered as a subjective study. However, the results obtained are based on a mathematical expression, which reduces relativity.

5. Conclusion

According to Meitner (2004), landscape quality assessment is an important component and a step that should not be ignored in environmental planning and management, and it is a current methodological approach used by different professional disciplines such as landscape architecture, forestry, psychology, which was developed after the 1950s. The main goal of these studies is to gather the preferences of the experts of the area to be planned or the users living in that region on a common ground. In such studies, economic considerations and aesthetics should never be ignored (Kiracıoğlu, 2007).

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The visual quality assessment of the landscape is used as a guiding tool, which is important in the planning and design of rural and urban environments, in the formation of some administrative policies, in the context of the data that it visually creates the changes in the physical environment. Assessment of the visual quality of the landscape unit; It is important to determine what the existing landscape structure is in terms of the potentials of the elements and components that make up the landscape in that area. Expert evaluation, user evaluation and visibility analysis methods made through GIS, which are different methods used to determine the quality of visual landscape units, can be used separately or the results of these methods can be integrated with each other. As a result, by providing information about the visual characteristics of the landscape unit and its condition, the degree of sensitivity is determined against the changes that may occur in the future. This information will guide the decision-making and solution and follow-up development stages in land use planning and resource management studies. In a land use planning process, the biophysical landscape characteristics of the area along with the natural and socio-cultural landscape features should be evaluated and the presence of visual landscape resources belonging to the region should be observed. In this context, the land use planning decisions taken; It will ensure the continuity of landscape assets that need to be protected, repaired and strengthened.

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Relationship and Integration of Building and Landscape Design Projects in Urban Design

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Abstract

In our country, it is seen that cities develop rapidly and irregularly, with or without a plan, for the sake of economic profit, and in addition, the production and formation of urban public spaces, which are isolated from urban identity, are created with the Development Plans that are widely used today. Urban planning studies carried out under the name of Development Plans have played an important role in the emergence of unhealthy, irregular, and identityless cities that are similar to each other due to their lack of unity with urban design and fragmented approaches. Today, it has been accepted that zoning regulations are not considered sufficient in the production of public spaces and the management of change and that various control tools and mechanisms should be developed together with urban planning and urban design that should be done. Urban design is a sprawling discipline that bridges the gaps between the built-environment professions of architecture, planning, surveying, landscape architecture, and engineering. It consists of architectural project production, building, and landscape design projects. Building and Landscape projects are the most important key to healthy urbanization. For this reason, criteria and standardization for building permit landscaping projects are important and necessary for healthy cities and our future. However, today, in the building production process, the Building Architect and the Landscape Architect do not act as a unity, but as singular and disconnected from each other, and a common standard is not developed. This situation can lead to an aesthetic, functional, and uneconomical building production process within the scope of urban design. In this study, the "Landscape Projects Guide at the Building Permit Stage" prepared by PMO (2017) will be examined, associated with the existing regulations, and solution proposals will be brought about the integration with building projects within the scope of the architectural project that can change the housing policies and decision-making processes.

Keywords: Urban Design, built environment, building project, landscape design project, project processes.

1. Introduction

The concept of "Architecture", which has a history as old as the history of humanity, has changed the dimensions of discourse and action as a result of the interaction of many factors (e.g. knowledge, increase and diversification of spatial needs and demands, increase in urbanization trends, technological developments, spatial inadequacies, environmental problems, climate change, destruction of natural ecosystems, decrease in biological diversity, global epidemic, etc.) in the historical process and has evolved in many ways. Today, the emergence of the relationship between building and space as an economic commodity – a tool of investment and wealth – on a global scale has required the concept of building to be handled

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with different visions and multiple dimensions. With the pandemic process experienced today, the most basic function of the house, the shelter function, the adequacy of the healthy, reliable, aesthetic, and functional levels and quality that the building and its environment need are discussed (Gül & Çakır, 2021).

The concept of "architecture" was defined by the famous architect Vitruvius with expressions such as "beauty, usefulness, and robustness". Today, however, the concept of Architecture is associated with versatile and diverse values (e.g. scientific, sustainability, ecological, participatory multidisciplinary approach, nature, and environmental awareness, public interest, aesthetics, aesthetics, fine arts, functionality, economy, equality, local identity, healthy, reliable, etc.) is accepted as a branch of science and art that integrates and includes interdisciplinary studies.

It is seen that the concept of "architecture" is in close relationship and interaction with scientific, social, cultural, political, psychological, technical, technological, and artistic factors. In this context, spatial planning, design, management, and repair processes, which include holistic approaches to the building and its environment, rather than a singular architecture, necessitate the implementation of interdisciplinary vision and cooperation (e.g. structural Architecture, landscape architecture, city and regional planning, interior architecture, industrial design, civil engineering, etc.) (Gül & Çakır, 2021).

Cities in our country show rapid and irregular development in a planned/unplanned manner for the sake of economic rent. However, it is seen that the production and formation of urban public spaces are created with urban development plans isolated from today's urban identity. In this context, urban planning studies have played an important role in the emergence of unhealthy, irregular, and unidentified cities that are similar to each other due to their lack of unity with urban design and fragmented approaches. According to Ünlü (2006), the structuring approach in planning in the production of the urban built environment in Turkey has not been able to respond to the dynamism of urban spaces and has remained inadequate as a result of its lack of flexibility and providing a rigid framework. From this point of view, it has been accepted that development regulations are not considered sufficient in the production of public spaces and the management of change, and that various control tools and mechanisms should be developed together with the needed urban planning and urban design. In developed countries, the production and shaping of public spaces are carried out and controlled by urban design and its tools, which are a part of the planning process.

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This study, it is aimed to develop a conceptual perspective on the question of "How to produce a holistic urban design process approach in the built environment?". According to the current legislation and practices, solutions have been proposed for the built environment urban design that can change the housing policies and decision-making processes and integrate the architectural project and landscape project processes.

2. Urban Design and its Legal Dimension

In the second half of the 20th century, urban design was considered a means of organizing urban aesthetics. However, today it has become one of the implementation tools of strategic planning. It is defined as the projecting process that establishes the spatial connection of planning and puts social and spatial goals into practice (Kentsel Tasarım Rehberi, 2016).

Urban design is a discipline that requires cooperation between building architecture, landscape architecture, urban planning, interior architecture, and civil engineering, which are considered "built environment" professions. In this context, urban design also receives support and contributions from various disciplines such as urban geography, sociology, public administration, cultural studies, environmental management, conservation, and urban transformation. Urban designs are not only buildings or residences, but also establishing the relationship between buildings and their surroundings such as streets, spaces, or parks (Mahalmimarlik, 2022).

As a result, urban design is accepted as a holistic design and application form for the built environment.

The concept of Urban Design has been defined in the Spatial Plans Construction Regulation (14 June 2014, No: 29030) and the "Directive on the Preparation and Evaluation of Urban Design Projects to be Approved by the Ministry of Environment and Urbanization (02.04.2018)";

> Urban Design: *"Containing mass and structuring order or open space arrangements according to the design purpose, taking into account the natural, historical, cultural, social and economic characteristics and land structure; establishing vehicle transportation, parking and service relations, and pedestrian circulation relations; showing the relationship of building, street, texture, open and green spaces, and urban furniture details; dealing with infrastructure elements interdisciplinary with a holistic approach; expressing image, meaning and identity features; It is an appropriate scale project that includes design principles and tools.*

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Urban design is an important part of the urban planning process, urban development, and spatial quality. Urban design is a design process that ends with the product, and it also directs the implementation and management process. Urban design has a scientific and artistic approach content and is an intersection of both. Urban design is considered an interdisciplinary or multidisciplinary "common" platform topic rather than a single professional work topic. At the same time, it requires joint decisions to be made to create livable and suitable spaces for everyone as a result of the cooperation of all actors and stakeholders.

Urban design is a field of expertise that includes the creation of sustainable and applicable designs that increase the quality of life with multidimensional approaches such as aesthetic, sociological, ecological, economic, and interdisciplinary cooperation to spatial problems. Urban design includes not only building arrangement (building), but also the holistic organization of buildings together with their surroundings (landscape space) and transportation systems (Gül & Bostan, 2018).

Key elements of urban design according to the urban design guide; It is expressed as vibrant urban spaces, Mixed-use spaces, Contextual design at a human scale, Use on the ground, Safe and attractive public spaces, and imaginatively designed details (Kentsel Tasarım Rehberi, 2016).

The topics that can be considered in the urban design process are as follows (Gül & Bostan, 2018, p.505):Urban identity and image, building architecture typology, structure island and densities, urban open and green space systems, infrastructure and superstructure systems, construction materials, hard landscape and materials, urban furniture and accessories, implementation development plans, transportation and accessibility, urban conservation building and landscape areas, urban transformation (iteration), street rehabilitation (improvement), environmental systems, urban space security, urban governance and policies, urban food system and urban agriculture, city information system, urban economy, urban energy system, public, private and legal spaces, spatial demands and tendencies of urban people, urban design strategies etc.

3. Building and The Built Environment

According to Development Law No. 3194 (Article 4); The phenomenon of 'construction' is defined as "fixed and mobile facilities, including permanent or temporary, official and private underground and surface construction, and their additions, alterations, and repairs, on land and in water" (İmar Kanunu, 1985).

ISBN: 978-625-8246-12-4

In addition, according to the Ministry of Public Works and Settlement, Engineering and Architecture Specifications published in the Official Gazette dated August 5, 1985, and numbered 18883, as an appendix to the Cabinet Decree dated 16.07.1985 and numbered 85/9707; It is defined as "permanent and temporary, underground and above-ground constructions on land and water and their additions and replacements, fixed and mobile facilities and their parts" (Bayındırlık ve İskân Bakanlığı, 1985).

According to Planned Areas Zoning Regulation, (Article 4. oooo) The building construction area is defined as the area of all the floors of the building, including the spaces between the basement, mezzanine, and roof, roof or floor gardens, terraces on the roof, floor and ground, balconies, open overhangs and common areas in the building excluding the illuminated areas and courtyards of the building.

According to the Development Law and Planned Areas Development Regulation, "**Built Environment"** is obligatory to obtain a "building license" and "occupation permit" for all official and private buildings in and outside the borders of the Municipality and adjacent areas. In this context, the constructions in these places are arranged to ensure that they are formed by the plan, science, health, and environmental conditions.

According to Article 22 of Development Law No. 3194, titled "Requirements for Licensing", " to obtain a building permit, an application is made to the municipality, the governor's office, by the building owners or their legal representatives. Documents to be submitted.

• Building deed (document to replace title deed in exceptional cases),
• Architectural project,
• Static project,
• Electrical and plumbing projects,
• Pictures and accounts,
• Dimensional sketch with reference or not

According to the Planned Areas Zoning Regulation (Article 57 and Paragraph 15), it is not obligatory to "submit landscape projects 'during the construction permit application'". However, it may be required to be requested by the relevant Authority during the construction permit application of landscape projects by the characteristics of the structure and settlement. However, in any case, the submission of the landscape projects to the administration within 1 month after the approval of the construction permit and their approval by the administration are

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not left to the discretion of the relevant administration as per the provisions of the legislation, and it has become mandatory.

4. Building Project and Stages

The building project is prepared by the implementation zoning plan, the subdivision plan, and the current Regulation principles. According to the Planned Areas Development Regulation (Article 57):

(1) According to the documents listed in Article 55, the projects specified in this article are prepared by the owner of the building or his representative, by the relevant law, plan, this Regulation, Turkish Standards, environmental conditions, science, art, and health rules and all relevant legislation.

(2) Architectural project.

a) It is prepared by the architects by the implementation development plan, the subdivision plan and the principles of this Regulation, and this project.

1) Site plan,

2) Sharing table based on floor servitude and condominium ownership,

3) The gross construction area of the independent sections and common areas, the annexes, and the square meter scale including the total building construction area,

4) All floor plans, including basements,

5) Roof plan,

6) At least two sections and a sufficient number of views regarding floor and roof plans, one of which is to pass through the common staircase,

7) Soil excavation calculation,

8) Preliminary project and application projects with system sections and point details when necessary,

9) It consists of the car park, shelter, and tree calculations.

b) Also prepared by the relevant engineers and architects; elevator preliminary project, heat and water insulation project or report, and noise protection project or report are attached. In addition, the landscape project to be requested by the relevant administration according to the characteristics of the settlement and structure is added**.**

According to the Architectural Services Regulation of the Union of Chambers of Turkish Engineers and Architects.

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Article 5a) Building design processes include the following services (building architectural project services, surveying, restitution, restoration services, manufacturing project studies, and urban design services made together with related professional disciplines, conservation plans, etc.). The issues included in the Architectural Project are; Parcel area, the size of each building in the parcel, which is the subject of the precedent, the size of the total precedent area of all buildings in the plot, building construction area, total building construction area, the floor area and coefficient of the buildings, floor area coefficient (precedent), block numbers of the buildings on the parcel, independent section numbers in the blocks, Each independent section; independent section net area, annex net area, independent section gross area, extension gross area, independent section general gross area, independent section total gross area.

In both the construction project and the application project; Information about the point where the level is taken as the basis for the number of floors in the zoning plan, -Building depth, projections and structure approach distances, levels related to natural ground, and leveled ground, building heights and elevations, definitions in Article 16 of this the Regulation, It must be shown by the development plan and land registry records.

5. Landscape Design Projects and Stages

Landscape architecture is a professional discipline that is considered the essential element of the building production process.

The discipline of landscape architecture is an important discipline that technically and scientifically struggles with the healthy and planned growth of a city, giving the city an identity, ensuring the continuation of the identities formed with the natural and cultural texture of the settlements, and the deterioration of urban health caused by the density of construction, global warming, and climate changes.

Landscape architects are those who make and implement the plan and design processes of urban and rural open and green spaces outside the building, based on the international definition of 'Landscape'. At the same time, Landscape Architects are also interested in land engineering, topographic shaping of lands, engineering studies in the building production process, spatial planning, design, and management (Chamber of Landscape Architects (PMO), 2017).

Landscape projects include open and green areas outside the construction described in the zoned areas, roof gardens, parking lots and walking paths, and other specially defined areas (e.g. highways, tourism areas, protected areas, river and lake shores, sports and entertainment

ISBN: 978-625-8246-12-4

complexes, recreation areas, etc.) of different nature within the boundaries of the municipality's adjacent area. In this context, landscape projects cover all areas except the structure (building) in the development areas (PMO, 2017). These are the projects prepared by landscape architects, which are developed based on the temporal and spatial analyzes of the ecological, cultural, local, physical and functional characteristics of these areas, covering landscape planning, landscape design, landscape application projects, and engineering studies.

Architectural and engineering projects are prepared together with landscape projects and integrated. Landscape projects must be designed together with the building project (PMO, 2017).

Services and Contributions of Landscape Design Projects to The Building and Physical Space; (PMO, 2017).

• It increases the visual quality of the building and its surroundings and reveals the existing character and texture of the building.

• Adds identity, personality, and memory to the building and space,

• It organizes the relationship between the building and the environment,

• It creates a livable and sustainable environment.

• It provides accessibility and orientation between the street and the building.

• The internal dimension of the building diversifies and increases the functionality of the landscape in the space.

• It provides an organic connection between the building and urban open and green spaces.

• Increases the monetary value and attractiveness of the Building and Property.

• The building integrates with the natural ecosystem.

• It contributes to the quality of life of the users living in and around the building.

• It positively affects the user's psychology, reduces stress, and increases motivation.

• It gives a sense of belonging to the people living in the building and space.

• It brings a sense of happiness to living buildings and increases social interaction.

• It creates a micro-climate by planting on the facade and around the building.

• Contributes to the carbon storage and sequestration function in and around the building.

• Provides soil and water protection by planting around the building. It prevents erosion.

• It protects the building and space against noise, heat, wind, etc negativities.

• It prevents heat loss in the building.

• It allows the collection and multi-purpose use of rainwater.

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• Rainwater regulates the flow of surface waters and allows water to pass underground, enriching and nourishing it.

• Contributes to the creation of a landscape culture for the people of the city.

• It enriches nature and environmental culture.

• The building and the space provide opportunities for the recreational activities of the users.

• They serve to be used as safe and gathering areas with landscape areas during natural disasters (earthquakes, floods, pandemics, etc.).

• Increases the amount of urban green space, etc.

A guide titled "What Should Be in Landscape Projects During the Building Permit Stage" was prepared by the Chamber of Landscape Architects (PMO) in 2017 (PMO, 2017). According to this Guide, Project titles and scales are as follows.

- Layout Plan in 1/100, 1/200, 1/500 Scales
- Structural Application Project in 1/50, 1/100, 1/200, 1/500 Scales
- Herbal Application Project in 1/50, 1/100, 1/200, 1/500 Scales
- Irrigation and Drainage Project in 1/50, 1/100, 1/200 Scales
- Detail Projects in 1/1, 1/5,1/10, 1/20, 1/50 Scales
  - At least 2 sections (describe the project most comprehensively, if possible, at two different angles perpendicular to each other)
  - At least two views (if it describes the project in more detail, the section/view can be drawn together.
  - Site List, Soil Calculation, Plant Calculation, Fertilizer Calculation, Grass Calculation, Legends
- Project Disclosure Report/Note

According to the Planned Areas Zoning Regulation dated October 1, 2017, the working area boundaries of all architecture and engineering disciplines related to the built environment have been determined based on blocks/plots.

Article 57 of the Planned Areas Type Zoning Regulation "(Paragraph 5) Landscape project; It refers to the project that will be requested by the relevant administration according to the characteristics of the settlement and the building, prepared and signed by the landscape architects, based on ecological, natural and cultural data for open and green spaces.

According to Article 57 and Paragraph 15 of this Regulation, "It is not obligatory to submit electricity, telephone, and natural gas installation projects to the relevant administration at the

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stage of issuing the construction permit. However, these projects must be approved by the relevant institutions by the building inspection organization or by the engineers who assume the technical responsibility for the supervision of the implementation of the projects and to be submitted to the authorized administration within thirty days at the most, before the foundation concrete is poured as of the date the building permit is issued. Landscape projects do not have to be submitted to the relevant administration at the licensing stage. However, this project must be submitted to the administration and approved by the administration within one month after the license approval. According to the statement, it has become mandatory to request landscape projects.

However, in practice, it is no longer a requirement to submit "during the construction permit application", and this situation is left to the discretion of the relevant administrations.

6. Integration of Building (Architecture) and Landscape Design Process in Built Environment Design

Built Environment design consists of building and landscape design projects. Building and landscape projects are the most important keys to healthy urbanization.

According to the 57th article of the Planned Areas Zoning Regulation, titled "Building Projects", an architectural project is prepared by the owner of the building or his attorney by the documents listed in Article 55, the relevant law, plan, regulation, Turkish Standards, environmental conditions, science, art and health rules.

However, it is a legal obligation to prepare a landscape project, static project, mechanical installation project, or electrical installation project to be requested by the relevant administration according to the characteristics of the settlement and the building.

According to this regulation, it was deemed necessary to request a landscape project in all parcels whose garden area is larger than the floor area of the building, regardless of the size of the parcel and the nature of the building. Front garden, side garden, and backyard areas were determined as the main areas for garden arrangement areas, and it was stated that roof gardens, interior gardens, and floor gardens should not be included in the area calculations (Eroğlu et al., 2019).

In our country, in the production process of the built environment, the building and the landscape spaces are designed as singular and disconnected from each other and do not present unity. This situation can cause the aesthetic, functional, and uneconomical unhealthy and identity less design production process of urban spaces. For this reason, determining and

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standardizing the criteria for building and landscape projects for the built environment and its license is important and necessary for healthy cities and our future.

Building and Landscape Projects Process Stages in Built Environment Design

From the preparation, design, and implementation of the built environment design projects to the management, building architects and landscape architects should act and cooperate. In addition, this process should be carried out together with other professional disciplines. In the design of the built environment, a sustainable, participatory, ecological, functional, aesthetic, protection-oriented, environmentalist, technological, and public benefit should be understood, and a process that includes appropriate time and cost. The ideas and needs of key designers, authorities/decision makers/employers/other stakeholders should be prioritized at all stages of the built environment design (Figure 1).

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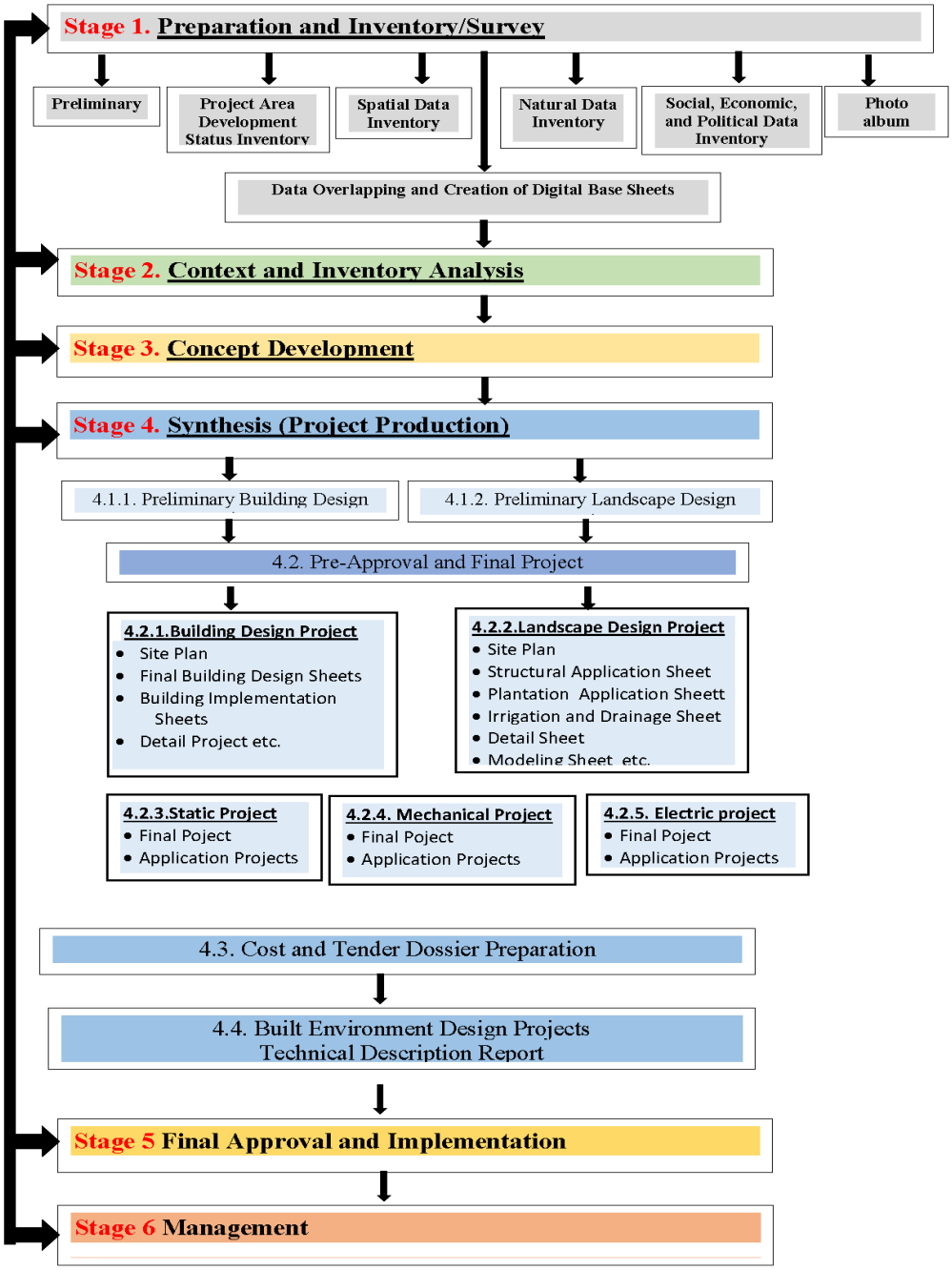


Figure 1. Suggestion of Process Stages for Built Environment Design Projects

ISBN: 978-625-8246-12-4

Stage 1. Preparation and Inventory/Survey

a. Preliminary

The project subject is defined. The project design team is formed. Basic disciplines (Building Architect, Landscape Architect, Urban Planner, Interior Architect) and other supporting disciplines are determined. Duties and responsibilities are defined. The goals and objectives of urban design are determined. All relevant stakeholders are identified, and their level of participation is determined.

b. Project Area Development Status Inventory:

Development Status Document: As a basis for the preparation of the projects in the implementation of the approved Development plan for the project area, the application development plan of the parcel and information showing the construction conditions according to the provisions of this regulation are prepared and a development status document is prepared. In this document, there are building regulations, the decision of use, front-side-backyard approach distances, building height, TAKS, KAKS (Precedent), mass measurements, and similar criteria. In addition, road/channel elevation, channel level report, and geological and geotechnical survey report are provided, etc.

c. **Spatial Data Inventory**

The location, legal and physical boundaries of the work area,

• Relationship with the existing Zoning Plan and top-plan decisions for the relevant area,

• Background and history of the study area,

The city's identity and image relationship

• Boundaries of the project area, existing structure and building coordinates and dimensions, island and parcel information,

• Total amount of project area (Building area and landscape area, etc.),

• Transportation and accessibility data inventory (Existing transportation types in and around the area, usage type, current circulation system, and density points, road widths, road material type, existing parking lots, public transportation stops, intersections, vehicle and pedestrian transportation relationship, transportation focus and density points, etc.)

• Existing structures in and around the site, buildings and their elevation, elevations, locations, property status and functionality, architectural texture, building density, number of floors and heights, registered building status, materials used, etc.

ISBN: 978-625-8246-12-4

• Inventory of open and green areas in and around the area (types, landscape plant list, amount of green space per person, etc.)

• Inventory of existing landscape plants in the area (tree relief and individual characteristics, plant species, height, crown widths, wet health status, old trees, and their characteristics, etc.) Landscape visual and Landmark points and transportation distances inside and outside the area

• Detection and presentation of the work area with photographs

• Point areas that need to be hidden

• Determination of existing and possible infrastructure and superstructure systems (electricity, sewerage, natural gas, etc.) in the area and facility lines and features,

• Detection of urban equipment and furniture in and around the area

d. Natural Data Inventory

• Climatic data (insolation status, duration, and angle, shading rate, Temperature status, min., and max. and average temperatures (daily, monthly and annual values), Annual precipitation, (daily, monthly, and yearly), intensity, cloudiness density, Condition and duration of frost, Dominant wind direction (wind rose), maximum, minimum wind speed, etc.)

• Elevation

• Land morphology

• Earthquake fault

• Soil Properties: (Soil Structure Texture, Depth (0-30 cm, 30-60 cm, 60 <. Organic matter ratio, chemical structure, pH ratio Bedrock type condition, type, depth, Soil salt ratio, etc.)

• Surface drainage condition

• Erosion condition

• Existing Water resources data (Detection of water resource types in the area (Well, fountain, artesian City water capacity and level, Physical and chemical content and analysis of the existing water resource, etc.).

• Natural vegetation (Natural plant species in the area and their density, Endemic status, Biodiversity status, Endangered and risky species, and their distribution, Monument trees and their features, Forest fire risk, etc.)

• Wildlife data (existing natural animal species and distribution in and around the area, Endemic status and distribution, Endangered and risky species and their distribution, Biological diversity status and density, Underground and above-ground animals, Migration routes and stopover points, etc.)

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• Natural Visual data

Social, Economic and Political Data Inventory:

User requests, needs, and trends, User demographics, existing historical and archaeological values, Current lifestyle, Traditions and customs, Current activities in the area, data with conservation status (protected areas, historical, archaeological, and proprietary structures and objects, etc.), current and possible finance amount of the area, Income status, Project cost and implementation cost, budget possibilities, Current problems and negativities in and around the area, (Noise, pollution, etc.), Relationship with current legislation and legislation, To the area Top plan decisions for the field, possible investment decisions of Institutions and Organizations, etc.

e. **Photo album**: Pictures and images taken from different parts of the project area are created.

f. **Data Overlapping and Creation of Digital Base Sheets**: A plan quote, topographic map, or survey of the project area is created by using the units related to the project area (Deeds Office, Municipality Development Directorate, etc.) and other digital bases. Natural and cultural data are processed digitally on this base. As a result of survey studies and observations and examinations to be made in the field, the data are updated and new additions are made.

All data on the project area and its immediate surroundings are provided. After the digital bases are created, they are updated and developed with the necessary surveys (observation, examination, survey studies, photographing, all kinds of measurements, etc.) in the project area. Survey study is the most important stage of the inventory process.

All obtained data are processed and displayed on the Inventory Sheet as point, linear and spatial. It is obtained in 1/1000 or 1/500 or 1/2 200 scales according to the field size.

Stage 2. Context and Inventory Analysis:

The Inventory/survey analysis sheet is a stage in which building, and landscape data are correlated and interpreted and decisions are made by analyzing all kinds of spatial, natural, and socio-cultural data.

According to the data in the project area, natural (slope analysis, aspect analysis, elevation analysis, existing vegetation analysis, water resources and drainage analysis, climate analysis, visual analysis, etc.), cultural (parcel, urban plan relationship, and analysis of the area at the upper scale, current land use). Analysis, transportation analysis, social analysis, economic analysis, structure (zoning) analysis, infrastructure analysis, etc.) and other context data

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analysis (analysis of stakeholder demands and trends, SWOT analysis, compliance analysis, threshold analysis, risk analysis, multi-criteria decision data analysis, statistical analysis, etc.) should be made and shown on the sheet.

Structure and landscape data analyzes are displayed on the digital sheet, interpreted numerically, and enriched with text and 2D and 3D visuals.

Context and analysis sheets should be prepared separately for the building and landscape area and at 1/1000 or 1/500 or 1/200 scales depending on the area size.

Inventory and analysis in the design process form the basis of the project. For this reason, the data belonging to the field should be up-to-date, reliable, and sufficient. As a result of the correct analysis, interpretation, and association of the correct data, it will facilitate the creation of the right options and the taking of the right decisions. Thus, a successful, healthy, comfortable, and high-quality built environment space organization that can meet all future goals and needs will be achieved.

Stage 3. Concept Development

Concept work forms the basis of spatial planning and design studies, directs them, and provides the opportunity to understand and make sense of the space.

As a result of the analysis of the inventory and survey data obtained in the project area, the problems related to the building and landscape area are determined. Goals and purposes/tools, design decisions, and principles are determined for the holistic design setup. In the concept development process, ideas and functionalities (functions=actions=programs) are produced, associated, and constructed holistically by engaging thoughts, imagination, ideas, principles, and creativity. Thus, at the design scale, a need/action program is created in a fragmented and holistic manner for the building and landscape area, strategies and predictions are defined by making a spatial scenario/fiction, and a spatial organization is made.

It is the generation, association, and holistic design and organization of ideas and functionalities (functions=actions=programs) according to the goals and objectives of the study area as a result of the analysis of the concept sheet, inventory, and survey data.

The Concept Sheet Process detail level can be prepared in 3 ways. Superficial schematic/blot concept creation, Medium Detailed Concept creation, Concept creation in preliminary project detail.

The concept sheet, the concept of design decisions are determined, and the project progress stages, the functions to be used and the operation of these functions are specified in form and

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text. A concept sheet should be prepared at 1/500 or 1/200 scales depending on the area size and should be set up as a preliminary project. Inventory, Analysis, and Concept Sheets should generally be used on the same scale.

Stage 4. Synthesis (Project Production)

4.1. Preliminary Project Production

Preliminary project: The current development status, the current plan, the urban design project, if any, which forms the basis for the implementation projects, and in its content; a building project (site sheet, all floor plans, and sufficient amount of sections and views, including all dimensions and elevations for floor area, floor area (precedent) and building construction area calculations, with silhouettes when necessary, etc.) and landscape projects (site sheet, structural, plant and detail sheets, etc.).

4.1.1. Preliminary Building Design Project

The Building Situation Sheet includes this information (e.g. parcel area, the size of the precedent area of each building in the parcel, the total size of the precedent area of all the buildings in the parcel, the building construction area, the total building construction area, the floor area and coefficient of the building, the floor area coefficient (precedent), the block numbers of the buildings on the parcel, the numbers of the independent sections in the blocks, the net area of each independent section, the net area of the annex, the gross area of the independent section, the gross area of the extension, the overall gross area of the independent section, the total gross area of the independent section, etc.).

Preliminary Project: According to the definite need program of a certain structure; It is a project that includes one or more solutions in which the plan, section, view, and profiles are prepared based on the data obtained, including the environmental impact assessment and feasibility reports, without the necessary land and ground surveys being carried out.

The Building Preliminary project includes a 1/500 site plan, 1/200 ground floor plan, 1/200 floor plans, 1/200 sections, 1/200 views, and a material suggestion list.

4.1.2. Preliminary Landscape Design Project

Preliminary Project Sheet: It is the sheet that reveals the relationship of the project area with its surroundings, which shows the overall situation of the spatial organization as a whole. Features of the preliminary project sheet

The construction of the structural and plant design of the project area is displayed on the map in its entirety on the digital base.

ISBN: 978-625-8246-12-4

• All landscape functions, capacities, standards, and materials in the project area, except for the building, are defined.

• Parcel information from 1/1000 scale Implementation Development Plan plots on the sheet, ground settlement of buildings, corner points of buildings and parcels, distances of buildings to parcel border, plan notes, parcel and mass borders of buildings, construction approach borders, building locations, distance to ring roads, road elevation report, diameter-zoning status, application sketch, etc. should be included.

• All structural and engineering information such as slope, hard floors, garden walls, external stairs, curbs, all elevations, building entrance and fire exits, children's playground, etc. on the Sheet should be shown in scale detail. For this reason, it should not be confused between the preliminary sheet and the structural landscape application sheet in terms of content and drawing technique.

• Current and suggested tree and plant species are displayed on the sheet. The number of trees (at least one tree per 30 m^2) should be foreseen according to the landscape area,

• Transportation and accessibility relationship within and around the project area, vehicle and pedestrian transportation relationship, road widths and materials, parking lot and capacities, pavement, etc. are displayed.

• Infrastructure and superstructure (natural gas, telephone, electricity, water, sewerage, etc.) are shown on the map.

• All the sheets should be prepared by the legislation of the relevant institutions, technical drawing rules, and TSE standards of the productions considered.

• Explanatory and supportive silhouettes, sections, views, and/or perspectives are prepared.

The scale of the preliminary sheet should be 1/500 or 1/200 about the size of the area. If the area is very large, it can also be prepared on a 1/1000 scale.

4.2. Pre-Approval and Final Project (Delivery Sheets)

As a result of the production of the building and landscape plan sheets, consultations are made by the authorized and responsible institution/organization, the person, and the relevant stakeholders. Final evaluations are made on the project area in line with criticism and suggestions, revised, approved, and turned into a final project.

Visualization is done with rendering programs such as V-Ray, Lumion, and Twinmotion for the project, the concept of which is created in 3Ds Max, CD4, and SketchUp programs, to see the work that will emerge after the implementation of the project. These 3D presentation images

ISBN: 978-625-8246-12-4

are prepared in the digital environment; It provides the project owners with the opportunity to see the design of the project in the closest way to reality with high image quality and to have a clearer foresight. Possible revisions are made at this stage before the implementation starts.

4.2.1. Final Building Design Project

Final Building Design Project: According to the approved preliminary project of a certain building; It is a project in which possible land and ground surveys have been made, construction elements are dimensioned and dimensioned, and construction systems and equipment and technical features are specified.

The final Building Design Project includes the following sheets (1/500 layout sheet, 1/100 floor sheets, 1/100 sections, 1/100 views, 1/20 system details, 1/100 furnishing proposal sheet, and site list, etc.). Implementation Project: It is a project in which every detail of the structure is specified according to the approved final project of a certain structure. The content of the implementation project is as follows;

• 1/500 site plan,

• All floor sheets (1/500 infrastructure coordination principal sheet, 1/100 floor sheet, 1/50 partial ground, and 1st-floor sheet, another roof sheet, etc.)

• 1/100 sections, 1/100 views,

• Details: (1/20 system details, 1/1, 1/2, 1/10 partial details, 1/20 WC plans and openings, 1/20 staircase plans and sections, 1/100 and 1/50 ceiling coordination (Air conditioning, lighting, fire), 1/100, 1/50 floor covering, 1/20 entrance hall and sections, 1/20 entrance hall stairs, etc.)

• Pictures (1/20 isolation principal pictures, Door position pictures, Joinery position pictures, etc.)

• Construction application project to be prepared according to soil excavation calculation, construction approach distances, and construction projects,

• Location list

• Special specification and technical specification

• Unit price recipes

• Quantities

•Discovery

• 3D views

• Tender dossier

• Fire projects, etc.

ISBN: 978-625-8246-12-4

4.2.2. Final Landscape Design Project

After the prepared Preliminary Project is checked and revised, it is turned into an approved Final Project (Status Sheet). The Final Project Sheet is a sheet that includes all the features mentioned in the Preliminary project sheet, which shows the overall situation of the spatial organization and its relationship with its surroundings. It is delivered as an approved Landscape Design Project containing a Site Plan, Structural Application Sheet, Plant Application Sheet, Irrigation and Drainage Sheet, Detail Sheet, and Project Explanation Report to the relevant Institutions/Organizations/persons.

a Landscape Project Layout Sheet (Site Plan)

Approved and revised Final Position Sheet is prepared and delivered in 1/500 or 1/200 scales according to the size of the area.

b. Structural Application Sheet

The natural and physical structure of the area and ground information, existing and proposed system solutions for infrastructure, measures taken according to climate data and meteorological conditions, measures taken against existing structures and/or surrounding structures, affected areas, and natural features are examined. As a result of these, a structural sheet is obtained, which includes the qualities and properties of the materials to be used in the project area, grading, dimensioning, locations of lighting elements and urban furniture, land shaping, water-oriented areas, surface drainage solutions, etc.

From the data coming from the site plan, the building approach boundary, "Ground Floor Plans" should be included, pavements should be shown, the steps leading up to the land/road level at the entrance to the building, their dimensions, and exit directions, ramp slopes and exit directions, the location of the section line, retaining walls, etc. should be shown. Thus, the relationship and connection between the building and the street landscape should be well-constructed and shown.

In addition, there should be dimensioning on the sheet and structural elements, slope, scales, and horizontal and vertical elevation differences should be clearly stated in the sections. What should be in the Structural Application Sheet;

1. Direction/north sign, scale, name of the plan
2. Table showing site list, reinforcement/object symbols, and numbers
3. Plot, building approach, building exit lines
4. Natural Ground Level (TZK), Leveling Level (TK/TSK, etc.), Basement Level (SBK)

ISBN: 978-625-8246-12-4

5. Write the names of the uses (ceremonial/emergency meeting area, children's playground, etc.)

6. Space functional usage names or codes, capacities, building/street/street names

7. Flooring/floor/green area etc. Heights/jeans

8. Vehicle and pedestrian road widths, elevations,

9. Dimensioning, radius/diameter information

10. Names, dimensions, standards of flooring materials used,

11. Marking of the garden, building, parking lot entrances/exits

12. The exit direction of the stairs, the number of steps, and their dimensions

13. The exit direction of the ramps, the ramp dimensions

14. Display upper/lower elevations and heights of walls

15. Ramps, slopes, lifts, elevators, etc. will provide accessibility for the building entrance and the entire garden.

16. Kuranglez, exhaust discharge/suction, skylight, if any, with their orientation

17. Parking lot sizes, vehicle capacities, etc.

18. Retaining/retaining wall, perimeter mesh system size, height, and quality information

19. Location, type of lighting elements

20. Display of equipment (bench, gazebo, trash can, etc.), objects

21. Dimensions, features, materials used, irrigation tap, water installation system, valve locations, etc. of water-oriented places such as pools, ponds, water games, etc. should be displayed.

22. Section lines, directions, codes, at least 2 sections (must be from two different angles perpendicular to each other and explain the project most comprehensively). The layout scale must be the same as the section scale.

Structural Landscape Application Sheet should be prepared in 1/200 or 1/100 scale detail according to the area size.

Note: The same scale should be used in Structural and Herbal Application Sheets. If the area is very large, a 1/500 scale can be used.

c. **Plantation Application Sheet**

It is the sheet where the plantation design is shown in detail according to the design elements and principles of the plants (tree (leafy and coniferous), shrub, ivy, ground cover, and grass

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plants) suitable for use, taking into account the structural sheet in the project area. What should be on the sheet;

• Must have direction/north sign and scale

• Current or protected plants in the area should be shown.

• Herbal material/material list and explanations should be included.

Trees (leafy and coniferous), shrubs, ivy, ground cover, and grass plants should be grouped and shown on the sheet.

• Latin and Turkish names, sequence numbers, symbols, and numbers of plants should be shown.

If necessary, it should contain information about the stem diameter of the plants, the age of the seedlings, the planting depth, the planting place (natural, filled, and potted), the crown diameter of the mature state, and the number.

• Crowns/widths that show the advanced status of the plants should be positioned in scale and shown with different symbols.

The size of the flower pillows and the number of seedlings should be shown.

• Grass species/varieties, mixing ratios, number of seeds per m^2, mold grass sizes, standards, etc. must be specified

The amount and calculation of vegetable soil and fertilizer should be done.

• Grass, ground cover, mulch, gravel, rock, etc. animate/inanimate material names/notes, quantities should be given

• Open area and open green area names should be written.

• Plants shaped by pruning should be shown

• Section lines, directions, and codes should be shown

At least 2 sections on the sheet (must be from two different angles perpendicular to each other and explain the project most comprehensively). The layout scale must be the same as the section scale.

The plantation Application Sheet should be shown in 1/200 or 1/100 scale detail.

Note: The same scale should be used in Structural and Plantation Application Sheets. If the area is very large, a 1/500 scale can be used.

d. Irrigation and Drainage Sheet

Irrigation Sheet; It is an irrigation system project to give the water needed by open and green areas and all plants. The criteria of the irrigation system are determined. The water source, flow

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rate, and volume of the water source are planned and designed in integration with engineering and architectural projects. For example, irrigation system calculations, quantity charts, the location and quality of the water source (tank, network, etc.), the project note, irrigation tap, valve locations, etc. are displayed.

Drainage Sheet: It includes the management, control, displacement, accumulation, and arrangement of hard soils and above-ground waters specified in the Structural Implementation Plan. Moreover, decisions are taken regarding the management, control, and conservation of underground waters. To prevent damage to surface waters, slopes are given in the area, directions and percentages are shown, and places and materials where water will be collected are defined. It is planned in integration with infrastructure projects. For example, surface flow direction/surface slope percentage, rain collection channel/tank and its details, water discharge channel/point, etc. are displayed.

• Scale of Irrigation and Drainage Application Sheets: It should be in 1/200 or 1/100 detail and the same scale should be used with the Structural and Plantation Application Sheets.

e. Detail Sheet

This is the sheet where the information regarding the construction and production standards of all kinds of structural-vegetative equipment and reinforcements used in the structural and vegetative landscape application plans are drawn at appropriate scales. The Detail Sheet consists of material detail drawings, as well as sections - views and perspectives if necessary.

Detail Sheet should be given in different scales according to the dimensions of the object, reinforcement, material, structure, etc. (1/1, 1/5,1/10, 1/20, 1/50 Scales)

f. Modeling Sheet

The modeling sheet is made in 3D modeling programs by its real dimensions and appearance, where every detail of the project is processed and displayed in color.

4.2.3. Static Project

According to the Planned Areas Type Zoning Regulation (Article 57 and Section 6), the static project is prepared by civil engineers within the framework of the relevant legislation by the architectural project and the ground/foundation survey report. The scales are determined according to the size and characteristics of the building, and the load-bearing systems are shown according to the types of reinforced concrete, masonry, steel, and similar structures.

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All floor plans including the basement, roof plans, scaffolding system, and their sections, details, and calculations should be given. Engineering projects are superposed on architectural and landscape projects and applied to the application project.

• Final Project: Formwork plans 1/100, Final project basic study and report, etc.

• Application Projects: Formwork plans 1/100-1/50, Manufacturing drawings, Reinforced concrete static calculations

4. 2. 4. Mechanical Project

• Final Project: Device layout plans 1/100, cooling/heating group calculations, device selections, etc. are displayed.

• Application Projects: Heating/cooling floor plan 1/100-1/50, heating/cooling roof plan 1/100, heating/cooling column diagrams, sanitary system floor plan 1/100-1/50, plumbing column diagram, rain installation floor plans 1/100, fire installation floor plan 1/100, heating/cooling calculations, plumbing calculations, rain installation calculations, shelter ventilation project, etc. is displayed.

4. 2. 5. Electrical Project

Building Electricity Project: Application Projects: Grounding installation projects 1/100, lighting installation projects 1/100-1/50, emergency lighting and exit 1/100-1/50, socket installation projects 1/100-1/50, mechanical systems electrical supply projects 1 /100, equipment supply project 1/100-1/50, LV tables single pole projects, telephone distribution system projects 1/100, CCTV distribution system projects 1/100, galvanized cable carrier system projects 1/100, lightning rod project 1/100, fire alarm installation projects 1/100, data distribution projects 1/100, etc. are shown.

Landscape Area Electrical Project: In the Landscape Structural Application Project, lighting elements, grounding installation, lighting installation, socket installation, etc. are displayed.

4. 3. Cost and Tender Dossier Preparation

All the application projects to be delivered (building, landscape, mechanical, electrical, and construction) are integrated with the design criteria, and approaches on system detail solutions at the construction stage, point detail solutions, quantity-exploration work, progress payment preparation, and operation maintenance costs are brought together. Service definition, costing and financial conditions, requirement program, feasibility Tender dossier, and project tender are made, and contracts are prepared.

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4. 4. Built Environment Design Projects Technical Description Report

Technical Description Report should have textual and visual content, including the project area, all the building, landscape, and other engineering project and sheet information, the project subject, justification, target, and working method, briefly and concisely determining the problems that will form the basis of the project, inventory and survey analysis, concept content and decisions of the project, zoning, materials used, quantity list, contract text, work program, and technical and special specifications, project implementation, monitoring and maintenance studies, accessibility monitoring and inspection regulation, indoor and outdoor fire regulations, occupational safety regulations measures to be taken, etc.

Stage 5. Final Approval and Implementation

It is the stage that includes the site delivery and construction site installation, plan application, landforms, soil preparation, construction, installation, electricity, and infrastructure of the projects.

Stage 6. Management

Maintenance, repair, monitoring, control, inspection, and all kinds of administrative organization are carried out.

7. Conclusion and Recommendations

Today, in the face of new developments and changes, it has become necessary to integrate the planning and design scales with each other and to deal with them within the scope of city-neighborhood-neighborhood-street-structure and object scales by considering the protection-use balance. There is a need for a new understanding of the design of the built environment in which the content, effectiveness, products, and processes are defined to increase the holistic and quality of life.

In Urban Design approaches, it is necessary to target a livable and ecological built environment approach, rather than just zoning (building).

The urban design includes the built environment design production process and its essential elements are the architectural discipline of Building Architecture and Landscape Architecture. Spatial site selection, inventory/questionnaire, analysis, and decision-making processes in the spatial design process of the built environment should be carried out with the unity and cooperation of these two disciplines.

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In urban design policies, space, structure, environment, identity, aesthetics, and functionality should be considered as a whole and the dimension of discourse and action should be revealed within the framework of interdisciplinary cooperation.

Urban design project production processes, scale details, method, content, duties, and responsibilities of professional disciplines, project drawing and presentation standards, legend information, etc. should be clearly defined in the legislation.

In the built environment design process, each project area has a unique identity. Therefore, each project should require processes that include a different inventory, analysis, concept, and design setup. The compatibility of the spaces to be designed with the land and environmental conditions should be interpreted in line with the needs and their suitability for the determined target should be investigated.

For the built environment design to be livable, healthy, accessible, aesthetic, functional, and sustainable, the project production process of the building and its environment should be considered as a whole. Accurate and up-to-date data should be utilized in multiple ways. Accurate analyzes and interpretations should be made for the purpose. Optimal options and decisions should be made. It should be implemented and managed by the purpose and design concept.

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Evaluation of Renewable Energy Use in Terms of Sustainable Development

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Abstract

Energy sources play an important role in electricity generation for varying levels of consumer satisfaction. However, electricity production creates negative effects on the environment and greenhouse gases arising from electricity production are effective on all individuals in the society. Therefore, the need to reduce emissions from the energy sector improves environmental quality leading to improved human health and sustainable development. The natural disasters experienced worldwide due to the effects of global warming and the large-scale pollution of natural resources reveal the importance of developing and applying clean production methods in order not to cause further damage to the environment. It contributes to sustainable development through clean energy production, efficient management of energy resources and the development of new technologies.

Sustainable development is possible through sustainable use of energy and access to affordable, reliable and modern energy for citizens. The use of renewable energy sources, which play a vital role in providing sustainable energy with lower emissions, advances economic development, ensures energy security and reduces climate change.

Renewable energies are defined as energy sources that are not exhausted by use and are also known as clean energy because they do not produce additional pollution or waste like fossil energy sources. The use of renewable energy sources creates an effective ecological solution to reduce carbon dioxide emissions and combat the greenhouse effect. This study examines the roles that the use of renewable energy sources in energy production can play in the sustainable development of our country and the contribution of the transition from fossil energy sources to renewable energy sources to reduce the impact of climate change.

Keywords: Climate change, renewable energy, sustainable development.

Introduction

Energy is seen as the most important factor of the production process, especially together with labor and capital. On the other hand, energy is considered as the most important determinant of sustainable development goals. This is because it increases productivity and provides essential information for the economy and society. It also improves humanity in terms of food production, economic growth, education, employment and empowerment (Wei & Huang, 2022).

The aim of energy systems is to provide energy services that increase people's welfare and support economic growth and social development. Energy plays a fundamental role in achieving sustainable development. This role is often referred to as sustainable energy development. Currently, sustainable energy development is linked to some of the important

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environmental, social and economic challenges facing the world. In order to realize sustainable energy development, environmental, social and economic impacts must be taken into account (Gunnarsdottir et al., 2022).

Energy is an indispensable factor for economic development. However, energy use causes carbon dioxide emissions, which cause climate change and environmental problems. The increase in the emission level causes a global concern. The depletion of natural resources, energy-based economic growth and the global consumption model pose a problem for future generations. Therefore, the basis of sustainable development is damaged (Xue et al., 2022).

The International Energy Outlook projects strong growth in global energy demand through 2025. It is worrying that fossil fuels contribute to around 80-95% of the world's primary energy demand. This high dependency increases the risk of "blackout" energy that can result from the depletion of natural resources. Because of that, it is necessary to call for new energy sources in order to grow the economy without harming the environment. Therefore, industrialized countries are engaged in the development and use of renewable energy sources such as solar, biomass, geothermal, tidal, hydroelectric and wind energy (Saidi & Omri, 2020).

Today, due to worldwide demands, more sustainable energy technologies are needed, especially in developed and developing countries, instead of traditional electricity generation sources such as fossil fuels (Ang et al., 2022).

There is currently a global trend to replace traditional fuels with renewable energy sources to meet the excess energy demand. Many challenges such as greenhouse gas emissions, climate change and energy security are the main factors that cause renewable energy to try to meet the increasing energy needs. Unlike fossil fuels, renewable energy sources protect the environment and create a clean environment. It also provides energy security and offers economic benefits. Therefore, it is vital that current societies and future generations rely on renewable energy sources to meet their energy needs (Qazi et al., 2019.).

Materials and Methods

The main material of the study is renewable energy resources in our country and in the world, and it is aimed to examine the contribution of the use of these resources in energy production to sustainable development. For this purpose, first of all, the concept of renewable energy and sustainability are mentioned in the study. Then, the types of renewable energy sources were examined and the importance of these sources in energy production was evaluated.

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While creating the method of this study, previous studies on the subject were researched and examined. As a result, general theoretical concepts and various data that may be useful for the study were evaluated.

Sustainable Development and Renewable Energy Sources

Sustainability is essentially making the act of continuation feasible. Considered here as an act of continuation; to cause minimal damage to the ecosystem with the judicious consumption of natural resources but besides this, it is to benefit from the blessings of the age without ignoring the technological developments.

Sustainable development refers to many processes and ways to reconcile the ecological, economic and social dimensions of life (Figure 1). Sustainability is a long-term goal, that is, the goal of a more sustainable world (Baker, 2015).

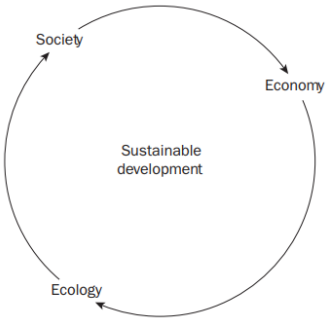


Figure 1. Sustainable development (Baker, 2015).

Sustainable development goals are a worldwide goal that is primarily intended to be implemented at the national level. However, it is imperative to meet the increasing energy demands in order to ensure sustainable development. Energy is a vital element in obtaining the production necessary for the economy. Because it helps individuals in the society to raise their general living standards. Currently, many countries rely on fossil fuels to meet their energy needs. However, the emissions resulting from the burning of fossil fuels pollute the environment. Therefore, the use of renewable resources to meet the increasing energy demand seems to be an effective method as it not only provides long-term growth but also reduces environmental problems (Wei & Huang, 2022).

Climate change is one of the most important problems of the 21st century. Scientists state that the risks and uncertainties posed by climate change can affect various dimensions of the global economic system. Climate change arises from global warming, environmental pollution and greenhouse gas emissions. The use of fossil fuels and non-renewable energy sources creates carbon dioxide emissions. Therefore, ensuring the use of renewable energy instead of fossil

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fuels is an important policy tool in the transition to a low carbon economy. It is stated that with higher renewable energy consumption, the negative effects of climate change on the economic system can be slowed down (Shang et al., 2022).

Renewable energy sources, which have a critical importance due to their environmentally friendly nature, are considered as clean energy sources. It is understood that the use of fossil fuels causes carbon dioxide emissions, greenhouse gas problems and environmental pollution, thanks to the increase in the awareness of clean environment in societies. Renewable energy sources have the potential to fulfill energy services with zero (or nearly zero) emissions of air pollutants and greenhouse gases, thus meeting local energy requirements (Qazi et al., 2019).

Renewable energy sources are essential to meet the growing population and energy demand worldwide. The use of non-renewable energy still disrupts the environmental quality and climate. This situation affects and jeopardizes economic development. It is widely known that traditional energy consumption supports economic growth, but this obscures the negative effects of environmental pollution. Therefore, renewable energy consumption is required for a sustainable environment and economic development (Wang et al., 2022).

Renewable energy has a direct relationship with sustainable development through its impact on human development and economic productivity. Renewable energy sources offer opportunities for energy security, social and economic development, energy access, climate change mitigation and environmental and health impact reduction. Figure 2 shows the opportunities of renewable energy sources for sustainable development (Asantewaa Owusu & Asumadu-Sarkodie, 2016)

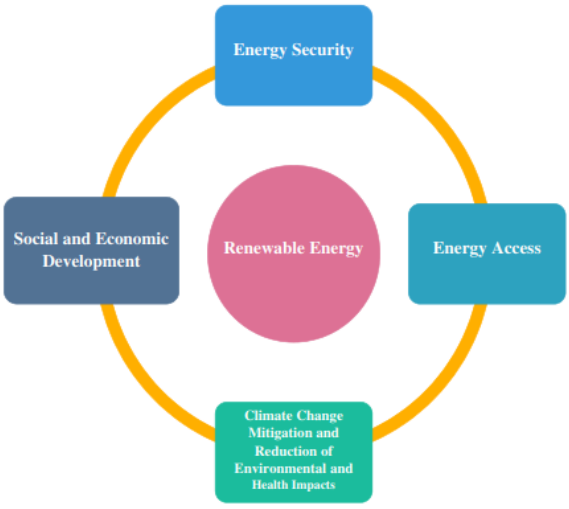


Fig 2. Opportunities of renewable energy sources (Asantewaa Owusu & Asumadu-Sarkodie, 2016)

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The use of renewable resources is often characterized as region-specific by the type of renewable energy resources available locally. Therefore, the transition to renewable energy supply requires resource assessments, appropriate technologies and systems that can properly meet demands and integrate them into renewable energy sources (Østergaard et al., 2020).

Findings and Discussion

Pollution and emissions from today's industry continue to have negative environmental impacts. Renewable and clean energy sources are becoming more and more attractive. The use of renewable energy sources offers a clean alternative to environmentally damaging energy sources. It also helps to reduce climate change (Sui et al., 2019).

Even in the 21st century, most countries still depend on fossil fuels due to the lack of technology, resources and conditions to take full advantage of renewable energy sources for electricity generation. However, the production of electricity from renewable energy sources is increasing rapidly today, thanks to the sensitivity and awareness of the society towards the environment. Figure 3 shows a comparison of the increase in fossil fuel production and renewable energy generation from 2010 to 2019. Fossil fuel use for electricity generation declined in 2020, although it increased from 121,531 TWh in 2010 to 136,131 TWh in 2019. On the other hand, renewable energy generation has increased significantly from 4098 TWh in 2010 to 7,140 TWh in 2019. Renewable energy production has managed to surpass fossil fuel production in 2020, especially during the pandemic. It is believed that electricity generation in residential residential areas can be provided entirely by renewable energy in the future (Ang et al., 2022).

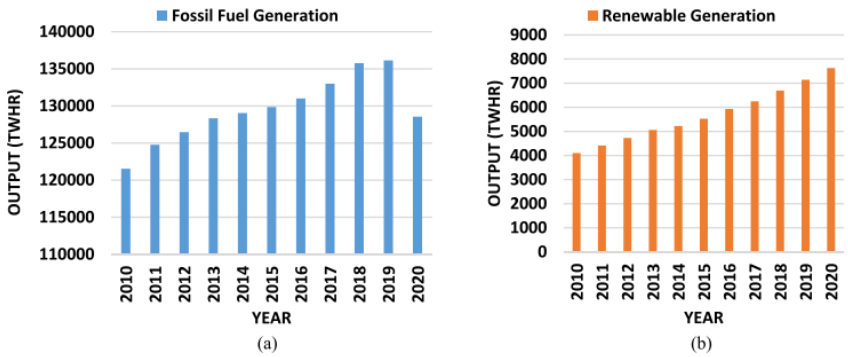


Fig 3. Comparison of (a) fossil fuel generation and (b) renewable generation growth (2010–2020) (Ang et al., 2022)

Renewable energy is also known as clean energy because it does not produce additional pollution or waste like fossil fuel energies. They have a low carbon footprint and produce less greenhouse gases. Different countries are trying to minimize their dependence on polluting

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fossil fuels. For this reason, clean energy has become popular in recent years. The electricity produced from renewable energy sources met the world's electricity need by 28%, and 96% of this was obtained from hydroelectric, solar and wind technologies (Jaiswal et al., 2022).

Renewable energy could meet two-thirds of total global energy demand and contribute to the reduction of greenhouse gas emissions needed between now and 2050 to limit average global surface temperature rise to less than 2°C (Gielen et al., 2019).

Renewable energy refers to energy produced from inexhaustible sources or energy produced from sources that can be renewed throughout a person's life. Renewable energy systems produce lower greenhouse gas emissions when compared to fossil fuel energy systems. Greenhouse gas emissions are known to cause global climate change. The United States Energy Information Administration divides renewable energy into five classes. These are: biomass, geothermal, hydroelectric, wind and solar energy (Ilechukwu & Lahiri, 2022).

Conclusion and Recommendations

All societies need energy services to meet their basic human needs and to operate their production processes. The growing energy crisis is one of the most important problems of the 21st century. Energy is the most important factor for the economic development and welfare of countries. Therefore, the demand for energy increases in proportion to the population and economic growth of a country. With the rapid population growth in the world economy, the demand for energy in sectors such as industry, service and agriculture is increasing. This increase in demand is mostly met by fossil-based energy sources. However, fossil-based energy sources seem to cause environmental problems such as climate change, global warming and increasing carbon dioxide emissions.

Climate change occurs when greenhouse gas emissions from fossil fuel use are trapped in the atmosphere and the temperature value of the earth increases. In this respect, it is extremely important to use renewable energy sources instead of fossil-based energy sources. Clean, renewable and sustainable energy is necessary to improve social, economic and environmental health that leads to economic development and productivity. It is better understood with each passing day that we should turn to renewable energy sources instead of relying on traditional fossil fuel sources. This is not only because fossil fuels are running out, but also because they negatively affect our health. Consideration should be given to the use of renewable energy sources in order not to cause further harm to the environment for both present and future generations.

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Energy is used to produce products and services needed for societies, and as a result, the environment is exposed to emissions and pollution. Therefore, as long as production continues, environmental pollution will occur. For sustainable development, energy supply must be secure and environmental impacts must be low. For energy services to be environmentally friendly, they must be provided with low environmental impacts, including greenhouse gas emissions. In addition, providing guaranteed and affordable access to needed energy resources is extremely important for sustainable social and economic development.

Renewable energy resources are own resources that have an important place in reducing energy imports and creating a clean, reliable and sustainable energy policy. Carbon intensity will decrease as countries prefer to use renewable energy instead of fossil energy use. Thus, the possibility of easy accessibility of all individuals to reliable, affordable, sustainable and modern energy, which is one of the most important goals of achieving sustainable development, will increase.

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Does Blockchain Technology Really Help to Achieve a Sustainable Future? Perspective on Energy Efficiency

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Abstract

As each year goes by, there is a greater need for energy, which means that improving energy efficiency is quickly becoming one of the most pressing concerns in the globe. It is imperative that advances in energy efficiency be increased by a double by the year 2030, if the Sustainable Development Agenda is to be realized. However, owing to a number of market constraints, the implementation of energy efficiency solutions is moving at a glacial pace. The blockchain is a relatively new technology that has the ability to overcome these obstacles or even radically alter the designs of energy system architectures by allowing systems that are transparent, decentralized, and resistant to tampering. The blockchain technology has lately emerged as a major technology in the digital transformation of the energy industry, and various worldwide experts have highlighted blockchain potential for the energy globe. The focus of the article is to study the relationship between blockchain technology and the effective use of energy. The findings of the article have the potential to be included as significant inputs into further study as well as practical applications in the field.

Keywords: Blockchain, energy efficiency, sustainability.

Introduction

Recent years have seen the emergence of blockchain technology as a crucial component in the ongoing digital transformation taking place in the energy industry (Burger et al., 2016; Khatoon et al., 2019). It is equipped to revolutionize the manner in which people and corporations have interacted with the energy industry over the course of the last several decades. The decentralization, digitization, and democratization of the energy industry are effectively accomplished with the assistance of essential enabling technologies like information and communication technologies (ICTs) and blockchain (Burger et al., 2016). The purpose of this research is to investigate the connection that exists between blockchain technology and the efficient management of energy resources. The results of the paper have the potential to be incorporated as important inputs into both the conduct of more research and the development of practical applications in the sector.

Blockchain: What is it?

The blockchain is a decentralized internet technology that enables peers to conduct financial transactions with one another without the need for an intermediary organization such as a bank (Pierro, 2017). This technology occurs in the absence of a centralized administrator or data storage. Blockchain technology is the foundation upon which cryptocurrencies such as Bitcoin operate. The blockchain technology is not just the basis for all cryptocurrencies, but it has also found widespread use in the more conventional financial sector (Nofer et al., 2017). Blockchain

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applications do not need to be monetary in nature. One example of a non-monetary application of Blockchain technology is the smart contract, which is a contract that is automatically executed once certain the conditions are fulfilled.

The blockchain is essentially a decentralized database that stores what are known as blocks. This collection of data entries is constantly being added to and expanded upon. These blocks include data and programs, as well as batches of individual transactions and executables. They are timestamped, shared, and cannot be altered. Additionally, they are related to blocks that came before them. Transactions are validated at regular intervals by computers that are operated by users of the network. These machines are referred to as "nodes," and they are encrypted, dispersed, and public. If someone wanted to change a contract, the whole Blockchain would need to be modified at each node, which is a challenging process both computationally and organizationally (Radziwill, 2018). Figure 1 provides a representation of a blockchain.

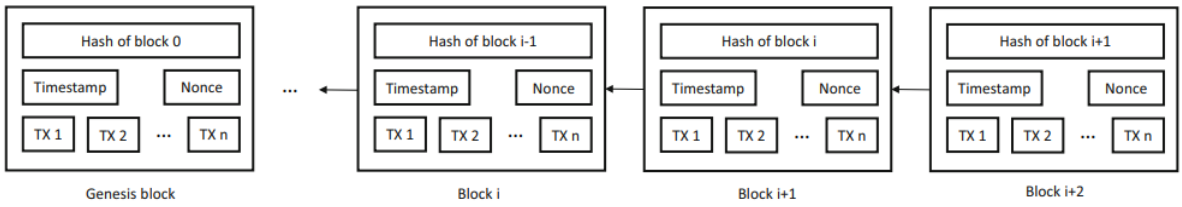


Figure 1. An Illustration of A Blockchain (Zheng et al., 2018)

Blockchain and energy

The three stages of development that are commonly referred to as Blockchain 1.0, 2.0, and 3.0 (Swan, 2015) are paralleled by the predicted progression of Blockchain in the energy industry The introduction of cryptocurrencies as a competitive alternative to existing forms of digital currency is the defining feature of the first phase. In Phase 2.0, the use case of Blockchain is expanded to include Smart Contracts as well as more complex financial instruments — in general, any sort of transaction between two parties that can be represented via a digital counterpart. At the end of Phase 3.0, blockchain will be integrated into Big Data and predictive task automation systems (Burger et al., 2016).

The use of blockchain technology has the potential to increase both transparency and consumer confidence, and it might be used in a variety of energy saving projects to bring about significant change.

- It can provide consumers with an additional incentive to participate in energy efficiency and energy saving initiatives by giving them the ability to trade these savings and generate additional income through an automated system that is based around smart contracts. This can

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give consumers an additional reason to participate in energy efficiency and energy saving initiatives.

- It has been extremely difficult to set a value on energy efficiency since, in many circumstances, the advantages of energy efficiency cannot be properly assessed or evaluated (Rogers, 2018). The distributed ledger technology known as blockchain, combined with information and communication technologies and process automation, could be able to assist, at least to some degree, in evaluating the related advantages of energy savings.

Potential applications and use cases

Energy service companies, often known as ESCOs, have been conducting research to identify potential uses for blockchain technology that might simplify the process of energy performance contracting (EPC) (Rogers, 2018).

One of the most successful examples of a trading plan with the goal of increasing end-user energy efficiency is Italy's White Certificate Scheme (WCS). It has been claimed that the WCS has the largest potential for boosting energy efficiency in Italian sectors, and it is expected that it will be able to reach at least sixty percent of the objective set for 2020 by EU Directive 2012/27/EU (Rotiroti, 2017). The program requires electricity and natural gas distribution system operators (DSOs) with more than 50,000 customers to meet an annual energy savings target. This can be accomplished in one of three ways: by implementing energy-efficient solutions among end users; by purchasing white certificates from other DSOs equal to their obligation; or by combining the first two options (Franzò et al., 2019). When greater energy savings are accomplished in comparison to the goal, the regulator will award a white certificate. Each white certificate is equal to one ton of oil equivalent (toe), and they are given out if the objective is met (Di Santo et al., 2011). Measurement and verification (M&V) is one of the most significant operations, along with the issue of white certificates and their subsequent trade. These are difficult processes that are not entirely clear to see when they occur in nature. It is possible to construct a smart contract that can contain all of the requirements, ranging from M&V to trading of certificates. This contract would be maintained on blockchain technology. It will no longer be necessary to have a centralized entity to manage and approve the trading because it will be possible to directly manage it through the smart contract (Khatoon et al., 2019).

The most apparent use for cryptocurrencies in the energy industry is to be used for conducting monetary transactions. The majority of the impetus for this trend has been coming from new

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business initiatives, but established companies are quickly catching up in the uses of Blockchain technology and are initiating joint ventures and cooperations. If individuals in nations with high inflation rates make payments in advance, rather than waiting until the due date, their expenditures are reduced, and they avoid accruing any debt as a consequence. A South African start-up company named Bankymoon is responsible for the development of this concept. Additionally, Bankymoon makes use of Bitcoin as a kind of cryptocurrency for carrying out remote payment transactions. These transactions are carried out through the company's Bitcoin-compatible Smart Meters, for instance in savings public schools (Bankymoon, 2017).

Using Ethereum's Blockchain to facilitate the ability to charge electric vehicles is the goal of a project that was initiated by the German utility innogy with the assistance of a startup company called Slock.it. This company specializes in providing large corporations with expertise in Blockchain technology. They have given their business the name BlockCharge, and they guarantee that charging electric cars will be simple and inexpensive (Burger et al., 2016).

Conclusion

The development of new technologies and the ability to assess energy efficiency measures are essential to the creation of a smart, connected grid of prosumers. This is necessary in order to ensure that energy saving measures may be traded in an open and honest manner. The energy sector may take heart from the development of blockchain technology since it bolsters the possibility of a secure and reliable digital transaction platform that enables customers to take an active role in the energy market.

The Blockchain technology faces competition from already established solutions and must demonstrate to consumers why it is more desirable than the alternatives. The growing need to be transparent is another trend that may be addressed by blockchain technology. Customers have come to anticipate having quick and simple access to all pertinent information, which enables them to make wise decisions. It is possible that blockchain may serve as the underpinning technology for a variety of applications that provide complete transparency.

It is possible that blockchain technology will make it possible for new participants to join the existing structure of the energy supply system; it may also serve as a platform for the more efficient reorganization of regional or local markets; and energy companies may use blockchain technology to improve the efficiency of their operations.

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Investigating Intelligent Energy Control in Iot- Based Homes

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Abstract

Today, the integration of renewable energies and optimization of energy consumption are important factors in using sustainable energy and reducing climate change. Modern technologies such as the Internet of Things (IoT) provide many applications in the energy sector, including in energy supply, transmission and distribution. Internet of Things can be used to improve energy efficiency, increase the share of renewable energy, and reduce undesired impacts. By using the Internet, as one of the useful components of human life, many appliances used in daily life such as televisions, air conditioners, refrigerators, washing machines, can be monitored and controlled, and by making homes smart through technology of Internet of Things (IoT), they can be controlled remotely. This article deals with a descriptive review of the existing literature on the application of IoT-based houses in intelligent energy management. For this purpose, after the definition of the problem, the review and adaptation of the literature on the subject are done and finally the conclusion is presented.

Keywords: Internet of Things, Smart Home, Energy Consumption, Intelligent Energy Management

1. Introduction

Nowadays, many modern technologies such as intelligent communication systems, robots, and the Internet of Things are expanding [1]. The Internet of Things connects a number of devices, people, data and processes and enables them to seamlessly communicate with each other. Besides, the Internet of Things has the ability to process a large amount of information and enables us to remotely control environments [2]. The Internet of Things can also increase people's quality of life in various fields, including medical services, smart cities, construction industry, agriculture, water management, and energy sector [3]. We will also be able to make automated decisions in real time and access facilitating tools to optimize such decisions.

One of the most important applications of the Internet of Things is in equipping smart homes. Smart home can be considered as a subset of smart cities. In this subset of residential appliances, lighting, heating and air conditioning systems, audio and video players, and security systems are able to communicate with each other. Also, they are used through a central control unit to create comfort, security and energy efficiency for home owners.

2. Material and Methods

2-1. Internet of Things (IoT)

The term Internet of Things can be defined as an Internet-based platform that facilitates the exchange of services, information and data between objects. This technology was first introduced by Kevin Ashton in 1998 and has been widely used in industry and academia [4]. In some cases, IoT is used to emphasize the ubiquitous use of Internet-enabled objects. The Internet of Things connects all these things to make people's lives easier in all situations.

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In this technology, different aspects of hardware and software solutions work together to create the Internet of Things platform. The Internet of Things must be able to connect many heterogeneous devices through the Internet, and therefore there is a fundamental need for a flexible layered architecture. Here, architecture is defined as the framework in which things, people, and cloud services combine to facilitate application tasks. Briefly, the reference model for the Internet of Things can be shown schematically as in Figure 1.

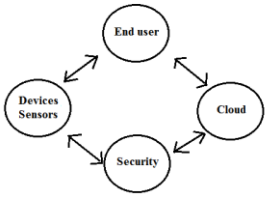


Figure 1. General elements of a IoT system

The Internet of Things includes a wide range of standards and non-standard technologies, software platforms and diverse applications that make it difficult to use. Although a reference model can be considered for the Internet of Things, the communication of different devices in this reference model may face challenges [5].

2-2. Smart Buildings

The so-called smart building is a building that creates a high productivity and cost-effective environment with the help of optimizing services, management, structure and systems as well as mutual communication between them. Smart buildings will change the face of cities. To build a smart home, smart architecture, building architecture with integrated advanced technology and the use of telecommunication technologies are required [6].

From another point of view, the smart building is an environment that effectively creates the inhabitants towards the environment, and in its best case, it creates an intelligent connection between humans, the residential building and the environment. At the same time, it manages resources, facilities and optimal hardware at the lowest cost. In general, the smart building has the following conditions [7]:

• Continuous and intelligent monitoring of various facilities such as ventilation, temperature, lighting, security, fire, etc. through advanced and automatic control systems are provided.

• The communication infrastructure between different building systems should be available to transfer data, information and control commands.

• It is possible to remotely service and manage the systems, structures and devices in the building. Figure 2 shows a general energy saving strategy for smart homes

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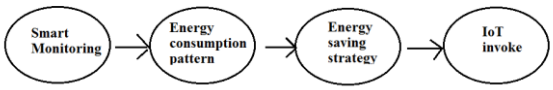


Figure 2. Flow of a smart home energy saving system

One of the items that the Internet of Things can help is in making buildings smarter by using it to manage the energy losses of lighting systems. For example, through the use of IoT-based lighting systems, users are alerted when energy consumption exceeds the standard. Also, with real-time data analysis, load is efficiently transferred from high peak levels to low peak levels. This significantly contributes to the optimal use of electrical energy [8,9] and the reduction of greenhouse gas emissions. With IoT, demand response will be more agile and flexible, and demand-side monitoring and management will become more efficient.

3. Discussion

It is expected that in the near future the Internet of Things will be widely used as a network to connect a large number of objects. All services and content around us will be available for current and future applications. The new structure can enable communication and new ways to perform tasks, work, social networks and entertainment, and thus enable a new lifestyle. The Internet of Things offers many applications, only a few of which are currently deployed. In the future, there will be many applications for smart cities, such as intelligent energy control for buildings. Here, the comparison of some techniques based on IoT for smart home energy saving is presented. Table 1 shows the list of techniques and their model and their success.

Table 1. Comparison of IoT Techniques in smart homes

Techniques	Objectives and achievements
Genetic harmony search algorithm [10]	Minimizing electricity cost, peak to average ratio (PAR) and maximizing the user comfort, Good real-time electricity pricing (RTEP) and critical peak pricing (CPP) tariffs.
Fuzzy logic and heuristic optimization [11]	Total energy cost minimization, PAR reduction
Genetic algorithms [12]	Cost and PAR reduction by satisfying user comfort
Big data analysis [13]	Motivates users to locally monitor and control devices
Hybrid genetic wind driven heuristic optimization algorithm [14]	Reduces the energy consumption, electricity cost and achieves energy savings for week days and weekend
binary backtracking search algorithm [15]	Reduces the energy consumption and electricity cost
Particle swarm optimization algorithm [16]	Cost and PAR reduction and user comfort maximization
Q-learning algorithm [17]	Reduces the energy consumption and electricity cost
Dijkstra algorithm [18]	Minimizes the total cost, trades the computational complexity for lower performance
distributed optimization algorithm [19]	Minimizes the total electricity cost

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generic demand side management model [20]	Total energy cost minimization, PAR reduction and Waiting Time of Appliances (WTA)

4. Conclusion

Smart home and IoT-related technologies are developing rapidly, and many smart devices are being developed to help users enjoy a more comfortable lifestyle. However, the existing smart homes are limited by a scarcity of operating systems to integrate the devices that constitute the smart home environment. However, many techniques have been developed to not only reduce the energy consumption but also provide a user comfort. In this paper, a comparison of new techniques for energy saving in smart homes was presented and effectiveness of each of them has been discussed.

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In-Situ Synthesis of Zsm-5 Zeolite from Kankara Clay

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Abstract

The research on In-situ synthesis of Zeolite Socony Mobile-5 (ZSM-5) Zeolite using Kankara clay as a starting material was done by beneficiating, oven drying, sieving and calcining the clay at high temperature to convert the in-active state of the clay to it active Kankara microspheres. The high silica to alumina ratio content ZSM-5 synthesized via the in-situ hydro-thermal crystallization method. The physicochemical properties and propylene boosting performance of the resulting samples was characteried by using phenol adsorption and Fourier Transformed Infrared Spectroscopy (FITR) respectively. The results obtained from the phenol adsorption characterization shows that, the adsorption increases slightly from raw Kankara clay to the Zeolite produced at 1200 OC calcined temperature. IR spectra of these samples showed the characteristic adsorption bands corresponding to those from the literature bands at 900-1150 cm-1 and 850-950 cm-1, due to internal symmetric and asymmetrical stretches, and bands at 520-620 cm-1, due to ring vibrations, and bands at 410-500 cm-1 bends were observed and were slightly in accordance with the band assignments reported in the literature.

1.Introduction

Zeolites are complex hydrated aluminosilicate minerals made from interlinked tetrahedra of alumina (AlO_4) and silica (SiO_4) (Drisko, 2018). ZSM-5 is a synthetic zeolite used in reactions involving aromatic compounds and in fluid catalytic cracking (FCC) zeolites. The rapid increase in world energy demand which calls for the processing of heavy petroleum feedstock has increased the importance of developing new catalyst systems. Heavy feeds have residue contents of about 40 % and require further processing in order to form a market through catalytic processes using zeolite catalyst (Strathmann *et al.*, 2010). Nigeria with a huge amount of oil reserves estimated recently to be about 3 7.2 billion barrels and the 13th world producer of petroleum, with four refineries across the nation (another one still on construction) and a total processing capacity of 450,000 bpd consumes approximately 1600 t of zeolite catalyst per day. The catalysts are imported annually over 500,000 t, at a cost of about ₦25 m while the country has the clay that can be used for producing the zeolite. Nigeria has a good potential to develop zeolite for its local use (Ratel *et al.*, 2022).

There are many significant efforts that have been made to synthesize ZSM-5 zeolite in Nigeria using different kaolin clay sources such as at Covenant University Ota, Amadu Bello University Zaria, Federal University of Technology Minna and Obafemi Awolowo University Ile-ife but

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mostly for ex-situ or incorporation method. The attempt made here in Modibbo Adama University of technology Yola was for in-situ but failed due to inadequate knowledge of the ratio of seed composition that can go into the kaolin microsphere to form ZSM-5 in-situ (Ratel *et al.*, 2022; Wise, 2013).

The aim and objectives of this research is to synthesize in-situ ZSM-5 zeolite from reformed Kankara microspheres under hydrothermal condition in a period of 72 h at a contant heating temperature of 100 °C using 5 h aged seed solution. Towards ascertaining its production, the synthesized samples were characterized by water absorption, phenol adsorption, fourier transform infrared (FTIR) and Scanning electron microscopy (SEM) (Dyer, 2001; Wise, 2013). ZSM-5 zeolites are synthesized using different alumina/silica sources such as diatomites and kaolin clay (Wise, 2013). But in this study, Kankara clay was used as a starting material. This research was based on in-situ method used by Engelhard technology using seed solution without organic template, binders or ZSM-5 seeding crystals because previous works on the synthesis of this catalyst via traditional ex-situ method from Kankara clay has produce catalyst of low attrition, much impurities and various zeolite like materials which are undesired product(Feng *et al.*, 2022). Therefore in-situ technique was used because it provide best active acid sites for feedstock cracking, highest porosity so that the zeolite can be used to its maximum capacity, high attrition index and regeneration can be made easy, bulk properties that are important for heat transfer during regeneration and cracking and heat storage in large-scale catalytic cracking (Hu *et al.*, 2014). The catalyst via in-situ technique exhibited improved properties such as activity, activity stability and anti-heavy metals ability (Wise, 2013).

2.Materials and Methods

2.1.Instrumentation and Equipments

Instruments and steps Kankara clay was beneficiated to remove the impurities present in the clay. The resultant slurry was then spray dried to particle sizes, the particles was calcined at extremely high temperatures of 1050 ^{o}C such that organic cations are removed. The calcined microspheres were then treated with zeolite seed solution along which the ZSM-5 zeolite crystals was grown.

After the ZSM-5 zeolite crystallizes, sodium hydroxide was ion-exchanged out of the produced Zeolite. This was done with a hydrogen ion through ammonium nitrate exchange ion through rare earth exchange. This stabilizes the zeolite. The produced zeolite was finally dewatered and dried.

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A process for making ZSM-5 comprises forming an aqueous reaction mixture containing calcined kaolin microspheres, a solution of seeds characterized as promoting growth of zeolite Y crystals, and silicate, said reaction mixture having a mole ratio of silica to reactive alumina of at least 20 and a pH of less than 14, reacting said mixture at elevated temperature and for a time forming in-situ ZSM-5 crystals on said microsphere, said aqueous reaction mixture been free of organic template and free of ZSM-5 seed-crystals as illustrated in Figure 1 bellow;

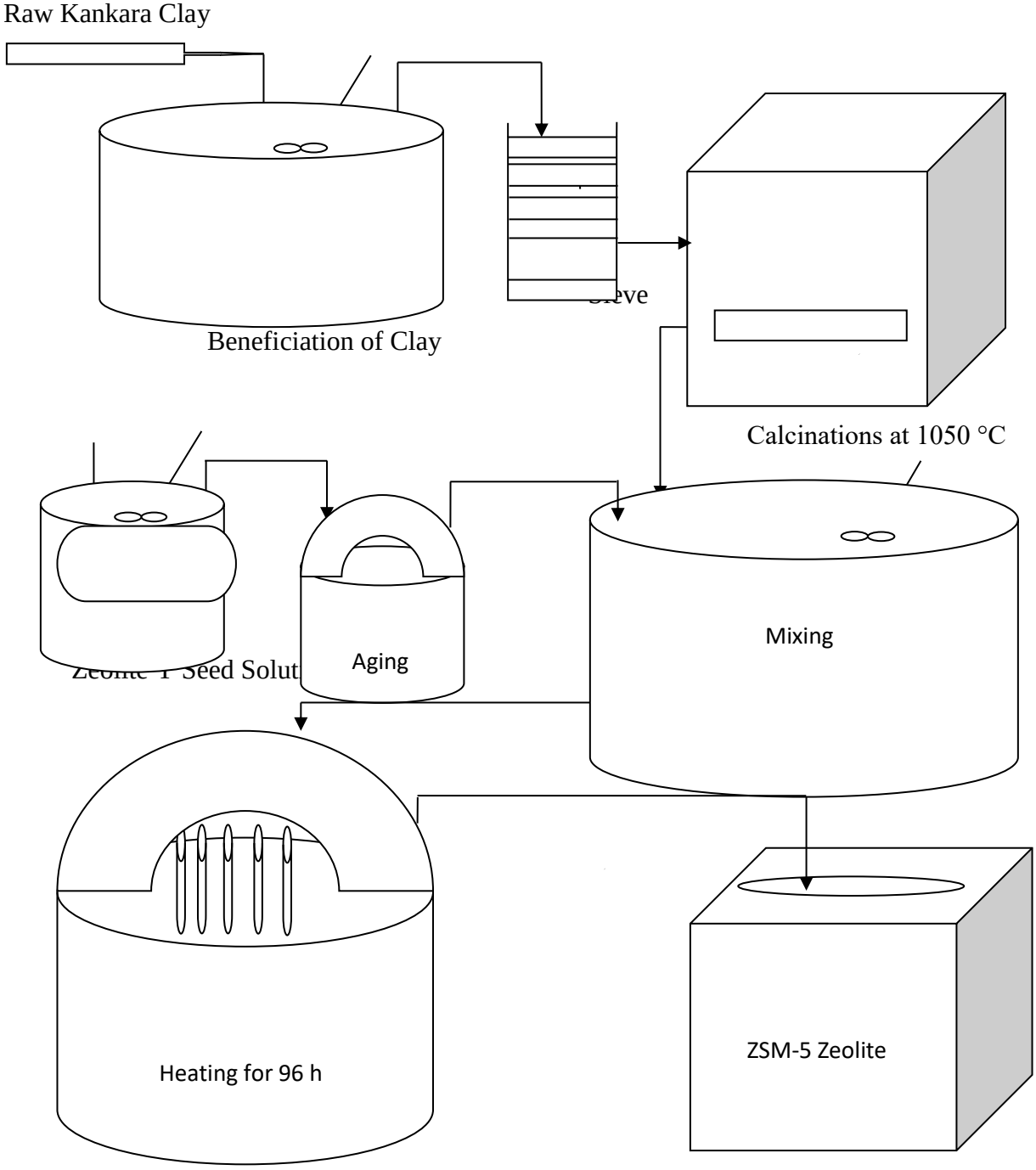


Figure 1. In-situ ZSM-5 Synthesis

ISBN: 978-625-8246-12-4

2.2. Experimental Procedure

The procedures that was used in the in-situ synthesis of ZSM-5 Zeolite from Katsina kaolin includes; procurement of the Kankara clay from Kankara Local Government area of Katsina state, beneficiation of the clay using: a plastic container with manufacturer; Dana plast, model number; DP 1566, The ground-up mass was sieved to pass through the ASTM standard sieve number 30 (i.e. sieve aperture size of 200 μm) after oven drying at a temperature of 200 ^{o}C. Any aggregate retained on the 200 μm sieve was rejected as too coarse. The accepted aggregates obtained from sieving were remixed.

Calcination using mulfle furnace: manufacturer; Chesterfield UK, model number LF3, maximmun temperature; 1200 ^{o}C, zeolite Y seed solution was prepared using plastic manufacturer; Dana plast, model number; DP 1566, and was transferred to polypropylene bottles of model number; formation and crystallization will be done in a rubber bath of model number; DP 1566 as illustrated in the figure bellow.

2.2.1 Beneficiation of Clay

Two kilograms of raw Kankara Kaolin clay was poured into a large plastic container with manufacturer; Dana plast, model number; DP 1566 and sufficient quantity of water was added to it so as to suspend the dry clay. The mixture in the container was stirred thoroughly and was left for two days. During this period, sand, stones and other forms of impurities was removed and at every four hours, the mixture was decanted, fresh de-ionized water was added and it was left to settle. On the fifth day, the clay was then filtered using a sieving cloth and the remaining water contained in the filter cloth was removed by squeezing. The resulting clay was then spread out for further drying.

2.2.2. Sieving of Clay

The beneficiated clay was then charged into the oven at 200 oC to reduce the moisture content and enhance sieving. The ground-up mass was sieved to pass through the ASTM standard sieve number 30 (i.e. sieve aperture size of 200 μm). Any aggregate retained on the 200 μm sieve was rejected as too coarse. The accepted aggregates obtained from sieving were separated into three different samples said A, B and C for calcinations process.

2.2.3. Calcinations of Clay

The clay was separated into three different samples said sample A, B and C each sample contain one hundred and forty grams (140 g) of the beneficiated kaolin clay was put into a crucible and charged into an electric mulfle furnace manufacturer; Chesterfield UK, model number LF3,

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maximmun temperature; 1200 ^{o}C was left in the furnace for five hours at a temperature of 1200, 1000 and 800 ^{o}C respectively. The furnace was left to cool and the calcined samples were discharged thereafter.

2.2.4 Procedure for Preparing Zeolite Seed Solution

The seed solution was prepared by dissolving 4.50 g of sodium silicate via heating with stirring at 100 ^{o}C mixed with a solution of 5.50 g of sodium aluminate + 0.5 g of sodium hydroxide and 0.36 g of sodium silicate with continuous heating and stirring for 2 h. and aged for 8 h to improve it pour sizes. Upon in-situ hydrothermal synthesis, the active Si and Al species dissolve in the alkali solution and form the supersaturated solution. They react with each other and reconstruct to form some ring-like reconstruction. It is this reconstruction and recrystallization of Si and Al species that results in the formation of ZSM-5 type zeolite skeleton. This seed solution reveals the changes of chemical composition of zeolites prepared and corresponding Si/Al molar ratio, percent yield and morphological structure of ZSM-5 zeolite obtained with respect to variation of water volume and aging time.

2.2.5 ZSM-5 Zeolite Syntheses

ZSM-5 zeolite was synthesized from Kankara clay in alkaline phase under hydrothermal conditions. The seed solution was then mixed with 5 g each of the clay calcined at 800, 1000 and 1200 ^{O}C respectively and allowed to be aged for five hours before transferring into different polypropylene bottles. The hydro-thermal crystallization was done for 48 h for sample A, and 72 h for sample B as shown in Figure 14a bellow.

The calcined kaolin microsphere (20 g) was mixed with the Zeolite seed solution and stirred continuously for ten minutes before transferring to the poly propylene bottles for aging. After the aging period of 5 d and addition of the remaining quantity of water to each of the samples, the samples ware then placed inside a pot containing water for heating. The heating was achieved with the aid of a gas cooker for 96 h at 100 ^{o}C. Water already boiling was used to replace the one inside the pot when the water level reduces. After the 96 h, the samples were discharged, and each of the samples was poured into a bigger plastic container containing de-ionized water to cool them and stop any further reaction. The resulting cake was dried at room temperature

2.3. Characterization of ZSM-5 Zeolite

The dried sample was then taken for and Absorption (Cation Exchange Test) analysis, in the synthesis of ZSM-5zeolite, the effect of various parameters such as the amount of water volume

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added, ageing time, crystallization time and ageing temperature on the zeolite formation was investigated. In order to know the crystal structure and the relative crystallinity,

2.3.1. Characterization by Adsorption

Adsorption studies were carried out using 50 ppm stock solution of phenol in distilled water as calculated bellow.

$C=m/10^6$

$m/v = 50\times10^{-6}$

for 1000 ml of distilled water

$m=50\times10^{-6}\times1000 = 0.05$ g

Therefore, 0.05 g of phenol was dissolved in 1000 ml of distilled water to form the stock solution. One hundred milligramme (1g) each of raw kankara clay, beneficiated clay, calcined clay at 800, 1000, 1200 ^{O}C and the in-situ ZSM-5 zeolite synthesized hydro-thermally at different temperatures and crystallization times were introduced into 10 ml of the stock solution. Eachnj of the mixtures were shaken for 2 h and allowed to settle for 6 h. After the adsorption, the samples were centrifuged to separate the adsorbent particles. The change in phenol concentrations in the liquid were monitored using UV scans Perkin Elmer UV/VIS Spectrometer Lambda.

3.Results and Discussion

3.1.Clay Beneficiation

Kankara clay which was found in Kankara Local Government Area located in Katsina state of Nigeria precisely around longitudes 7°26E and 7°28E and latitude 11°53N is a weathering product of a unit of the basement rocks in this area, most likely feldspars. The clay sequence overlies mica schists and underlain by marble which are impurities to the highly aliminosilica clay as shown in Figure 8a bellow. ZSM-5 zeolites with chemical formula: $(0.9\pm0.2)\ H\cdot Al_2O_3\cdot (25–50)SiO_2\cdot 2H_2O$. In order to synthesize from this clay which at this state, has a low exchange capacity, its surface area and absorption capacity is relatively low and were removed by benficiation process as shown in Figure 8b bellow. The results obtained by taking account of the weight of clay before and after beneficiation were recorded and tabulated in appendix A1, and sample three (3) was picked and oven dried at 200 ^{O}C for 2 h to prepare it for sieving analysis.

ISBN: 978-625-8246-12-4



a **b**

Figure 2a. A Sample of Raw Kankara Clay. Figure 2b. Sample of Beneficiated Kankara Clay

3.2.Oven Drying

The beneficiated Kankara clay was not well sun dried and needed more drying to reduce the moisture content which prepared the sample for sieving analysis. The weight of Kankara clay before and after the oven drying was tabulated as shown in appendix A2 and the weight of kaolin after oven drying sum up to 4.74 kg. The sample was then charged into the oven at 200 ^{O}C for an hour to reduce the moisture content and enhance sieving as represented in the Figure 3a bellow.



Figure 3a. A Sample of Oven Dried Kankara Clay. Figure 3b: A Sample of a Sieved Kankara Clay

3.3.Sieving

The ground-up mass was sieved to pass through the ASTM standard sieve number 30 (i.e. sieve aperture size of 200 µ mesh). Any aggregate retained on the 200 µ mesh sieve was rejected as too coarse as illustrated in Figure 9b above. The weight of kaolin before and after sieving using 200 µmesh is tabulated in appendix A3. The total sieved kaolin clay amount to 2.897 kg.

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3.4.Calcination

Kaolin possesses the Si-0 or Al-0 octahedral and tetrahedral sheets which are inactive to modification or activation. This means that it is difficult to directly synthesize ZSM-5 zeolites and the kaolin must be pre-activated to change this inert structure. The most effective way to activate such natural clay was to thermally transform the inert phase into the active phase at elevated temperatures in an electric muffle furnace, the weight of beneficiated uncalcined kaolin clay, weight of beneficiated calcined kaolin clay at the temperature of 800, 1000 and 1200 ^{O}C were shown in appendices A4, A5, A6, A7, A8, and A9 respectively. Under the basic environment the inert skeletal structure of Kankara clay was converted into activated silicate and aluminate as shown in Figure 4 bellow.



a **b** **c**

Figure 4. Samples of Calcined Clay at 800, 1000 and 1200 ^{O}C respectively

3.5. In-situ Synthesis of ZSM-5 Zeolites

After the crystallization processes, the samples were oven dried at 150 ^{O}C for 4 h which gives ZSM-5 zeolite as shown in Figure 11b bellow.



a **b**

Figure 5a. Crystallization Process. Figure 5b. Samples of ZSM-5 Zeolite Synthesized

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3.6. Characterization of ZSM-5

3.6.1.Characterization by Adsorption

The picture obtained from the change in phenol concentrations in the liquid which was monitored using UV scan, Perkin Elmer UV/VIS Spectrometer Lambda was shown in Figure 12 bellow. The adsorption of the stock solution was obtained to be 4.02. Therefore, each absorbance value was subtracted from its value as shown in appendix A10, A11, and A12 for different samples. The adsorption test was also shown in the bar chart in Figure 7, 8 and 9 using table A10, A11, and A12 respectively. From the result of the pH of zeolite samples as shown in appendix A13, it shows that, as the pH increases from the zeolite synthesized at 800 ^{O}C to the zeolite products calcined at 1200 ^{O}C the adsorption increases slightly.



a **b** **c**

Figure 6a/b. Samples of Stock Solutions for Adsorption Test, Figure 6c.UV Spectrometer

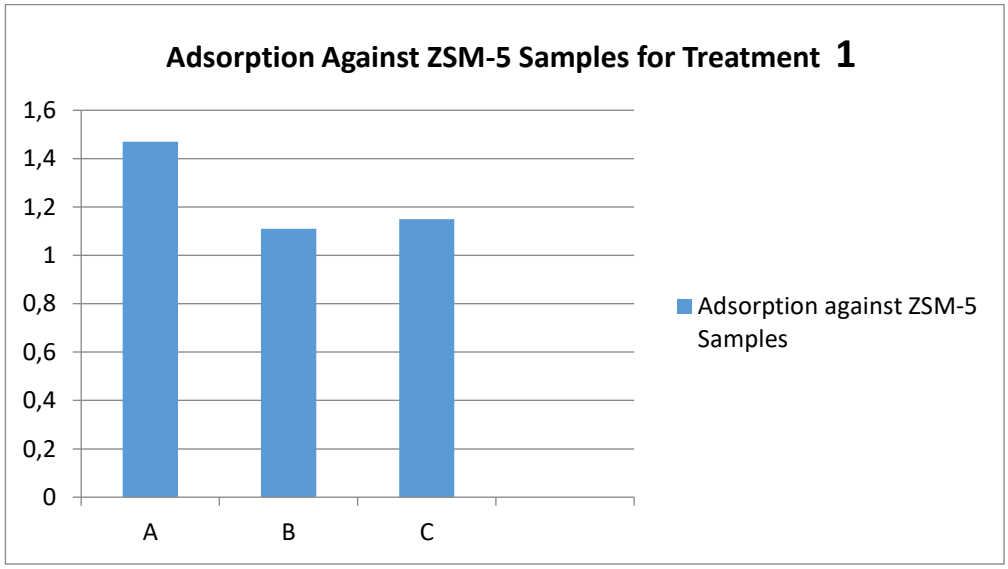


Figure 7. Treatment 1

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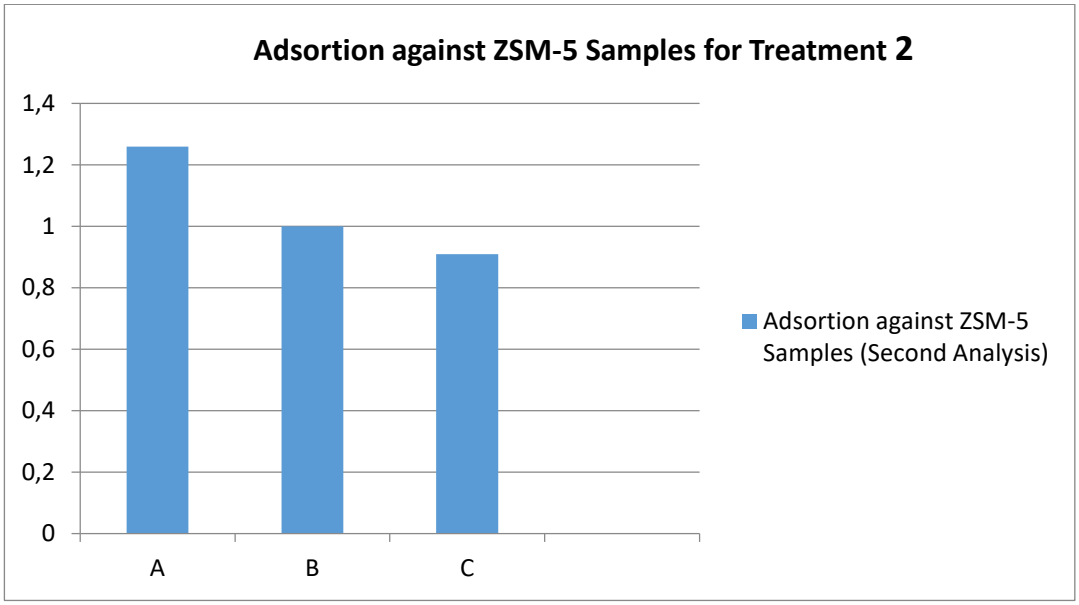


Figure 8. Treatment 2

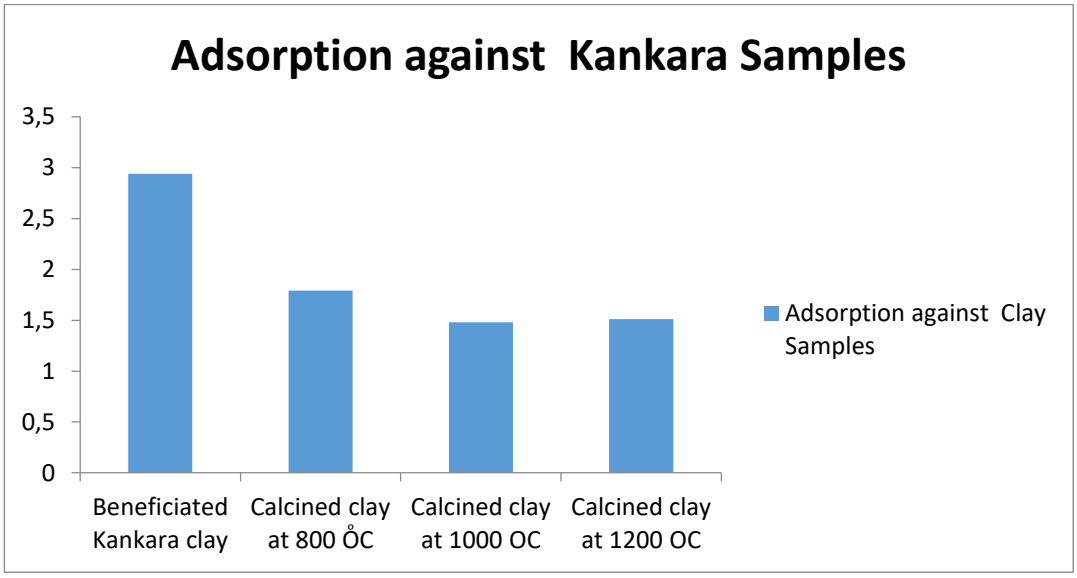


Figure 9. Adsorption for Kankara Clay

3.6.2.Characterization by Fourier Transform Infrared (FTIR)

The IR spectra of these samples showed the characteristic adsorption bands corresponding to those from the literature bands at 920-1250 cm-1 and 1050-1150 cm-1, due to internal symmetric and asymmetrical stretches, and bands at 500-650 cm-1, due to ring vibrations, and bands at 420-500 cm-1 bends were observed and were in slightly accordance with the band assignments reported in the literature. However, the extra peaks observed in the fingerprint region of the spectrum are probably due to the slight crystalline changes, different extra-framework cat ions, and presence of ZSM-5 as shown in Figure 10 and 11.

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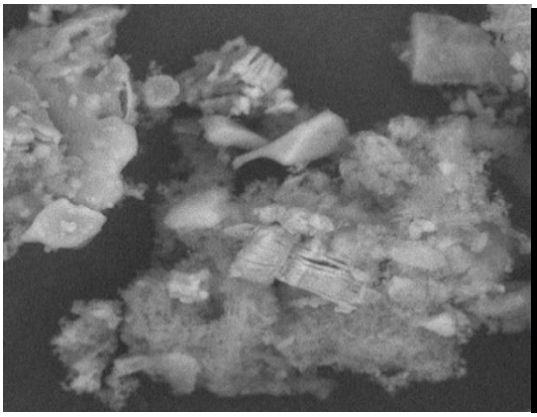


Figure 10a. Fiber Metric Image

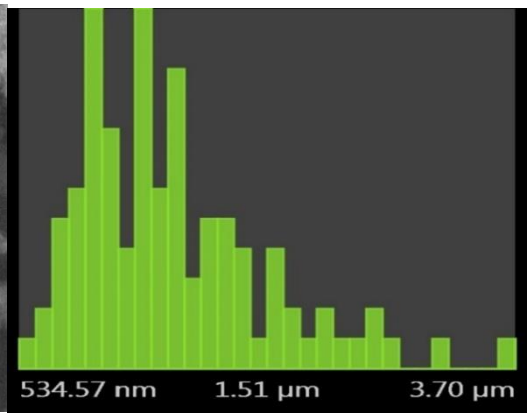


Figure 11b. Width of Crystal

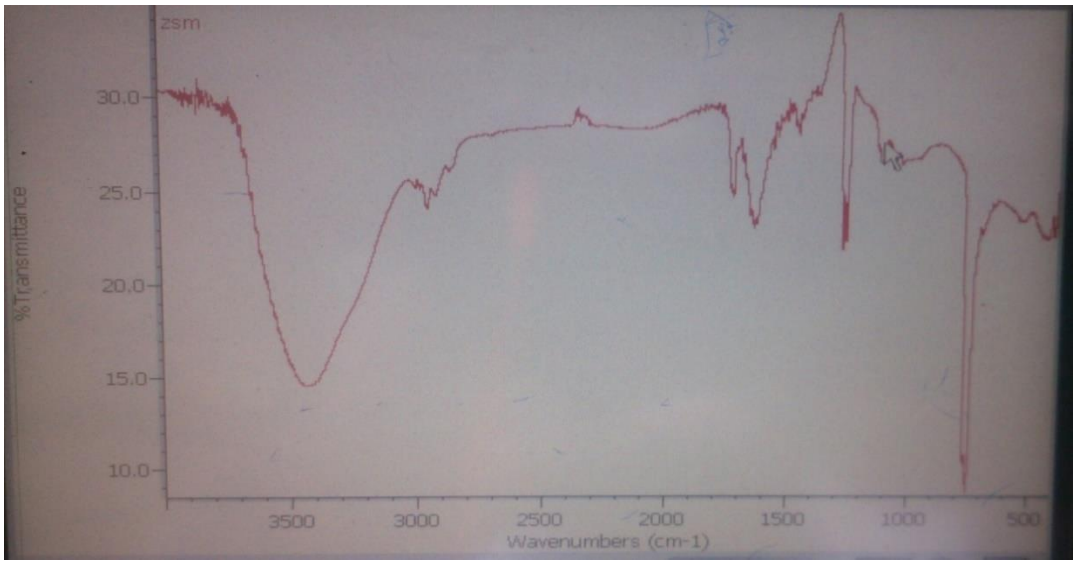


Figure 12. FT-IR image of ZSM-5 Zeolite Synthesized at 1200 ^{O}C

4.Conclusion and Recommendation

1. From the result obtained after the adsorption characterization, it was observed that in-situ ZSM-5 zeolite may likely be present due to the small change in adsorption found on sample at 1200 ^{O}C for treatment 2.
2. It was also observed that, the crystallization time has little or no effect on the adsorption of the product.
3. From the result of the pH of zeolite samples as shown in appendix A13, it shows that, as the pH increases from the zeolite synthesized at 800 ^{O}C to the zeolite products calcined at 1200 ^{O}C the adsorption increases slightly.
4. It was concluded that, the IR spectra of these samples showed the characteristic adsorption bands which does not completely corresponds to those from the literature bands at 920-1250 cm-1 and 1050-1150 cm-1, due to internal symmetric and asymmetrical stretches, therefore, there may or may not be ZSM-5 present.

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5.Recommendation

1. It was recommended that, further research on this project should include spray dried kankara clay which gives the right morphology, particle sizes and pore sizes for the synthesis of ZSM-5 zeolite in-situ from Kankara clay under hydrothermal condition using zeolite seed solution.

2. More research on this work should include characterization using X-ray diffractometer (XRD) to determine the right finger print and wave length of the ZSM-5 synthesized compared to the commercial zeolites.

3. It was also recommended that, more study on this project should include characterization using Scanning Electron Microscope (SEM).

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An Examination of Adana Historical City Center in terms of Urban Lighting

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Abstract

With the change of living conditions in cities over time, functional and aesthetic lighting of cities has become a necessity. The main purpose of lighting cities can be summarized as defining functions, creating aesthetic, safe and accessible public spaces, and ensuring the circulation of living and non-living things in the city. Another important issue in illuminating cities is the inclusion of historically important and valuable regions in the city in night view and their technical and aesthetically correct lighting. In this context, the existing lighting system of the historical city center of Adana has been examined within the scope of the study. It is understood from historical sources that the city of Adana had city walls built during the Roman period, and the walls were used in the Byzantine Period and the Middle Ages. The historical buildings and ruins in the region that have survived to the present day are spread over the Tepebağ mound and its surroundings. The restoration and excavation works of this region, which is considered to be the historical city center of Adana, are still continuing. However, the existing lighting in the area cannot fully meet the needs of the area in question. Tepebağ District, Kayalıbağ District and Ulucami District, which contain Abidinpaşa Street, Cemal Gürsel Street, İnönü Street and Seyhan Street, were chosen as the study area. In order to make the area a livable place in terms of historical, cultural, touristic and local users, it is important to determine the areas that are insufficient in terms of lighting and to produce solutions. In this study, the lighting elements in the historical urban fabric of Adana were analyzed in the light of lighting standards through observation and measurement. As a result of the analyzes, it has been determined that lighting poles that are insufficient in terms of illuminance, low color rendering, randomly positioned and exceeding the height of the building are used. It has been observed that the regions outside the main axes remain in darkness at a level that poses a security threat, and this situation negatively affects the nightlife in the region. Inconsistent illuminance levels, lighting elements that cannot capture the common language in the street and the region, and dangerous lighting poles have left the registered buildings in the dark and distanced them from the main city. Within the scope of the study, it was seen that the existing lighting scheme of the area could not provide the necessary conditions both aesthetically and technically, and suggestions were presented on the subject.

Keywords: Urban lighting, Lighting in historical texture, outdoor lighting.

Adana Tarihi Kent Merkezinin Kentsel Aydınlatma Açısından İncelenmesi

Öz

Kentlerdeki yaşam koşullarının zaman içinde değişmesiyle birlikte kentlerin işlevsel ve estetik olarak aydınlatılması zorunlu bir ihtiyaç haline gelmiştir. Kentleri aydınlatmanın temel amacı, işlevleri tanımlamak, estetik, güvenli ve erişilebilir kamusal alanlar oluşturmak, kentteki canlı ve cansız varlıkların dolaşımını sağlamak gibi temel konular olarak özetlenebilir. Kentleri aydınlatmaktaki diğer önemli bir konu da tarihi önemi ve değeri olan bölgelerin gece görünümünde kente dahil edilmesi, teknik ve estetik olarak doğru aydınlatılmalarıdır. Bu bağlamda çalışma kapsamında Adana tarihi kent merkezinin mevcut aydınlatma sistemi incelenmiştir. Tarihi kaynaklardan Adana kentinin, Roma döneminde inşa edilen şehir surlarına sahip olduğu, surların Bizans Döneminde ve Ortaçağ'da kullanıldığı anlaşılmaktadır. Bölgede bulunan ve günümüze kadar ulaşan tarihi yapı ve kalıntılar Tepebağ höyüğü ve çevresine yayılmış olarak bulunmaktadır. Adana tarihi kent merkezi olarak kabul edilen bu bölgenin restorasyon ve kazı çalışmaları hala devam etmektedir. Ancak alanda bulunan mevcut aydınlatmalar söz konusu bölgenin ihtiyaçlarına tam olarak cevap verememektedir. Çalışma alanı olarak Abidinpaşa Caddesi, Cemal Gürsel Caddesi, İnönü Caddesi ve Seyhan Caddesini sınırları içinde barındıran Tepebağ Mahallesi, Kayalıbağ Mahallesi ve Ulucami Mahallesi seçilmiştir. Alandaki tarihi, kültürel, turistik ve yerel kullanıcı açısından yaşanabilir bir yer haline getirmek için aydınlatma açısından yetersiz alanların tespiti,

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çözüm üretebilmek için önem arz etmektedir. Bu çalışmada Adana tarihi kent dokusu içinde yer alan aydınlatma elemanları, gözlem ve ölçme yoluyla aydınlatma standartları ışığında analiz edilmiştir. Analizlerin sonucunda aydınlık düzeyi açısından yetersiz, düşük renksel geriverime sahip, gelişigüzel konumlandırılmış ve yapı yüksekliklerini aşan aydınlatma direklerinin kullanıldığı tespit edilmiştir. Ana aksların dışında kalan bölgelerin güvenlik açısından tehdit oluşturacak düzeyde karanlıkta kaldığı ve bu durumun bölgedeki gece hayatının olumsuz etkilediği gözlemlenmiştir. Tutarsız aydınlık düzeyleri, sokakta ve bölgede ortak dili yakalayamayan aydınlatma elemanları ve tehlikeli aydınlatma direkleri tescilli yapıları karanlıkta bırakmış ve ana kentten uzaklaştırmıştır. Çalışma kapsamında alanın mevcut aydınlatma düzeninin hem estetik hem de teknik anlamda gerekli koşulları sağlayamadığı görülmüş ve konuyla ilgili öneriler sunulmuştur.

Anahtar Kelimeler: Kentsel aydınlatma, tarihi dokuda aydınlatma, dış aydınlatma.

Giriş

Bir kentin, başka kentlerden farklılaşması ya da kent kullanıcıları için anlamlı hale gelmesini sağlayan çeşitli özelliklere sahip olması beklenir (Lynch, 1960). Bu durum ancak o kentin kendine özgü kimliğiyle olanaklıdır. Erkmen'in ifade ettiği gibi kent için önemli olan; bir farklılığın saptanması ve bunun kentle ilgili "her şey" de özenle uygulanmasıdır (Erkmen, 1990).

Kentlerin, tarihsel süreç içindeki gelişimi ve geçmişten günümüze kadar taşınan tarihi izlerinin ön plana çıkarılması özgün kimlikler edinebilmek açısından önemlidir. Günümüzde ise kentler küreselleşmenin etkisiyle değişip gelişmekte ve her geçen gün birbirlerine daha da benzemektedirler. Bu gelişmelerin kent mirasını korumaya yönelik şekillendirilmesi ve bu yönde adımlar atılması gereklidir.

Özellikle kentlerin büyümesi ve gece kullanımlarının artmasıyla birlikte güvenlik ve emniyet problemi başta olmak üzere pek çok sorun ortaya çıkmaya başlamıştır. 17. yüzyılın sonu, 18. yüzyıl başlarında gaz tüketiminin başlamasıyla kentler aydınlatılmaya başlamıştır. Başlangıçta belli alanların aydınlatılmasıyla parçacıl bir özellik gösteren kent aydınlatma çalışmaları, teknolojinin gelişmesiyle birlikte kent geneline yayılan ve kent yaşamının sürekliliğinin sağlanmasını amaçlayan bir uygulamaya dönüşmüştür (Ok, 2022).

Aydınlatmanın yaygınlaşması ve gelişmesi her kentte olumlu sonuçlar vermemiş, gelişi güzel ve plansız aydınlatma düzenlerinin ortaya çıkmasına da neden olmuştur. Bu açıdan kentlerin geceleri de kimliklerini yansıtabilmeleri adına sadece işlevsel olarak değil aynı zamanda kentin estetik ve tarihi önemini de ortaya çıkaracak şekilde aydınlatılması ihtiyacı ortaya çıkmıştır.

Bu çalışmada Adana tarihi kent merkezi örneği üzerinden kentsel aydınlatmaların, mevcut durumunu irdelemek ve kente olan etkisini belirlemek amaçlanmıştır. Bu bağlamda Adana tarihi kent merkezinde yer alan mevcut kentsel aydınlatmaların durumu gözlem ve ölçme yoluyla belirlenmiştir. Çalışma alanında tespit edilen sorunlar üzerine çeşitli değerlendirmeler yapılmış, öneriler sunulmuştur.

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Kentsel Aydınlatma

Binaların iç mekan aydınlatmaları haricindeki bütün aydınlatmalar dış aydınlatma olarak tanımlanmaktadır. Kent aydınlatması, önem taşıyan mimari yapıları ve ulaşım yollarının geceleri vurgulanabilmesi, algılanabilmesi ve güvenli bir gece yaşamı sunulabilmesi için uygulanmaktadır (Ünver & Öztürk, 1992). Belirli bir plan ve program çerçevesinde yapılması gereken kent aydınlatması, geceleri kullanıcıların yaşamını kolaylaştırmak ve yapılarla uyumuyla kent kimliğini desteklemelidir (Sözen, 2005). Kentsel aydınlatma, sadece yolları veya kaldırımları aydınlatmak değil aynı zamanda gece ve gündüz kullanımını dengeleyen, kentsel değerleri ortaya çıkaran, kentteki özgün yapı ve mekanların önemini vurgulayan, kullanıcılarının konforunu, emniyetini, güvenliğini ve huzurunu sağlamayı amaç edinen bir düzen haline gelmiştir. Bunun yanında, kenti işlevsel olarak en iyi şekilde kullanılabilir hale getirmenin yanı sıra, tarihi, mimari, estetik, sosyal, sanatsal değerlerini de anlamlandıran bir kent güzelleştirme sanatı haline gelmiştir (Neri, 2001). Pellegrino'ya göre ise kentsel aydınlatma, hem insanların eylemlerini hızlı, doğru ve güvenli bir şekilde yapmalarını sağlamalı, hem de keyifli ve tatmin edici bir ortamın oluşmasına katkıda bulunmalıdır (Pellegrino, 1999).

Corten (2001), kentsel aydınlatmanın kamusal mekânlar açısından vazgeçilmez bir öğe olması gerekliliğini ve kullanıcıların kent hayatını daha iyi hale getirmek için en önemli aracı olduğunu savunmaktadır. Aydınlatmanın, dış mekânların daha işlevsel hale gelmesi için önemli bir araç olduğunu belirtmiş ve mekânların aydınlatmayla iyileştirme amaçlarını;

• Kentsel belleği korumak,
• Alanın anlaşılabilirliğini arttırmak,
• Mekâna değer katmak,
• Olumlu bir kentsel mekân/atmosfer yaratmak, sosyal etkileşim ortamı sağlamak,

olmak üzere dört başlık altında toplamıştır (Küçük, 2014).

Tüm bu bilgiler ışığında kentler, dengeli bir şekilde aydınlatılarak zorunlu aydınlatma ve işlevsel aydınlatmalar birlikte uyum içinde tasarlanmalıdır. Örneğin, yolu aydınlatan bir eleman, bir tarihi eserin aydınlatılmasına da katkıda bulunabilir ancak aydınlık-karanlık oranları, çevrenin ışıklılık düzeyleri gibi konular tekniğine uygun olarak kurgulanmalıdır. Her çevrenin ve eserin özellikleri ayrı olduğundan aydınlatma tasarımı için her defasında disiplinler arası çalışmalar gerçekleştirilmeli ve en uygun çözüm elde edilmelidir (Şahin, 2011). Ayrıca,

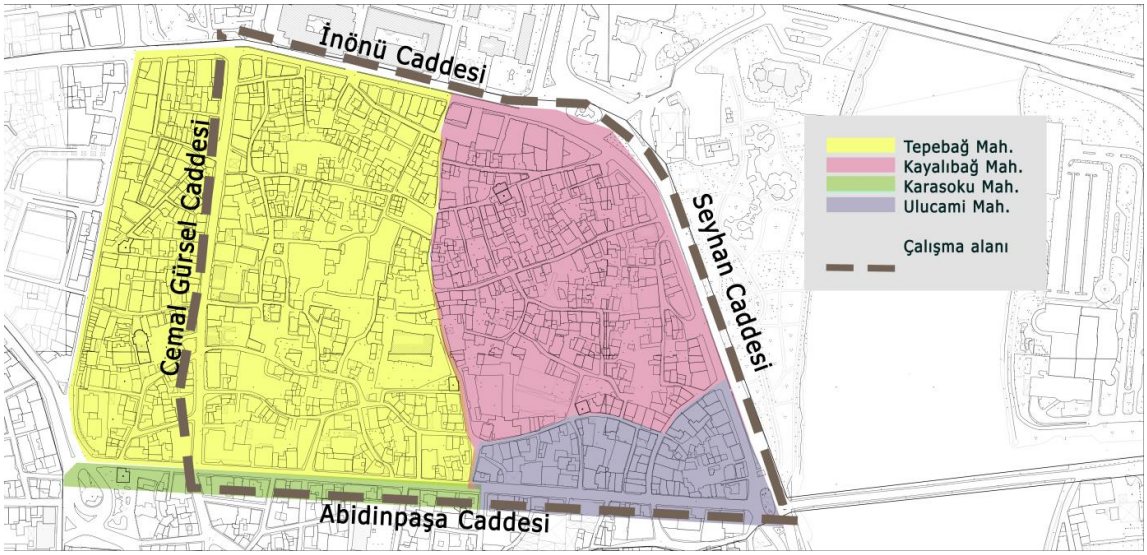
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yapılan aydınlatmanın sadece işlevsel anlamda değil kent kimliğine etki edecek şekilde önemli yapılar, bölgeleri ve alanları da vurgulaması gerektiği unutulmamalıdır.

Çalışma Alanı

Adana kentinin tarihinin MÖ 1900'lü yıllara kadar uzandığı tahmin edilmektedir. Adana'nın Roma döneminde inşa edilen şehir surlarına sahip olduğu, bu surların Bizans Döneminde ve Ortaçağ'da kullanıldığı anlaşılmaktadır. Osmanlı İmparatorluğu'nun son dönemine kadar Taşköprü'nün bugünkü Seyhan İlçesi'ne bağlanan batı ucunda bir iç kalenin var olduğu anlaşılmaktadır (Saban, 2017). Adana'daki ilk yerleşim bölgesi, etrafı surlarla çevrili Tepebağ Höyüğü olarak kabul edilir. Adana, Doğu Roma İmparatorluğu zamanında yapılıp günümüzde de hala aktif olarak kullanılan Taşköprü'nün inşaatıyla doğuya ve güneye doğru genişlemiştir (Payaslı Oğuz, 2002). Adana tarihi kent merkezi sınırları içerisinde bulunan Tepebağ höyüğü, Roma döneminden günümüze kadar ulaşan antik kentin merkezi niteliğindedir (Tulucu, 1999). Bölgedeki, kentin tarihine ve tanıtımına katkıda bulunan sokak sağlıklaştırma çalışmaları devam etmesine rağmen bölgedeki aydınlatma ihtiyacı için aynı düzeyde bir iyileştirme planı oluşturulmamıştır. Çeşitli sur kalıntılarının, tescilli ve koruma altında olan yapıların bulunduğu mahallelerde özel yapılar aydınlatma ile ön plana çıkarılması gerekirken, aksine, karanlıkta kalmış ve güvenlik tehdidi oluşturmuştur.

Bu bağlamda çalışma alanı olarak, Abidinpaşa Caddesi, Cemal Gürsel Caddesi, İnönü Caddesi ve Seyhan Caddesini sınırları içinde barındıran Tepebağ Mahallesi, Kayalıbağ Mahallesi ve Ulucami Mahallesi olarak belirlenmiştir (Şekil 1).



Şekil 1. Çalışma alanı (Yazar tarafından hazırlanmıştır, 2022)

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Adana'nın işlek bölgeleriyle doğrudan bağlantısı olan çalışma alanının çeperlerinde ticaret alanları yoğunluk gösterirken alanın içinde konut yapıları yoğunluktadır (Şekil 2).



Resim 1. Taş Köprü, **Resim 2.**Abidinpaşa Caddesi Taş Köprü Girişi, **Resim 3.** Abidinpaşa Caddesi, **Resim 4.**Cemal Gürsel Caddesi, **Resim 5.** İnönü Mahallesi, **Resim 6.** Seyhan Caddesi

Şekil 2. Çalışma alanından fotoğraflar

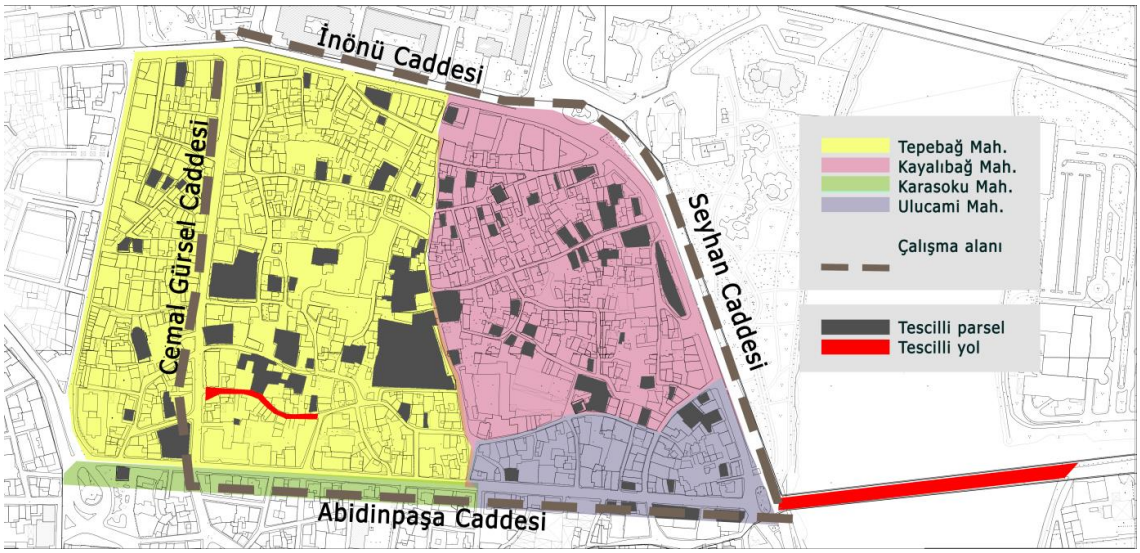
Tepebağ höyüğü ve çevresinde bulunan tarihi yapıların mahalle ölçeğinde kente kazandırılması bu çalışma alanının seçilmesinin başlıca sebeplerindendir. Bu yüzden ana caddeler sınır olarak belirlenmiştir. Bölgenin tarihi açıdan öneminin ve turizm potansiyelinin yüksek olması nedeniyle kentsel aydınlatma açısından yetersiz alanların tespiti ve çözüm önerilerinin geliştirilmesi önemlidir. Bölgenin sadece gündüzleri değil, akşamları da kentin görünümüne katkı vermesi ve daha görünür kılınması sağlanabilir.

Materyal ve Metot

Çalışmada izlenen adımlar analiz, gözlem ve ölçüm olmak üzere üç ana başlık altında toplanmıştır.

Analiz: Çalışma alanının kentsel aydınlatma açısından incelenebilmesi için mevcut durum analizleri yapılmıştır. Tarihi kent izini göstermek için oluşturulan tescilli parsel/yol haritası, alan içerisinde aydınlatma açısından diğer yapılardan daha fazla göz önünde bulundurulması gereken bölgeler işaretlenmiştir (Şekil 3).

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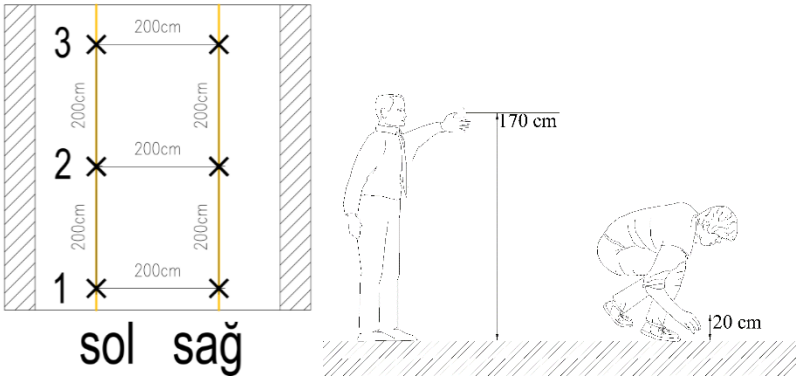


Şekil 3. Tescilli Parsel ve Yol Haritası (Yazar tarafından hazırlanmıştır, 2022)

Sınırlar, bölgeler, izler, düğümler ve nirengiler konu başlıkları adı altında Lynch analizi gerçekleştirilmiş ve alanda öncelikli alanlar belirlenmiştir.

Gözlem: Çalışma alanında aydınlatma elemanlarının, bölgede ortak bir dilin olup olmadığı gözlemlenmiş, farklı tipte olan aydınlatma elemanları belirlenmiştir. Gözlem sonucunda aydınlatma elemanları ile ilgili elde edilen veriler fotoğraflarla desteklenerek belgelenmiştir.

Ölçüm: Çalışma alanındaki aydınlatma elemanlarının, aydınlatma performanslarını değerlendirmek adına ilk olarak aydınlık düzeyi ölçümleri yapılmıştır. Ölçümler, Şekil 4'te belirtildiği gibi sokaklar ortalanarak eşit mesafede yerleştirilen iki noktanın farklı yüksekliklerdeki (20 cm ve 170 cm) aydınlık düzeylerinin ölçülmesiyle gerçekleştirilmiştir.



Şekil 4. Sokak aydınlatması ölçüm yöntemi (Yazar tarafından hazırlanmıştır, 2022)

Yatay aydınlatma düzeyleri yaya yollarında göz hizasından, yerden 170 cm yükseklikten, taşıt yollarında ise yerden 20 cm yükseklikten ölçülmüştür. Ölçümlerde aydınlatma birimi 'lux' olarak alınmıştır. Aydınlık düzeyi ölçümlerinde 'Extech Environmental Meter 45170' cihazı

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kullanılmıştır. Ölçümler '15.02.2022-26.04.2022' tarihleri arasında, '20.00-00.00' saat aralıklarında gerçekleştirilmiştir.

Bulgular ve Tartışma

Aydınlatma Elemanları Gözlem Çalışmaları

Adana tarihi kent merkezi ve çevresi için planlanmış herhangi bir aydınlatma master planı bulunmamaktadır. Bu da aydınlatma elemanlarının ortak bir dil olmaksızın çevresel faktörler ele alınmadan yerleştirildiğini göstermektedir (Şekil 5).



Şekil 5. Mevcut aydınlatma elemanları

Bölgede düşük renksel geriverimli ve sodyum buharlı sokak lambaları gelişigüzel konumlandırılmıştır. Ana yol akslarının dışında aydınlatma yetersiz kaldığından, tarihi kent merkezi, kent kullanıcıları için güvenlik açısından sorunludur. Ana akslarda kullanılan verimsiz aydınlatma elemanları da tarihi kentte gece hayatını tekdüze kılmaktadır. Bunların yanında aydınlatma elemanları elektrik direkleriyle birlikte kullanıldığından tehlike arz etmektedir. (Şekil 6).



Şekil 6. Mevcut aydınlatma elemanları

Diğer bir sorun aydınlatma elemanlarının, tescilli yapılara çok yakın ve yapı dokusuna zarar verecek şekilde yerleştirilmesidir. Çıkmaz sokaklarda bulunan boş alanlar ve diğer kentsel boşluklarda yetersiz aydınlatmadan kaynaklanan güvenlik sorunu bulunmaktadır (Şekil 7).

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Şekil 7. Mevcut aydınlatma elemanları

Ana akslarda sadece taşıt yolu aydınlatması planlandığı için yaya yolları iyi aydınlatılamamaktadır. Sokak girişleri yeterince aydınlatılmadığı için bölgede emniyet duygusu yeterince sağlanamamaktadır. Düzensiz aydınlatma elemanı dağılımı ve ticaret alanlarında dükkan sahiplerinin kullandığı floresan ve ev tipi lambalar, estetik ve teknik acısan zayıf kalmaktadır (Şekil 8).



Şekil 8. Mevcut aydınlatma elemanları

Yapılan gözlem ve incelemeler sonucunda çalışma alanında tespit edilen Tip1, Tip2, Tip3, Tip4 ve Tip5 olarak isimlendirilen beş farklı tipte aydınlatma elemanı bulunmaktadır (Tablo 1). Söz konusu aydınlatma elemanlarının belli bir düzen ve plan dahilinde yerleştirilmediği tespit edilmiştir.

Tablo 1. Çalışma alandaki aydınlatma tipleri

Tip	Görsel
Tip1	

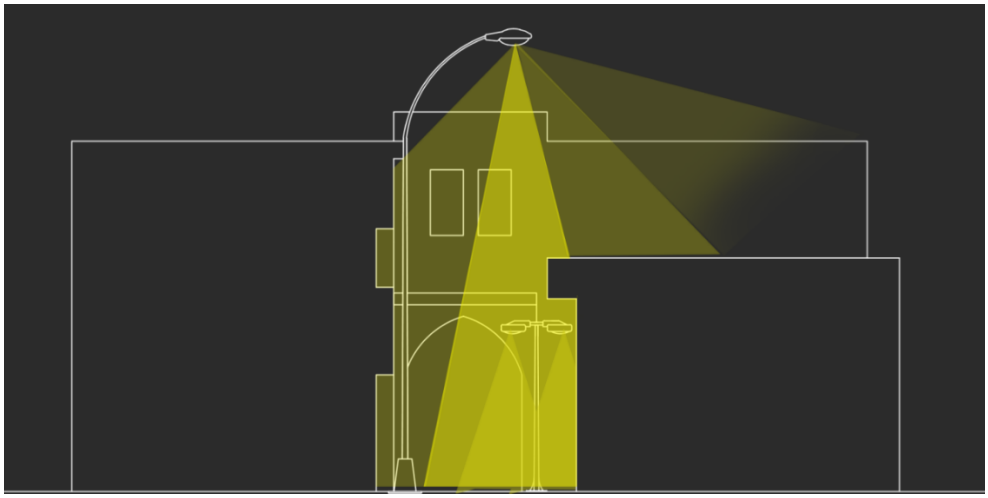
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Tip2	
Tip3	
Tip4	
Tip5	

Aydınlatma elemanları çalışma alanının güney ve batı çeperlerinde sık kullanılmıştır. Ancak kuzey ve batı cephelerinde yayalar için aydınlatmalar ihmal edilmiştir. Çalışma alanının içinde kalan bölgelerde ise tamamen gelişi güzel ve birbirinden farklı aydınlatma elemanları kullanılmıştır. Kullanılan aydınlatma elemanlarının ortak bir dili olmaksızın yerleştirilmesi, restorasyon çalışmaları devam eden sokaklarda bulunan çalışmaları olumsuz etkilemektedir. Bozuk ve kırık aydınlatma elemanları ile elektrik direkleriyle birlikte kullanılan Tip2 aydınlatma elemanları da kullanım açısından tehlike arz etmektedir.

Işık kaçmasına neden olacak düzeyde yüksek aydınlatma direklerinin kullanılması ve dengesiz aydınlatma elemanı konumlandırması sebebiyle bölge kullanıcısı için konforsuz alanlar oluşturmaktadır (Şekil 9).

ISBN: 978-625-8246-12-4



Şekil 9. Tarihi yapılar çevresindeki aydınlatma direklerinin yanlış konumlandırılması sebebiyle oluşan ışık kaçakları (Yazar tarafından hazırlanmıştır, 2022)

Tepebağ höyüğü ve çevresinde dış aydınlatma elemanlarının tespiti ve konumu açısından yapılan gözlem çalışmasında, aydınlatma elemanlarının kent kullanıcısı için verimsiz olduğu tespit edilmiştir. Özellikle aydınlatmalarının konumu ve ışık kaynaklarının türleri alan için yetersizdir. Yaya kaldırımında bulunan direkler, yapı gövdelerine iliştirilmiş aydınlatma elemanları ve tarihi yapıları gözetmeden yerleştirilmiş aydınlatma direkleri başlıca sorunlar olarak göze çarpmaktadır.

Aydınlık Düzeyleri Ölçüm Çalışmaları

Alandaki aydınlık düzeyi ölçümleri Işık ve Aydınlatma Topluluğunun (The Society of Light and Lighting) üç sınıfa ayırdığı yol aydınlatma sınıflarına göre yapılmıştır. Bu aydınlatma sınıfları aşağıdaki şekilde sıralanabilir.

- Sürücünün ihtiyaçlarının baskın olduğu trafik yolları,
- Aydınlatmanın öncelikli olarak yayalara ve bisikletlilere yönelik olduğu yardımcı yollar ile aydınlatmanın kamu güvenliği için tasarlandığı ve aynı zamanda ilgi çekici bir gece ortamı sağlamak amaçlanan şehir merkezleri,
- Trafik veya trafik akışı ile yayalar arasındaki çatışmanın sorun olabileceği alanlar (The Society of Light and Lighting, 2012)

Tablo 2'de alanda yapılan aydınlık düzeyi ölçümlerinin ortalamaları, yapılan ölçme noktalarının sayısı ve ölçülen sokakların tipleri verilmiştir. Belirtilen standartlara göre ölçülen yolların aydınlık düzeylerinin standartlara uygunluğu renkler ile tabloda belirtilmiştir.

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Tablo 2. Aydınlık düzeyi ölçümü yapılan sokaklar ve ölçüm sonuçları

Sokak Adı/Kodu	Ölçülen Nokta Sayısı	CE-Yol Aydınlatma Sınıfı	Ölçülen Değer (lux, 0.2 m yüksekliğinden)		S-Yol Aydınlatma Sınıfı/	Ölçülen Değer(lux 1.7 m yüksekliğinden)	
			sol	sağ		sol	sağ
Tepebağ Mahallesi 27046 sokak 1-10.sokak/a	56	CE3	26	26	S2	32	29
Tepebağ Mahallesi 27048 sokak 1-10.sokak/b	24	CE4	17	16	S2	26	18
Tepebağ Mahallesi 27047 sokak 1-10.sokak/c	23	CE4	19	21	S2	20	24
Cemal Gürsel Caddesi/ç	86				S1	27	
Musabalı Sokak/d	150	CE3	15	15	CE1	16	17
Kayalıbağ Mahallesi 26004 sokak 16. sokak/e	37	CE3	11	12	S1	13	14
Tepebağ Mahallesi 27044 sokak 19.sokak/f	40	CE3	19	22	S1	20	28
Kayalıbağ Mahallesi 26005 sokak Şeyhoğlu Camii sokak/g	20	CE4	2	2	S2	3	3
Kayalıbağ Mahallesi 26012 sokakTurhan Arın/ğ	26	CE4	7	7	S2	9	8
Tepebağ Mahallesi 27027 sokak 17. sokak/h	74	CE3	9	8	S1	11	10
Tepebağ Mahallesi 27032 sokak 13. sokak/ı	42	CE3	3	3	S1	4	4
Tepebağ Mahallesi 27031 sokak 75. sokak/i	23	CE4	6	7	S2	8	9
Tepebağ Mahallesi 27031 sokak Turhan Arın/j	17	CE4	23	25	S2	29	29
Tepebağ Mahallesi 27030 sokak Turhan Arın/k	9	CE4	43	31	S2	54	35
Tepebağ Mahallesi 27013 sokak Turhan Arın/l	56	CE3	3	4	S2	5	5
Kayalıbağ Mahallesi 26009 sokak 25. sokak/m	79	CE3	11	13	S1	14	16
Musabalı Sokak/n	15	CE4	10	10	S2	12	12
Musabalı Sokak/o	14	CE4	5	7	S2	7	8
Kayalıbağ Mahallesi 26014 sokak 8.sokak/ö	15	CE4	2	2	S2	3	3
Kayalıbağ Mahallesi 26019 sokak 19.+13.sokak/p	57	CE3	10	12	S2	13	16
Tepebağ Mahallesi 27009 sokak 1. sokak/r	30	CE4	9	11	S2	11	15
Tepebağ Mahallesi 27001 sokak 6. sokak/s	90	CE3	17	19	S1	20	22
Kayalıbağ Sokak 28. sokak+ Kayalıbağ Caddesi/ş	50	CE3	23	22	S1	27	26
Ulucami Mahallesi 25030 sokak 22. sokak/t	44	CE3	12	13	S2	15	16
Abidin Paşa Caddesi/u	196				S1	32	31

	Sınıfınınn altında değer
	Sınıfınınn üstünde değer

Şekil 11'de sunulan haritada aydınlık düzeyi ölçümleri yapılan sokaklar işaretlenmiştir.

ISBN: 978-625-8246-12-4



Şekil 11. Aydınlık düzeyi ölçümü yapılan sokaklar

Tablo 2'deki değerler incelendiğinde çalışma alanında ortalama yatay aydınlatma değerlerinin e,g,ğ,h,ı,i,l,m,o,ö,p,r,t kodlu sokaklarda standartlarda verilen değerlerin altında olduğu gözlemlenmektedir. Sınıfının üstünde ortalama yatay aydınlatma değerine sahip olan a,c,ç,j,k,u kodlu sokakları ise gereğinden fazla aydınlatıldığı görülmektedir. Bu değerlerden elde edilen verilerin sonucunda çalışma alanında bütüncül bir kentsel aydınlatma dilinin benimsenmediği anlaşılmaktadır.

Sonuç ve Öneriler

Kentsel aydınlatma projeleri, kentlerin kimliğini güçlendirebilir ve akılda kalıcı bir gece ortamı yaratmaya yardımcı olabilir. Bunu başarmak için uygulanacak aydınlatma projelerinin, öngörülen standartları sağlaması, enerjiyi etkin olarak kullanması, kentin işlevine ve estetiğine uygun olması gerekir.

Bu çalışma Adana tarihi kent merkezindeki tarihi dokunun kentsel aydınlatma aracılığıyla canlandırılması ve bu amaçla mevcut durumun tespiti amacıyla gerçekleştirilmiştir.

Yapılan incelemelerde, Tepebağ höyüğü ve çevresinde kullanılan aydınlatma elemanlarının, ortak bir dil olmaksızın, gelişi güzel konumlandırıldığı tespit edilmiştir. Bunun yanında ışık kirliliğine sebep olan yüksek aydınlatma direkleri ve tehlike arz eden elektrik direkleriyle kullanılan aydınlatma elemanlarının, tarihi kent sokaklarının ihtiyaçlarını karşılayamadığı görülmüştür. Düşük renksel geri verimli aydınlatma elemanları yapıların ve sokakların karanlıkta farklı algılanmasına sebep olmaktadır. Antik kentin izi yeterince aydınlatılmadığı

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için güvenlik kaygısı nedeniyle yeterince kullanılmamakta ve bölgenin tanıtımı engellenmektedir.

Genel olarak Adana tarihi kent merkezinin mevcut aydınlatma sisteminin estetik ve işlevsel ihtiyaçları karşılayamadığı anlaşılmaktadır. Kısmi olarak yapılan iyileştirme çalışmaları bölgenin aydınlatılması için yeterli değildir. Elde edilen veriler ışığında, hala devam eden sokak sağlıklaştırma çalışmalarının kentsel aydınlatma açısından da değerlendirilip bölgenin ihtiyacını karşılayacak, tarihi kent merkezini gece hayatına katacak biçimde planlanması önerilmektedir. Bu planlamanın bölgenin potansiyelini en üst düzeyde ortaya çıkarabilmesi için bütünsel yaklaşılması ve özellikle tarihi dokunun bulunduğu bölge için aydınlatma master planı hazırlanması gerektiği önerilmektedir. Böylece bölgenin kentin gece görünümüne dahil edilmesi kolaylaşacak ve kent kullanıcısının konforunu arttıracaktır. Yapılacak planlı ve sistemli bir aydınlatma tasarımıyla bölgenin estetik değeri artacak ve turizm amaçlı kullanımının artmasıyla sosyal ve ekonomik iyileşmenin de sağlanabileceği düşünülmektedir.

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2001 ve 2022 Yıllarına Ait IPCC Raporlarının Kentleşmeye Yönelik Politikalarının Karşılaştırılması ve Değerlendirilmesi

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Öz

İklim değişikliği dünyanın karşı karşıya kaldığı en önemli sorunlardan birisi olarak karşımıza çıkmaktadır. İklim değişikliği hem küresel hem de bölgesel anlamda birtakım olumsuzluklara neden olmaktadır. Bunlardan bazıları, sıcaklık artışı, yağış rejiminin düzensizliği, kuraklık gibi mevcut hassasiyetin daha da artmasına neden olan etmenlerdir. İklim değişikliğinin birçok nedeni vardır. Bu nedenlerden birisi de hızlı kentleşme olarak karşımıza çıkmaktadır. Dünya nüfusundaki hızlı artış beraberinde sosyal, kültürel, ekonomik, siyasi ve diğer birçok alanda kentleşmeyi etkilediği görülmektedir. Kentleşme hızı, kentsel alanlardaki sorunlarında hızla artmasına neden olmaktadır. Bu sorunlardan bazıları, arazi kullanımındaki yanlışlıklar, plansız yapılaşma, yeşil alan varlığının yetersizliği, tarım alanlarının ve orman alanlarının tahribi, enerjinin verimsizliğidir. Bu gibi sorunlar iklim değişikliğinin hızlanmasına ve sera gazı emisyonlarının artmasına neden olmaktadır. Bu kapsamda, iklim değişikliğin önlemek için sera gazı emisyonlarını hızla azaltılmasına ihtiyaç vardır. Bu emisyonun azaltılmasında etkin olan rollerden birisi ise kentleşmeden geçmektedir. 2050 yılına kadar dünyadaki nüfusun %68'inin kentsel alanlarda yaşayacağı düşünüldüğünde iklim değişikliğinin azaltılmasında kentlerin önemli bir rol oynadığı görülmektedir. Bu çalışmada iklim değişikliğinin azaltılmasında yönelik Hükümetlerarası İklim Değişikliği Panelleri (IPCC)'nin geliştirmiş olduğu politikaların kentleşme kısmı incelenmiştir. Bu kapsamda, 2001 ve 2022 yıllarında gerçekleştirilen IPCC'ye ilişkin raporlar incelenerek iklim değişikliğinin önlenmesi kapsamında yıllar içinde kentlere yönelik yapılan çalışmalar ve bu çalışmalar sonucunda ortaya konulan stratejilerin değişimi irdelenerek iklim değişikliğine yönelik yıllar içinde alınan kararların karşılaştırılması ve bu kararların ne kadarının uygulanabilir olduğunu irdelenmiştir.

Anahtar Kelimeler: İklim değişikliği, Sera gazı, IPCC, Kentleşme.

Comparison and Evaluation of IPCC Reports of 2001 and 2022 on Urbanization Policies

Abstract

Climate change is one of the most important problems facing the world. Climate change causes some negatives both globally and regionally. Some of these are the factors that cause the current sensitivity to increase, such as temperature increase, irregularity of the precipitation regime, and drought. There are many causes of climate change. One of these reasons is rapid urbanization. It is seen that the rapid increase in the world population affects urbanization in social, cultural, economic, political, and many other areas. The speed of urbanization causes the problems in urban areas to increase rapidly. Some of these problems are inaccuracies in land use, unplanned construction, insufficient green space, destruction of agricultural lands and forest areas, inefficient energy. Such problems cause the acceleration of climate change and an increase in greenhouse gas emissions. In this context, there is a need to rapidly reduce greenhouse gas emissions in order to prevent climate change. One of the effective roles in reducing this emission is through urbanization. Considering that 68% of the world's population will live in urban areas by 2050, it is seen that cities play an important role in reducing climate change. In this study, the urbanization part of the policies developed by the Intergovernmental Panel on Climate Change (IPCC) for the reduction of climate change has been examined. In this context, by examining the IPCC reports made in 2001 and 2022, the studies carried out for cities over the years within the scope of preventing climate change and the changes in the strategies put forward as a result of these studies are examined and the decisions taken regarding climate change over the years are compared and the results of this study are evaluated. In this context, the extent to which the decisions are applicable has been examined.

Keywords: Climate chance, Greenhouse gas, IPCC, Urbanization.

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Giriş

Küresel iklim değişikliği, toplumun karşı karşıya olduğu en önemli, kalıcı ve son derece dinamik sorunlardan birisi olarak karşımıza çıkmaktadır (Birchall & Bonnett, 2021). İklim değişikliği deniz seviyesinin yükselmesi, sıcaklık artışı, sera gazı emisyonunun artışı gibi birçok sorunun ortaya çıkmasına neden olmaktadır. Avrupa iklim politikası son yıllarda büyük ölçüde iklim değişikliğini azaltmak için odaklanmıştır (Losada & Toimil & Munoz & Garcia Fletcher & Diaz Simal, 2019).

Küresel ısınmayı 2100 yılına kadar sanayi öncesi seviyelerin 1,5 °C üzerinde sınırlamak için sera gazı emisyonlarını hızla azaltmaya ihtiyaç vardır (Hurlimann & Moosayi & Browne, 2021). Bilim topluluğu, sera gazı emisyonlarının mevcut ve gelecekteki değişimi göz önüne alındığında, iklim değişikliğinin önemli ve geri döndürülemez sonuçlarına ilişkin artan risk hakkında ciddi endişeleri olduğunu dile getirmektedir (Spyridi & Vlachokostas & Michailidou, 2015).

Yüzey ısısındaki artışa eş iklim sisteminde meydana gelen değişliğe bağlı olarak, dünya üzerinde bazı etkiler daha sık ve şiddetli görünmesi beklenmektedir. Bunlar;

- Sıcaklık artışı, sıcak gün sayısında artış ve gecelerin uzaması
- Soğuk günlerin ve gecelerin azalması,
- Sıcak nöbetler ile sıcak hava dalgalarının sıklığının artması
- Yağış miktarının artması ve sel, fırtına gibi olayların sıklaşması,
- Denizdeki su seviyesinin yükselmesi,
- Kuraklık ve su stresinden etkilenen alanların artması şeklinde sıralayabiliriz (Kaya, 2018).

İklim değişikliğinin en temel nedeni insan kaynaklıdır. İklim değişikliği, özellikle kalkınmanın sürdürülebilir kılınması için sahip olduğu önem gün geçtikçe daha da arttırmaktadır. İklim değişikliğine yol açan birçok nedenin olmasıyla birlikte, bu nedenler içindeki en önemli payı, insan kaynaklı sera gazları almaktadır (Tütüncü, 2008). Özellikle sanayi devrimi ile metan, diazotmanoksit, karbondioksit gibi doğal sera gazları emisyonlarında önemli ölçüde bir artış meydana gelmiştir (Kanat & Keskin, 2018).

İklim değişikliğinin nedenlerinden birisi kentleşme olup iklim değişikliğinin azaltılması açısından bu konu da oldukça önemlidir. Kentlerin kendine özgün koşulları birçok alandaki etkisini şiddetle arttırmakta ve iklim değişikliği kentlerde alt yapı sistemlerinden kamu

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hizmetlerine, yapılı çevrelerden ekosistem hizmetlerine kadar birçok alanda önemli etkilerin meydana gelmesine neden olmaktadır (Kaya, 2018).

Bugüne kadar iklim değişikliğine neden olduğu düşünülen birçok etmene yönelik politikalar ve çözüm önerileri üretilmiştir. Hükümetlerarası İklim Değişikliği Paneli' nin bu kapsamda 1990'dan 2022 yılına kadar toplamda 6 adet rapor yayınlayarak iklim değişikliğini azaltmaya yönelik politikalar ve stratejiler üretmiştir. Bu çalışmada 3. IPCC raporu ve 6. IPCC raporlarına ilişkin kentleşmeye ilişkin ortaya konulan önlemler incelenerek 20 yıllık süre zarfında alınan kararlar irdelenerek kentleşmenin iklim değişikliği üzerindeki etkisinin ortaya konulması amaçlanmaktadır.

Materyal ve Yöntem

IPCC, kuruluşundan bu yana, bir dizi değerlendirme raporu, özel raporlar, teknik belgeler ve yaygın olarak standart referans çalışmaları haline gelen Ulusal Sera Gazı Envanterleri için Kılavuz İlkeler gibi metodolojiler üretmiştir. IPCC kurulduğu günden bugüne iklim değişikliği ile mücadele eden önemli bir kuruluş olarak karşımıza çıkmaktadır. Kurulduğu günden bugüne toplamda 6 adet iklim değişikliğine yönelik rapor yayınlanmıştır. Bu çalışmada IPCC'nin hazırlamış olduğu raporlardan 2001 ve 2022 yılları incelenmiş olup çalışmanın materyalini bu iki rapor oluşturmaktadır. Bu iki raporun seçilmesinde 20 yıllık süre zarfında nelere dikkat edildiği, hangi başlıkların önem arz ettiği ve bu başlıklar içinde kentleşmenin iklim değişikliğinde ki rolünün ne olduğu saptanmaya çalışılmıştır. Bu kapsamda çalışmanın yöntemi, raporlara ilişkin okumalar yapılarak iklim değişikliğine ilişkin veriler toplanarak bu verilerin kentleşme açısından durumu değerlendirilmiş olup nitel araştırma yöntemi kullanılmıştır.

Bulgular

19. yüzyılın sonlarından beri yüzeyde atmosferde ortalama 0,4 ila 0,8°C küresel ısınma olduğu ve bu ısınmanın ilki 1910 ile 1945 arasında ve son zamanlarda 1976'dan beri olmak üzere iki farklı aşamada karşımıza çıkmaktadır (IPCC, 2001). Bu kapsamda Hükümetlerarası İklim Değişikliği Paneli (IPCC) 1988 yılında World Meteorological Organizasyon (WMO) ve Birleşmiş Milletler Çevre Programı (UNEP) tarafından ortaklaşa kurulan yaklaşık 2000 bilim insanı ve uzmandan oluşan önemli bir organdır (Burton, 2003). Mevcut görev tanımı şunlardır: Bilim hakkında mevcut bilgilerini ve etkilerini iklim değişikliğine uyum sağlamak için değerlendirir (IPCC, 2001).

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Dünya kentlerinin başlangıcından beri iklim değişikliğini azaltmaya yönelik politikalara ağırlık verilmiştir. Bu politikalar, kentlerde ulaşım, enerji, atık, kent planlama, arazi kullanım gibi konular öne çıkmaktadır. Kentler için önem arz eden bir diğer husus ise, kentsel ısı adasıdır. Kentsel ısı adası dediğimiz kavram, kentsel alanların yapılı çevrelerin yoğunluğuna bağlı olarak çevrelerine göre daha sıcak olmasını ifade etmektedir (Kaya, 2018; Filho vd., 2018: 1140; Tromeur vd., 2012: 1811). Yapılaşmanın yoğun olduğu bölgelerde kentsel ısı ada etkisinin daha fazla olduğu bilinmektedir. Her yıl kentlerde yaşayanların sayısının artması iklim değişikliğini ve iklim değişikliğini tetikleyen faktörleri de artırmaktadır. Bu durumda kentsel alanlarda insanlardan kaynaklı iklim değişikliği sonucunda yerel ve küresel çevre etkileri ortaya çıkmaktadır (Kahraman & Şenol, 2018).

Sanayi devrimi sonrası kentlerde yaşayan nüfus artmaya başlamıştır. Özellikle 1970 li yıllardan sona kentleşmenin hızlandığı 2018 Revizyonu. Birleşmiş Milletler Ekonomik ve Sosyal İşler Departmanı raporunda (UN DESA) görülmektedir. Gün geçtikçe kentsel nüfusun büyüklüğü de artmaya devam etmektedir. 2018 itibariyle, dünya nüfusunun yaklaşık %55'i kentsel alanlarda yaşamaktadır (UN DESA, 2019). 2050 yılına kadar dünyadaki nüfusun %68'inin kentsel alanlarda yaşayacağı öngörülmektedir. Bu, 2018-2050 yılları arasında kentsel alanlara 2,5 milyar insanın eklenmesi anlamına gelecek ve bu artışın %90'ı Afrika ve Asya'da gerçekleşeceği ön görülmektedir. Bu durum insanların doğaya zarar vererek kentsel alanlar yaratmasına ve devamında iklim değişikliğini tetiklenmesine neden olmaktadır. Bu kapsamda 2001 ve 2022 yıllarına ait IPCC raporlarının kentleşmeye ilişkin yapılan çalışmaları aşağıdaki gibidir.

2001 IPCC Raporunda İklim Değişikliği ve Kentleşme

Hükümetler arası İklim Değişikliği Paneli'nin (IPCC) 2001 yılında yayınladığı 3. Değerlendirme Raporu incelendiği zaman iklim değişikliğinin kendine has küresel bir sorun olduğu vurgulanmaktadır. Bu rapor, iklimsel, çevresel, ekonomik, politik, kurumsal, sosyal ve teknolojik süreçler arasındaki karmaşık etkileşimleri içermektedir.

2001 yılında yayınlanan IPCC raporu incelendiği zaman 4 bölümden oluştu görülmektedir. Bu 4 çalışma raporunun ilki Ocak 2001 'de, ikincisi, Mayıs 2001'de, üçüncüsü Temmuz ve dördüncüsü Ekim 2001'de yayınlanmıştır. Bu raporlar sırasıyla

- Bilimsel temel
- Etkiler, Uyum ve Kırılganlık
- Azaltma ve

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- Sentez Raporu olarak karışımıza çıkmaktadır.

İklim değişikliğini genel olarak insan kaynaklı olarak karşımıza çıkmaktadır. İnsan kaynaklı iklim değişikliği, sera gazı üretiminin artması, arazide meydana gelen bozulmalar insan kaynaklı bazı değişimlerdir (IPCC, 2001).

2001 yılına ilişkin Hükümetler arası İklim Değişikliği Raporu incelendiğinde iklim değişikliğinde sera gazı emisyonunun azaltılmasına yönelik aşağıdaki konu başlıklarının öne çıktığı görülmektedir. Bunlar;

- Binalar
- Ulaşım ve hareketlilik
- Üretim endüstrisi
- Tarım ve enerji mahsulleri
- Atık ve
- Enerji kaynakları olarak toplamda 6 konu başlığından oluşmaktadır.

İklim değişikliğinden kaynaklı arazi kullanımında meydana gelen değişimler, yerel, bölgesel ve hatta küresel iklimin değişmesine önemli ölçüde katkıda bulunabileceği ve ayrıca karbon döngüsü üzerinde önemli bir etkisi olduğu artık kabul edilmektedir (IPCC, 2001). Bu değişkenlerden birisi kentleşmedir. Yukarıda görülen maddeler için kentleşmeye yönelik değişimler Binalar kategorisi içinde değerlendirilmiştir.

Kentleşme, yoğun nüfuslu insan yerleşimlerinin yaydığı ısı, buharlaşma, özelliklerindeki değişiklikler, yüksek binalar gibi etmenler tarafından engellenerek giden uzun dalga radyasyonunun değiştirilmesi yoluyla çevredeki kırsal kesime göre önemli ölçüde daha sıcak bir yerel iklim yaratabilmektedir (IPCC, 2001). Kentleşme sonucunda artan nüfus ve yapılaşmalar sonucunda gelecek yıllarda iklim değişikliğinin hız kazanacağı ön görülmektedir. Bu durumda dünyada beklenen bazı olaylar IPCC raporunda;

- Nehir kıyısındaki yerleşimler için sel felaketleri artan bir tehdit olacaktır
- Yağış miktarı artacaktır
- Heyelan riski artacaktır
- Sel ve heyelanlar sonucunda daha sıcak bir dünya ile karşı karşıya kalınacaktır.
- İnsan yerleşimleri için artan sıcaklık sonucunda su kaynaklarında azalmalar meydana gelecektir.
- Su sorunu çeken yerleşim bölgelerinde (Kuzey Afrika gibi) daha fazla suya talep artacaktır.

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- Azalan su kaynakların yerine yeni su kaynakların bulunması yüksek maliyetlere neden olacaktır
- Orman alanlarına yakın yerleşim bölgelerinde yangın tehlikeleri artacaktır
- Dolu ve fırtınalar yerleşim yerlerine daha fazla zarar verecektir.
- Tarımsal sanayi ve zanaatkâr balıkçılık iklim değişikliği karşısında savunmasız kalacaktır.
- Daha sıcak hava, daha fazla buharlaşma ve daha az yağın tarımsal verimliliği düşürecektir.
- Isı dalgalarının insan sağlığı ve üretkenliği üzerinde daha ciddi etkileri olacaktır.
- Deniz seviyesinin yükselmesi alt yapının ve kıyı kaynaklarına dayalı endüstrinin maliyeni artıracaktır.
- Konutlarda ısınma için harcanan enerji tüketiminin azalacağı ancak soğutma için gerekli olan enerji tüketimi artacaktır.
- Kuraklık ve sel felaketlerinde ki artış nedeniyle yerleşim bölgelerinde hava ve su kirliliğin artacağı ön görülmektedir.

Yukarıda bahsi geçen maddelerin gerçekleşmemesinin yolu sürdürülebilir kentlerden geçmektedir. Bu kapsamda IPCC raporunda sürdürülebilir kentlere yönelik bazı stratejilere yer verilmiştir. Bunlar;

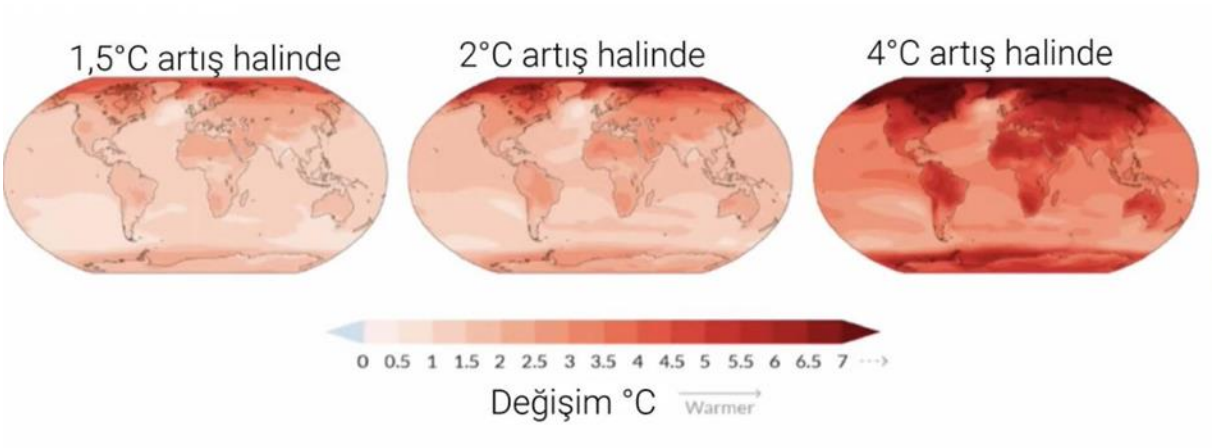
- Otomobil ve diğer hafif ticari araçlar yerine toplu taşımaya, motorlu araçlar yerine yayalara ve bisikletlilere öncelik verilmelidir.
- Her bir kentsel sorun kümesi için bir eylem planı oluşturulmalıdır.
- Hızlı demografik büyüme sırasında bile, fiziksel genişleme, entegre yol planlaması, toplu taşıma yatırımları ve uygun arazi kullanımı mevzuatının uygulanmasıyla yön verilmelidir.
- Toplu taşımadan geri dönüşüme kadar her şey için teknolojik çözümler ve standartlar, satın alınabilirlik temelinde seçilmelidir.
- Yeni yapılacak inşaatlarda, iyi planlama ve bina uygulamaları ile önemli miktarda enerji ve çevre maliyetinden tasarruf edilmelidir.
- Isı adalarının azaltılmasına yönelik, bitki örtüsünün ve açık renkli yüzeylerin akıllıca kullanılması, motorlu taşıtların azaltılması ve güneş kaynaklarından yararlanılmalıdır.
- Kentlerde tsunami hasarını önlemeye yönelik tesisler kurulmalıdır.
- Peyzaj yönetimi iyileştirilmelidir.
- Tarım ve balıkçılık kooperatifleri geliştirilmelidir.

ISBN: 978-625-8246-12-4

- Çölleşmeye karşı önlemler alınmalıdır.
- Katı, sıvı ve gazlı atıklar için kirlilik kontrolleri oluşturmalıdır.
- Binalara ilişkin artan soğutma talebine yönelik uygun tasarım yöntemleri kullanılmalıdır.

2022 IPCC Raporunda İklim Değişikliği ve Kentleşme

Hükümetler arası İklim Değişikliği Paneli'nin (IPCC) 2022 yılında yayınladığı 6. Değerlendirme Raporu'na göre iklim değişikliğinin hızla ilerlediği belirtilmektedir. IPCC raporuna göre iklim değişikliğinin önüne geçilemediği takdirde küresel ısınma seviyelerinin 1,5°C eşiğinin aşılması tehlikesi ile karşı karşıya kalındığını belirtilmektedir. Aşağıdaki şekilde sıcaklık artış simülasyonu sıcaklığının 1,5°C, 2 °C ve 4 °C artması durumunda Dünya'nın nasıl etkileneceği gösterilmektedir (IPCC Raporu, 2022).



Şekil 1. Sıcaklık artış Simülasyonu (IPCC, 2022)

İklim değişikliğinin en büyük nedeni insan kaynaklı olduğu bilinmektedir. Bugüne kadar iklim değişikliğine neden olduğu düşünülen birçok etmene yönelik politikalar ve çözüm önerileri üretilmiştir. Hükümetlerarası İklim Değişikliği Paneli'nin raporunda, toprak, enerji, kentler, ulaşım ve sanayi gibi etmenler ve bu etmenlere karşı geliştirilmesi gereken stratejiler üzerinde durulmuştur (IPCC, 2022). Bu raporda üç çalışma grubu vardır. Bunlar:

- Fiziksel Bilimin Temeli (WGI);
- Etkiler, Uyum ve Güvenlik Açığı (WGII);
- İklim Değişikliğinin Azaltılması(WGIII).

Bunlardan ilki 2021'de, ikinci raporu Şubat 2022'de ve üçüncüsü Nisan 2022'de yayınlanmıştır. Nihai sentez raporunun 2022'nin sonunda tamamlanması beklenmektedir (IPCC, 2022).

Rapor, iklim etkilerinin önceki tahminlerin en üst noktasında olduğunu ve dünyanın tüm bölgelerinin etkilendiğini tespit etmiştir. Dünya nüfusunun yaklaşık %40'nı oluşturan 3,3

ISBN: 978-625-8246-12-4

milyar insan, şu anda en ciddi "yüksek düzeyde savunmasız" en kötü etkileri gelişmekte olan kategoriye girmektedir. Emisyonlar artışı devam ederse, Afrika mısır ekim alanlarının %30'unu ve fasulye için ektiği topraklarının %50'sini kaybedecek olup deniz seviyesinin yükselmesi nedeniyle bir milyar insan sel felaketiyle karşı karşıya kalacaktır (McGrath, 2022). Kuraklık, seller ve sıcak hava dalgaları her geçen gün artmaktadır.

Hükümetler arası İklim Değişikliği Paneli'nin (IPCC) 2022 yılında yayınladığı 6. Değerlendirme Raporu'na göre (IPCC, 2022);

- 1850'den bu yana CO_2 emisyonları günümüzde de artmaya devam etmektedir.
- Son 10 yılda en yüksek emisyon ölçümü yapılmıştır.
- 2019 itibariyle, mutlak emisyonlardaki en büyük artış, fosil yakıtlardan ve endüstriden kaynaklanan CO2'de meydana gelmiştir.
- COVİD-19 Pandemisi nedeniyle 2020 yılında emisyon miktarında %5.8 azalma meydana gelmiştir.
- 800'den fazla şehir, ekonomi genelinde veya belirli bir sektörde net sıfır sera gazı emisyonunu elde etmek için taahhütte bulunmuştur.
- Bütün sektörlerde emisyon artışı gerçekleşmiştir. Ancak, ulaşım, tarım ve orman sektöründe ki artış diğer sektörlere daha belirsizdir.
- En büyük kentsel arazi Asya ve Gelişmekte olan Pasifik ve Gelişmiş Ülkelerde karşımıza çıkarken, en hızlı kentsel arazi büyümesi Afrika, Doğu Avrupa ve Batı- Orta Asya'da gerçekleşeceği ve bu alanlarda inşaat altyapısı, enerji tüketimi, karbon stoklarında kayıp, tarım ve orman arazilerinin tahribi ile karşı karşıya kalınılacaktır.
- Nüfus büyüklüğü, kentleşme durumu ve kentsel biçimi, kentsel alanlardaki emisyon miktarının artmasında önemli rol oynamaktadır.
- Fosil yakıt kullanımındaki azalmadan dolayı 2010-2019 yılları arasında küresel enerji yoğunluğu azalmıştır.
- En az 18 ülke, 10 yıldan uzun bir süredir sera gazı emisyon azaltımlarını sürdürmüştür.
- Dijitalleşme, emisyonların azaltımını sağlamıştır.
- Etkili ve adil iklim yönetişimi, sivil toplum aktörleri, siyasi aktörler, işletmeler, gençler, işgücü, medya, Yerli Halklar ve yerel topluluklar ile etkileşime dayanır.

Gibi birçok iklim değişikliğine yönelik tespit dikkat çekmektedir.

ISBN: 978-625-8246-12-4

Hükümetler arası İklim Değişikliği Raporu 2022 yılı içinde iklim değişikliğine ilişkin hazırlanan en önemli rapor konumundadır. Çünkü birçok konuyu içinde barındırmaktadır. Bu raporun kapsadığı konular şunlardır (IPCC, 2022);

- Sera gazı emisyonlarının eğilimleri ve itici güçleri;
- Uzun vadeli net sıfır hedefleriyle eşleşen emisyon azaltma yolları;
- Emisyon azaltımı için daha kısa vadeli yollar ve bunların istihdam yaratma, rekabet edebilirlik, yoksulluk, sürdürülebilir kalkınma ve daha fazlası için "ulusal kalkınma hedefleri" ile uyumluluğu;
- BM Sürdürülebilir Kalkınma Hedefleri kapsamında insan ihtiyaçlarını karşılamaya yönelik hedefler de dahil olmak üzere sera gazı emisyon azaltımlarının sosyal yönleri;
- Enerji sistemleri;
- Tarım, ormancılık ve diğer arazi kullanımları;
- Şehirler ve diğer insan yerleşimleri;
- Binalar;
- Toplu taşıma;
- Sanayi;
- Farklı ekonomik sektörlerde maliyetler ve fırsatlar;
- Ulusal ve alt ulusal politikalar ve kurumlar;
- Uluslararası işbirliği;
- Yatırım ve finans;
- Yenilik, teknoloji ve teknolojik transfer;
- Sürdürülebilir kalkınma ve iklim değişikliğine yanıt arasındaki bağlantılar.

Gibi birçok önemli konuya bu raporda ulaşılabilmektedir.

İklim değişikliğine ilişkin birçok önemli konu yukarıda belirtilmiş olup bu konular içinden kentleşme de iklim değişikliğinin azaltılmasında önemli bir rol oynamaktadır. İklim değişikliği kentlerde her geçen gün daha da tehlike yaratmaktadır. Bu durumun, bölgesel ve kentsel alanlarda IPCC'nin formüle ettiği iklim değişikliği sorunlarına karşı izlenmesi gereken hem azaltım hem de uyum politikaları ile kontrol altına alınması gerekmektedir.

- Azaltım: İklim değişikliğini hızlandıran insan kaynaklı etkenlerin azaltılarak iklim değişikliği hızının yavaşlatılması (UN-Habitat, 2014).
- Uyum: Bir diğer adıyla Adaptasyon, iklimsel uyarılara ilişkin ekolojik, sosyal veya ekonomik sistemlerde yapılan düzenlemelerdir (UN-Habitat, 2014)

ISBN: 978-625-8246-12-4

IPCC raporunda ise iklim değişikliğinin azaltılmasına yönelik stratejilere yer verilmiştir (IPCC, 2022). Bunlardan bazıları;

- Şehirler, işletmeler, vatandaşlar, ulus ötesi girişimler ve kamu-özel kuruluşlar dahil olmak üzere iklim değişikliğine yönelik küresel çabada devlet dışı ve ulus altı aktörlerin bir araya toplanması,
- Mevcut fosil yakıt bazlı enerji sektörü altyapısının hizmet dışı bırakılması ve kullanımının azaltılması,
- Mevcut tesislerin Karbon Yakalama ve Depolama (KYD) ile güçlendirilmesi ve düşük karbonlu yakıtlara geçiş yapılarak KYD'siz yeni kömür tesislerinin iptal edilmesi,
- İklim yönetişimi, genel bir yön sağlayarak, hedefler belirleyerek, iklim eylemini politika alanları arasında ana akım haline getirerek, düzenleyici kesinliği artırarak, iklim değişikliğine yönelik uzmanlaşmış kuruluşların oluşturulması,
- Yerli Halkların, yerel toplulukların ve küçük arazi sahiplerinin biyolojik çeşitlilik ve ekosisteminin korunması,
- 2050 yılına kadar emisyon projeksiyonuna kıyasla, küresel olarak CO_2 ve CO_2 dışı sera gazı emisyonlarını %40-70 oranında azaltılması,
- Yüksek sosyo-ekonomik statüye sahip bireylerin emisyonu azaltmak için katkıda bulunması,
- Yeni şehirlerin ve kasabaların nasıl tasarlanacağı, inşa edileceği, yönetileceği ve güçlendirileceği, davranışları, yaşam tarzları gibi parametlerin emisyonun azaltılmasında önemli olması,
- Kentler için iklim değişikliği ele alındığı zaman kent için artan sera gazı emisyonunun azaltılması için iklim değişikliğine karşı kent direncinin artırılması,
- 2030 yılına kadar mevcut kentsel altyapının ve mevcut yapıların iyileştirilmesi ile CO_2 emisyonlarını azaltılması,
- Esnekliği ve refahı artırmak için gayri resmi yerleşimlerin ve yetersiz konutların iyileştirilmesi,
- İklim değişikliğinin azaltılması ve adaptasyonu için şehirlerde dönüşümsel değişikliklere ulaşmak, gibi kentleşme kapsamının iklim değişikliğine yönelik stratejiler karşımıza çıkmaktadır.

İklim değişikliğine yönelik çalışmalar incelendiği zaman iklim değişikliğinin önüne geçilemediği takdirde dünya geri dönülemeyecek tehlikeler ile karşı karşıya kalacaktır. Bu

ISBN: 978-625-8246-12-4

yüzden iklim değişikline ilişkin stratejilerin çok iyi belirlenmesi gerekmektedir. Bu alana ilişkin yapılacak stratejik planlar sürdürülebilir bir dünya için gerekmektedir. İklim değişikliği birçok sektörde, alanda karşımıza çıkmaktadır. Bu yüzden her bir parametreye yönelik sorunlar belirlenmeli ve bu sorunlara yönelik çözüm yolları üretilmelidir. Bu çözüm yolları göz önünde bulundurularak stratejik planlar değerlendirilmeli ve iklim değişikliği için önceliklerin belirlenmesi gerekmektedir. İklim değişikliğine ilişkin öncelik sera gazı emisyonlarının azaltılmasıdır. Bu emisyon miktarının azaltılması da temiz enerji, temiz enstitüden, temiz kentlerden geçmektedir. Bu kapsamda;

- Deniz seviyesinin yükselmesi ile karşı karşıya kalan kıyı bölgelerinin taşınması,
- Biyoçeşitliliğin korumak için yasaların güçlendirilmesi,
- Kentsel ısı ada etkisinin azaltılmasına ilişkin imar planlarında yeşil altyapı sistemlerinin oluşturulması,
- Ulaşımda motorlu taşıtlar yerine sürdürülebilir taşıtlara öncelik verilmesi,
- Kent içi ulaşımda bisiklet ve yaya kullanımının özendirilmesi,
- Fosil enerji kullanımının son bulması,
- Tarım alanlarında verimliliğin artırılmasına yönelik plan kararlarının alınması,
- Orman alanlarının korunması ve ağaç kesimine yönelik önlemlerin alınması,
- Konut tasarımında akıllı yapıların öncelik oluşturması,
- Emisyonu azaltmak için home ofis çalışılmasına teşvik edilmesi Havzaların azalması, su kıtlığının önüne geçilebilmesi için havza yönetim planının uygulanması,
- Su kıtlığını önlemek amacıyla binaya entegre alternatif su temininin oluşturulması,
- Doğal afetlerin sayısının azaltılması için afet olayları için erken uyarı sistemi ve tahliye planının hazırlanması,
- Alternatif ulaşım araçlarının geliştirilmesi,
- Ağaç ekim programlarının yapılması,
- Düşük karbonlu ulaşım altyapısının oluşturulması gibi birçok iklim değişikliğini azaltmaya yönelik stratejilerin gerçekleştirilmesi gerekmektedir.

Tartışma ve Sonuç

Son yıllarda iklim değişikliğinin etkileri gittikçe artmaktadır. Bu etkilerin olumsuz sonuçları ise dünyanın gündeminden inmemektedir. Her geçen gün sıcaklık artışları, sel felaketleri, kuraklık, tarım alanlarının verimsizleşmesi gibi birçok sorun gelişmiş ve gelişmekte olan ülkelerin gündeminden inmemektedir. Bu kapsamda birçok çalışmanın yapıldığı

ISBN: 978-625-8246-12-4

görülmektedir. Bu çalışmalardan en ses getirini ise Hükümetler Arası İklim Değişikliği Panelidir.

Bu çalışmada bu panele yönelik incelemeler yapılmıştır. Özellikle 2001 ve 2021 yıllarına ait raporlar incelenerek 20 yıllık süre zarfındaki değişimlerin ortaya konulmuştur. Bu kapsamda;

- 20 yıl içinde IPCC'nin hazırlamış olduğu iki farklı rapor incelendiği zaman iklim değişikliğinin nedenlerine ve sonuçlarına değinildiği gözlemlenmiştir.
- Her iki yıla ait raporlarda da iklim değişikliğinin önüne geçilebilmesi için önemli stratejiler dikkat çekmektedir.
- 2001 yılına ait raporda kentleşmeye ilişkin kapsamlı bir çalışmanın yapılmadığı, 2001 yılında kentleşmenin iklim değişikliği için önemli bir sorun teşkil etmediği yapılan taramalar sonucunda saptanmıştır.
- 2001 yılında kentleşmeye yönelik yapılan stratejilerde sürdürülebilir kentlere değinildiği gözlemlenmiştir.
- 2001 yılına ait raporda alt başlıkların sınırlı kaldığı ve rapordaki başlıkların ise daha sınırlı konulara değinildiği gözlemlenmiştir. Bu raporda toplam 6 ana başlığa yer verilmiştir.
- 2001 raporunda iklim değişikliğinin kentler üzerindeki etkisi binalar başlığı altında değinilmiştir.
- 2022 yılına ait IPCC raporuna bakıldığında ise, kentleşmenin son yıllarda hızla arttığını ve bunun iklim değişiminde olumsuz etkileri olacağından söz edilmiştir.
- 2022 yılına ait raporda konu başlıklarının artırıldığı ve iklim değişikliğine neden olabileceği düşünülen bütün konulara değinildiği gözlemlenmiştir. Toplam başlık sayısının 16 olduğu görülmektedir.
- 2022 yılında özellikle kentleşmeye yönelik alt başlığın olduğu ve iklim değişikliğine etkilerinin neler olabileceğinden söz edildiği gözlemlenmiştir.
- 2022 yılındaki raporda daha önceki yıllar ile karşılaştırma yaparak nasıl bir değişimin yaşandığı ortaya konulmuştur.
- 2022 raporunda ülkelerin hangi konumda oldukları, neler yaptıklarından bahsedilmiştir.
- 2022 raporunda 2019 yılının sonlarında ortaya çıkan Covid-19 salgınına yer verilmiş olup bu salgının iklim değişikliğini nasıl olumlu etkilediğinden bahsedilmiştir.

Yapılan iki rapora ilişkin gözlemlerde 2022 yılına ait raporun bugüne kadar yapılan raporlar içinde en kapsamlı olduğu anlaşılmaktadır. İklim değişikliğinin tehlikelerinden, önüne

ISBN: 978-625-8246-12-4

geçilmediği taktirde ne gibi sonuçlar doğuracağından ayrıntılı bir şekilde bahsetmektedir. Aynı şekilde 2001 yılına ait raporda da iklim değişikliğinin doğuracağı sonuçlara yer verilmiştir. Ancak geçen 20 yıllık süre zarfında iklim değişikliğinin önüne geçilemediği taktirde doğuracağı sonuçlara yenileri eklenerek günümüze geldiği görülmektedir. Bu durumda 2001 yılında IPCC'nin aldığı iklim değişikliğini azaltmaya yönelik stratejilere uyulmadığı görülmektedir.

20 yıllık süre zarfı içinde iklim değişikliğinin yavaşlatılması ya da durması bir yana iklim değişikliği bu süre zarfında hızla artmaya devem etmiştir. Alınan kararların uygulanmadığı, sera gazı emisyonunun arttığı, sulak alanların zarar gördüğü, orman alanların tahribinin devam ettiği, yağış rejiminden meydana gelen değişimler ve enerji savaşlarının hız kazandığı bir dönemin içinde bulunmaktayız. Bu kapsamda IPCC'nin raporlarına ilişkin gerekli hassasiyetin artırılması gerekmektedir. Bu rapora ilişkin stratejiler bütün ülkelere duyurulması ve bu konuda neler yapmaları gerektiğine ilişkin eğitimlerin verilmesi iklim değişiklinin önlenmesi için önem arz etmektedir. Özellikle ekonomik açıdan gelişmemiş ülkelere, gelişmiş ülkelerin yardımcı olmaları, kaynak sağlamaları gerekmektedir. Çünkü dünyamız bir bütündür ve sadece bir ülkenin bile iklim değişikliğini tetiklemesi gelecek nesiller için büyük bir tehlike arz etmektedir. Gelecek nesillerin devamlılığı, dünyamızın yaşanılabilir bir yer olması için, sürdürülebilir bir kent için iklim değişikliğinin önüne geçilmesi gerekmektedir.

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Investigationof Urban Park Accessibility by Using Space SyntaxMethodAs A Design Tool

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Abstract

Parksarepart of greenspaces in citiesthatallowpeopletosocialize as well as providingenvironmental, ecological, economicandaestheticcontributionstothecity. Duetotheincreasingpandemicrecently, peoplewhostay at homeneedtospend time in greenspaces in theirspare time. Inthiscontext, parksthat can be easilyaccessedfromresidentialareas in citiesbecomesmoreimportant. Thisstudy is aimedtorevealsocialandfunctionalcontributions of urban park in terms of designbyexaminingaccessibility. Theaccessibility of Çankırı urban park, which is thestudyarea, wasevaluatedbyspacesyntaxmethod. Firstly, physicalaccessibility of urban park tothecenterwasexaminedbased on thestreet network of city. Accessibility of the park wasanalyzedthroughthezoning plan of thecityandintegrationmapwasrevealed. Secondly, perceptibility of openareas in the park designwasevaluatedbyvisibilitygraphicanalysisand an integrationmapwascreated. Allanalysisresultswereevaluatedtotallyandperceptibilityandaccessibility of thestudyarea is foundmoderate. Lastly, accessibility of park andwithinthecitywasexaminedandevaluationsweremade in terms of designfeatures. Thespacesyntaxmethod, as a designtool in urban areas, contributestotheproduction of successfulprojectsbysolvingmathematicalinfrastructure of thespace, determiningtheproblemsthatmayarise in thefuture, andcreating of sustainablespace. Thestudypointsoutto how thespacesyntaxmethodshould be used as a tool in accessible park design. Thisanalysiswillprovidetheissuessuch as park locations, sizes, spacings in cityplansto be consideredmoreprofessionallyandimprovecitiesdevelopment. Accessibility in different park examples in otherstudiesshould be examinedwiththismethodandimprovedbyintegrating it withdifferentmethods.

Keywords: Accessibility, greenspaces, perceptability, spacesytax, visibilitygraphanalysis.

1. Giriş

Kentlerde açık ve yeşil alanların içerisinde yer alan kent parkları, insanların doğayla etkileşim kurduğu alanlardır. Kentlerdeki açık ve yeşil alanlar ekolojik, ekonomik, estetik ve rekreasyonel olanaklar yaratma gibi işlevlerle kente pek çok katkı sağlamaktadır. Kentsel açık ve yeşil alanlar, su ve hava kalitesini arttırmak, rüzgâr ve gürültüyü filtrelemek ve kentin mikro iklimini düzenlemenin yanında kent sakinlerinin refahı için sosyal ve psikolojik gelişimlerini destekleyici etkiye de sahiptir (Ulrich, 1981). Yeşil alanlar rekreasyon ve dinlenme alanlarını temsil ettikleri, doğa ile temasa izin verdikleri ve kent sakinlerinin zihinsel ve fiziksel sağlığına olumlu katkıda bulundukları için çok sayıda kültürel ekosistem hizmeti sunmaktadır (De la Barrera ve diğerleri, 2016). Parklar sağladıkları ekolojik, kültürel katkıların yanı sıra sosyal faydalar da sunmaktadır. Londra, Paris, Amsterdam gibi Avrupa kentlerindeki parklar, sosyal hayatın iyileştirilmesi amacıyla oluşturulmuştur. Özellikle 1850'lerden itibaren değişen kent yapısı nedeniyle sağlıksızlaşan yaşam koşullarının kentlerde düzeltilmesi için Şehri Güzelleşme Hareketi başlatılarak, mimari olarak kentlere kimlik kazandırmak, kentlerde yeşil alanlar planlayarak sosyal ve fiziksel iyileştirme sağlamak amaçlanmıştır (Aytaç &Kuşuluoğlu, 2015). Bu hareketin öncülerinden biri olan Frederick LawOlmsted Londra'daki, Hyde Park,

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Newyork'daki Central Park gibi parklardan etkilenmiştir. Kent parkları, yoğun ve kalabalık şehir dokusu içinde bitki örtüsüne ve doğaya özgür bir şekilde temas etmeye olanak veren kamusal kullanımına yönelik birçok sosyal etkileşim alanı yaratan mekânlar olduğu belirtilmektedir (Atanur & Ersöz, 2020). Son zamanlarda yaşanan Covid-19 pandemisi döneminde kısıtlamalar sebebiyle evlerinde kalan insanlar, boş kalan vakitlerinde rahatlamak, dinlenmek ve için doğayla etkileşim halinde olmak için yeşil alanda olmaya ihtiyaç duymaktadır. Günümüzde insanların dinlenebilecekleri, eğlenebilecekleri ve sosyalleşebilecekleri kent parklarının varlığı önem kazanmaktadır. Bu bağlamda herkes için ortak kullanım alanı olan ve tüm bireylerin kullanımına hizmet eden kent parklarının erişilebilirliği güncel araştırma konularındandır.

Kent parklarının planlaması ve tasarımı açısından değerlendirilmesinde erişilebilirlik açısından ele alınmaktadır. Kaplan (1989) erişilebilirliği, "belirli bir varış noktasına ulaşabilme kolaylığı ya da rahatlığı" olarak tanımlamıştır. Erişilebilirlik, fiziksel, sosyal, ekonomik gibi farklı pek çok boyutları olan bir kavramdır. Diğer yandan Kaplan'a göre (1998) paralel olarak yapı ölçeğinde gerçekleşen iç dolaşım "içsel erişilebilirlik", yapının coğrafi konumuna ve yapılı çevre ile olan ilişkisine bağlı olarak gerçekleşen ulaşılabilirlik değeri de "dışsal erişilebilirlik" olarak tanımlanmıştır. Bu bağlamda kentsel açık ve yeşil alanların yakın çevresine ilişkin değerlendirmede fiziksel erişilebilirlik diğer ifadeyle dışsal erişilebilirlik analizleri ile birlikte içsel erişilebilirlik bir arada değerlendirilmelidir.

Kentsel alanların erişilebilirliğini sağlamada çözüm yolları arayan ve bunu değerlendiren araç olarak mekân dizimi yöntemi kullanılmaktadır. Mekân dizimi kuramını ortaya koyan Hillier& Hanson (1984), "TheSocialLogic of Space" kitabına bina ölçeğinden kent ölçeğine kadar tüm mekân organizasyonda mekân ve sosyal yaşam arasındaki ilişkiyi anlamak üzerine kuruludur. Mekân dizim analizi, kentsel açık alanlarda görüş ve hareket alanlarını çakıştırarak insanların bir araya gelme potansiyelini incelemektedir (Çil, 2006). Kamusal alanların tasarımında oluşturulan yolların üzerindeki hareket etkilerini incelemek için bu yöntem kullanılmaktadır. Yöntem ile yaya yollarındaki hareketin yanı sıra kullanım alanlarının ulaşılabilirliği değerlendirmektedir. Mekân dizimi yöntemi kamusal alanlarda tasarım uygulanmadan önce alternatiflerin karşılaştırılması bakımından yol göstericidir. Yöntemin temel felsefesi, mekânın oluşum kurgusunu anlamak ve sosyal yapıyla ilişkilendirmektir. Mekân dizimi, mekân örgütlenmesi ve sosyal yapı arasında doğrudan ilişki olduğu çıkış noktası ile mekân

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örgütlenmesinde hareket ve görüş alanlarına bağlı olarak insanların mekânı algılama ve kullanma biçimlerini ortaya koymaktadır (Atak, 2009).

Mekân dizimi yönteminin yanı sıra Benedict (1979) tarafından geliştirilen görünürlük grafik analizi, görünür alanların bir ortam planı içerisinden ne kadar başarılı bütünleşebildiklerinin ölçümünü sağlamak amacıyla ortaya çıkarılmıştır. Görünür alan kavramı ilk kez Benedict (1979) tarafından mekânın sayısal olarak algılanması için ortaya çıkarılmıştır. Görünür alan, bir mekânda belirlenen noktalardan görünen bütün noktaların oluşturduğu çokgendir (Benedict, 1979). Görünür alanlar mekânı tanımlama ve hareket tahmini için yararlı olduğu grafiğin çeşitli analizlerini gerçekleştirebilmektedir (Turner, 2001). Erişilebilir mekânların haritalanması için insan ölçeği temel alınmakta ve grid sistemler oluşturularak değerlendirme yapılmaktadır. Mekân içerisindeki tüm noktalardan görünebilen alan çokgen şeklinde ortaya çıkmaktadır.

Görünür alan analizi ve mekân dizimi analizinin birleştirilmesiyle görünürlük grafik analizi (VGA) ortaya çıkmaktadır. Görünür alan analizi Turner (2001) tarafından Depthmap X yazılımı ile geliştirilmiştir. Bu program mekânsal çevrelerde çeşitli birimlerin görünebilirliğini hesaplayarak bu ilişkilere yönelik bir matris üretmektedir (Turner, 2001). Depthmap X yazılımı üzerinde oluşturulan grid sistemi, içerisinde görünebilir alanları bulmaya çalışmaktadır. Program, plandaki grid bölgelerinin her birinden teker teker görülebilir bölgeleri bulmaya çalışır ve bunun için mevcut konumdan yayılan basit görüş testi kullanarak her nokta konumunu diğer nokta konumlarına bağlar (Atak, 2009). Bu yöntem mekânın algılanma ve görünürlük durumunu ve kullanıcıların deneyimleme şeklini ortaya koymaktadır.

Bu çalışmada mekân dizimi kapsamında görünür alan kavramı araştırılarak bu tekniğin kullanım alanlarının geliştirilmesi amaçlanmaktadır. Herkes için kullanım alanı oluşturan kent parkı tasarımı örneğinde görünür alanlar ortaya çıkarılarak mekânın erişilebilirliğine yönelik değerlendirme yapılmaktadır. Bu kapsamda çalışmada, etrafı yollar ve Acıçay ile çevrili, kentin merkezine yakın bir konumda yer alan kamusal işlevlerin dâhil edildiği Çankırı kent parkında inceleme yapılmıştır. Bu değerlendirme mekân dizimi (spacesyntax) yöntemi kullanılarak desteklenmiştir. Araştırmada parkın kentsel doku içindeki erişilebilirliği ve parkın içindeki algılanabilirliği analiz edilmiştir. "Kentlerde parkların erişilebilirliğini destekleyen ulaşım ağı tasarım özellikleri nelerdir?" çalışmanın araştırma sorusunu oluşturmaktadır. Bu bağlamda kentlerde yaya ve araç hareketini gösteren erişilebilirlik düzeyinin, kentlerde yeşil alanların mekânsal organizasyonu üzerindeki etkisi incelenmiştir. Kentlerde yolların biçimleniş şeklinin, mekânların erişilebilirliğinde, algılanabilirliğinde ve dolayısıyla kullanımında etkili olduğu

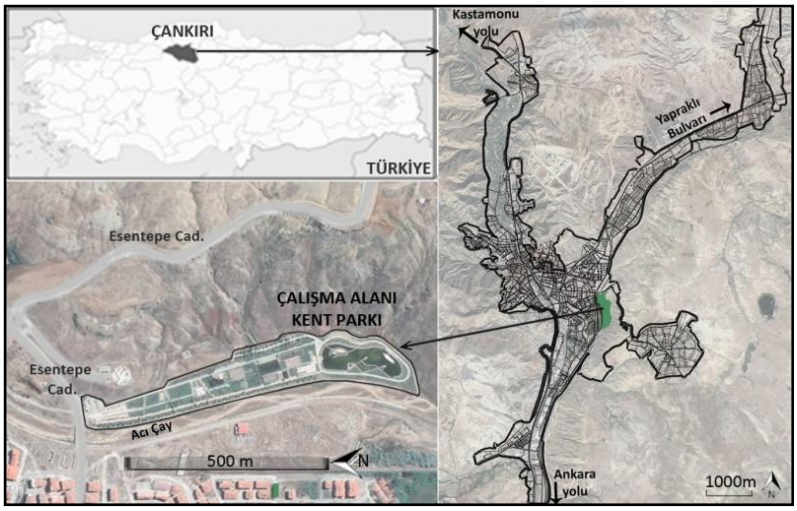
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hipotezinden hareket edilmiştir. Çalışma alanı olarak seçilen Çankırı Recep Tayyip Erdoğan Parkı'nda mekânların kullanım nedenleri ve fiziksel özellikleri tartışılmıştır. Çalışma çıktıları Çankırı'da kent parkı ve çevresinde hareketlilik değerlendirilerek kentte mekânsal strateji üretmeyi hedefleyen incelemelere katkı sağlayacaktır. Ayrıca çalışma kentsel açık ve yeşil alanlardaki ulaşım deseninin morfolojik yapısını ortaya koyarak, kent planlamasındaki fonksiyonel katkılarını ortaya koymaktadır.

2. Materyal ve Yöntem

2.1 Materyal

Çalışma alanı ana materyalini Çankırı ili merkezinde yer alan Recep Tayyip Erdoğan Parkı ve çevresi oluşturmaktadır. Alanın doğusunda ve kuzeyinde Esentepe Caddesi, batısında ise Acıçay yer almaktadır. Çankırı kentinin rekreasyonel ihtiyaçlarının karşılandığı bir alan olan parkın, kentin yeşil alan sisteminde önemli yere sahip olması ve yakınındaki ekolojik değerlerin bulunması çalışma alanı olarak seçilme sebeplerindendir. Kent merkezine yakın bir konumda bulunan ve sahip olduğu doğal, kültürel değerler bakımından değerlendirilmesine yönelik kaynak oluşturmaktadır. Şekil 1'de çalışma alanının konumu görülmektedir.



Şekil 1. Çalışma Alanı

Çalışma, daha önce ortaya konulan çalışmalara ve standartlara dayalı olarak veri toplama, analiz-sentez ve değerlendirme aşamalarından oluşmaktadır. Veri toplama aşamasında, Çankırı Belediyesi'nden (2022) temin edilen 1/1000 ölçekli imar planı ve saha araştırmaları ana materyal olarak kullanılmıştır. Ayrıca erişilebilirlik ve algılanabilirlik düzeylerini belirlemek için DepthmapX0.80, Autocad 2017 ve Photoshop CS6 yazılımları kullanılmıştır.

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2.2. Yöntem

Bu çalışmada mekân dizimi yöntemi kullanılarak kent parkının fiziksel erişilebilirliği analiz edilmektedir. Mekân dizimi, mikro ve makro ölçekteki mekânsal dokuların nasıl şekillendiğini, çalıştığını, geliştiğini ve değiştiğini analiz eden bir yöntemdir (Arslan &Şıkoğlu, 2015). Mekân dizimi yöntemi ilk kez Hillier& Hanson (1984) tarafından mekânın sosyal mantığını anlamak üzerine kuruludur. Bu yöntem kent morfolojisi üzerine yapılan araştırmalarda, kentin mekânsal organizasyonunu tanımlayarak bunun sosyal yaşamla ilişkisini açıklamaya çalışır. Dolayısıyla yöntem kentin farklı ölçeklerinde analiz ederek, mekânların ne kadar erişilebilir ve algılanabilir olduğunu tanımlar. Bu tanımlamayı yaparken mekânın sayısal alt yapısından faydalanarak bütünleşme grafikleri oluşturur. Mekân dizimi bir kentsel alanda yer alan bağlantılı yeşil alanların bir matrisi temsil edeceğini varsayarak bunun nicel özelliklerini bilgisayar simülasyonu kullanarak ölçebilmektedir. Mekân dizimi temel kavramları arasında "bütünleşme" ve "bağlantı" değerleri yer alır. Entegrasyon değeri, hem araç hem de yaya hareketlerinin kentsel sistem içinde nasıl işlediğini tanımlamada ve kamusal alanların ne sıklıkla kullanıldığını anlamada büyük önem taşımaktadır (Hillier, 2007). Bütünleşme değeri o mekândan mekânsal sistemdeki diğer tüm mekânlara gitmek için gereken ortalama çizgi sayısının ve yön değişikliklerinin bir fonksiyonudur. Yani belirli bir yerin başka yerden ne kadar uzakta olduğunu göstermek için "mesafe" yerine "derinlik" ifadesi kullanılır. Bütünleşme değerleri tasarıma yön vermektedir. Bütünleşme değeri yüksek olan akslar mekân örüntüsü içinde erişilebilir ve ağ yapısıyla güçlü bağlantılar kuran aksları; bütünleşme değeri düşük olan akslar ise mekân örüntüsünden ayrılmış erişimi zor aksları ifade eder (Hillier ve diğerleri, 1993). Bütünleşme değerine göre bütünleşme haritaları üretilmektedir. Bütünleşme haritaları, kentsel sistem içinde hem araç hem de yaya hareketlerinin nasıl çalıştığını açıklamak ve kamusal alanların ne sıklıkla kullanıldığını anlamak için önemlidir (Hillier, 2007).

Çalışma, Çankırı kent parkının kent içindeki fiziksel erişilebilirliğini ve park içindeki algılanabilirlik düzeyini değerlendirmeye odaklanmaktadır. Çalışmada ilk aşamada Çankırı Belediyesi'nden (2022) temin edilen imar planı Autocad altlığı üzerinde, akslar ve mekânlar çizilmiştir. Elde edilen sayısal altlık Depthmap X programına aktarılarak erişilebilirlik durumu bu programda üretilen aks haritası üzerinden analiz edilmiştir. Böylelikle parkın kent içindeki erişilebilirlik durumuna ilişkin bütünleşme haritası oluşturularak değerlendirme yapılmıştır. Bir düğümün bir bütün olarak bir sistemden (küresel entegrasyon) veya birkaç adım ötedeki düğümlerden oluşan kısmi bir sistemden ne derece entegre edildiğini veya ayrıldığını gösteren

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'entegrasyon'dur (yerel entegrasyon)” (Volchenkov&Blanchard, 2008). Mekân dizimi yöntemiyle elde edilen bütünleşme haritaları kentsel sistemdeki yaya ve araç hareketini ifade etmektedir (Hillier, 2007). Bütünleşme değeri, sistemdeki her bir parçanın birleştiği ya da ayrıldığı noktalar olup sistemde ne kadar erişilebilir olduğunu göstermektedir. Bütünleşme değeri kullanım yoğunluğunu vermekte olup kırmızı renkten mavi renge doğru düşmektedir. Yüksek değerde bütünleşme değerine sahip alanlar iyi bağlantılı, erişilebilir ve algılanabilir olduğunu ifade eder. Bütünleşme değeri yüksek olan yollarda yer alan yeşil alanların erişilebilirliği, bütünleşme değeri düşük olan yollardaki yeşil alanlara göre daha fazla olmaktadır. Bu bağlamda çalışma alanının kent içinde yer alan aksların bütünleşme değerlerine göre hangi düzeyde erişilebilirliğe sahip olduğu ilk aşamada belirlenmiştir.

Çalışmanın ikinci aşamasında, parkın Autocad altlığı park içerisindeki kullanımlar gruplandırılarak DepthmapX programına aktarılmıştır. DepthmapX programında çalışma alanı insan ölçeğinde oluşturun gridlere bölünerek görünebilirlik grafik analizi oluşturulmuştur. Bu analiz insan görüşüne göre üç boyutlu analiz yapmakta ve algılanabilir alanları bütünleşme değerlerine göre sınıflandırmaktadır. Çalışma alanında insan görüşünü engelleyen yapısal elemanlar haritaya işlenerek alanın insan görüşüne göre taraması yapılmıştır. Görünürlük grafik analizinde erişilebilir alanlar en yüksek olan kırmızıdan en düşük olan mavi renge doğru azalmaktadır.

Son aşamada tüm veriler birleştirilerek parkın erişilebilirlik durumu ortaya konulmuştur. Sonuç kısmında parkı kullanım yeri, yoğunluğu ve tasarım özellikleri arasında ilişki tartışılmıştır. Kent parkı alanında yaya ve hareketleri ve yeşil alanların mekânsal organizasyonu analiz edilerek bunun tasarım üzerindeki etkisi değerlendirilmiştir.

3. Bulgular ve Tartışma

3.1 Çalışma alanı mevcut durumu

Çalışma alanı olan kent parkı, içerisinde yer spor alanları, meydan, otopark, gölet, piknik alanları, üst örtülü gösteri alanı, koşu ve yürüyüş yolları, oturma alanları ve çocuk oyun alanları gibi kullanımları ile Çankırı'da en büyük rekreasyon alanlardan biridir. Parkın kuzey ve batısında yer alan karayolu ve güneyinde yer alan Acıçay çizgisel peyzaj özelliğiyle alanı sınırlandırmaktadır. Parkın genel görünümüne ilişkin fotoğraf Şekil 2'de verilmektedir.

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Şekil 2. Çalışma alanı genel görünümü

Park düz alan üzerinde konumlanmaktadır. Parkın kuzeydoğusu ve güney kısmında yüksek derecede eğimli alanlar bulunmaktadır. Alan içerisinde mimari birim olarak, spor merkezi, büfe, kafeterya, namazgâh ve güvenlik yer almaktadır. Çalışma alanına ilişkin alan kullanımları Şekil 3'de verilmektedir.



Şekil 3. Parkın alan kullanımları

2010 yılında yapımına başlanan park uygulaması 2018 yılında tamamlanmıştır. Uydu görüntüleri incelendiğinde parkın yapımıyla birlikte çevresindeki alan kullanımları (ticaret, konut vb.) de arttığı görülmektedir. Alan çevresinde bulunan Acıçay da zamanla birlikte değişime uğramıştır.

3.2 Parkın kent içindeki erişilebilirliğinin mekân dizimi analiziyle değerlendirilmesi

Çalışma alanına ait imar planı üzerinde parka ulaşım sağlayan yolların erişilebilirliği mekân dizimi yöntemiyle analiz edilmiştir. İmar planı üzerine yollar ve adalar çizilerek parkın kent ulaşım ağı içerisindeki erişilebilirliği ortaya koyulmuştur. Böylece yaya ve araç ulaşımı üzerinde hareketliliğe sahip alanlar çıkarılmıştır. Çankırı kenti imar planı üzerinden aksiyel harita oluşturulmuş ve her aksın bütünleşme değeri incelenmiştir. Çalışma alanın uydu görüntüsü Şekil 4a'da, mekân dizimi sonucunda elde edilen bütünleşme haritası ise Şekil 4b'de verilmiştir.

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Şekil 4a. Çankırı merkez uydu görünümü 4b. Çankırı kent merkezi bütünleşme haritası

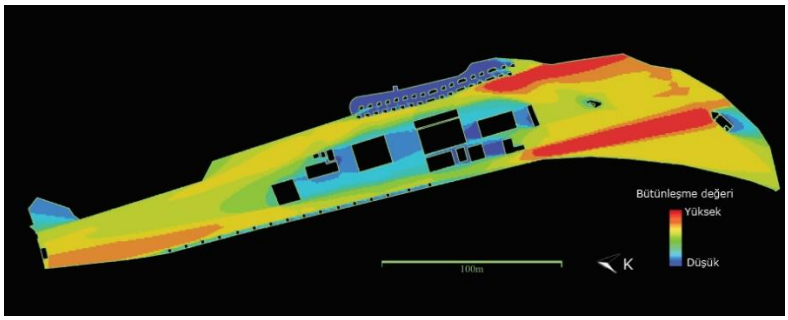
Bütünleşme haritasına göre parkın yüksek değerde bütünleşme değerine sahip kırmızı renkteki akslarla kent merkezine bağlandığı görülmektedir. Kent merkezinin içerisinden geçen Atatürk Bulvarı yüksek bütünleşme değerine sahiptir. Bu aks ile bağlantı oluşturan Ahmet Talat Onay Bulvarı ve Esentepe Caddeleri de yüksek değerde bütünleşme değerine sahiptir. Dolayısıyla parkın yüksek derecede erişilebilirlik değerine sahip akslarla bağlantılı konumda olduğu görülmektedir. Kent merkezine bağlantı sağlayan aksların erişilebilirlik düzeyinin erişim açısından önemli olduğu ortaya çıkmaktadır. Time Saver Erişilebilirlik Standartları'na göre yürünebilirlik mesafesi 400-800 metre olarak gösterilmektedir (Harris &Dines, 1998). Alan kent merkezine yürünebilirlik mesafesi içerisinde değildir bu nedenle yaya erişimi açısından erişilebilirlik düzeyi düşüktür. Parkın en yakınında bulunan durak 600 metre mesafede olup standartlara göre yürünebilirlik mesafesi yer almaktadır. Fakat alana kent merkezinden toplu taşıma araçlarıyla ulaşılabilmektedir. Park Çankırı Merkez ilçesinde yer alması nedeniyle kullanım potansiyeli yüksek olarak değerlendirilebileceği konumdadır. Parkın kuzey doğu ve kuzey sınırlarında karayolu bulunmaktadır. Parkın kuzey batı kısmında yer alan Acıçay, kent ile arasında sınır oluşturarak kent ile ulaşımda kopukluk yaratmaktadır. İmar planına göre parkın kuzey batı yönünden geçecek karayolu yüksek derecede (kırmızı renkte) erişim düzeyi sağlanmaktadır. Bu bağlamda gelecekte kent ile entegrasyonun sağlanarak erişilebilirlik düzeyi gelişimi sağlanabilecektir.

3.2 Park içindeki erişilebilirliğin görünürlük grafik analiziyle değerlendirilmesi

Parkın tasarımına ilişkin vaziyet planı üzerinde mimari yapılar ve açık alanlar çizilmiştir. Çizilen sayısal altlık DepthmapX programına aktarılarak görünebilirlik grafik analizi yapılmıştır. Bu analiz ile park içerisinde insan görüşüne göre üç boyutlu tarama yapılmakta ve algılanabilir alanlar derecelerine göre sınıflandırılmaktadır. Öncelikle park alanı insan ölçeğine göre gridlere ayrılarak mimari yapılar dışında kalan alana görünürlük grafik analizi

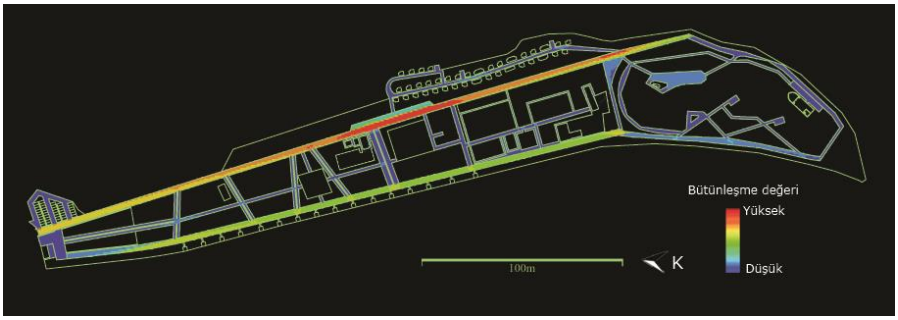
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uygulanmıştır. Çalışma alanı mevcut durumuna ait görünürlük grafik analizi Şekil 5'de verilmektedir.



Şekil 5. Parkın görünürlük grafik analizi

Görünürlük grafik analizine göre, parkın girişi, meydan, gölet sarı ve kırmızı renkte yüksek bütünleşme değerine sahipken, spor ve çocuk oyun alanları, piknik alanları, otopark mavi renkte düşük bütünleşme değerine sahiptir. Parkın orta kısmında yer alan, spor binaları, kafeterya, ihtiyaç birimleri gibi mimari binaların olduğu bölgenin düşük değerde bütünleşme değerine sahip olduğu görülmektedir. Bütünleşme değeri yüksek olan alanların algılanabilirliği de yüksektir. Park içerisindeki aksların bütünleşme haritaları ise Şekil 6'da verilmektedir.



Şekil 6. Parktaki aksların bütünleşme haritası

Park içerisinde iki ana aks bulunmaktadır. Parkın girişi ve gölet arasında ulaşım sağlayan bu akslar kırmızı ve sarı renkle yüksek bütünleşme değerine sahiptir. Ana aks olan bu yolların; kesintisiz, doğrusal ve uzun olmaları erişilebilirliklerini artırmaktadır. Dinlenme alanları bu akslar etrafında sıralanmakta olup, bu alanlar yoğun kullanım potansiyeline sahiptir. Bunun dışında kalan mekân çevrelerindeki kısa ve kesintiye uğrayan diğer aksların mavi renkle düşük bütünleşme değerine sahip olduğu görülmektedir. Parkın sınırlarına doğru gidildikçe bütünleşme değeri düşmektedir.

4. Sonuç ve Öneriler

Günümüzde hızlı kentleşme ve bununla birlikte insanların dinlenebilecekleri sosyal ve psikolojik gelişimlerini sağlayacakları kent parklarının erişilebilirliği önemli bir konudur. Özellikle Covid-19 salgını sürecinde evlerinde vakit geçiren insanların, kentlerde rahatlıkla

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ulaşabileceği parklara ihtiyaç vardır. Kentlerde yeşil alt yapı sisteminin geliştirilmesi ve yaşanabilir şehirlerin oluşturulması için parkların erişilebilirliğinin geliştirilmesi gereklidir. Kentsel yeşil alanlar, kent sakinlerine çevresel, sosyal, ekonomik vb. açılardan olumlu katkılar sağlamaları bakımından kentin önemli bileşenleridir. Bu nedenle insanların sosyalleşme amacıyla parklara kolay erişim sağlamaları son derece önemlidir. Kent ölçeğinde parkların erişilebilirlik durumu ve park içindeki mekânsal erişilebilirliğin değerlendirilmesi önem taşımaktadır.

Bu çalışma parklara erişimde yolların kent içinde ve park içinde biçimleniş şeklinin erişilebilirliğe ve mekân kullanımına etki ettiği hipotezinden hareket etmektedir. Bu doğrultuda parklara erişim sağlayan ulaşım akslarının tasarımı değerlendirmektedir. Çalışma kapsamında Çankırı'da yer alan kent parkı, kent içinde ve kendi içindeki ulaşım bağlantıları bakımından değerlendirilmesinde kullanılan mekân dizimi analizi sonuçları yüksek derecede erişilebilirlik düzeyine sahip akslarla bağlantılı konumda olduğu göstermektedir. Bütünlük değerleri yüksek olan yollardaki yeşil alanların erişilebilirlik düzeyleri daha yüksek olacağı saptanmıştır. Program çıktıları ulaşım hatları bakımından parkın erişilebilirliği uygun olduğu görülse de kent ile yeşil alan arasındaki mekânsal ilişkilerin geliştirilmesine ihtiyacı vardır. Acıçay kent ile park arasında çizgisel sınır elemanı oluştursa da imar planında geliştirilecek olan karayolu ile parkın ulaşım potansiyelini artırabilmektedir. Parkın kuzeydoğu ve güney kısmı eğimli araziden oluşmasına rağmen bu bölgelere doğru park alanın genişletilerek daha büyük bir kent parkı yaratılmalıdır. Parkın tasarım alanı geliştirilerek bu alanda tasarım yaklaşımı bakımından kentlinin eğlence, dinlenme ve kültürel etkileşimime olanak veren kullanımlara yer verilmelidir. Kullanıcıların ihtiyaçlarına cevap veren aktiviteler belirlenerek tasarıma dâhil edilmelidir. İnsanların daha çok doğaya temas etmesine imkân sağlamak amacıyla parkta bitki kullanımları artırılarak bitkisel tasarım geliştirilmelidir. Kent parkında doğayı ve ekolojik değerleri ön plana alan uygulamalar yapılarak yaşanabilir bir çevre oluşturulmalıdır. Bu amaca yönelik olarak parkın eğimli olan kısmı ile akarsu kıyısında yer alan kısmı ulaşılabilir şekilde kurgulanarak parkta işlevler buna göre konumlandırılmalıdır. Park alanı kenarından geçen Acıçay'ın alanla ilişkisi göz önünde bulundurularak, çevresi kentsel yerleşimi ayırmaktan ziyade birleştirmeyi amaçlayan tasarımlar (seyir terasları, yaya köprüleri vb.) geliştirilmelidir.

Mekân dizimi mimarlar ve kentsel tasarımcılar tarafından binaların ve şehirlerin mekânsal düzeninin insan hareketinin ve sosyal etkileşimin ekonomik, sosyal ve çevresel sonuçlarını nasıl etkilediğini incelemek için kullanılan grafik tabanlı bir teoridir (Dawson, 2002). Mekân

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dizimi, kent ve yapı ölçeğinde inşa edilmiş mekânların matematiksel yapısını hesaplayarak insan ve mekân arasındaki ilişkiyi incelemeye yarayan bir yöntemdir (Hillier ve Hanson, 1984). Öter (2008), mekân dizimi yönteminin kullanım yoğunluğu fazla alanları tespit ettiği, bu sebeple yapılacak olan yeni açık ve yeşil alanlar için bu yöntem kullanılarak yer tespiti yapılmasının daha doğru olacağını belirtmiştir. Alemdar & Özkan Özbek (2021) ise bir yerleşmede yaşayan insan topluluklarının hareket yönleri, toplanma mekânları, doğrultuları, o yerleşmenin geometrisinin oluşturduğu sisteme göre belirlendiğini ifade etmektedir. Dolayısıyla kentin strüktürel yapısı içerisinde yer alan mekânların kullanımını şekillendirmektedir. Bu çalışma erişilebilir kent parkı oluşturmak için kentlerde sürdürülebilir ulaşım modeli oluşturmak açısından değerlendirme yöntemi önermektedir. Kentin yapısını değerlendiren mekân dizimi yönteminden yola çıkarak, objektif sonuçlar edilmektedir. Bu yöntem kent parklarının erişilebilirliğinde ulaşım akslarının hareketini değerlendirmesine olanak sağlamaktadır. Mekân dizimi yöntemi kentsel ölçekte çalışabilen bir sanal beyin olması nedeniyle, diğer çalışmalarda da kullanılarak kentin gelişimi ve sürdürülebilirliğinde katkılar sunmaktadır. Bu değerlendirme yöntemi, kentlerde park yerlerinin seçimi, düzeni ve yerleşimi gibi konularda yol gösterici olmaktadır. Gelecekte kentte yeni yapılacak olan parkların yer seçimi ve mekânsal tasarımında ve kullanımların organizasyonunda bu çalışmanın çıktılarından faydalanılabilir. Diğer yandan çalışmada kullanılan yöntem farklı park örneklerinde test edilerek, parklara ilişkin çıkarılan erişilebilirlik özellikleri, diğer araştırmalarla ve yöntemlerle kıyaslanmalıdır. Çalışmadan elde edilen sonuçlar kentlerde yeşil alanların kullanımına katkı sağlayarak, yeşil alanların planlama ve tasarım ilkelerinin belirlenmesine katkı sağlayacaktır.

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Using Fuzzy Logic Based Decision Support Systems for New Function Selectionin Structures

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Abstract

These buildings, which function as important documents for the period in which they were built, and which have managed to preserve their or iginal qualities, have been abandoned as a result of various some factors and have lose their functionality. It is very important to continue to use these original structures, which have since lost their functionality, with re-functioning as opposed to a passive conservation approach. This solution brings economic, ecological and social benefits, and also ensures the sustainability of the buildings. However, in order for an existing structure to provide a new function, it is likely that a significant change and transformation will occur in the spatial arrangement of the original structure. Specification of the correct function is of great importance in order to determine this change and transformation framework and to adapt the structure to new requirements. Successful design and implementation can only be achieved after the appropriate function of the existing structure is determined. Especially in the re-functioning of the building stock on a regional basis, it is necessary to determine the selected function with a systematic and rational method in order to provide decision support to the design and construction stages for the purpose of re-use of the building. Architectural decision support systems, also known as "models," used to create a solution mechanism for multi-layered design problems can assist architects in deciding on the most appropriate function option for any building by systematizing the relationship between spatial analysis of the existing building stock and functional expectations. Inparticular, fuzzy logic-based decision support systems are the preferred method in these models, with the success of representing situations of uncertainty using mathematical methods, and consideration of the existence of variable environmental conditions in the decision-making stage, such as determining a new function for the structure. Based on the above determinations, and on the relationship between the existing capacity and the demands for change regarding the new function, the necessity of presenting the decision support as a quantitative value with a systematic and rational method in order to determine the most appropriate functionality option before the design and construction stages, for the purpose of re-use of the building, and its applicability with fuzzy logic, has been determined as the problem of this study.

Keywords: Refunctioning, adaptation, decision support systems, fuzzy logic.

Yapılarda Yeni İşlev Seçimi İçin Bulanık Mantık Tabanlı Karar Destek Sistemlerinin Kullanımı

Öz

Yapıldıkları döneme dair önemli bir belge niteliği taşıyan, özgün niteliklerini korumayı başarabilmiş yapılar, kimi faktörler neticesinde terkedilmekte ve işlevlerini yitirmektedir. İşlevini kaybetmiş özgün yapıların, pasif bir koruma anlayışı yerine, yeniden işlevlendirme ile kullanılmaya devam edilmesi oldukça önemlidir. Bu çözüm, yapıların sürdürülebilirliğinin sağlanmasının yanında ekonomik, ekolojik ve toplumsal faydaları da beraberinde getirmektedir. Fakat mevcut bir yapının yeni bir işlevi sağlayabilmesi için orijinal strüktürün mekân düzeninde, oldukça büyük değişim ve dönüşüm meydana gelmesi muhtemeldir. Bu değişim ve dönüşüm çerçevesinin belirlenmesi ve yapının yeni gereksinimlere uygun hale gelebilmesi için doğru işlev seçimi büyük önem taşımaktadır. Başarılı tasarım ve uygulama, ancak mevcut yapının uygun işlev seçeneğinin belirlenmesinden sonra gerçekleşebilir. Özellikle bölgesel bazda yapı stoğunun yeniden işlevlendirilmesinde, yapının yeniden kullanım amacına yönelik tasarım ve yapım aşamalarına karar desteği sağlamak üzere işlev seçiminin sistematik ve rasyonel bir yöntemle belirlenebilmesi gerekmektedir. Çok katmanlı tasarım problemlerine yönelik çözüm

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mekanizması oluşturabilmek adına kullanılan mimari karar destek sistemleri bir diğer adı ile modeller, mevcut yapı stoğunun mekânsal analizleri ile fonksiyona dair beklentiler arasındaki ilişkiyi sistematize ederek, herhangi bir yapı için en uygun işlev seçeneğine karar verilebilmesi adına mimarlara destek olabilir. Özellikle bulanık mantık tabanlı karar destek sistemleri, yapıya yeni işlev belirlenmesi gibi, karar verme aşamasındaki değişken ortam şartlarının varlığı göz önüne alındığında, belirsizlik durumlarını matematiksel yöntemler kullanarak temsil etme başarısı ile bu modellerde tercih edilen bir yöntem olmaktadır. Bu tespitlerden hareketle, mevcut kapasite ile yeni işleve dair değişim talepleri arasındaki ilişkiden yola çıkarak, yapının yeniden kullanım amacına yönelik tasarım ve yapım aşamalarına geçilmeden önce en uygun işlev seçeneğinin belirlenebilmesi için karar desteğinin kantitatif bir değer şeklinde sistematik ve rasyonel bir yöntemle ortaya konulmasının gerekliliği ve bunun bulanık mantık ile uygulanabilirliği bu çalışmanın sorunsalı olarak belirlenmiştir

Anahtar Kelimeler: Yeniden işlevlendirme, adaptasyon, karar destek sistemleri, bulanık mantık.

Introduction

Historical environments refer to the ruins and settlements that have survived from past periods to the present day. These ruins and settlements, which take part in the transmission of many information in the historical process, are of vital importance in ensuring the continuity of culture. A lot of unwritten information about the past periods reaches the present day through structures. The structures in the historical rural settlements, on the other hand, are examples of architecture without architects. These structures are also important because they are a means of transmitting how sustainable architecture should be in terms of criteria, such as materials, construction techniques, plan diagrams, and adaptation to the topography, which have occurred as a result of the experience gained over the years. However, rural settlements are gradually losing population because the people of the region leave these settlements due to some reasons such as economic difficulties encountered in rural areas, security, education, and health; thus, the structures that make up the settlement tissue remain unclaimed over time. In order to maintain the existence of rural dwellings, which are one of the most important elements that constitute the rural fabric and which have become open to external influences because they remain derelict and dysfunctional and are facing the danger of extinction, different conservation approaches have been developed at different periods on the scale of settlement. Investigating the adaptive reuse of the settlement, and if possible reuse of it is one of these conservation approaches. In this context, four different options can be mentioned in order to reuse rural settlements: museumization, tourism, resettlement, and reforestation (Güler, 2016).

Following the identification of the appropriate revitalization and adaptive reuse option for the current settlement, it is inevitable that many of the structures shaped according to the time to which they belong will be loaded with a new function other than their original function. The fact that the structures maintain their economic life with their new function instead of a passive conservation understanding brings with it ecological and social benefits as well as cultural benefits. However, in order to ensure the sustainability of the structures in their original state

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as much as possible, the existing structure and the spatial requirements of the new function must be adaptable. In reuse, to be able to decide on the function option that will serve the revitalization option at the settlement scale, first of all, it is necessary to conduct spatial and environmental analyzes and, accordingly, the right choice of functions should be realized. A successful design and implementation can only be possible after this step. In the process of changing the function of single historical buildings, the intervention method can be determined by comprehensively analyzing the environmental and architectural features of the structure. But especially on a settlement basis, to be able to determine the adaptability capacity of the existing building stock and possible suitable functions, and to be able to provide decision support for the design and implementation stages, the selection of functions should be carried out systematically and rationally. At this point, support systems for decision makers can be developed for structure transformation by using multi-input models. It is thought that in this kind of multi-input design problems, a model that helps to make the right decision can support architects to decide on the most suitable function option for any structure by making spatial and environmental analyses of existing structures and systematizing the relationship between expectations about function. In particular, a decision support system based on fuzzy logic comes to the fore as a method that can be preferred in such models in cases where the most appropriate one among the adaptation options is evaluated instead of the exact results, such as determining the function.

Based on the above-mentioned considerations, in this study, it was aimed to create a fuzzy logic-based decision support system by systematizing the relationship between existing capacity and new functional change demands and to produce decision support in this way.

ConceptualContext

In this section of the study, the concepts of "re-functionalization" and "fuzzy logic", which constitute the subheadings of the research, are discussed in line with the limitations of the research, and general information about reuse and functional adaptation in structures is provided.

Re-functionalization

When it is aimed to protect an existing structure, there are various methods that can be applied. *Re-functionalization* is one of these methods. It can be expressed as an intervention to extend the life of the structure by adapting it to a need that is different from its function at the first construction time (Yıldırım&Turan, 2002). Structures bearing the traces of the period in which

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they were built become unable to meet the requirements expected from them over time as a result of changes occurring in the structure and identity of society. Especially with regard to the structures in settlements that have lost their population as a result of various factors, an overall dis-functionalization can be talked about. Structures that are out of function become structurally unusable over time by becoming vulnerable to the corrosive effects of external environmental conditions. Giving a new function to the civil architecture samples, which have the nature of historical documents, by preserving their structural features with certain principles ensures the transfer of memory and culture in addition to providing a significant amount of energy and resource conservation. When the sustainability of the existing structure is aimed with a new function, it is inevitable to experience a change and transformation in the existing space layout with a new program. In this process of change and transformation, which can be defined as adaptation in reuse, the adaptation of the structure in a way that can serve the new function and the preservation of its original identity should be considered in combination. Sustainable adaptation can only be possible in this way. The first step to be taken for this is to select the right function for the structure and perform a successful design and implementation (Aksoya&Aydın, 2015).

The sustainability and habitability of the structure depend on the adaptability of the existing structure to the requirements of the new function. The adaptation of the function to be given to the structure with the old space means that the context and spatial possibilities overlap (Büyükarslan&Güney, 2013; Kutlu&Ergün, 2021). Therefore, the spatial requirements of the new function should be questioned and its compliance with the structure should be well analyzed. For this, it is relatively easier to perform detailed analysis studies on the basis of a singular structure. However, a preliminary decision support system will inevitably be needed to be able to make decisions for a large number of structures on a settlement basis.

Fuzzy Logic

Fuzzy logic is a concept that was put forward by the mathematician Zadeh in 1965. Fuzzy logic, which is a rule-based algorithm, also represents uncertainties in contrast to classical logic. This logic type was designed inspired by the human decision-making mechanism in changing environmental conditions. With this feature, it has been used for a long time in many decision support models in the field of architecture (Baran Ergül, VarolMalkoçoğlu, &AcunÖzünler, 2022). In Fuzzy Logic, the main idea is to be able to generate other probabilities that fall between the values of 0 or 1. In classical logic, the result of a given proposition is either true or

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false. In fuzzy logic, on the other hand, intermediate values can be generated to represent uncertainties as an addition to the results of "0-1", "there is-there is not", and "yes-no" (Zadeh, 1965). The fuzzy logic system is basically based on the concept of a set and consists of three basic parts. These parts are as follows:

1. Fuzzification
2. Rule-based inference
3. Defuzzification

In fuzzification, the degrees of membership (membership value) corresponding to the value of the input variables are determined. These degrees help to determine how much an element belongs to that set or not. The function that shows the "degrees of belonging" of the set elements is called the membership function. The start and end values are included in this function. In the function (1) below, X represents the universal definition set, A represents the fuzzy set, x represents the cluster elements, and μ_A represents the membership degrees of the x cluster elements.

$$\mu_A(x): X \rightarrow [0,1] \begin{cases} \mu_A(x) = 0; \text{ the element x is not included in the set A.} \\ \mu_A(x) = 1; \text{ the element x is fully included in the set A.} \\ 0 < \mu_A(x) < 1; \textit{ the element x is a part of the set A.} \end{cases}$$

(1)

In rule-based inference, verbal rules are determined by experts using the degrees of membership coming from the fuzzification unit, and fuzzy results are obtained. That is, the result of the inference is a fuzzy set.

In defuzzification, in order for these fuzzy sets to make sense in the real world, the obtained fuzzy information is converted into information used in the real world. These operations can be performed through various mathematical operations, such as the center of gravity, weighted average, and center of area methods (Ödük, 2019).

With fuzzy logic, solutions can be produced for complex problems that classical logic cannot solve, and uncertainties that are also inherent in human nature can be represented. Thus, more objective results can be obtained by distinguishing between elements that are members of the same set.

Reuse and Functional Adaptation in Structures

The ability of unused structures to continue their service with their new function is primarily related to many issues, such as the compatibility of the function to be installed with the spatial layout of the structure (spatial adaptation) and its location in the settlement layout

ISBN: 978-625-8246-12-4

(environmental adaptation) (Aksoya&Aydın, 2015). In this context, it is possible to consider the adaptation of an old structure for the new function under two headings: "spatial functional adaptation" and "environmental functional adaptation".

Spatial functional adaptation

In re-functionalized buildings, spatial functional adaptation is determined by identifying the spatial requirements and analyzing how the use and purpose of use are affected. Since identifying the spatial requirements related to the function and measuring the adaptation of the existing structure with these requirements will also shape the future of the structure to be re-functionalized, it is very important for the sustainability of its function.

The following criteria determine the functional performance of the space in the structures that are considered to be re-functionalized:

- *spatial dimension* (the compliance of dimensional characteristics for the intended use of the new function and for users),
- *circulation/circulation* (compliance of the existing circulation scheme of the structure with the functional relations of the new function),
- *zoning/communication/workflow* (being able to meet some of the possibilities of the new function, such as service),
- *flexibility / change* (adaptation of the current state of the structure to the needs of the new function, adaptation of the structure to the current situation, functional adaptation and flexibility of the reinforcement elements)
- use /specialization (being a harmony between the original function of the structure and its reuse)"

Environmental functional adaptation

The re-functionalized structures continue to exist and are protected if they benefit the environment and the people of the region and if they can respond to environmental needs. Thanks to the re-functionalizing, it is possible to contribute to the environment by taking advantage of the existing structures, the sustainability of the settlement is supported, and it is ensured that future generations benefit from these resources (Dyllick&Hockerts, 2002; Aydın&Yaldız, 2010). In this context, the environmental performance of the place can be evaluated through creating a benchmark in the environment (emphasizing the cultural and historical value of the region, being a means of description in the environment in which it is located, and accepting a new function in the city as a whole) and symbolic value (revealing the

ISBN: 978-625-8246-12-4

urban symbolic value, aesthetic value, document value of the building) (Yaldız, 2013). In addition, the location of the structure within the settlement, reachability as pedestrians and vehicles, accessibility for different users, or adaptability to the accessibility nature can be considered within the environmental functional adaptation criteria.

The reuse and functional adaptation table for the structures created in accordance with the specified performance criteria is shown in Figure 1. In the study, these adaptation criteria were analyzed, and in order to determine the ranges for all criteria, values were determined based on literature research.

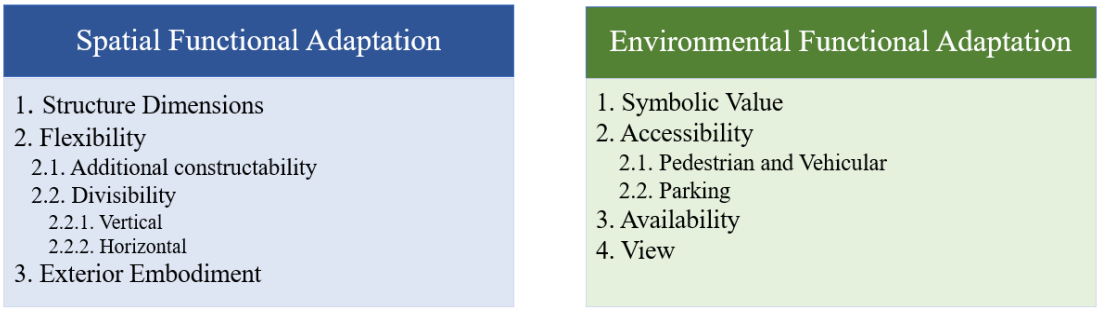


Figure.1 Reuse and functional adaptation table for structures

Materials and Methods

Benefiting from decision support systems for re-functionalizing an existing building stock in a way that will serve the re-evaluation decision taken on a settlement basis will increase the efficiency of the design and implementation processes. Therefore, the study focused on the development of a fuzzy logic-based model for the selection of new functions in structures. The main reason for choosing a fuzzy logic algorithm in the model is that fuzzy logic can produce results that are not sharp and have high accuracy in uncertain ambient conditions. For this reason, it allows space for intuitiveness due to the nature of the design. Fuzzy logic can transform the design into a more subjective structure in a multi-layered decision process such as the selection of new functions in structures by ensuring that the designers' point of view and the variable environmental conditions in which the design is carried out are also included in the decision mechanism.

In this context, the fuzzy logic algorithm was used in the MATLAB environment for the purpose of creating a model for the selection of new functions in structures. The starting and ending ranges of the membership functions were determined in accordance with the expert opinion. The Mamdani controller was used. As shown in Figure 2, there are 9 inputs and 4 outputs in the model. Each input and output value consists of continuous sets with a certain range.

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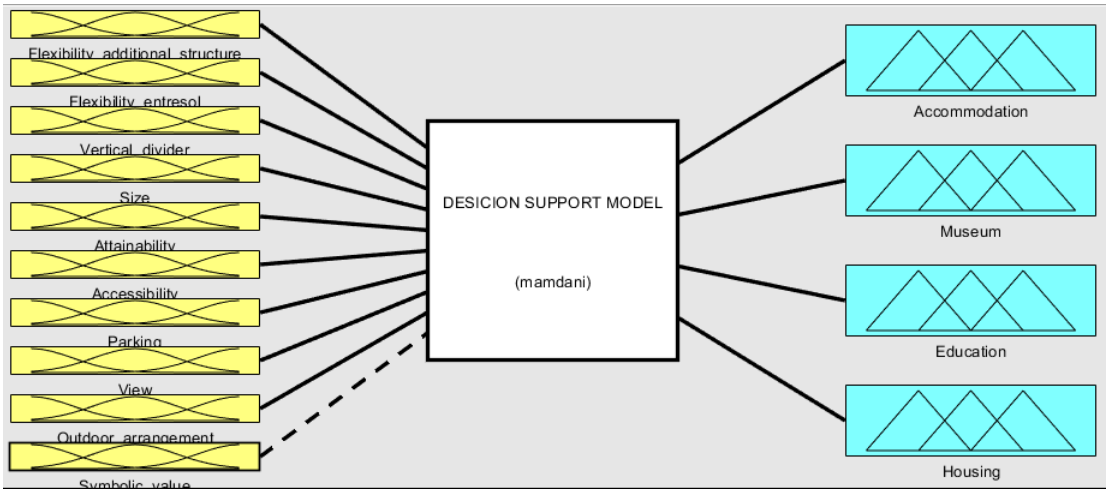


Figure 2. Fuzzy Logic-Based Decision Support Model

The entry parameters were determined based on the spatial and environmental adaptation criteria. These criteria were concretized and evaluated in order to be included in the algorithm. For example, the horizontal divisibility criterion included in the flexibility criterion was evaluated based on the floor height. In addition, flexibility, which allows changes to the plan according to the new function, was included in the algorithm depending on the vertical divisibility axle range. The parking criteria included in the functional adaptation parameter in terms of environmental point of view were numbered taking into account whether there were enough parking lots in and around the structure, whether the structure had a relationship with the surrounding parking lots, or whether there is an urban place that can be considered as a parking lot. The target values related to all these criteria were obtained from the literature review and the opinions emerging in the focus group study. The range values determined for the mentioned properties are shown in Table 1 and Table 2.

Table 1. Membership functions belonging to each input property

Input Parameters	Degree of Membership		
	Name	Parameters	Types
Flexibility_additional_structure	None	[0 0 0]	trimf
	Small	[0 1 2]	trimf
	Medium	[1 2 3]	trimf
	Large	[2 3]	smf
Flexibilit _entresol	None	[2 3]	zmf
	Small	[2.5 3.25 4]	trimf
	Medium	[3.5 4.25 5]	trimf
	Large	[4.5 6]	smf
Vertical_divider	Small	[1 2.25 3.5]	trimf
	Medium	[2.75 4 5.25]	trimf
	Large	[4.5 6]	smf
Size	Small	[1 75 150]	trimf
	Medium	[120 235 350]	trimf
	Large	[300 500]	smf
Attainability	Small	[0 1 2]	trimf
	Medium	[1 2 3]	trimf

ISBN: 978-625-8246-12-4

	Large	[2 4]	smf
Accessibility	None	[0 0 0]	trimf
	Small	[0 1 2]	trimf
	Medium	[1 2 3]	trimf
	Large	[2 3]	smf
Parking	None	[0 1]	zmf
	Small	[0.5 1 1.5]	trimf
	Medium	[1.5 2 2.5]	trimf
	Large	[2 3]	smf
View	Small	[1 2]	zmf
	Medium	[1.5 2 2.5]	trimf
	Large	[2 3]	smf
Outdoor_arrangment	None	[0 1]	zmf
	Small	[0.5 1 1.5]	trimf
	Medium	[1.5 2 2.5]	trimf
	Large	[2 3]	smf
Symbolic_value	None	[0 0 0]	trimf
	Small	[0 1 2]	trimf
	Medium	[1 2 3]	trimf
	Large	[2 4]	smf

Table 2. Membership functions belonging to each output property

Output Parameters	Degree of Membership		
	Name	Parameters	Types
Accommodation	Small	[0 0 40]	trimf
	Medium	[20 50 80]	trimf
	Large	[60 100 100]	trimf
Museum	Small	[0 0 40]	trimf
	Medium	[20 50 80]	trimf
	Large	[60 100 100]	trimf
Education	Small	[0 0 40]	trimf
	Medium	[20 50 80]	trimf
	Large	[60 100 100]	trimf
Housing	Small	[0 0 40]	trimf
	Medium	[20 50 80]	trimf
	Large	[60 100 100]	trimf

In the next step of the creation of the model, the structure types were determined. In the re-evaluation and selection of structures, the possibilities of new functions are quite numerous. However, in this study, re-evaluation alternatives were focused on for settlements of a rural nature, especially those that had been abandoned as a result of various factors, and the structure types that can serve options such as musealization, tourism, resettlement, and forestation were tried to be determined (Güler, 2016). In the study, the structure types were limited to four different types as accommodation service units, educational buildings, museums, and residences in a way that can serve all the options of musealization, tourism, and resettlement of course, in different studies, it is possible that different structure types that serve different main functions may also be included in the new function options.

At the stage after determining the types of structures, their interaction with the spatial and environmental adaptation parameters determined at the previous stage was carried out and they

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are shown in Table 3. The interaction values in this table were organized based on the data obtained from the literature review, and they indicate the importance of the criteria for the mentioned structure types that have four different functions. For example, structural dimensions are most important for accommodation service units in order to implement the correct plan design. Whereas reachability is an important criterion for accommodation service units, educational structures, and museum options in terms of the sustainability of the function, it is of less importance for the housing option. Whether the structure has a symbolic value or not is evaluated as an important criterion for choosing the museum function.

Table 3. Interaction with spatial and environmental adaptation parameters

Accommodation		Education		Museum		Housing	
Structure Dimensions	high	Structure Dimensions	medium	Structure Dimensions	medium	Structure Dimensions	less
Flexibility/ Additional Constructability	high	Flexibility/ Additional Constructability	medium	Flexibility/ Additional Constructability	less	Flexibility/ Additional Constructability	none
Flexibility/ Divisibility/Vertical	medium	Flexibility/ Divisibility/Vertical	medium	Flexibility/ Divisibility/Vertical	less	Flexibility/ Divisibility/Vertical	none
Flexibility/ Divisibility/Horizontal	high	Flexibility/ Divisibility/Horizontal	medium	Flexibility/ Divisibility/Horizontal	medium	Flexibility/ Divisibility/Horizontal	less
Exterior Embodiment	medium	Exterior Embodiment	high	Exterior Embodiment	none	Exterior Embodiment	less
Symbolic Value	medium	Symbolic Value	medium	Symbolic Value	high	Symbolic Value	none
Accessibility/ Pedestrians and Vehicular	high	Accessibility/ Pedestrians and Vehicular	high	Accessibility/ Pedestrians and Vehicular	high	Accessibility/ Pedestrians and Vehicular	medium
Accessibility/Parking	high	Accessibility/Parking	medium	Accessibility/Parking	high	Accessibility/Parking	medium
Availability	high	Availability	high	Availability	high	Availability	less
View	high	View	medium	View	medium	View	less

In the model, after determining the possible structure types, the functional adaptation parameters that affect the selection of these structure types, and the interaction of these parameters with the structure types, rules were established based on these interaction states.

Findings and Discussion

In the fuzzy logic-based decision support system designed within the scope of the study, parameters, ranges of the parameters, and rules were determined by considering the literature review and the focus group. In order to test the resulting model, the results to be produced by the model were observed by taking the sample structure criteria. In this regard, the accuracy and likelihood of the results produced by the model were evaluated using a sample.

With the aim of testing the appropriateness of the decisions made by the fuzzy logic-based decision support system designed for the selection of new functions in structures, the examination of the VasfiSüsoy House, which is located in the historical vicinity of Tokat and had been re-functionalized and transformed into a Tourism Development and Education center was carried out. The study in question was conducted based on the data obtained in the study titled "A Traditional House that has been Re-Functionalized; TokatVasfiSüsoy House" (Akin, KalınbayrakErcan, Mumcuoğlu&YaprakBaşaran, 2018). VasfiSüsoy House was built in 1933

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as a residential building in the Topçular Neighborhood of Tokat, which is now declared an urban protected area. The layout features, inward-facing layout, and plan and facade features of the traditional houses in Tokat and Anatolia are also seen in the VasfiSüsoy House. The facade of the structure, which is in a garden and located on a plot of land that does not have a lot of slopes, is seen in a form leaning against the street. Considering the studies on the spatial performance of the building, and its harmony between the environment and users, the appropriateness of the Tourism Development and Education Center function for the building emerges. From the point of view of spatial and environmental functional adaptation criteria, it is seen that due to the fact that the structure is located in the garden, the outdoor arrangement value is high. The horizontal divisibility values of the structure are low due to additional constructability and floor height. However, especially due to the barn space that is present in its original structure, its vertical divisibility is possible. Although the building has a symbolic value due to the fact that it is located in the urban protected area, it is not a residential building that has taken place in the memory of the city. In addition, due to the fact that it is located within the urban protected area, the parking value was also determined as medium. As can be seen in Figure 3, when the values determined in accordance with the criteria were processed into the model, the model produced the result showing that the structure in question can be transformed into an educational structure by 87%. Based on this, it can be said that the model is able to produce correct decisions.

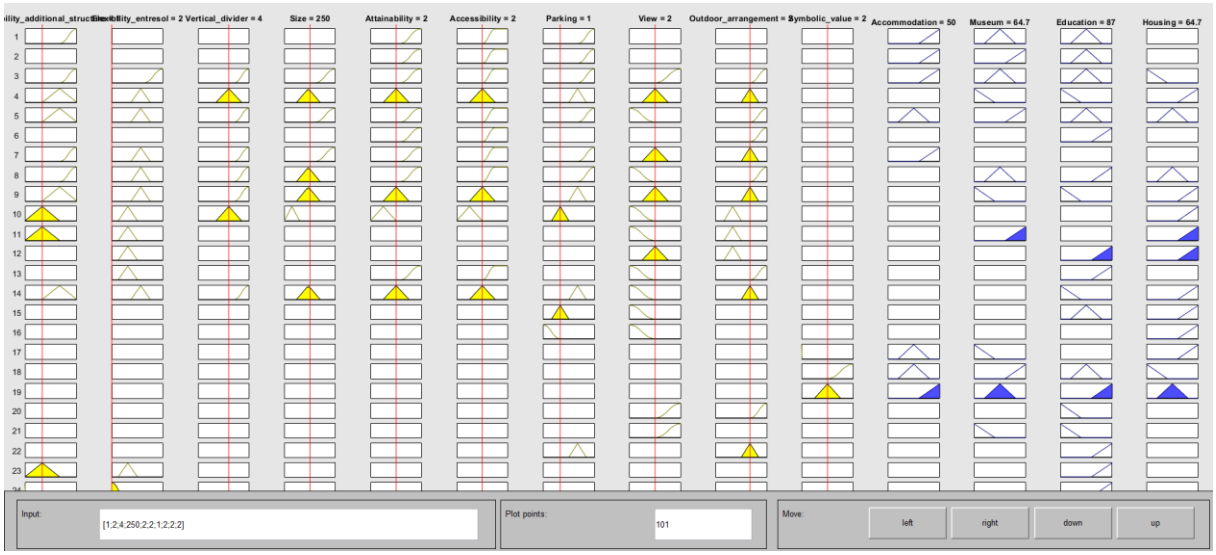


Figure 3. The example performed with the fuzzy logic-based decision support model

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Conclusion

It is seen that the fuzzy logic-based decision support model, which will be used to decide on a function option that will serve the revitalization option at the settlement scale in reuse, works if the appropriate criteria related to the structures and the rules related to the structure types are determined correctly. But in order for the model to produce healthy decisions, in the documentation studies on the existing building stock, it is very important that spatial and environmental parameters related to the reuse of structures are included as data.

The model designed within the scope of the study has 9 different input features and gives results for 4 different structure types. The number of parameters belonging to the input and output characteristics used in the structure, the range of the parameters, parameter types, and the rules created thanks to these parameters were created as a result of a focus group method and literature review. It is possible to differentiate the number and nature of the determined input and output parameters in such a way as to serve the re-evaluation option, and to include different target-oriented structure types into the model as a result of this. In the decision support system developed for the selection of new functions in structures, more than 20 rules have been determined. It is thought that the number of rules should be increased to define more detailed results.

Finally, the determination of the interaction between the structure types and the functional adaptation parameters, which were determined in this study by literature review and the focus group method, is planned to be carried out by an artificial intelligence-based model in a future study.

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A Qualitative Evaluation of Executive Functioning and Social Maturity of Children Attending Online Classes: A Case Study Method (October 2020-21)

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Abstract

Cognitive development and social maturity are the utmost requirements for one's growth. In consideration to children, one achieves it both at home and school. Cognitive grounding is incumbent for every child's healthy growth, for which parents send their children to school seeking growth and development. With the onset of the pandemic all over the nation, the online platform has taken its firm place, making children screen dependent for their learning and higher accomplishments. Training and Monitoring are required in higher-order skill developments, which is lacking in online classes, therefore making it strenuous for children to cope. The current research study aims at evaluating the cognitive growth and social maturity of children through a case study method (October 2020-21). Six samples were selected for the study within the age range of 5-7 years. The tools administered were the Mini-Mental state examination for Children (MMC) was adapted by Dr Gouri Rao Passi and M Jain, The Vineland Social Maturity Scale, Indian Adaptation developed by Dr A. J. Malin (1965). Each parent was interviewed and their child was thoroughly examined. Through observation and evaluation of all the functions, adopted scales, similarities, differences finding themes and categorizing them accordingly. The findings reveal differences in cognitive growth and social maturity of children attending online classes from their earlier records.

Keywords: Cognitive grounding, pandemic, training, monitoring and maturity

1. Introduction

From the creation of the human race both cognitive functioning and social maturity go together and are inseparable throughout human growth. Cognition plays an important role and is needed in every step. Cognitive functioning suggests higher-order functioning which capacitates the brain in the acquisition of knowledge, reasoning and executes goal achievement activities. According to Lezek et al., 2004, the cognitive function encompasses the domains of attention, memory, language processes visuo-construction etc. Social maturity is equally important to children and it equally progresses with chronological age. The transition of the offline world into the online can be seen due to the current conducive situation of the COVID-19 pandemic. For its rescue, technology came into the forefront and due to the sudden, on and off change of platforms we can also anticipate changes in the above-mentioned functions in both children and their parents. Though the necessary technological evolution could present new challenges in making one screen dependent on that cognitive decline and social skills development too. Social skills are learnt through socially interacting and are taught explicitly in the home and school environment in terms of familial and cultural values. To a much larger extent, social values and the behaviours associated with them are acquired incidentally through interactions, and

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particularly interactions involving language (Vygotsky, 1978, p. 27), with friends, classmates, teachers, and strangers as well as family members.

2.Methodology

2.1. Objective

1. To compare Self-help general, Self-help Dressing and Self-direction of children attending online classes before and during the pandemic.
2. To compare Sustained Attention, Episodic Memory and Language of children attending online classes before and during the pandemic.

2.2. Participants and Procedure: Qualitative case study method was used in the study where 6 participants were taken. Participants who responded up to the expectations of the researcher without hesitation were selected. About 30 participants were interviewed out of which 3 boys and 3 girls, the age range of 5-7 years along with their parents attending online classes since (October 2020-2021) were only selected keeping in view the interest of participants and their parents to give their valuable inputs in the present research. Participants' parents were also thoroughly interviewed which makes the overall sample size 18. Participation in the research was entirely voluntary and if in the middle of the session the participants felt fatigued and did not want to respond, the study was discontinued. Therefore, the sample size was reduced to 18 from the total of 35. The questionnaires were administered in paper-and-pencil format with instructions given by the researcher from the manual and subsequent assessments were carried out with the approval from children and their parents.

2.3. Measures

2.3.1. A Parent and Child Information Demographics Schedule prepared by the Researchers were administered.

2.3.2. Vineland Social Maturity Scale (VSMS): It is developed by Dr Edgar. A. Doll, 1935. This scale was ready for an understanding of parents, teachers, clinicians, Pediatricians, Psychiatrists and psychologists in all who have responsibility for guiding the development of either normal or handicapped children or adults. The very first attempt to adopt this scale to Indian cultural conditions was done by Reversal. Fr. Dr A.J. Malin while working at the Nagpur Child Guidance Center. It is designed to measure social maturation in eight social areas: Self-help General (SHG), Self-help Eating (SHE), Self-help Dressing (SHD), Self-direction (SD), Occupation (OCC), Communication (COM), Locomotion (LOM), and Socialization (SOC). The scale consists of 89 test items grouped into year levels. VSMS can be used for the age

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group of 0-15 years. The examiner should collect information on VSMS test items regarding the child's abilities through direct observation and supplement it by interviewing the mother.

2.3.3. Mini-Mental State Examination for Children (MMC) is an Adapted Version of the Mini-Mental State Examination (MMSE) developed by Folstein et.al., 1975. A version of the Mini-Mental State Examination was adapted for Indian children by Jain and Dr Gouri Rai Passi. The final version was decided consensually, comprising 13 items covering five cognitive abilities i.e., orientation (12), Focused Attention i.e., in Digit Span Forward (4) and Sustained Attention i.e., Digit Span Backward is (3) overall (7), episodic memory (3), language (14) and constructional praxis (1) with a maximum score of 37

3. Result

The major findings are put in various paragraphs:

Sustained Attention of Child A (5 years 11 months) was found to be Low. Through Parents input, it was found that the child had difficulty in focusing and takes time to grasp information. Sustained Attention of Child B (6 years 1months) and Child F (6 years) were found to be Moderate. Through parents' input, it was found that the child's attention hasn't deteriorated and it's the same as before and also improving than before since the child is learning new things and paying full attention to grasp new knowledge. Sustained Attention of Child C (6 years), Child D (7 years) and Child E (5 years) were found to be High. Through Parents Input it was found that his attention has been improved more through online classes since its new platform and he is exploring.

The memory of Child A and E were found to be Moderate. Through parents' interviews, it was found that before the child had to do multiple revisions but during online classes, it was not as before.

The memory of Child B, C, D and F were found to be High. Through parents' input, it was found that the child Memory or recall ability is improving more since the child has to remember things that are new into the platform and needs to respond online.

Language of Child A, B, C, D, E and F were found to be High. Through parents' input, it was found that the child language ability was good and it is improving through the online class as the child had to listen carefully and also had to respond as soon as possible.

Child A in **Self-help General (SHG)** was found to be Normal, through Parents Input it was found that child was able to care for the toilet him/herself. Child B, C and D in (SHG) were found to be Below Normal, through parents input it was found that the child only gives a signal

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to go to the toilet. Child E and F in (SHG) were found to be Above Normal, through Parents Input it was found that the child could differentiate between AM and PM

Child A, B and C in **Self-help Dressing (SHD)** were found to be Normal, through Parents Input it was found that the child was able to bath unassisted. Child D (SHD) was found to be Below Normal, through Parents Input it was found that child was able to dress themself except to tie. Child E and F (SHD) were found to be Above Normal, through parents Input it was found child could bath self-unaided.

Child A **Self-direction (SD)** was found to be Normal, through Parents Input it was found that the child could be trusted with money. Child B, C and D in (SD) were found to be Below Normal. Child E and F (SD) were found to be Above Normal the child could not be trusted with money etc.

4. Discussion

The undertaken case study on Cognitive Functioning and Social Maturity of Children Attending Online Classes (October 2020-21) intended to conceive the sustained attention, episodic memory, language and Self-help general, Self-help Dressing and Self-direction level of a child attending online classes in comparison to previous offline classes. It was found that in terms of cognitive functioning it was found that sustained attention, language and memory is improving through online classes as there one had to be attentive while attending classes and it was also something for the child to explore. Also, self-help general and the dressing was found to be normal whereas self-direction were in the score of below normal might be because during a pandemic one doesn't get much opportunity to go out and socialize due to COVID related protocols. These functions seem to be necessary for intellectual growth, sustenance and effective functioning. Therefore, identifying both the risk and benefits can provide general intervention which can be adopted by the teacher, parents for the proper development of a child. So, an attempt has been made to understand the cognitive functioning and social maturity of children attending online classes before and during the pandemic. The result of this study will help in the identification of the various effects of technology on children's cognitive ability as well as to shed light on preventive measures if any, to draw the highest advantages for the satisfaction of the child's immediate need.

5. Conclusion

Cognitive functioning and social maturity are overall important and most important in the developing child. However, during the pandemic, the cognitive functions were found to be

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improving even with the level of social maturity. Though some level of social maturity that is self-direction was hampered due to COVID. Hence, from the findings of the present study, online classes in terms of the use of technology can be considered a boon to a child's cognitive development and some extent social maturity too.

6. Acknowledgement

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Digital Preservation Technology: The Derivative Digitalization for Our Modern Day Enterprise Architecture

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Abstract

The visible impacts of technology have cut across so many industries in the present day. Modern computing technologies are newly incorporated into human endeavors and we have seen the derivative effects of the use of digital objects in the recent times. The innovations brought by the inception of digitalization including preservation processes for trusted digital repository are able to preserve electronic materials for noticeable periods of time comparable to the traditional preservation methods. While traditional preservation practices are also developed, lack of consensus are raising questions on how to proceed with digital-based preservation processes. This paper is a descriptive survey of digital preservation technology. The paper explored a variety of digital repositories and the preservation architecture and finally, the paper discussed the major technologies for enabling trust in digital preservation architecture. Research questions and answers were given and collected from respondents using online Google form. The responses collated were subjected to reliability analysis by specialist. The paper concludes that there are so many new technologies that can help us build trust in digital preservation process and these technologies can be incorporated into operational digital preservation framework.

Keywords: Digital preservation, technology, digital objects, digitalization, modern day.

Introduction

The inception of digital technologies in the modern world post a challenge to the traditional techniques of archives, libraries and other cultural institutions in carrying out their preservation responsibility. Digital Preservation is the activities required to ensure that digital objects are relocated, maintained and safe from software and hardware obsolescence. Conventionally, the overall aim of preservation is to avoid the possibility of the destruction of materials so as to ensure their futuristic usage. Long term preservation of artifacts information on built environment is very crucial as it will help to retrofit legacy buildings and enable knowledge reuse of engineering and design solutions. Long term preservation technology are redirecting attention towards evoking data type as there are new developmental shift in architecture paradigm from analog 2D scale and plans models to digital 3D information models of building.

Related Literature

Digital preservation (DP) is the safekeeping methods of digital materials so that they can remain usable as technological advances render the original software and hardware specification obsolete (Harrod's Librarian Glossary). Wikipedia refers to digital preservation as the sets of managed activities that necessitate the continued access to preserved digital materials. In

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general, digital preservation can be defined as the managed activities necessary for the continued accessibility of the contents of a document through time and changing technology. Digital preservation can also be defined as the managed activities necessary for the long time maintenance of a byte stream sufficient to reproduce a suitable facsimile of an original document. Digital preservation enables the storage of digital documents or files for a long periods of time that transcend technological advances without concern for loss or alteration of readability. In all, digital preservation ensures that digital objects are accessible over a long period of time. Digital preservation is a core area that intersects IT problems with organizational mission and policies aimed at the implementation of long term visions using IT solution that are inherently short lived and ever changing. Rosenthal et al. (2005) explain that the goal of any digital preservation system to ensure that information remains accessible to users over a long period of time. According to the Department of Defense (2009), the major mission of Enterprise Architecture is purportedly driven by defense domain and as achieved wide acceptance at the same time (Open Group, 2009). According to Arora (2004), the Reference Model for an Open Archival Information System (OAIS) has been very influential in the digital preservation domain and provides a very high-level view of an archival organization. Enterprise Architecture incorporates digital preservation in two ways: firstly, it can be used as a management/audit tool and secondly, it can be used as a methodology for engineering design.

Digital Repository and Preservation Architecture

Digital repository is a place for the storage, accessibility and preservation of digital objects. The complexity of digital objects reflects the structure of the physical artifact which includes multiple content byte streams and specific software used to deliver dynamic results to the user. Digital object contains the entire relevant pieces of information needed to reproduce the document including byte streams, metadata and special scripts that govern dynamic behavior. A digital object might be a digitized image of a photograph, an electronic journal article, a digital video, numeric data or a complete book in digital form. It should be noted that repository do not only provides for preservation but also creates an environment for the accessibility of the objects that have been preserved.

Major Technologies for Enabling Trust in Digital Preservation

The major technologies integrated into digital preservation architecture in order to help improve trust in digital repositories include:

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1. Digital signatures:

A digital signature ensures that there is an integrity check on the digital content that is to be preserved. Digital signature technology guarantee the integrity of the digital object. Integrity is a characteristic feature which conveys that data has not been changed, lost or destroyed in an unauthorized or inadvertent manner.

2. Persistent identifiers:

A persistent identifier (PID) is a long term reference to a document, file, web page or digital object. The rapidly changing environment of digital objects calls for a method of citing or referencing an object for futuristic usage. The concept is based on assigning a globally unique name to specific digital object which can be used for the referral and retrieval of such digital object.

3. Audit Trails:

The audit trail is essential for maintaining all preservation actions performed on a representation of a record of the life cycle of the digital object. This ensures that the documented record contains sufficient detail for present and future users.

Materıals and Methods

This paper adopted a descriptive survey design approach in order ensure the adequate collection of data using online Google form questionnaire instrument. The data collected were are carefully collated and analyzed. To ensure accurate reliability index, the drafted copies of questionnaire were appropriately subjected to Cronbach's alpha reliability analysis. The result of 0.82 gave a good reliability index of the instrument. The entire exercise took place within the space of three weeks.

Results and Discussion

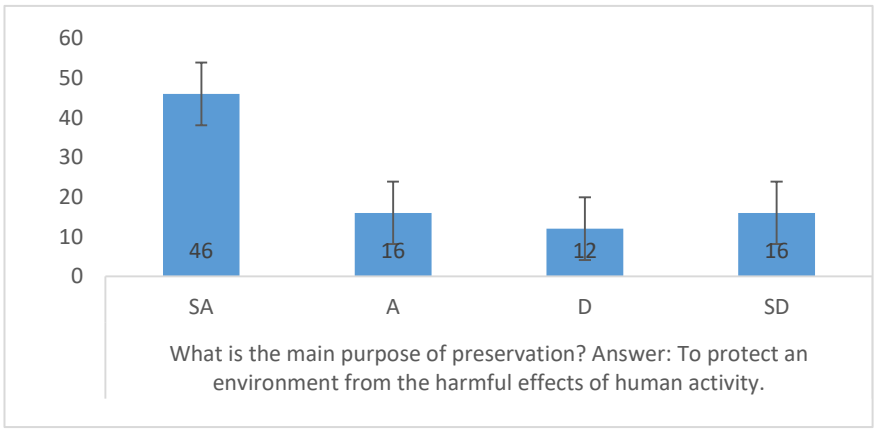


Fig. 1. Chat

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The chat analysis in Fig. 1 indicates that majority of the respondents agree that the general term 'preservation' means to protect an environment from harmful events cause by human activity. Hence, the respondents came to a conclusion that preservation activity in relation to enterprise architecture is aimed at minimizing the chemical and physical deterioration of records and to prevent the loss of informational content.

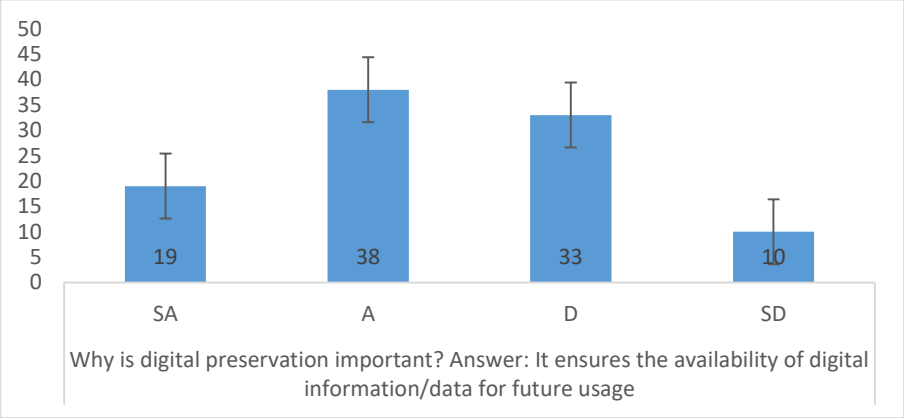


Fig.2. Chat Analysis

The responses in Fig. 2 clearly show that a high number of respondents submitted that the essence of digital preservation is directed to enhance availability of information for immediate use in the nearest future. Hence, there will be assured protection and provision for a long term usability and access when there is a futuristic need by generations to come.

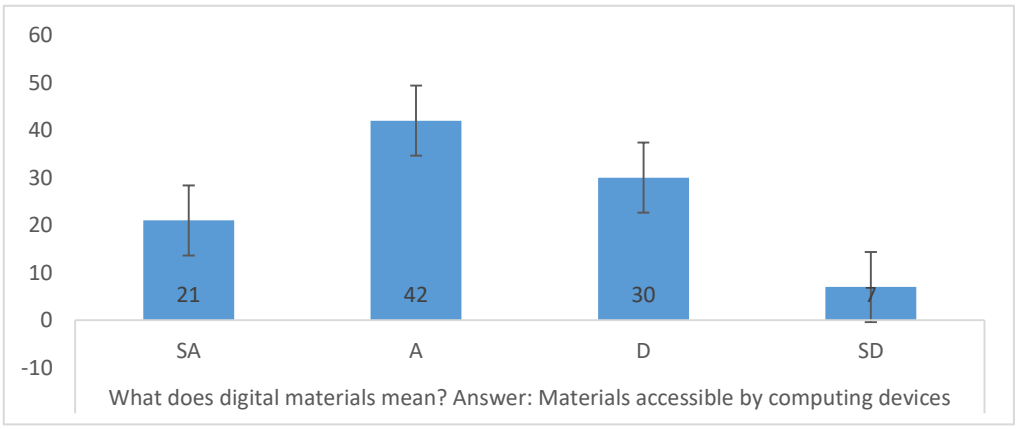


Fig.3. Chat Analysis

Fig. 3 indicates from the responses that most of the respondents affirm that digital materials or objects accessible by computing devices. The correspondents clarified that some digital materials originated in a digital form while others materials or objects were converted into digital forms as files.

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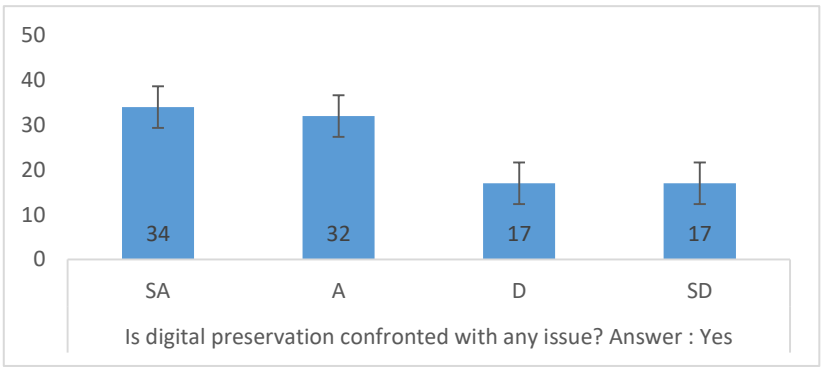


Fig.4. Chat Analysis

From the chat analysis in Fig. 4, a greater number of the respondents agree that digital preservation is faced with so many challenges. It was deduced from their response that the major ones are data loss, the fragility of storage media, file format, security and privacy concerns

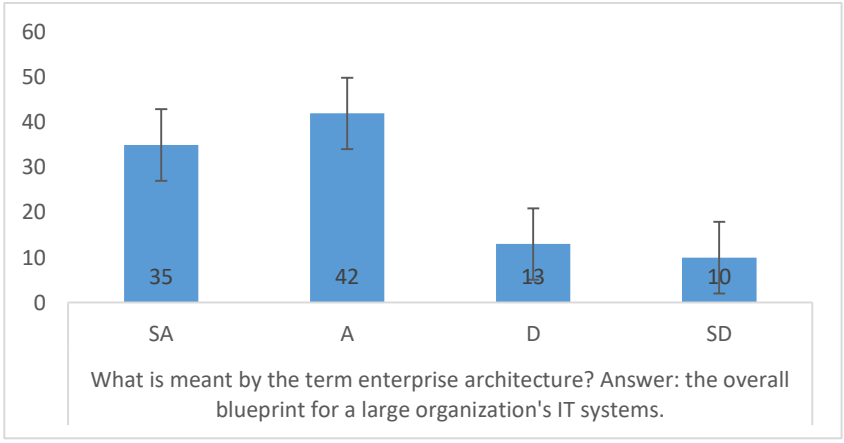


Fig.5. Chat Analysis

The pictorial representation in Fig. 5 shows that a sufficient number of respondents agree with the statement that the term 'Enterprise architecture generally refers to the IT systems of an organization. It is a proactive and holistic enterprise responses that is responsible for identifying and analyzing the execution of change toward the organizations desired outcomes.

Conclusion

In this paper, we have discussed digital preservation technology and its essentials in enterprise architecture. It was presented that there is a greater need for digital preservation as it aims at keeping digital information or materials for accessibility purpose and usability over a long time. The paper described that the derivative digitalization of enterprise architecture poses a substantial global benefits as some other technologies that can help build trust in digital preservation process if incorporated into an operational digital preservation framework.

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The Status of Housing and Public Areas Surroundings During Global Crises (Covid-19); A Review Special of Urban Design

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Abstract

With their flexible and dynamic structure, cities have faced economic, environmental and social changes from past to present. Urbanization has brought many problems in urban areas. Apart from the rapid development/growth of urban areas, many different crises that have emerged in the global world (for example Covid-19) and their effects have also shown their effect from the smallest building unit in urban areas to the regional scale. Climate change, epidemics, global economic changes, etc. crises are occurring. While climate change and economic disruptions changed cities socially and spatially, the epidemic, which suddenly affected the whole world, caused new urban habits by creating a different effect. The housing have been used as both a school, a workplace and a private living space. Technological developments also played an active role in this process. From shopping habits to sports activities, public use has completely changed. During the Covid-19 process, the use of space will be reorganized within social limitations, and the relationship between the residences of individuals and public spaces will be examined theoretically in the context of urban design principles

Keywords: Urban housing areas, public spaces, urban design, urban design principles, Covid-19

1. Introduction

Urbanization is increasing in the globalizing world. In the historical process, the structure and processes of urbanization have changed with many different breaks. Today, it is inevitable to experience crises on a global scale, as cities interact with each other with technological developments and borders are almost non-existent. Global crises have affected the whole world, and the rate of spread has increased. For this reason, cities are always faced with economic, environmental and social changes. The new urbanization has brought many problems in urban areas.

The whole world has been exposed to many different crises for centuries. Ecological, economic and human epidemics, etc. Crises have caused great changes in people's life activities. These changes have emerged with the need to adapt themselves to the difficult conditions they are exposed to. Today, the climate crisis and economic crises on a global scale still show their existence in the ongoing process. In addition, the Covid-19 epidemic, which has affected the whole world since the beginning of 2020, has emerged. With the restrictions and mandatory sanctions brought by the pandemic, the spatial, social and economic change in cities has shown itself very quickly. It has transformed and continues to transform both social life and the way

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the built environment is used in an unprecedented way. The Covid-19 pandemic is not only limited to changing people's daily activities, but also threatens the social structure and social health conditions in cities. Today, the global emergence of human activities by the pandemic in our environment has changed the socio-spatial structure. For this reason, attention is drawn to the integration of the living environment for a better future environment where social and mental comfort is provided (Milala et al., 2022).

In the pandemic process, many different interventions, legal restrictions and socio-spatial changes are emerging for the whole of the cities, starting from the houses, which are the smallest living units in the cities. The resulting restrictions on the use of public spaces have also caused many urban problems. Neighborhoods, which are a small model of cities in addition to spatial changes, are places where people meet face to face, sometimes in front of the door, sometimes on the street, sometimes in the park of the neighborhood, and where sharing is high. With the onset of the Covid-19 epidemic, socializing spaces have been restricted, and the social relations of people who try to maintain communication from balcony to balcony, at the entrance of an apartment or on the sidewalk they encounter have almost come to a breaking point (Gök & Erman, 2021). This situation shows the need for both social and spatial interventions of the pandemic process.

On the other hand, the existing systems that direct the spatial development of the cities and shape the city were insufficient in solving the emerging problems and the proposed solutions caused other new problems. Urban design, which is a new tool that will re-establish the lost unity in the cities, fill the gap between the architecture of the cities and the planning decisions, and direct the multi-disciplinary urban development process, plays an active role. It is seen that urban design theories, design principles, urban design processes are effective in arranging urban space and are defined with different approaches. However, the effectiveness of urban design in the implementation processes is changing under the conditions of the Covid-19 pandemic, which is still in effect today, similarly, the use of housing is changing, and accordingly, the use of public spaces is re-interpreted and transformed.

Çalışmanın genel amacı konut ve kamusal alan kullanımlarındaki değişimin belirlenmesi ve pandemi sürecinin getirdiği koşullara uygun olarak yeniden tasarlanma süreçlerinin teorik olarak incelenmesidir. Bu amaç doğrultusunda kentsel tasarımın konut ve kamusal alan tasarımındaki değişen rolü ele alınmıştır. Çalışma, literatürde ele alınan diğer çalışmalar ile karşılaştırıldığında teorik olarak ele alınan mekânsal değişimlerin kentsel tasarımla

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ilişkilendirilmesi, konut ve kamusal alan ilişkisinin değişen durumunun ortaya çıkarılması ile özgünlüğünü sağlamaktadır.

2. Materials And Methods

The study was designed to present the theoretical framework by conducting a literature review on the role of housing, public spaces and urban design in the Covid-19 pandemic process. The spatial changes that emerged during the pandemic process caused a rapid transformation of the functional and structural status of the existing urban structuring, residential uses and public spaces. With the onset of the pandemic, these changes, which have an important place in the literature, have been dealt with in a piecemeal manner and point solutions have been tried to be brought. However, due to the holistic development of the city, it has emerged that this situation should be handled together. In addition, it is an important question how these effects will change after the pandemic with the urban design processes. Accordingly, the study was shaped by evaluating the theoretical studies that emerged during the pandemic process. First of all, the status of current housing uses during the pandemic process has been determined. In this process, with the integration of social functions into residential areas, changes have emerged in urban uses. Secondly, the state of public space uses was evaluated within the scope of the study. In the conclusion part, the role of urban design in the relationship between housing and public space is evaluated today, when we come to the normalization process in the last period of the pandemic.

3. Findings and Discussion

Covid-19 is not the first epidemic the world has faced. Moreover, it is not the deadliest of all epidemics (Ensarioğlu, 2021). However, the physical and social structure of the urban environment leads to a socially disconnected and isolated life. High time spent in front of the screen and communities living side by side have revealed (Erdoğanaras et al., 2020). With what is happening around the world, people's lifestyles are changing and many jobs are being tried to be done remotely. People have entered the quarantine process in their homes and work from home by providing social isolation, meeting with the social environment using online connections (Erdoğanaras et al., 2020)

With the Covid-19 pandemic, life all over the world has come to a standstill from time to time, and information and communication technologies have mostly been used in order to adapt to the uncertainties and follow the agenda. The quarantine practices carried out in this process

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intensified the use of digital technology to mediate effective communication between family members and friends (Akt, Sezgin & Fırat, 2020; Junio, 2020).

3.1. Housing Use During the Pandemic

Along with the changing production and consumption habits in the 20th century, the lifestyles of societies have changed with the effect of technological developments. Urbanization, which is presented as a symbol of development, has led to a significant increase in the rate of residential user mobility. While the decrease in the preferences of living in the rural area and the increase in the demand for life in the urban area, the migration to the city affects the formation of new textures in the urban space, while the lifestyles of the people have begun to change along with it (Haksever & Markoc, 2020). Crises experienced on a global scale directly affect these processes, and urban uses and forms of urbanization change according to the difficulties experienced.

The Covid-19 pandemic that emerged today has spread rapidly all over the world. During this period, curfews were imposed. Due to compulsory situations, people have started to spend time in their homes. In addition to complying with personal hygiene measures, they should stay at home as much as possible, avoid contact with anyone other than the household, and avoid being in closed environments for a long time in order to protect the health of themselves and the environment. In the following stages, measures such as the transition of employees to work from home, the closure of schools and the transition to distance education, the temporary closure of businesses in some service sectors where interpersonal contact cannot be prevented, have seriously affected socio-economic life. During the pandemic process, the methods applied to adapt the built environment to the current conditions and to reduce the spread of the disease have begun to emerge (Ensarioğlu, 2021).

During the pandemic, people's consumption habits have changed, and this is reflected in their housing preferences. First of all, the demand for changing housing and improving living conditions has dominated, and the need for quality living conditions has become an increasing demand. There has been a change in the relationship of people residing in both structural and population-dense areas with their housing and housing satisfaction during the pandemic process. The demand for less dense residential areas and living in harmony with nature has increased. The demand for low-rise houses, especially in secondary housing areas, has increased, and people have started to continue their daily lives from their secondary houses. Due to the fact that the common areas cannot be used due to the epidemic, the people living in

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the closed complex have started to be interested in the areas in the periphery of the city with lesser floors instead of paying high fees (Haksever & Markoc, 2020). In this process, the interaction between the spatial activities of the individual, which is diversified under the influence of daily life habits, and the social structure and spatial uses, gains importance in terms of the formation of the social space (Cited by Küçükyalı & Bregger, 2022; Lefebvre, 2014). When considered within this framework, it is seen that the boundaries of the indoor-public space become ambiguous in the spatial setup of the residential areas in urban life, under the influence of the needs related to daily life, which is the basis of the need for shelter. Activities related to the domestic space, such as care services, spill over into the public space; Leisure activities, which are considered to be in the public sphere, and situations where working life is reflected in the domestic space also arise (Cited by Küçükyalı & Bregger, 2022; Hayden, 1984; Sanchez de Madariaga, 2013). As a result of the rethinking of the indoor space with the effect of the Covid-19 pandemi, the spatial intermediate situations that have become permeable in the public-domestic space setup in residential areas are being discussed again. (Küçükyalı &Bregger, 2022)

The Covid-19 has caused people to withdraw to their homes and to question themselves, their homes and social relations as well as make them question (Özbek & Eke, 2022). While lives fit into the house, houses are undergoing a multi-component change in parallel. The only reason for this change is not the compulsory needs in the process, but the desire for psychological relaxation also supports this change. It is thought that small changes made in the house during the process of staying at home will reduce the increased stress associated with staying at home and make the house a healing place (Cited by Özbek &Eke, 2022; Ak, 2020). It is clear that these habits that emerged after the pandemic will change the routine spatial habits of the past and cause us to rethink their spatial use. In addition to the different spatial realities and meanings imposed on the houses after the epidemic, it is foreseen that different spatial needs will be met and there will be demands such as creating a new atmosphere in the houses (Özbek & Eke, 2022).

3.2. Public Spaces During the Pandemic

Public spaces can be defined as public spaces that everyone can use equally and fairly, interact by socializing. Meeting points, recreation areas, gathering and dispersal points (squares) in urban areas can be exemplified as places where social-cultural activities are provided. In addition to these, public spaces can also be defined as places where social and cultural rules

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governing public behavior are dominant (Cited by Demiroğlu, 2020, Staeheli & Mitchell, 2009). Many different studies on the public sphere are the place of free communication, gathering or interaction (Demiroğlu, 2020).

During the pandemic process, the view of housing and public space has changed in line with the needs, the actions performed in these spaces have differentiated, and the actions of each space have diversified. In this process, with curfews, temporarily closed businesses and white-collar working opportunities with the flexibility of working from home, the pace of urban life has slowed down, the time spent in the dwelling has increased considerably. increased. In addition to not being able to use public spaces as a result of prohibitions, they were insufficient in terms of meeting these needs due to the physical adequacy arranged in proportion to the urban population density and their inaccessibility within walking distance (Oğuz & Uzun, 2022).

The elements of the built environment that were most affected by the epidemic process were public spaces. The public spaces where crowded groups of people come together and where the socialization that makes the city a city is experienced has turned into areas where people are afraid to be and spend as little time as possible during the epidemic. However, public spaces are extremely important urban images for the user, they have an important place in the formation of cultural memory. In the post-pandemic period, the need to organize public spaces in a way that will encourage the re-socialization of the citizens, offer areas of use in accordance with the new norms, and reopen them to active use has emerged. In this sense, it is predicted that the experiences gained during the epidemic will bring along new alternatives for the use of urban space (Ensarioğlu, 2021).

During the epidemic process, open spaces were preferred in public spaces due to restrictions such as not being in crowded places due to health-related reasons, legal bans, and pandemic process measures. Closed public spaces have begun to be used in a controlled manner. This situation has caused imbalances that suddenly appeared in the use of the space. Existing open public spaces were inadequate within these limitations, difficulty in accessing emerged and faced with many problems that were not considered in the current planning system. For example, large urban parks and urban forests play an important role in meeting the city's need for fresh air. However, as the epidemic process shows, neighborhood-scale parks, which are more easily accessible to those living in the city and within walking distance of the living area,

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are of vital importance (Cited by Ensarioğlu, 2021; Koca & Tutal, 2021; Partigöç & Turhan, 2020; Ugolini et al., 2020).

On the other hand, many urban imbalances have emerged such as the decrease in socio-cultural activities, the emergence of unused areas in cities, and the emergence of difficulties in accessing shopping centers and commercial areas. The fact that the spatial and demographic distributions of the cities have entered into a different balance directs the possible changes in the urban areas.

3.3. Change in Housing and Public Space Use During the Pandemic

With the Covid-19, the time spent indoors has decreased, and people have sought more open spaces. The pandemic, which brings with it social and spatial effects, has affected all of our lives, and many concepts (social distance, quarantine, etc.) that we have not been familiar with until now have settled in the very center of our daily lives. (Güvlü & Yılmaz, 2021). The limited open public spaces in the immediate environment where people can spend time apart from housing and indoor spaces have made temporary structures that can be built in intermediate spaces in the immediate environment an alternative. It can be said that temporary structures built in open public spaces are in an intermediary position between people, nature and the built environment, and act as a catalyst between all these factors. Temporary structures that benefit both the enrichment of social life and the character of the city can be places where social production is provided by gathering people together (Gök & Erman, 2021).

Distance rules, which entered our lives with the pandemic, have become important measures such as the maximum number of users per square meter in public spaces. Although it is an open space, some public spaces have become areas that cause people to come together in a cramped order due to their intense use. The coming together of urban equipment and even its designs were affected by this process, and with the reduction of restrictions, an organization was tried to be created in open and green areas in accordance with social distance rules (Güvlü &Yılmaz, 2021)

It is thought that the spaces that we include directly inside or outside can serve as an interface as well as the physical transition points that connect the private space with the public space. In this direction, although it is generally defined as physical contact points such as doors, balconies, and hallways, it has shown that interior spaces should also be considered as a different dimension of the interface due to the intersections in actions during the pandemic. The use of the same space with different functions, its adaptation with different actions during the day, or the adaptation of oneself to this space showed that the actions taking place there became

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more important than the defined function of the space, and compared the usage situation in the house and the city street, which is the close residential environment, during the quarantine process (Oğuz a& Uzun, 2007). 2022). As seen in Figure 3.1, public space and residential uses intersect in terms of needs. In addition, different solution processes and new functions have been started to be defined for each usage area.

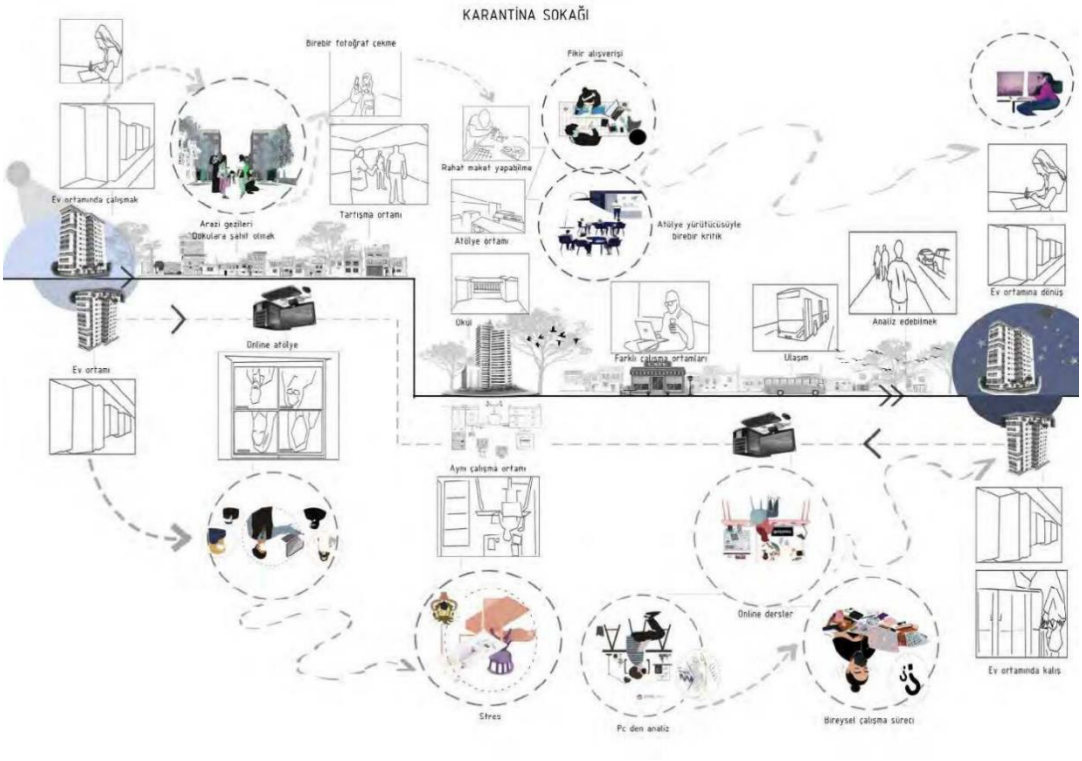


Figure 3.1. Different uses of the house and its surroundings during the day and conflicting actions (Oğuz &Uzun, 2022).

The pandemic process has led to increased street connectivity, utilitarian walking and physical activity in communities where those living in urban centers have easy access to various public facilities. In addition, the need for the development and reorganization of alternative urban systems that form the infrastructure of bicycle and pedestrian paths, sufficient pavement widths, road grading, street connection, neighborhood accessibility in living areas away from the city center has emerged (Erdoğanaras et al., 2020). Urban uses according to close walking distance at neighborhood scale are given in Figure 3.2.

Differentiation in the use of housing can be divided into public spaces, workplaces, educational spaces, etc. of the private space. As a result of the transformation, unused areas have started to appear in the urban neighborhood. People have tried to fulfill many activities in residences with private areas. This situation has also revealed the inadequacy of spatial uses for different functions within the residence for some people. This situation has led to the preference of

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secondary houses, detached houses and less dense residential areas in the peripheries. This demographic change in the city and the new emerging urban needs have revealed the necessity of reorganization.

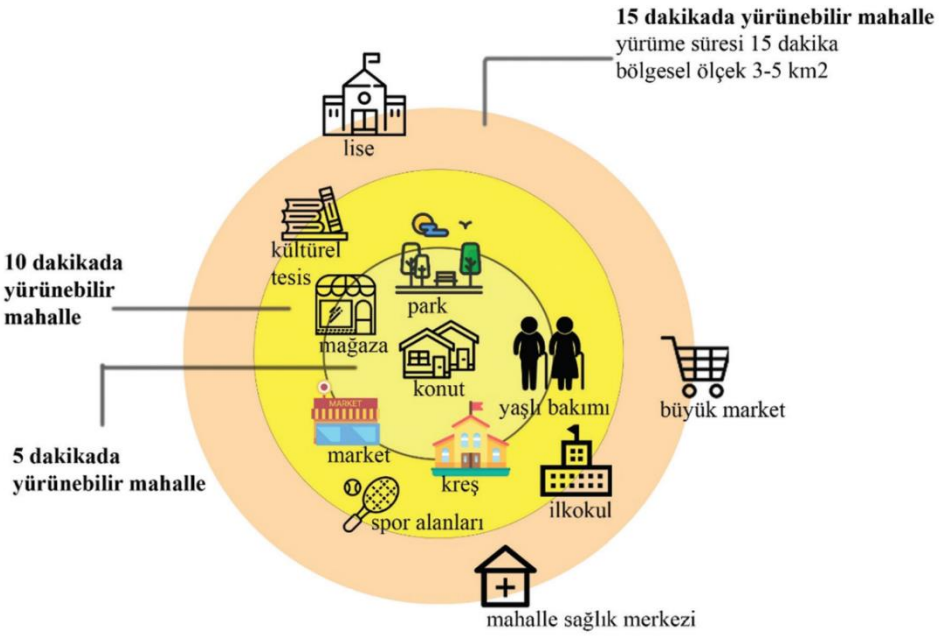


Figure 3.2. 5-10 and 15 Minutes Walkable Neighborhood (Acted by Erdoğanaras et al., 2020; Wenga et al., 2019)

In the study of Özbek & Eke (2022), it was emphasized that the importance of the use of gardens and balconies increased within the scope of housing use during the pandemic process. Relations with the outdoors gained importance; Demand for residences with open/semi-open areas such as balconies and terraces has increased. However, since it may be difficult to meet these features in every housing project, it is clear that innovative and creative internal-external relationship constructs will be needed. The focus of the forms of intervention in the space is to respond to the space setups that will meet the privacy and personal space needs of the user, as well as respond to the changing daily routines and spending time of the residence. Undoubtedly, the most needed environment is the state of communication when spending a long time at home away from public life and spaces. At this point, façade and roof systems that will make the houses more open to communication with the exterior in their current layouts have been directed, and where this cannot be achieved, equipment designs that create a special environment for plants in the interior are suggested (Özbek & Eke, 2022). In Figure 3.3, the example of the Urban Village project, which aims to increase social isolation and meet the need for affordable housing, is one of the examples that emerged in this process. They are designed

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as healthy spaces where urban areas are more inward-oriented, self-sufficient and open spaces are concentrated.



Figure 3.3. Urban Village project to increase social isolation and meet the need for affordable housing, (URL-1, Access Date; 2022)

On the other hand, different examples have emerged for purposes such as changing the existing housing typologies contextually and creating a public effect in small spaces. As can be seen in Figure 3.4, housing projects have emerged that contain many different functions apart from the need for accommodation, meet the open space needs of people, and provide public activities (sports area, resting and socializing places, etc.)



Figure 3.4. Example of Housing Transformed After the Pandemic, (URL-2, Access Date; 2022)

Housing use has increased during the pandemic process and has transformed in the ways mentioned before according to new needs. This has limited the use of existing public spaces. At the same time, the use of open spaces has increased and the existing open spaces have become insufficient. In particular, access to public spaces and limitations of persons have also

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led to the emergence of different problems. Different solutions have been sought in the design of public spaces. These solution proposals are structured to prevent the individualization of people during the pandemic process and to adapt to the epidemic conditions at the same time.

3.4. Reorganization of Living Spaces and the Role of Urban Design in the Pandemic Process

During the Covid-19 epidemic process, the changes in public spaces and residential uses have been tried to be organized in a fragmented way with many different design solution processes and approaches. Solution processes for the emerging direct problem have been shaped in line with the user's own possibilities, as well as professional solution suggestions. However, these sudden breaks in the existing urban system have also caused many problems. For the general purpose of the study, it is thought that this process can be regulated with urban design interventions, and it will be an important design tool for being controlled and prepared in the pre-pandemic and post-pandemic processes.

First of all, urban design is the most important transition platform between different disciplines. It is the area where inter-scale interaction and harmony are designed in the transition from urban planning to architectural and landscape values. urban design; It can be defined as a process used to shape, use and organize the urban environment in general terms (Aydıngün, 2000).

In the current upper scale planning processes and urban design scale, urban uses are arranged with each other in their organizational forms. In urban design processes, it is a priority to consider the optimum benefit and public interest according to the current demands. However, these demands and requirements have changed during the pandemic process. Designs that do not directly address certain standards and that are designed for social characteristics and physical constraints are suitable for the pandemic process. Urban design not only organizes the physical arrangements of the environment it deals with, but also examines the ecological, economic, social and political aspects and seeks to find solutions. It is important to consider the work area with its environment. Thus, it is responsible for both the area it has designed and the integration of this area with its environment in the context of ensuring urban continuity and its impact on its environment.

Visual and functional diversity in urban areas is a feature that users need psychologically. Pedestrians are looking for interestingness, variety and rapid changes in the outdoors. The fact that the structures that limit urban spaces have functions that are used at various times of the day, bring vitality to the outdoor life. For example, the fact that the squares are surrounded by

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various activities prevents these areas from becoming places to walk. In this sense, creating spatially quality open public spaces will contribute to the quality and healthy development of the social structure (Uzgören & Erdönmez, 2017).

In urban areas, it is important to correctly read, perceive, evaluate and observe the determinants of the existing ones. The design and construction process of the built environment, which will form the whole, will determine the degree of success for the totality that is expected to be realized by benefiting from the unity of social and spatial differences. Especially due to the conditions brought by the pandemic process, adopting a holistic approach in the trilogy of planning-urban design-architecture, 'planning architecture and the city together', and new relational structures of public space use and housing use can be sustained in a healthy way. It is clear that the binding role of urban design will provide fast and guiding solutions not only in the pandemic process but also in many similar global crises.

4. Conclusion and Recommendations

The age we live in has undergone a rapid change, causing a different pattern of need to emerge every new day. The pandemic, which has become the biggest and primary problem of our day, has also caused the change that has been experienced non-stop. This differentiation, which causes our daily routines, eating and drinking habits, the places we use to socialize, our education and business lives to change radically, forces the people of the twenty-first century to transform to meet their needs and adapt them to the present. Undoubtedly, the places that form the basis of our lives are among the things most affected by this transformation during the pandemic process (Güvlü &Yılmaz, 2021). This process, which has changed our spatial uses as much as possible, has now shown that some permanent changes are required, both personally and socially, and has changed the design needs of almost all built environments.

In the house, which is the personal space of the individual, a different fiction emerges from the use of traditional public-domestic space. The public space-housing relationship experienced during the pandemic process entered a different process and revealed common intersecting space fictions. It is important to consider these common areas between housing and public space in a broad context and especially through intersections. In this process, the change of needs and the diversification of the actions in the house also caused some public actions to be carried out in the house. This situation necessitated the integration of the public qualities of the house, which is identified with privacy. In order to create design guides regarding its changing and transforming function and form, the necessity of understanding the definitions and overlaps of

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private and public space uses emerges as a result of examining the private and public actions of the users and the space(s) where these actions can take place. For this reason, it is important to observe the changing needs and reactions of the user and to examine the regulations arising from the need. (Oguz & Uzun, 2022).

Functional changes in residential uses have accelerated the adaptation of the society to the pandemic process. The houses, which are based on the need for shelter, have started to host many different functions. It has brought the process of designing physically wider balconies, larger halls and privacy areas within the residence to be more privatized. At the same time, garden, balcony, large halls and accessibility came to the fore as important factors in housing preferences. While the pandemic process caused such changes in residences, it caused demographic movements in the whole city, decentralization of city centers and changes in the use of public spaces. The decrease in the use of public spaces and the emergence of problems related to accessibility have revealed different design processes. Especially with the spatial and personal restrictions brought by the pandemic, the importance of open spaces has increased and the visibility of open public spaces in urban areas has increased. Increasing demand for open public spaces necessitated the redesign of urban spaces.

Due to its inclusiveness and human-oriented solutions, urban design has an important role as a solution tool in urban areas to these crises that have emerged on a global scale. It is considered to be important in designing new solution processes, especially in uncontrollable mandatory situations. It is clear that some quick solutions brought by the use of housing and public spaces that emerged during the pandemic will also have a significant impact on the integration of urban areas. Especially in cases where new spatial habits are maintained or not maintained after the pandemic, its importance will emerge.

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Investigation of Sustainability Based Assessment Tools in terms of Urban Landscape Quality

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Abstract

Due to the lifestyles of people in urban areas and the designed urban spaces, the interaction between humans and the natural environment has decreased in an unprecedented way in history. In addition to the psychological effects of this situation on people, researchers have emphasized many problems such as the destruction of nature, the decrease in biodiversity, and global climate change. The European Landscape Convention underlines the urgent need to define, evaluate and protect different landscape types across Europe. One of the steps to achieving this is recognizing landscape quality, as not only landscapes of exceptional beauty must be protected, but also everyday areas, including rural and urban areas.

The methodological approaches put forward by the researchers aimed to guide how to adapt natural processes to the city more efficiently and sustainably. For this reason, researchers have developed various sustainability assessment methods. For example, the Building Research Establishment Environmental Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED), and Biodiversity Sensitive Urban Design (BSUD) methods are some of them. While greening of the built environment has been widely adopted in this process, one important element is largely missing: robust standards to guide the creation of sustainable landscapes with and without buildings. (Sustainable Sites Initiative) The SITES Rating System is based on the idea that, unlike buildings, properly designed landscapes can improve and renew natural systems. In this study, sustainability-based certification processes were investigated and compared in terms of evaluating urban landscape quality. The SITES initiative also sets "green" design and construction standards for large campuses, public parks, conservation areas, private resorts, recreation areas, or transportation and service corridors. SITES also touches on the social dimension of sustainability and the linking of natural and cultural processes. In this context, it is seen as an important step in ensuring sustainability and adapting natural processes to the built environment.

Keywords: Sustainability, landscape quality, sustainable development, sustainable cities, landscape architecture.

Introduction

The concepts of sustainability and sustainable development have long been one of the most used words in urban studies. Sustainability became prominent in 1987 when the Brundtland Report explained sustainable development as "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987; Wan & Ng, 2018). As reported by the United Nations' World Commission on Environment and Development, sustainability includes the elements of the environment, economy, and equity (Portney, 2015). Protecting the environment, ensuring economic development and growth, promoting equality, and ensuring the balance between these three elements mean sustainability. According to Jabareen (2006),

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the term sustainability refers to the potential of an ecosystem to subsist with no change over time and has an ecological perspective. When the idea of development is added, the concept is no longer viewed in terms of the environment, but in terms of society (Reboratti, 1999) and capital economy. "This paradox is represented in the most frequently used explanations of sustainable development: that of the Brundtland Report, which minimizes the environment while underlining human needs to be realized through development. Therefore, sustainability is seen as an environmental 'logo' and development as an economic one. The approach of sustainable development aims to mitigate and moderate the paradox between the two"(Jabareen, 2006). Ongoing urbanization and the relatively greater environmental footprint of urban residents has been an important factor in cities' overall goals of achieving sustainable development (Girardet, 2008/1999; Wangel et al., 2015).

Early attempts to re-establish the natural environment in urban areas have focused on the environment where the community lives. For example, the Garden City Movement proposed by Howard has studied independent communities surrounded by "green belts", including housing, industry, and agriculture (Howard, 2007). In the late 1970s, Seymour advocated self-sufficient lifestyles (Seymour, 1976) and formed several communities that nurtured self-sufficient lives and cared for the Earth. A pragmatic "more self-sufficient" approach has been adopted as a more realistic goal for contemporary communities inspired by Seymour (Bates, 2016). This philosophy can also lead to wider participation in the framework of participatory planning in urban greening studies. Although studies have identified positive outcomes of participatory urban planning and design approaches, such approaches have been criticized for reinforcing power relations and promoting elite views. Therefore, equal representation of stakeholders is an issue that needs attention to obtain input (Xing et al., 2014; Alexander, 1985). Participatory planning processes can be strengthened by open and transparent communication of potential actions to help identify and encourage community action as a basis for nature-based urban solutions (Xing, 2017). In addition to community actions, government policies play a significant role in shaping green actions. Policies and incentives are mostly focused on global warming. In dense urban areas to reduce the harm that people have to nature, to prevent air pollution and urban heat islands; green walls, roof gardens, and greening were suggested. Solutions such as rainwater management have also been put forward to ensure the efficient use of water (Grant et al., 2003; Toronto City Planning, 2015; Wilebore, 2013). In Switzerland and Germany, many laws related to the issue have entered into force. In Germany, 43% of cities

ISBN: 978-625-8246-12-4

offer financial incentives for roof gardening. Many UK cities have created their urban greening program under the law (Grant et al., 2003).

In this regard, new approaches, which are developed by researchers, are the third important component for the adaptation of nature to cities. These methodological approaches are also able to understand the importance of the issue and provide guidance on how to adapt natural processes to the city in a more efficient, economical, and sustainable way. Moreover, an interdisciplinary approach is necessary for the proper construction and implementation of research. The integration of natural processes into urban areas can only be achieved through principles and decisions established by a common language and methodology among disciplines. In this framework, researchers have developed comprehensive sustainability assessment Tools (SATs). To ensure sustainability as a whole, landscape quality components contribute to our approach to the environment from a holistic perspective. For this reason, considering the basic principles of sustainability, an important step in ensuring sustainability is related to increasing the quality of life of society. Furthermore, landscape quality is an important factor in ensuring the sustainability of cities in all aspects (economic, ecological, cultural, social, etc.). SATs aiming to ensure sustainability can contribute to the creation of qualified landscapes by including sufficient criteria in terms of landscape quality components.

This study, it is aimed to determine which of the Sustainability Assessment Tools (SATs) is more effective in measuring the necessary components in terms of landscape quality and the features that need to be improved in SATs to increase the quality of life of society. Based on the aim, the development and content of SATs were examined and the tools were evaluated in terms of landscape quality by comparison method. SATs were evaluated and compared according to landscape quality components (physical-naturalistic, historical-cultural, and socio-symbolic) proposed by Clementi (2002). The following sustainability assessment methods (SATs) were evaluated in this study.

- The Building Research Establishment Environmental Assessment Method (BREEAM),
- Leadership in Energy and Environmental Design (LEED),
- Biodiversity Sensitive Urban Design (BSUD)
- The SITES (Sustainable Sites Initiative)

As a result of the research, it is seen that landscape quality components can be used in the development of sustainability tools as an approach that provides the opportunity to examine the principles of sustainability in a strengthened way. In this context, when the tools are examined

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in terms of landscape quality, it is seen that environmental processes are evaluated at a limited level in the implementation of the Building Research Organization Environmental Assessment Method (BREEAM) and Leadership in Energy and Environmental Design (LEED) methods. Later, approaches such as Biodiversity Responsive Urban Design (BSUD), which deal with natural processes, seem to include the social component more in the process. SITES, on the other hand, evaluates the building and its environment as a whole and responds to most of the landscape quality components.

Landscape Quality and Sustainability

Creating a criterion system for the correct design of a city is a handicap that has been tried to be dealt with since the birth of landscape architecture. Planners, designers, citizens, and governmental agencies are interested in creating sustainable environments that are advantageous for all users (Burley et al., 2011; Dinç & Gül, 2022). The landscape is shaped as a result of a series of human and natural processes. Therefore, the landscape plays an important role in determining the quality of life for people who are in daily contact with it, and meeting people's demands for landscape quality becomes everyone's responsibility (European Council, 2000; Regione Piemonte, 2003; Regione Umbria, 2009). In this way, landscape quality plays a central role in contemporary processes for landscape analysis, planning, and design (Calcagno Maniglio, 2006; Clementi, 2002; European Council, 2000; Peano & Voghera, 2008; Romani, 2008; Vizzari, 2011). Therefore, the concept of landscape quality is discussed by researchers. It cannot be assumed that every user of a landscape perceives that area in the same way (Carmona & de Magalhaes, 2007; Dempsey, 2008). A person's definition of high quality may depend on individual perceptions, which may be influenced by other factors such as age, gender, cultural background, and religion (Worpole, 2003; Dempsey, 2008). However, it is not correct to suggest that good or high quality is a purely subjective concept. For example, few people prefer dirty, unsafe areas without vegetation to clean, safe and green public spaces (Dempsey et al., 2008). In addition, the measurement of high quality should not be limited to users'/residents' subjective opinions or satisfaction with a good or service, or their perceived ratings.

The quality of spaces can also be measured objectively, for example, by assessing building construction (Atkinson, 1995), levels of litter, and the extent of trees and greenery (Dempsey, 2006). Landscape quality is formed as a result of a series of environmental features, processes, and phenomena that are a direct result (spatial planning and landscape architecture) or a side

ISBN: 978-625-8246-12-4

effect (agriculture and industry) of human activity. Landscape quality includes spatial components (structure of land cover), ecological properties (functioning and diversity of ecosystems), visual components (harmony of forms, shapes, colors, etc., and public perceptions of this harmony), as well as a cultural value (resources and state of cultural heritage) (Cassatella & Peano, 2011; Sowińska-Świerkosz & Michalik-Śnieżek, 2020). Landscape quality is strongly bound to landscape elements and features and their spatial and functional interrelationships. Clementi (2002) classified the features related to landscape quality into 3 groups physical-natural, historical-cultural, and socio-symbolic (Figure 1).

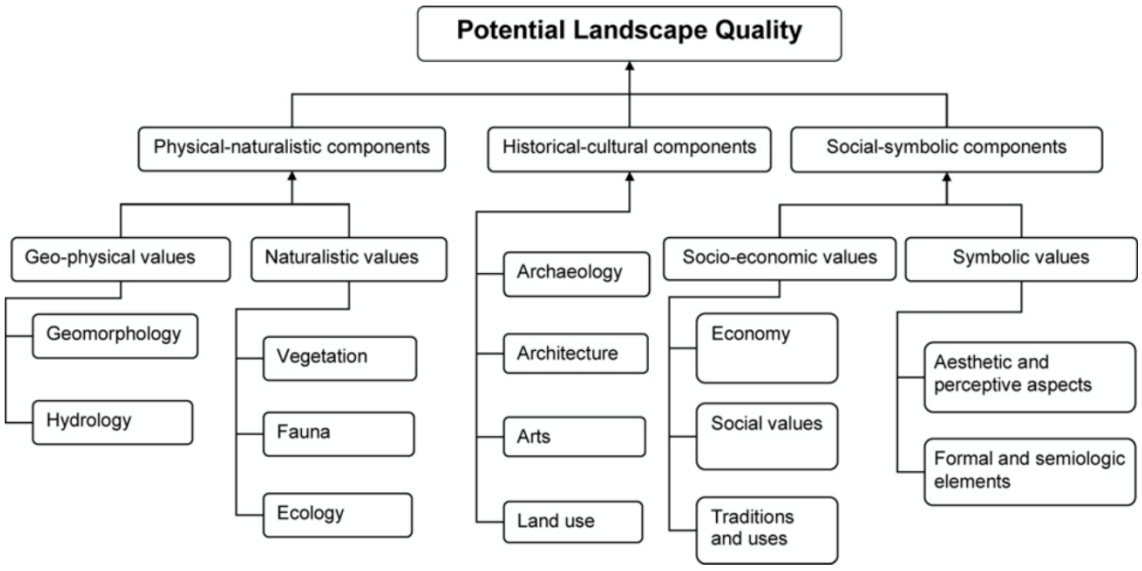


Figure 1. Landscape quality components (Clementi, 2002)

Firstly, geo-physical (composition and configuration of the terrestrial surface) and ecological systems are included in the classification. The historical-cultural components are related to the signs and coherences that document the history and transformations of a place and include information, study, and literary and figurative components (Clementi, 2002; Vizzari, 2011). While social components include social values and attitudes and knowledge of the local population, symbolic factors deal with aesthetic values and different forms of landscape perception (Vizzari, 2011). The urban environment provides ample opportunity to be a productive place, especially in the public sphere. In this context, sustainable areas in cities have three important effects. Providing ecosystem services and habitat, being productive places, and maintaining cultural connections with nature. Proximity to nature in urban environments can lead to long-term cultural and environmental sustainability by increasing human respect and care for the environment. The closer people are to the processes of stormwater cycles,

ISBN: 978-625-8246-12-4

vegetation growth, and food production, the more conscious they will be about what happens to rainwater and what kind of wildlife depends on our urban forests. In the past, the development of the built environment has negatively affected the natural systems of cities, but culture and natural systems can coexist and even enrich each other. In addition to life-sustaining ecosystem services, the psychological benefits of interaction with natural systems are becoming increasingly important as an increasing percentage of the population lives in urban areas. It is stated that visual access to natural areas can increase employee productivity, student learning, and hospital patient recovery. The aesthetic potential of sustainable landscapes is a crucial aspect of sustainable cultural systems. Beauty, delight, and the sensory qualities of a designed landscape are important for human health and human connection to natural system processes (SITES, 2022). For this reason, it is an important step for cities to take advantage of the landscape quality, which holistically deals with these processes, in the full realization of the concept of sustainability.

a. Building research establishment environmental assessment method (BREEAM)

BREEAM is one method of assessing, rating and certifying the sustainability of buildings (Dixon, 2015). It is generally intended to adapt the structures to the environmental processes. BREEAM emerged in the 90s when urbanization and industrialization grew rapidly. BREEAM is an assessment tool that quantifies and reduces the environmental burdens of buildings by rewarding those designs that take positive steps to minimize their environmental impacts (Dixon, 2015) owned by the Building Research Establishment. It addresses environmental and some social issues of a project. Standard BREEAM schemes exist for the assessment of common domestic and non-domestic building types and less common building types can be assessed by developing bespoke criteria. The purposes of a BREEAM assessment are as follows:

- Reducing the environmental impacts of improvements.
- Enabling developments to be recognized according to their environmental benefits.
- Providing a credible, environmental label for buildings to aid comparison and benchmarking
- Stimulating demand for environmentally sustainable buildings
- Distinguishing buildings of reduced environmental impact in the marketplace.
- Ensuring the best environmental practice is incorporated in building operation, design, maintenance, and management.

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- Setting criteria and standards surpassing those required by regulations.
- Raising the awareness of designers, owners, occupants, and operators of the benefits of buildings with a reduced impact on the environment.
- Informing the design process.
- Allowing organizations to demonstrate progress toward corporate environmental aims (Dixon, 2015).

Standard BREEAM schemes evaluate projects using a system of 'credits' in eight categories. These are Management, Energy, Transport, Health and well being, Water, Materials, Land use and ecology. Pollution.

b. Leadership in energy and environmental design (LEED)

LEED is a green building certification system developed by the US Green Building Council (USGBC). It is aimed at improving a building's environmental performance in areas such as energy savings, water efficiency, and CO_2 emissions reduction. LEED is a process to estimate the criteria of the structures and to examine whether the build has the appropriate standards for certification. These criteria include the selection of site area, the effective use of water, the sustainable energy of the building, the materials used, the quality of the building and its surroundings, the building's conviviality, and design procedures. To meet these standards, practitioners and designers employ "LEED certified professionals"(Crespi, 2004).

LEED includes assessments in various categories such as energy consumption, efficient use of water, and indoor quality. LEED certification receivables have to provide the standards in these lists. According to the LEED grade, the total score is determined. Extra points can be earned by installing particular features, such as renewable-energy generators or carbon dioxide monitoring systems. A gold-rated building is estimated to have reduced its environmental impact by 50% compared with an equivalent conventional building, and a platinum-rated building by over 70% (The Economist, 2004).

Similar to BREEAM, LEED certification is available for 5 project types; Building Design and Construction, Interior Design and Construction, Buildings Operations and Maintenance, Neighbourhood Development, and Homes. LEED is a system that scores building projects according to green building criteria. The project, based on the points received falls into one of four groups. These are Platinum, Gold, Silver, and Certified. The Platinum group has the highest scores and the Certified is the lowest score group. LEED aims to create high-performance sustainable buildings that: "establish a common standard; promote integrated

ISBN: 978-625-8246-12-4

design practices; recognition of eco-leadership in the construction industry; promoting competition; raise consumer awareness of green building benefits; and transform the building market (USGBC-LEED, 2004). LEED is a certification program to promote the development of environmentally friendly buildings. USGBC defines LEED as "a national, consensus-based, market-oriented building rating system designed to accelerate the development and implementation of green building practices" (USGBC, 2004; Crespi, 2004).

c. Biodiversity sensitive urban design (BSUD)

As in other examples given in the study, Biodiversity Sensitive Urban Design (BSUD) is a framework for the development of cities in an ecological sense. BSUD aims to include ecological processes in the planning, design, and development stages of urban design studies. It has important steps to address the challenges of biodiversity implementation in urban areas. Also, because it explicitly links urban design to measurable biodiversity outcomes, BSUD provides a flexible framework for developers and planners to make transparent trade-offs between biodiversity and other socioeconomic objectives (Garrard et al., 2018). BSUD aims to improve biodiversity by strengthening the relationship of urban residents with nature. In this context, BSUD makes many important advances in the field of urban conservation planning.

BSUD aims to benefit urban development and biodiversity. For implementing biodiversity sensitive urban design framework the following steps are followed.

- Document biodiversity values
- Identify biodiversity objectives
- Identify BSUD Actions (Identify development objectives)
- Assess BSUD
- Decide

To achieve biodiversity benefits in the side, BSUD must mitigate the detrimental impacts of urbanization, while encouraging community stewardship of biodiversity by facilitating positive human-nature interactions. Garrard et al. (2018) has distilled relevant ecological knowledge for addressing the impacts of urbanization into five BSUD principles:

- Maintain and introduce habitat.
- Facilitate dispersal.
- Minimize threats and anthropogenic disturbances.
- Facilitate natural ecological processes.
- Improve potential for positive human-nature interactions.

ISBN: 978-625-8246-12-4

In this technical approach, the inventory of existing ecological features is firstly created and evaluated. Measures are taken to improve the habitats of species that are in danger of extinction. Additionally, environments are provided for the recovery of endemic species that are destroyed.

d. SITES rating system

SITES is a sustainability-focused framework that guides landscape architects, engineers, and other disciplines into practices that protect ecosystems and increase their continued benefits to society, such as climate regulation, carbon storage, and flood mitigation. SITES emerged as a result of the urgent need for a coordinated response among landscape design professionals as a result of the environmental challenges of the twenty-first century. Greening of the built environment has been widely adopted in the past years, but SITES aims to guide the creation of sustainable landscapes with or without buildings. A key focus of SITES is that designed landscapes, unlike buildings, can, when done correctly, rehabilitate and renew natural systems. That's why it emphasizes "green" design and construction standards for major campuses, public parks, conservation areas, private resorts, recreation areas, or transportation and service corridors that aren't addressed in the SATs history.

SITES-certified landscapes aim to reduce water demand, filter and reduce stormwater runoff, provide wildlife habitat, reduce energy consumption, improve air quality, improve human health, and increase outdoor recreation opportunities. The SITES certification process allows projects to benchmark against performance criteria. SITES certification includes the certification process for open spaces, streets, plazas, and commercial, residential, educational and institutional spaces.

Sustainable design, defined by SITES, is "design, construction, operation and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs". Sustainable site design emphasizes the design of entire complex functioning systems; an expanded scale of analysis and design evaluation; rather site-specific (rather than universal) design responses; and continuous monitoring, management, and adaptation to provide healthy, functioning systems for the life of the landscape. Sustainability encompasses not only the protection of the environment but also the ideals of social equity and economic feasibility. This "triple result" is truly the key to sustainable development. The design of the built environment also has a direct impact on human and cultural systems (SITES, 2022).

SITES is based on a point system across ten criteria:

- Site context

ISBN: 978-625-8246-12-4

- Pre-design assessment and planning
- Water
- Soil and Vegetation
- Materials
- Human health and well-being
- Construction
- Operations and maintenance
- Education and performance monitoring
- Innovation / exemplary performance (Sites rating system, 2021).

Result and Discussion

For the development of cities, landscape quality will effectively support a more accurate measurement of sustainability and allow the appropriate identification of not only valuable landscapes but also degraded landscapes. For this reason, the inclusion of landscape quality components in the process and the participation of historical-cultural and social symbolic factors that are often overlooked in the assessment provide a new opportunity for the process to be directed and developed correctly. Sustainability assessment tools (SATs) were first produced after the environmental problems and energy crises that occurred during the urbanization of several developed countries in the late twentieth century. In its early stages, SATs were primarily concerned with the concept of 'green building', with a focus on environmental protection, energy efficiency, pollution and waste prevention, resource optimization, and water conservation. With the evolution of the 'green building' concept into a 'sustainable building', the three dimensions of sustainability (environment, economy, and equity) have become internationally recognized (Wan & Ng, 2018). Over time, evaluations on the social dimension of sustainability have increased. In parallel, it has been observed that SATs respond more to the landscape quality component over time. BREEAM and LEED, which are among the first examples of SATs, do not include evaluation criteria for physical-natural components such as geomorphology, vegetation, and fauna, which are important for landscape quality. On the other hand, BSUD and SITES contain criteria to measure many physical-natural landscape quality components (Table 1).

ISBN: 978-625-8246-12-4

Table 1. Examination of SATs in terms of physical naturalistic components

SATs	Physical-Naturalistic Components				
	Geo-physical		Naturalistic		
	Geomorphology	Hydrology	Vegetation	Fauna	Ecology
BREEAM	-	+	-	-	+
LEED	-	+	-	-	+
BSUD	-	+	+	+	+
The SITES	+	+	+	+	+

BSUD covers hydrology, vegetation, fauna, and ecology from Physical-naturalistic components. On the other hand, it does not take into account the Historical-cultural components but examines the components such as social values, traditions, and uses by supporting social participation. In terms of historical-cultural components, BREEAM refers to land use. In addition, BREEAM and LEED focus on the biological sustainability of the architectural structure and do not make an assessment of its cultural value (Table 2). According to the study by Aspinal et al. (2012), it was stated that BREEAM focuses largely on only one aspect of sustainability, namely the environmental impact of buildings. All interviewees within the framework of the study emphasized that BREEAM does not adequately grasp the social and environmental aspects of sustainability.

Table 2. Examination of SATs in terms of historical- cultural components

SATs	Historical-Cultural Components			
	Archaeology	Architecture	Arts	Land Use
BREEAM	-	-	-	+
LEED	-	-	-	-
BSUD	-	-	-	-
The SITES	-	+	-	+

As mentioned earlier, social-symbolic factors were ignored in the early stages of the SATs. However, over time, this component, which is an important step in ensuring sustainability, has started to be examined in SATs. For example, In terms of social-symbolic components, BREEAM and LEED only focus on improving the quality of life of users but do not examine components such as traditions and social values. The BSUD on the other hand stated that cities are human environments and public participation is the key to successful conservation. Urban

ISBN: 978-625-8246-12-4

design can help facilitate the local management of biodiversity by providing "tips for care", creating opportunities for positive interactions with nature, and addressing potential ecosystem damage (Table 3).

Table 3. Examination of SATs in terms of social-symbolic components

	Social-Symbolic Components				
	Socio-Economic Values				Symbolic Values
Sats	Economy	Social Values	Traditions And Uses	Aesthetic and Perspective Aspects	Formal and Semiological Elements
BREEAM	-	-	-	-	-
LEED	-	-	-	-	-
BSUD	-	+	+	-	-
The SITES	+	+	+	+	-

Sustainable sites (SITES) take into account social, environmental, economic, and experimental components. SITES encourages the unique conditions of each site and encourages project teams to be flexible and creative as they develop beautiful, functional, and regenerative landscapes. In this respect, SITES evaluates many components of landscape quality.

Conclusion

To meet the needs of society in urban spaces for a long time, the increasing areas of construction and industry led to the destruction of urban nature. In this process, the destruction of nature has been mostly ignored. Today, the destruction of nature in urban areas and the intensive construction with excessive population growth give rise to the many complex problems of mega-cities in the world. For example, in environmental disasters such as earthquakes and floods, there is great damage and loss of life in the cities. These reveal the importance of green spaces for the prevention of natural disasters. For this reason, it is accepted by many people that natural processes should be respected during and after urbanization. Because of the intensive construction in the city, researchers have long been interested in the adaptation of biodiversity to urban areas. However, it is difficult to reproduce the ecological processes that are fully maintained and at the same time meet the needs of people. A one-way system in urban design studies causes biological processes to be neglected and not estimated fully to assess the necessary ecological inputs. In addition, the creation of projects that include nature-friendly designs and the complexity of assessment after implementation is another issue that hinders sustainability. One of the most important reasons for this complexity is the lack of a common approach. From this point of view, there is a need for research and approaches to contribute to

ISBN: 978-625-8246-12-4

the creation of a common language in this area. For this reason, sustainability measurement tools, in which the components of landscape quality are fully ensured and the building, landscape, and built environment are considered as a whole, can be an effective tool in the development of cities and increasing the quality of life of the society. Many techniques and approaches have been put forward in this regard. In the development of SATs, it is seen that sustainability can be achieved with a holistic perspective to enable future generations to meet their own needs and improve sustainability.

The development of the built environment has often negatively affected natural systems, but culture and natural systems can coexist and even enrich each other. However, an important step in ensuring sustainability is the acceptance and dissemination of sustainability measurement techniques. To achieve this, community-conscious and national policies must be developed simultaneously. Respectful greening of old tissue in existing structures is an important step in the adaptation of biodiversity. Another important step in the formation of sustainability awareness in society is to consider the social dimension more in these evaluation processes. In this context, landscape quality components make an important contribution. In addition, it is necessary to have a common approach to shaping the implementation phase of the project and to apply these criteria throughout the province with various sanctions during the construction permit phase. In this framework, a common planning understanding and awareness should be developed. In this article, various sustainability assessment tools were reviewed in terms of landscape quality components and presented. As a result, holistic considerations of multiple benefits have become increasingly important in promoting nature-based solutions for urban planning.

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Crop Stubble Burning into Biocomposite: Problem, Solution and Legal Aspects With Special Study of Indian Gangetic Regions

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Abstract

Burning stubble (Parali) is a technique for getting rid of crop leftovers from the field before planting wheat from the final week of September to November. Widespread field burning of rice crop leftovers causes thick haze, which is to blame for an 80 % increase in traffic accidents and a 60 % increase in people with asthma, allergies, and other respiratory conditions. If these agricultural wastes are employed in biocomposites, they have enormous potential because of their high mechanical and tensile strength along with the ability to decompose. Bio-composite will be an excellent substitute for plastic as the worry about plastics throughout the world grows. The first part of the study discusses potential uses for agricultural leftovers in the Indian setting. Crop stubble burning resulted in a 22 to 80% increase in NO_2 emissions. On the other hand, CO levels have increased by 7 to 25%. A significant variation in aerosol optical depth (AOD), ranging from 1 to 426%, was observed. 2014 saw the introduction of the national crop residue management policy by the union government. For two years, this programme has allocated Rs 1,151.80 crore to states including Punjab, Haryana, Uttar Pradesh, and the national capital region. Several state and federal laws, like the Punjab Preservation of Subsoil Water Act (2009) and the Commission for Air Quality Management in the National Capital Region and Adjacent Areas Act (2021), deal directly or indirectly with concerns related to stubble burning. The paper investigates the above-mentioned legislation as is it a complete solution for the stubble-burning conundrum in India.

Keywords: Biocomposites, air pollution, legislation, crop stubble.

Introduction

India produces 117.47 metric tons (MT) of rice annually. In terms of production, it is ranked second worldwide. The nation's economy relies heavily on the production of rice, yet handling of used straws is a major problem that contributes to environmental contamination and infertile soil. More than 80% of the observed incidences of stubble burning happen in Punjab state, which is in North India (Singh, G., & Verma, 2021). The management of straw is a particularly difficult undertaking due to its slow degrading features. As a result, the field burning restriction and the availability of subsidies for the purchase of straw management equipment have yet to materialise as planned. Farmers use field burning because it is a quick and affordable technique that also excludes pathogens but emits a significant amount of greenhouse gases (GHGs) (Sain, 2020).

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Problems

More than 80% of the observed incidences of stubble burning happen in Punjab state, which is in North India. The management of straw is a particularly difficult undertaking due to its slow degrading features, therefore field burning is prohibited, and the provision of subsidies for the purchase of straw management equipment are still failing to take off as predicted. Farmers use field burning because it is a quick and affordable technique that also excludes pathogens but emits a significant amount of greenhouse gases (GHGs) (Abdurrahman et al., 2020). The field burning produces 3.3 kg of SO_2 equivalent/ton straw of SO_2 and NOX emissions, which contribute to air pollution and chronic respiratory diseases. There is a lot of cellulose in rice straw, which can be used to create biodegradable polymers or bioplastic packaging. Burning stumps has a negative influence on a variety of soil properties, including loss or degradation of structure, soil organic matter, and decreased porosity. Indirect effects from these alterations included increased hydrophobicity (water repellency), which reduced infiltration, and increased run-off, which frequently resulted in increased erosion. Waste rice straw contains a sufficient amount of cellulose (32%-47%), hemicellulose (19%-27%), and lignin (5%-24%). According to research, the solutions to the problems of synthetic plastic and stubble burning are as follows (Chada et al., 2010). Burning leaves and branches discharge the gas and particle pollutants into the air that have a negative impact on both the environment and human health (Abdurrahman et al., 2020). The heavy haze that is visible over South Asia in the winter has been linked to biomass burning since it happens when stubble is burned.] Due to their low cost and excellent efficacy, fiber-based compositions including knitting, woven, and nonwoven have attracted adequate attention in acoustic applications (Singh, 2022).

Rice Straw: Example for bio packaging

A few studies on the production of sustainable bioplastic materials for packaging have been carried out recently (Dian & Komala, 2019). To substitute the man made plastics, bioplastic packaging materials made from rice straw cellulose were created. Dissimilar ratios of chitosan and rice straw cellulose (chitosan: cellulose: 3:10, 4:10, and 5:10) were used to create the bioplastic utilising the phase inversion technique (Yang et al., 2018). When various physical and mechanical properties like density, water absorption, tensile strength, elastic modulus, and elongation at break were calculated, it was discovered that samples with higher chitosan content—specifically, the bioplastic 5:10 sample—had higher densities than the other two

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samples. The 4:10 bioplastic was found to have the best tensile strength, elastic modulus, and elongation at break. In contrast to the other two samples, the water absorption was higher in the 3:10 bioplastic. The results were most significant in that they demonstrated that rice straw-based bioplastic had a substantially greater water absorption rate than did standard synthetic plastics, which was desirable as increased water absorption facilitates easier disintegration.

Legal Aspects of Stubble Burning

In the year 2020, a new coronavirus known as SARS-CoV-2 or COVID-19 was discovered. The first case was discovered in Wuhan, China (Baghaei et al., 2020). This was the method through which the virus moved from one person to another and ultimately spread all over the world (Bogoch et al., 2020). According to the World Health Organization (WHO), the disease caused by the coronavirus (COVID-19) is now a pandemic (World Health Organization, Coronavirus disease (COVID-19) pandemic, n.d.). The world's population is at an all-time high, while pollution levels are at an all-time high, particularly in the Delhi National Capital Region of India. People in Delhi were forced to contend with poor air quality on an almost annual basis throughout the winter months. This was often the result of burning stubble in northern Indian districts (Abdurrahman et al., 2020).

The Ministry of Environment, Forests, and Climate Change (MoEF&CC), the Central Pollution Limit Board (CPCB), and its state-level divisions are the primary government organisations in India that work to control emissions and improve air quality. The board collaborates with the Ministry of Environment, Forests, and Climate Change as well as other entities to monitor and effectively address issues relating to air pollution. The Air (Prevention and Control of Pollution) Act, which was introduced in 1982, is the most essential law in India regulating air quality because it specifies out the regulations for managing air quality. This law is the reason why the Air (Prevention and Control of Pollution) Act is so important. The Air (prevention and control of pollution) Act and the environmental (protection) Act serve as the legal framework upon which the government bases its efforts to monitor and improve the nation's air quality. Additional regulations were introduced by the Environmental Protection Act of 1986. (Abdurrahman et al., 2020).

The Natural Impact Assessment (EIA) approach was first used in 1994 by the Ministry of Environment and Forest of the Indian government. This method analysed the air quality as well as other environmental resources. Before construction could begin on any project, no

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matter how large or little, an environmental impact assessment was required (including air quality control projects). In the year 2000, the government of Delhi mandated that all vehicles operating in the public transit system use only compressed natural gas as a fuel source. This is due to the fact that natural gas that has been compressed produces less pollution than gasoline or petrol does (Foster & Kumar, 2011). In the year 2006, a strategy to lessen and better manage air pollution was implemented in seventeen different cities. In 2009, the plan was modified so that it would apply to the entire nation. The Central Pollution Control Board (CPCB) determined that more than half of the industrialised cities had areas that were seriously contaminated in accordance with this standard (Ghosh et al., 2019). On October 8, 2016, the high court in Delhi issued an order to the states of Uttar Pradesh, Delhi, Punjab, Haryana, and Rajasthan instructing them to devise a strategy to prevent people from burning stubble outside in their own communities. Following this ruling, the states that have been stated above moved fast to enact stringent legislation, some of which include hefty fines, making it unlawful to burn agricultural residue anywhere inside their borders. On November 26, 2016, a total of 1,375 million rupees in fines were handed down to 1,406 farmers in Haryana for not adhering to the guidelines (The Indian Express, 2017). In 2017, the government of Punjab provided a number of farmers with direct seeders, which simplified the process of incorporating rice straws into the soil (Kamal, 2017). The government wants to reduce the overall amount of land used for rice farming by 7 lakh acres by the year 2020. Around 10% of the total paddy area that was grown in 2019 is represented by this (Hindustan Times, 2020).

The national clean air programme (NCAP), which would be executed over the next five years, was launched by the Indian government in 2019. The program's main goal was to utilise 2017 as the baseline year and reduce particulate matter emissions to 20–30% by 2024. The initiative requires all agencies at all levels and all stakeholders to work together and participate in the process. Additionally, it was intended to plant trees by 2060 that would absorb 2.3 billion tonnes of CO2 equivalent in order to address the transboundary transfer of pollutants. According to Kapil (2019), if this target is accomplished, the average life expectancy of the nation's population will rise by up to 2 years for IGP citizens. In his declaration from 1998, Male emphasised the need of promoting clean air by reducing and preventing air pollution, particularly at the trans-boundary level in southern Asia, which includes the nations of India, Pakistan, Bangladesh, Nepal, Iran, Sri Lanka, the Maldives, and

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Bhutan. The Indian government adopted a number of policies after it had been in operation for roughly 22 years, but they were largely ineffectual in addressing the environmental problems (Ghosh et al., 2019).

Conclusion

Burning stubble is the serious issue in India. It is causing problems both from individual level to the national level. Many programs are initiated from government to protect the environment. Stubble has a good potential if they are used in a proper way many new business ideas has been taken from it. New startups are under way in many parts of India in order to utilize the stubble into useful products. Stubble is a rich source of cellulose and this cellulose can be further processed into the high end biomedical products. On the legal aspect various laws has been made by the government of India in order to protect the environment. Huge amount of money is spent in order to aid the farmers but the problem is not solved yet. India is constantly moving towards the progress of the farmers but it will take time to deliver the results.

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Experiential Learning – A Case Study on Measurement and Instrumentation Course

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Abstract

The pandemic Covid-19 provided lot of challenging tasks for professional degree students and professors particularly in engineering education for successful completion of projects for projects based learning courses. Students appeared for the review through online platform. They used simulation software and simple project model for successful completion of the chosen projects in the relevant course. This paper presents a case study on project work carried out by students during Covid-19 and evaluation methods followed for measurement and instrumentation (MI) course in Vellore Institute of Technology (VIT) – Chennai for experiential learning. They have done the projects in air quality monitoring, smart dust bin, flame detector, smart health band, smart car parking, optical character detection, hydroponics, home automation, solar panel monitoring, smart blind stick, compact multi-meter, plant irrigation system etc. The rubrics for assessment and sample projects are presented.

Keywords: Experiential learning, LabVIEW, project based learning, rubrics, tinkercad.

1 Introduction

Learners generally find it challenging and difficult to understand the concepts of engineering courses by just reading text and reference books or attending lectures. In 2015, curriculum for applied learning (CAL) was introduved in Vellore Institute of Technology (VIT) University. The fully flexible credit system was introduced and project based courses were introduced for experiential learning. Single credit was given for projects along with theory components. The pandemic Covid-19 provided lot of challenging tasks in higher educational institutions' students and professors in professional engineering degree courses for successful completion of projects in project based learning. Students appeared for the review through online platform for interaction and presentation. They used simulation software and simple project model for successful completion of the chosen projects in the relevant course. Smart mobile phone based experiential learning was discussed in [1] where the merits and limitations of smartphones were presented. Smartphones based study was carried out in three different characteristics such as fun based learning, collaborative learning and online game learning. A case study on international experiential learning activities in engineering under graduate level was presented for capstone project and global seminar [2]. Tremendus efforts were taken by professors in different institutions to provide experiential learning to students during pandemic. A remote engineering lab was conducted for hands on experience and problem solving skills during pandemic period in National University of Singapore [3]. To enhance the learning on embedded systems including sensors, actuators and programming, a low cosr

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internet of things (IoT) based learning platform was created [4]. The learners practiced the control algorithms anywhere using smartphones or any smart devices. Students interacted with the real experimental set up available remotely and connected in real time. A case study on electrical machines laboratory was discussed [5]. Recorded video, live demo, calculation and simulation tools were used to understand the concepts easily through online. The structure of project based learning, advantages, disadvantages and the methods adapted in different countries were presented [6]. The effectiveness of remote virtual education on computer aided design (CAD) with assessment were discussed [7]. Students have designed and developed many prototype models. The information and communication (ICT) tools competency for teachers for online teaching and learning was discussed in detail [8]. The importance of team work, collaborative work, multi-level training, professional training are the few elements for project based active learning [9].

This paper presents a case study on project work carried out by students during Covid-19 and evaluation methods followed for measurement and instrumentation (MI) course in Vellore Institute of Technology (VIT) – Chennai. The methodology is discussed in chapter 2 and it is concluded in chapter 3.

2. Materials and Methods

Students have done different projects related to the course and attended all reviews through online mode. It was informed that the projects would be applications oriented and would provide some solution for the existing problems in the society. They have done the project as a team and interacted with each other even though they were from different landmarks in India. During review 1, the objectives, block diagram, circuit diagram, components required and action plan were presented. Review 2 was focussed on work progress and students completed 60% of the work. During the final review, project demonstration was done with project report for final evaluation. Rubrics were followed for each review process and the rubrics followed for first project review is presented in Table 1.

ISBN: 978-625-8246-12-4

Table 1. Assessment rubrics for review

	Max. Marks	Low (not prepared /not presented/ not answered well)	Moderate (prepared/ presented/ answered)	Good (prepared/presented/ answered well) (Added necessary diagrams/required explanation/required answers)
Assessment component for first review				
PPT preparation (as per content)	5	1	3	5
PPT presentation	5	1	3	5
Question and answers	10	2	6	10
Addditonal component for second review				
Progress	10	4	6	10
Addditonal component for final review				
Report submission	15	8	10	15

Students presented the objective, block diagram, circuit diagram, components required, simulation tools required, applications and the action plan in review 1. In review 2, the work progress was added additionally in the rubrics which is given in Table 1. Few batched have done some simulation work and few of them have done simple experiemental set up. The datasheet for each integrated circuits (Ics) was known by the students during review for component selection. The report component was added additionally with review 2 components as mentioned in Table 1. The work progress mark was 15 for final review instead of 10 for second review.

3. Findings and Discussion

The simulation working model and real time prototype working model of the projects during their final project review were demonstrated during the final review process. Students used Tinkercad (open access) and LabVIEW (campus licensed) for building the model in software environment. The remote access was given for the students to access the campus licensed LabVIEW software with protected user name and password. Few groups of students fabricated the circuits and demonstrated well. Students have designed and assembled a prototype model for smart dustbin. Various sensors are provided to identify the level of the waste in the dustbin. Once it is full, message will be delivered to collect the waste. The developed model is shown in Figure 1. Few of them tested home automation system with arduino processor as shown in Figure 2. The appliances were controlled by android app which was installed in smart phone. A blue tooth module was used to connect the arduino with mobile phone. Tinkercad was used for testing the system in simulation environment.

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Figure 1. Smart dustbin

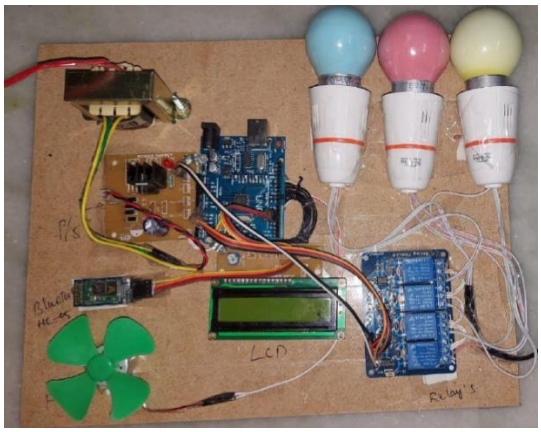


Figure 2. Home automation

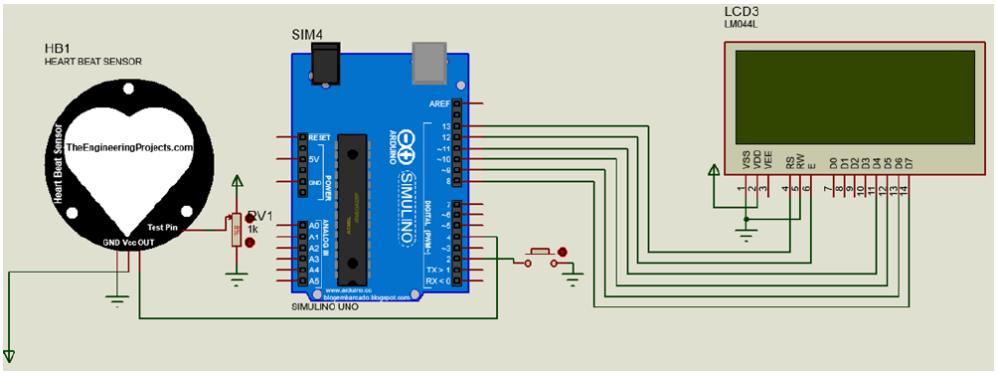


Figure 3. Heart beat pulse sensor

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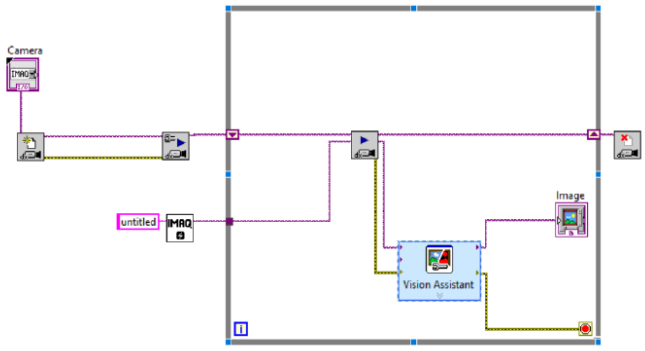


Figure 4. Text Training Block Diagram

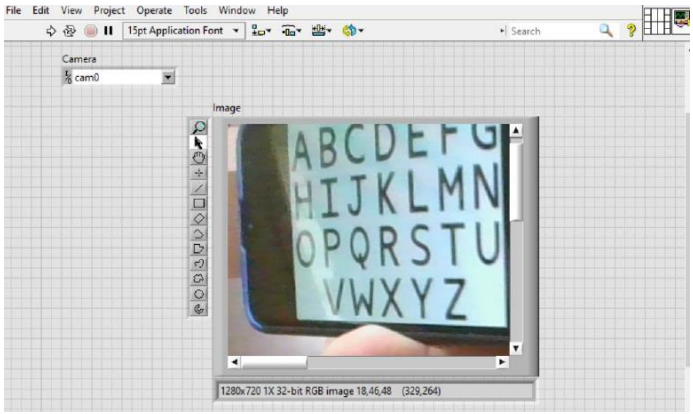


Figure 5. Text training results in the front panel



Figure 6. Hydroponics farming

Smart health band was designed which includes heart rate monitor and temperature sensor. The heart rate senosr was simulated in tinkercad tool and the schematic diagram is shown in Figure 3. An Optical character recognition (OCR) was done using LabVIEW. The LabVIEW block diagram and front panel are shown in Figure 4 and Figure 5 respectively. The vision and mission, NI-IMAQdx, image management, IMAQ-Create, vision express and vision

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assistant are some of the blocks used for OCR. A hydroponic farming using arduino which not only see the soil condition but also has features for closing of shades, checking atmospheric condition, providing artificial source of light as well as nutrition. The system is shown in Figure 6. It consists of a combination of sensors which help check various processes of farming effectively.

3. Conclusion

Students have done their projects in air quality monitoring, smart dust bin, flame detector, smart health band, smart car parking, optical character detection, hydroponics, home automation, solar panel monitoring, smart blind stick, compact multi-meter, plant irrigation system etc. It was a good experience for faculty and students. The pandemic provided an alternate option for the future engineers to execute their ideas using simulation tools and prototype set up.

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The Determination of the Naturel and Cultural Tourism Potential of Eğirdir and Suggestion of Sustainable Planning

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Abstract

While cities have developed their local identity with their own unique characters throughout their past history, their local and traditional values have become extinction as a result of rapid population growth and rapid build-up of migrant populations in the competitive environment they enter with globalization. In 1999, the calm City movement began with the mayors of four small Italian cities (in Chianti, Positano, Bra and Orvieto), in order to prevent the waste of local identities by making the ordinary and wasteful use of resources in the daily lives of the city. The goal of the calm urban movement, whose goal is to improve the quality of life of the local community and visitors, is to raise awareness of cities, strengthen local identity and to ensure sustainable urban development by drawing attention to local differences the city has. The calm urban model, where people can communicate with each other, socialize, self-sufficient, sustainable, and craft, it is intended to be a realistic alternative to cities that have their nature, tradition and traditions, but also without infrastructure problems, use renewable energy resources and benefit from the convenience of technology. In this context, Eğirdir District, which was chosen as a study area, has hosted many different cultures in its history, and gained the title of quiet City in 2017 with its unique local features and rich natural features. In this study, it is aimed to develop proposals for the determination and protection of natural and cultural resource values in order to ensure the sustainable development of Eğirdir District.

Keywords: Tourism, sustainable planning, Eğirdir district.

Introduction

Nowadays, the contribution of tourism in urban development is quite extensive. Especially due to its primary contribution to economic structuring, tourism is a phenomenon that should be considered as a priority in planning decisions related to cities.

Tourism generally develops in natural and culturally sensitive areas. For this reason, it should be considered that environmental values and economic development are interdependent in the attitudes and thoughts of the local people towards tourism (Varnacı Uzun & Somuncu, 2011).

In order for tourism to be considered as a means of development, it is possible with the continuity of the natural, cultural, historical and socio-cultural environment. Sustainability is the activities carried out to protect natural resources while meeting the needs of today and to leave a good environment to future generations. Whether the natural and cultural potential is used correctly and properly and not evaluated within the principles of landscape planning negatively affects the natural development process of cities. In this context, sustainable development is defined as "development that balances the protection of the interests of future generations and the satisfaction of people's present interests" (Collin, 2004).

In terms of tourism, the concept of sustainability refers to the preservation and development of natural, historical, cultural, social and aesthetic values, which are the source of tourism,

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and to ensure the continuation of their attractiveness. Sustainable tourism; It can also be expressed as the effective use of the environmental effects of new activities and developments (Demir & Çevirgen, 2006). Sustainable tourism has been defined as "a type of tourism that is generally small-scale, respects the participation of local people in policy decisions and is sensitive to cultural and environmental impacts" (Kuter & Ünal, 2009). Sustainable tourism is the only way to protect natural and cultural resources and minimize losses, increasing the activities and returns in the field of tourism in the future and making it possible to continue.

Characteristics of sustainable tourism according to Akşit (2007);

• Being nature-based,

• Contributing to the protection of biodiversity,

• Supporting the well-being of local communities,

• Organizing its activities under the responsibility of both tourists and local people in order to minimize negative environmental and socio-cultural impacts,

• Requires minimum use of non-renewable resources,

• It is listed as envisaging the generation of local ownership and employment opportunities for the local community.

Sustainable tourism has the possibility of realizing only with an environmentalist management and planning, depending on environmentally and ecologically sustainable, economically viable and socially acceptable characteristics (Gössling, 1999). In this context, Eğirdir District, which has hosted many different cultures in history and received the title of Cittaslow in 2017 with its unique local and rich natural features, has been determined as the study area. The main purpose of the study is to develop natural and cultural resource values and suggestions for the protection of these resource values in order to ensure the sustainable development of Eğirdir district.

Materials and Methods

Materials

Eğirdir district, which is 34 km away from Isparta city center, was chosen as a study area due to the rich natural and cultural landscape values it has, which have features that will create resources for tourism and recreation activities (Figure 1). In the research, based on natural and cultural resources, a method has been followed that will enable the determination and evaluation of the tourism potential of the area as a result of their analysis.

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Figure 1. Egirdir district location (URL 1, 2022)

Methods

The study conducted in Eğirdir district; literature research and resource inventory were carried out in three stages, including the synthesis stage for resource values and developing recommendations for the preservation of resource values.

At the stage of field observation and literature review, which is the first stage of the research, previous studies and literature related to the subject were used. In the field studies, tourism and recreation centers belonging to Eğirdir District were visited and images of the study area were obtained with the observations carried out there. In addition to on-site observations, promotional tools, maps and visual resources obtained from relevant institutions, organizations and non-governmental organizations were examined to provide data on the field of study.

In the analysis stage, which is the second stage of the research; SWOT analysis was performed in order to reveal the effects of data on the natural and cultural landscape characteristics of the area on tourism and recreation development in accordance with the information obtained in the first stage.

At the last stage of the research, evaluations were made in line with the data obtained in determining the effects of the natural and cultural landscape features of the area on tourism and recreation activities.

Findings and Discussion

Geographic Location

Eğirdir district 37°50'41" - 38°16'55" northern latitudes, 30°57'43" - 30°44'39" it is located between the degrees of east longitude. It is located at an altitude of 918 m above sea level in an area of 1414 km^2 (URL 1, 2022). The district is bordered by Yalvaç and Gelendost districts

ISBN: 978-625-8246-12-4

to the north-Senirkent district to the northwest, Sütçüler district to the south-Burdur province to the southwest, Şarkikarağaç and Aksu districts to the east, Isparta central and Atabey districts to the west. Eğirdir Lake, located in the north of the district, and Barla Mountain in the northwest, Davraz Mountain in the west and Dedegöl Mountain in the east form the surface shapes of the district.

The plateau on which the district of Eğirdir is located exhibits a fragmented appearance with its slopes, mountains, undulating terrain, several narrow alluvial plains and lakes. The most important plateau of Eğirdir district is the Barla Plateau and the district is surrounded by mountains. Barla Mountain (2799 m) is located in the northwest, Davraz Mountain (2635 m) is located in the west and Dedegöl Mountain (2992 m) is located in the east, which cuts this section in a north-south direction (Saraçoğlu, 1962). The largest and most important of the plains between the mountains is the Bozova Plain. Decadal plain is the largest and most important of the plains between the mountains. A large part of agricultural production and animal husbandry is carried out here (Gökarslan, 2021).

The climate of the district shows a transitional climate effect between the Mediterranean and Central Anatolian climates. The prevailing wind direction is the Poyraz wind blowing from the north and the lodos wind blowing from the south in winter (URL 2, 2022). Lake Eğirdir greatly affects the climate of its immediate surroundings. When the precipitation situation of Lake Eğirdir Basin is evaluated in general; The annual average precipitation amounts determined in the meteorological stations located in and around the basin and analyzed in detail vary between 790.4 mm and 501.1 mm. The monthly average values calculated according to the precipitation data of the mentioned meteorological stations are between 65.9 mm and 41.8 mm. According to the monthly average temperature of Eğirdir, the hottest month is July (23.56 °C) and the coldest month is January (2.15 °C). In terms of seasonal temperature distribution, the lowest temperatures were measured in winter (3.1 °C) and the highest temperatures in summer (22.35 °C) (Şener, 2021).

Egirdir has been in the position of economic, political and administrative links of important settlement areas from past to present. It is understood from the finds and records that Eğirdir and its surroundings have been inhabited since the Arzava Kingdom (2000-1200 BC).

Flora and Fauna

With the effect of the climate, the southern region of Eğirdir can be shown as the area with the richest natural vegetation in and around Lake Eğirdir. Kovada National Park and Kasnak

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Nature Reserve are located in this region. Red Pine (*Pinus brutia Ten.),* Anatolian Black Pine (*Pinus nigra Arnold. Subsp. Pallasiana (Lamb.) Halmooe*), Taurus Fir (*Abies cilicica Carr.)* and Taurus Cedar (*Cedrus libani A.Rich.)* types are common. The forest area formed by the Kasnak Oak (*Quercus vulcanica Boiss. Et Heldr.)* trees, one of the endemic species of Turkey, caused the 9 hectare Kasnak Oak forest to be declared a biogenetic reserve in 1981, at a distance of 15 km from Eğirdir (Arı, 1993).

The research area, especially the Kasnak Forest and Kovada Lake, and its surroundings contain different animal species. Among mammals in these areas; Wild Boar (*Susscorofa*), Marten (*Mustela foina*), Badger (*Meles meles L.),* Fox (*Vulpes vulpes L.),* Wolf (*Canis lupus L.*), Wood chipmunk (*Sciurus sp. L.),* Rabbit (*Lepus europaeus L.),* among reptiles Snake (*Elaphe longissime L.),* Common Lizard (*Lacerta vivipara L.),* Tortoise (*Caretta caretta L.),* among game birds Partridge (*Alectorisgraeca L.),* Woodcock (*Scolopax rustical L.),* Black crow (*Corvus corax L.),* Magpie (*Pica pica L.),* Pheasant (*Phasianus colchinus L.),* Quail (*Coturnix coturnix L.),* Wild Duck (*Melanitta fusca L.),* Woodpecker (*Dendrocopos sp. L.*) Roe deer (*Capreolus capreolus L.),* Bear (*Ursus arctos L.),* Mountain Goat (*Capraaegagrus L.*), Pars (*Panthera pardus tulliana L.)* and Red deer (*Dama dama L.)* are extinct mammal species today. In addition, the lake is ornithologically; Hoyran Lake, which is shallow in the northern part, creates an important incubation and feeding environment for water birds with its wide reeds (Arı, 1993). Of the 454 bird species in Türkiye, 225 live around Lake Eğirdir.

Socio-Economic and Demographic Characteristics

The population of Eğirdir is 31,308 according to the year 2021. This population consists of 15,794 males and 15,514 females. As for the percentage 50.45% are men and 49.55% are women (TUIK, 2022).

The average values of 3 different population methods have been accepted as the 1/100,000 scale Environmental Layout Plan planning period populations of Isparta province and districts. Accordingly, it has been accepted that the population of Eğirdir in December 2025 will be between 33,000 and 40,000 people (URL 3, 2022). In contrast to the downward trend of the rural population in the district, the increase in the urban population and the fact that every 3 projection methods have given fairly close values suggest that the average values for the urban and rural population are realistic. On the other hand, the fact that urbanization and the natural rate of increase tend to decrease also strengthens this idea. In this context Eğirdir,

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one of the favorite districts of Isparta, received the title of Cittaslow in 2017. Eğirdir is Türkiye's 12th and Isparta's 2nd Cittaslow.

There are many agricultural areas on the valley floor formed by the streams around Eğirdir Lake. Today, a large part of the economic income of the people of Eğirdir comes from agriculture. According to the 2022 data of Isparta Provincial Directorate of Agriculture and Forestry; The area of agricultural lands in Eğirdir is 15.555 hectares, the area of forest lands is 61.528 hectares and the area of meadow pasture lands is 765 hectares. In the annual crop production of agricultural land, rose, peach, cherry, cherry, apricot, pear, chickpea, barley, wheat and apple, which is in the first place with 359.624 tons, take place. In addition, animal husbandry is another important source of livelihood for the people of Eğirdir and there are 68,750 small cattle and 15,261 cattle (Tarım ve Orman Bakanlığı, 2022).

In Eğirdir, there are 7 ministry-certified hotels, 2 municipality-certified hotels and hostels, 14 municipality-certified hostels and 15 municipality-certified restaurants in order to meet the accommodation and catering services of the visitors participating in the tourism activities (URL 3, 2022).

Analysis of Natural and Cultural Tourism Potential

The natural and cultural resource values that the region has due to its location have a great attracts the attention of visitors with its natural beauties, cultural riches and historical values.

Natural Tourism Resources

Nature Parks

Areas with great potential for outdoor recreation and entertainment, as well as unique flora richness and wildlife diversity, are shown in Table 1.

Table 1. Nature Parks

Kasnak Oak Forest Nature Reserve 	Kasnak Oak Forest, located within the borders of Yukarı Gökdere Village, Eğirdir District of Isparta Province, was declared as a nature protection area in 1987. 253 genera and 442 taxa belonging to 78 families were determined in the Kasnak Oak Forest Nature Reserve located at the intersection of the Mediterranean and Iran-Turanian phytogeographic regions. 69 of these taxa are endemic to Türkiye (Özen & Fakir, 2015).

ISBN: 978-625-8246-12-4

Kovada Lake National Park



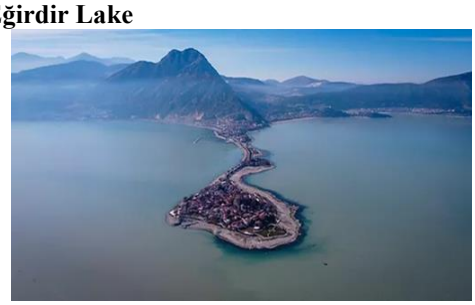
Kovada Lake National Park is located in the Mediterranean Region, within the borders of Eğirdir and Sütçüler districts. Kovada Lake, one of the karst lakes, extends in the north-south direction and covers an area of 790 hectares. The total area of Kovada Lake National Park is 6934 ha and it was registered in 1970 (Bahadır, 2012).

Lake

Located in the Mediterranean Region, Eğirdir, Acıgöl, Akgöl, Akşehir, Beyşehir, Burdur, Eber, Gavur, Ilgın (Çavuşçu), Işıklı, Karamık, Karataş, Kovada, Salda, Suğla and Yarışlı lakes, Eğirdir Lake, which is located in the lake region, is the greatest wealth of the region. In addition, the excess water coming out of the regulator of Lake Eğirdir is poured into Lake Kovada through a channel. The lakes in the region are given in Table 2.

Table 2. Lakes

Eğirdir Lake



The height of Lake Eğirdir above the sea is 917 m and it has an average depth of 10-12 m. The deepest point of the lake is 16.5 m. The lake, which has an area of 517 km², has a north-south length of 50 km and an east-west width of 3-15 km. It is Türkiye's 4th largest lake and 2nd largest freshwater basin. In addition to being a natural drinking water basin, it is a wetland of international importance in terms of biological diversity values (WWF, 2022).

Kovada Lake



Kovada Lake, located 29 kilometers south of Eğirdir District, is a very shallow lake. The width of the lake is 9 km and the circumference is 20.6 km. Except for the western part, the lake's surroundings are generally reeds (URL 2, 2022).

Islands

There are two small islands connected to Eğirdir by road in the lake. One of these islands is the Can Island and the other is the Green (Nis) Island. Can Ada, where there is no construction, does not have a residential area and is used as a tent and caravan tourism and picnic area. On the Green Island, there are hostels, hotels and fish restaurants. In addition to the natural beauties of the island, there are also Hagia Stephanos church, Ada mosque, Sheikh

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Muslihiddin Tomb and Eflatun Dede tombs, which are among the cultural resource values (Table 3).

Table 3. Islands

Green Island 	It is a 9-acre natural protected area, 1.5 km away from Eğirdir district center.
Can Island 	It is a 7-decare islet located between Eğirdir and Yeşilada.

Caves

There are many caves, each of which is a natural wonder, within the borders of Isparta province. On the caves within the borders of Isparta province, extensive surveys and investigations were carried out in the summer months of 1987 and 1988, with the project work "Cave Research in the Isparta-Beyşehir Region" by the General Directorate of Mineral Research and Exploration, Department of Geological Studies. In line with this study, the caves in Eğirdir district; İnönü Cave, Damlataş Cave, Kocakır Cave, Kapızini Cave, Su İni Cave, Culak İni Cave (URL 4, 2022).

Cultural Tourism Resources

It has a strong cultural tourism potential with its historical monuments, mosques, castle, baths, fountain and ancient cities of Eğirdir.

Castle

Located in the city center of Eğirdir, the castle is surrounded by public buildings such as the Government House, the Mayor's Office and the school. It is also located on the eastern side of the large area called Government Square, where the city Sunday was also established, and in the form of a relic consisting of bastions and fortification walls extending in a north-south direction. The exact date of the construction of the Eğirdir Castle is not known, but it is

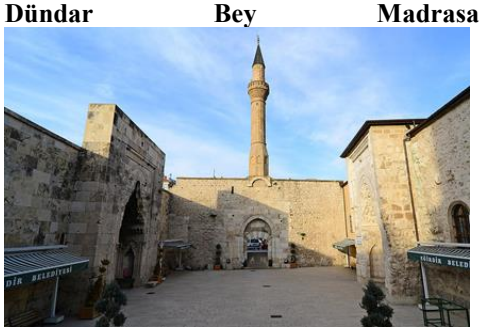
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believed that it was built by Croesus in the 4th century. The ruins of Eğirdir Castle today belong to the Byzantine Period. The condition of the city walls, the remains of which can still be traced among the houses that make up the old settlement area, also called Kale district, reveals that there was a small medieval settlement in this area, surrounded by walls and dating back to the Byzantine era. Eğirdir Castle consists of an inner and outer castle. Today, there are only the foundations of the outer castle, the other ruins are in the water. (Bilici, 2012).

Monumental Buildings

Dündar Bey Madrasa is facing the Eğirdir Hızır Bey Mosque and has a common courtyard, and both structures are within the boundaries of a single protected area. Egirdir Inn, one of the largest of the Anatolian Seljuk caravanserais, is one of the important monumental structures of the district (Table 4).

Table 4. Monumental Buildings

Dündar Bey Madrasa 	It is the oldest and largest madrasa located in the bazaar in Eğirdir. In 1237, the Seljuk Sultan II. It was built as inn by Gıyaseddin Keyhüsrev. Hamidoğlu Dündar Bey converted it into a madrasa in 1301. It was built with two iwan and two floors in accordance with the Seljuk period, but the second floor was later demolished (Karadağ & Akpınar, 2003).
Eğirdir Caravanserais 	Eğirdir Inn, located in the Yeni Neighborhood, has the characteristics of classic Seljuk inns. The building, located 3 kilometers south of the district center, on the shore of the lake, is one of the largest of the Anatolian Seljuk caravanserais. The structure on the Konya-Antalya caravan road has two parts, a courtyard and an indoor space. Both sections have been destroyed (URL 2).

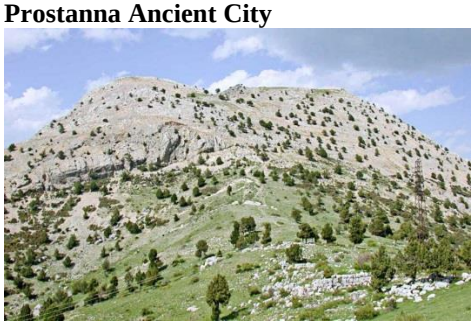
Archaeological Site

The Archaeological Sites, which have traces from the past to the present in Eğirdir district, are given in Table 5.

Table 5. Archaeological Sites

Mallos Ancient City	The city, which is called "Castle" today, was built on a medium-height, rocky land at the western end of Göynücek Plateau. Founded in the Hellenistic Period, the city continued to

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	exist until the 12th century AD (URL 5, 2022).
Prostanna Ancient City 	It is located approximately 1.5 km northwest of Akpınar village of Eğirdir District, east of the military area located in Camili Plateau. The Ancient City of Prostanna, which was first established as a defensive structure on the slopes to the south of the ancient Viarus Mountain, has been determined to date back to the Hellenistic Period. The discovery of the remains of buildings belonging to the Byzantine Period on Viarus Hill indicates that there were settlements in the city during the Byzantine Period (Kızılyalçın & Özcan, 2016).
Kaletepe Church Ruins 	The side walls of the church ruins in Kaletepe can be seen. There is a cistern next to the church ruins (URL 2, 2022).
Serpil Village Ancient Road 	St. Paul road is the second longest of the marked walking paths in Türkiye, after the Lycian road, with one branch starting from Antalya Perge and the other from Aspendos, merging in the ancient city on the Adada near Sütçüler and extending through lake Eğirdir to Isparta-Yalvaç.
Parlais Ancient City 	It is a small ancient city settlement of a Pisidia region located within the boundaries of Barla town of Eğirdir district (URL 6, 2022).

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Official Structure

Eğirdir Station Building

The first railway activities in the Ottoman lands started in the Western Anatolia Region. The İzmir-Aydın Railway, which was granted the right of concession in 1856, was later extended to Eğirdir in 1907. The station overlooks Lake Eğirdir. The State Railways station was built in the form of a complex including the main service building, warehouse, lodging, water tank, toilet and maintenance workshop (URL 5, 2022).

Bridges

The bridges located on the roads where the caravan routes spread and near the caravanserais are strategic structures built to overcome obstacles such as lakes, rivers, streams, valleys. In addition to these, bridges have been used for centuries to provide ease and speed in transportation to caravans and to maintain trade in a lively and safe environment. The bridges in Eğirdir are given in Table 6.

Table 6. Bridges

Barla Ottoman Bridge I **Barla Ottoman Bridge II** 	There are two Ottoman Bridges in the city. Both bridges were built on the Barla River and are single-eyed. The bridges are quite simple and there are no decorative elements. The bridges, which are thought to belong to the Ottoman Period, have survived to the present day in a intact condition and are still in use (URL 7, 2022).
Barla Roman Bridge 	The bridge over the Barla Stream, near the Yeniyol, was built in AD II. It is estimated that it was built in the 19th century (URL 7, 2022).

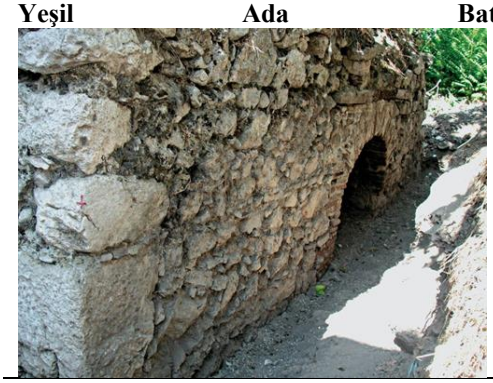
Baths

The baths, which are an important part of the traditional historical texture of Eğirdir, are given in Table 7.

Table 7. Baths

Esma Sultan Bath	Esma Sultan Bath is located in the center of Eğirdir district. The building extending in the east-west direction has a rectangular plan.

ISBN: 978-625-8246-12-4

	
Yeşil Ada Bath	19. the century is considered to belong to the Ottoman Period.
	
Ancient Bath Ruins	It is located in the old Hoyrat locality.
	
Gökçe Village Bath	It is located in Gökçe village on the shore of Eğirdir lake (Doğan, 2008).
Barla Göçeri İbrahim Paşa Bath	It is located in the Göçeri Neighborhood of the town of Barla. Based on the plan, material and technical characteristics of the building, it is thought that it belongs to the Early Ottoman-Principalities Period (Doğan, 2008).

Religious Places

Apart from their daily places of worship, people travel to places that they see as the central place of beliefs. The accommodation made during this trip, commercial activities such as shopping constitute faith tourism. The resource values that Eğirdir has within the scope of faith tourism are given in mosques (Table 8), churches (Table 9) and tombs (Table 10).

Table 8. Mosques

Ada	**Mosque**	In the records after 1480, there is a record that there was a mosque named "Dadegi" in the castle neighborhood. This mosque was converted into a mosque with the support of Yılanlıoğlu Şeyh Ali Ağa in the 1820s.

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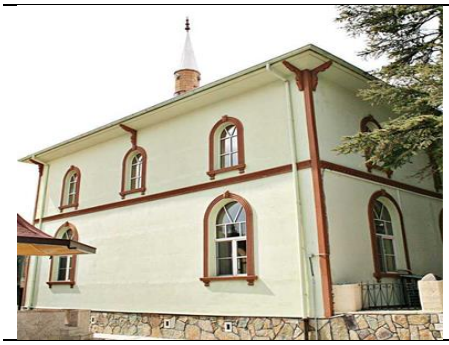
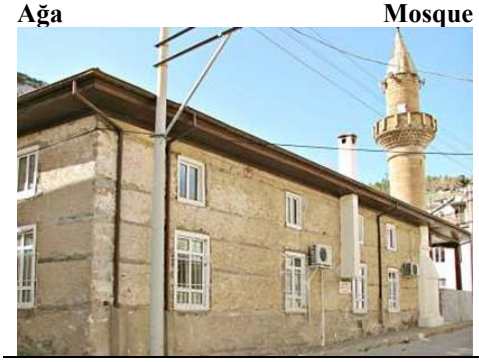
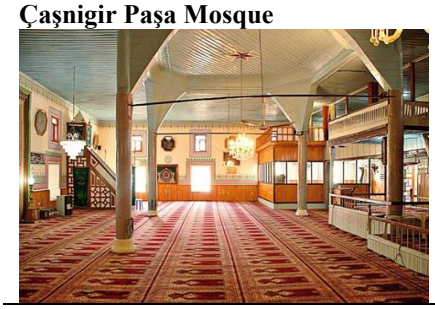
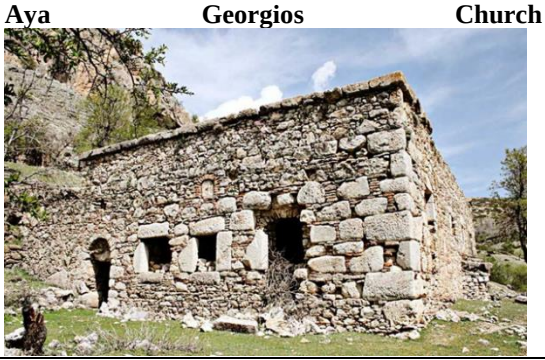
	
Hızırbey Mosque 	Hızırbey Mosque is popularly known as the Great Mosque. It is the largest mosque built in Eğirdir. Although there is no definite information about the date of construction, the inscription of the mosque writes the date of 1301 Gregorian. The building, which was first built as a church, was used as a warehouse during the Seljuk period. It is thought that the mosque was built by Hızırbey in 1327 (Karadağ & Akpınar, 2003).
Ağa Mosque 	It was built in 815 Hijri /1413-1416. It has a stone minaret. While Hacı Sefer Ağa was a masjid, it was converted into a mosque by Hasan Ağa in 1124 H/1712.
Çaşnigir Paşa Mosque 	The inscription on the door of the mosque, located in the Orta Neighborhood of the village of Barla, says that it was built by Çaşnigir Sinan Pasha in 1376.

Table 9. Churches

Aya Georgios Church 	Located in the Greek quarter of the Barla Village of Eğirdir District, the church was built in the 18th century and has a rectangular plan.

ISBN: 978-625-8246-12-4

Aya Stephanos Church 	Egirdir district is located in Yesilada. The church, which extends in the east-west direction, has a rectangular plan and has three naves and an apse. It was built in the second half of the 18th century. The side walls were built with rubble stone.
Kocapınar Church Ruins 	The town of Gökçehöyük is located on the east-west axis in the Kocapınar area. It is estimated that it was made in the 18-19th century.

Table 10. Tombs

Baba Sultan Tomb 	Baba Sultan Tomb is located on Eğirdir street, inside the castle gate. The tomb was first made of wood, then rebuilt in 1970. It was built in accordance with the Seljuk style. It has an octagonal body and has blind arches on each surface. It was made with kökve stone. Local people know the tomb as Arap Dede.
Şeyh Muslihiddin Tomb 	It consists of a wooden tomb and a masjid in Yeşilada.
Eflatun Dede Tomb	It is located in the west of Musluhiddin Dede in Yeşilada, and no record has been found in historical sources. After 1980, a small tomb was built there.
El-Berdai Tomb	It is in the Egirdir Yazla Neighborhood, on the east side of the mosque. The building has a square plan and there are Turkish triangles in the transition from square to dome. The west side of the tomb is open.

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Seyfullah Dede Tomb



Eğirdir Mawlawihane, also known as Seyfullah Dede Tomb by the people of Eğirdir, is located in the Hamam Neighborhood today (Ertaş, 2016).

Devran Dede Tomb



It is located adjacent to the castle in the inner part of Eğirdir Castle.

Recreation Areas

Egirdir Lake, Altınkum beach, Akpinar village viewing terrace, Bedre beach, Barla town, Çamyol recreation park, forest inner recreation area are important recreation areas (Figure 2). The fact that there are Barla, Dedegöl and Davraz mountains surrounding Eğirdir also allows mountaineering sports to be performed here. Barla Mountain, which has a height of approximately 2800 meters, provides the opportunity for cruising hills, mountain biking, paragliding and camping. In addition, water sports, sailing sports and angling for sports purposes are also of great interest in the region.



Şekil 2. Eğirdir recreation areas

The habitat of the Apollon butterflies, which grow in Eğirdir, in the Kasnak Oak Forest is one of the elements worth seeing. Bird watching, endemic plant watching, photo safari, trekking,

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orienteering, mountaineering, jeep safari, paragliding, water sports and highland tourism can be done in Eğirdir's rich geography (URL 2, 2022). Davraz Mountain, which was declared a Winter Sports Tourism Center in 1995, attracts tourists with mountaineering and winter sports. For botanical tourism, especially the rich flora (especially endemic plants) in the Kovada Lake National Park create ideal environments for nature tourism. In addition, Kovada Lake is one of the good examples that can be given to tectona-karstic lakes, which were formed as a result of tectonic and karstic events.

Cultural Events

It is the International Eğirdir Triathlon Competition held in August and the Historical Pınar Market event held in September (URL 2, 2022). In addition, the festivals held in the district are given in Table 11.

Table 11. Festivals

ETUDOSD Dedegöl Mountain Mountaineering Festival	21-22 May
Lavender Festival	23-25 July
Bridge Festival	4-7 August
Apple Harvest Festival	3-4 September
Rose Festival	3-5 June

SWOT Analysis

SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was carried out to reveal the existing natural and cultural resource values of the region. Field strengths, weaknesses, opportunities and threats related to the data public, institutions and dialogue with the public, the previously published studies, land was created as a result of observations in survey studies.

Thus, as a result of the SWOT analysis carried out to reveal the effects of the data on the natural and cultural landscape features of the region on the development of tourism and recreation, it is aimed to reveal what kind of planning is needed in order to make the natural and cultural tourism attractions of the region a structure that will contribute to the socio-economic structure of the region.

Strengths	Weaknesses
• It contains forest and wetland ecosystems • Having a rich structure in flora and fauna • Being on bird migration routes • The high and mountainous nature of the region, mountaineering, camping, hiking, etc. offering advantages in events • Being the habitat of Apollo butterflies	• Not being well known for its natural resource values • Insufficient recognition of cultural resource values • Lack of qualified personnel • Incomplete or inadequate spatial organizations of recreational and tourism areas

ISBN: 978-625-8246-12-4

growing in Eğirdir • Rich agricultural production potential • Protected nature areas • Gastronomic features • Having rich landscapes • The winter season creates suitable conditions for winter sports • The historical Silk Road and St. Paul Road route • Located in the Lakes region • Proximity to Antalya • Local cultural characteristic	• The residents of the region are not aware of the tourism potential originating from natural geography • Underdevelopment of services related to tourism activities originating from natural geography

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Opportunities	Threats
• Preservation of natural values • Re-evaluation of cultural resources • The fact that the region is rich in endemic plants further increases the importance of botanical tourism. • Having a variety that will allow different recreational and tourist activities • Ensuring that the tourism potential of the region is heard through developing communication tools (promotion) • Ecotourism provides an opportunity for the application of lake tourism • Accessibility in terms of transportation	• Intensive use on daily and weekends • The potential for destruction of natural resources • Economic difficulties • Increasing human pressure on natural areas • Mixing of pesticides used in agricultural activities into lake waters • The effect of climate changes on the lake

Conclusion and Recommendations

In Eğirdir district, it is important to consider and evaluate the natural, historical and socio-economic resources of the district in a holistic manner in field-oriented natural and cultural tourism practices. In this context, the district that is home to many civilizations, which are rich in cultural heritage, historic ruins, mosques, churches, inns, nature protection areas, caves, tombs, local gastronomy, traditional crafts, etc. it has a great cultural tourism potential with its tangible and intangible heritage. However, due to the inadequacy of the current planning and management situation, only the use of cultural tourism is observed. Cultural heritages should be protected in a way that preserves their authenticity and should be associated with each other in a holistic manner and their use should be ensured in accordance with the local identity structure.

While supporting tourism and recreational activities, care should be taken to make plans to ensure the continuity of existing resources, especially for the protection of natural and cultural resources. In the planning process, detailed land (survey) studies and determination of natural and cultural resource values, determination of user demands and expectations and inventory should be made in subjects such as creating the carrying capacity of the area.

The attraction of local tourism should be increased, it should be diversified numerically and seasonally, contribute to the development of the region in order to create a balanced use by increasing the tourism potential of the region. This situation will increase the awareness of the protection of natural and cultural assets among both local people and tourists.

Thematic tourism areas and corridors in the region that will be created should be integrated with tourism and cultural routes, providing accommodation and dining services who serve all stakeholders, tour operators and agents to information and awareness training program should

ISBN: 978-625-8246-12-4

be organized. Participation, cooperation, raising and developing awareness are of great importance.

To develop Eğridir's tourism by spreading it to all seasons; Sustainable tourism practices are needed to highlight the cultural structure and natural assets that span the entire geography of Isparta. Visitor ımpact management centers should be established for tourism areas based on natural geography in the region, and maps showing stopover points and tour routes showing different routes and regional characteristics should be presented to visitors.

The Apple Harvest Festival, which is being held in the district, should be enriched in terms of content and presentation and used as a tourism element. For this purpose, it is necessary to diversify the activities, organize the festivals by considering the accommodation and other needs of local/foreign tourists, present local dishes, and conduct information activities such as conversations, seminars and exhibitions on the subject.

In addition, the plant and animal production potentials of Eğirdir has should be evaluated in terms of agroturism. The county as a destination for dining and cultural positioning and branding; local food and commercial offer to be made for the compilation of the training to be done, encouraging the establishment and determination of local products and sales points, the variety and quality of food and beverage services, improving the understanding of tangible cultural heritage, tourism and local people awareness training should be given.

As a result, within the scope of protecting the resource values of Eğirdir and ensuring its sustainability, it is necessary to increase the existing tourism-recreational capacity, to work together with the people of the region and the relevant institutions, to raise awareness and publicity, and to transform it into action as a priority.

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Prevention Ways and Negative Effects of Fertilization in Sustainable Agriculture

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Abstract

It is estimated that the amount of fertilizer used in agricultural activities in our country is less than the amounts used in western countries. Despite this, the use of unconsciously and without proper technique (especially chemical fertilizers) adversely affects soil, water, and plant health. However, it harms human health and natural life in many ways. In general, fertilization is a factor that limits agricultural production, and its excessive use, especially to increase production and visual quality, causes barrenness and excessive salinity in the soil texture in the long run. At the same time, it causes permanent damage to the soil by reducing agricultural production and, accordingly, yield. In this context, it is known that our soils are heavier in texture, poor in organic matter, and barren, and there are residues in drinking water from fertilization and many products. It is a known fact that many exported fresh vegetables and fruits are returned by the countries they are exported to, due to the excessive amount of residues in the products. Effective and sustainable solutions to this issue, which has become a multidimensional problem, need to be put forward. Otherwise, in the future, we may encounter much greater negativities and costs. However, the fertilizer policy implemented in our country so far has been aimed at increasing fertilizer consumption. In this context, there is an urgent need for state policy and implementation, with measures regarding the correct and effective use of fertilizers, type, amount, application method, time, etc. for environmental protection and sustainable agriculture. In this study, the current situation of chemical fertilization applications in our country, SWOT analysis, negative effects, and solutions for its prevention will be presented.

Keywords: Sustainable agriculture, fertilization, chemical fertilization, SWOT.

1. Introduction

Regardless of the development level of the countries, the agricultural sector has an important place in the economic life of all countries. Because the supply of foodstuffs and raw materials required for human nutrition is provided by the agricultural sector and there is no substitute for this sector (Uludağ İhracatçı Birlikler, 2017).

The general purpose of today's plant production methods is to obtain the highest quality material with the latest technical and economic methods. It is the main target of agricultural economic policies. The plant production and cultivation sector is an increasingly developing sector that makes a significant contribution to the economy, and the development of new techniques and methods has become a priority (Şimşek & Gül, 2018).

Fertilizer consumption for agricultural purposes in our country shows an increasing trend every year. Fertilizers can be of organic origin as well as inorganic origin. According to 2021

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data, the amount of chemical fertilizer used in our country is approximately 6-6.5 million tons (Tarım ve Orman Bakanlığı, 2021).

Fertilization is not only the introduction of plant nutrients to the environment but also the process of increasing and raising the productivity status of the grown product material. Soil fertility is the ability of the soil to provide essential plant nutrients in sufficient quantities and in suitable proportions to sustain plant growth. The general soil factors affecting soil fertility are as follows; soil water, soil texture, soil air, soil temperature, soil reaction, soil organic matter, soil biological properties, plant nutrient amounts and ratios, soil-plant water relations, colloidal properties of soil, cation and anion exchange in soil and soil salinity, etc. Among these factors, the organic matter ratio of the soil is very important. It has indispensable importance on the fertility of the soil, both because of its positive effect on the physical, chemical and biological properties of the soil and because it is a source of nutrients, especially nitrogen.

The study aims to bring up the positive and negative aspects of chemical fertilizers used for agricultural purposes, reveal the current situation with SWOT analysis, and develop strategies to prevent unconscious use. Thus, it is aimed to increase the awareness of producers about fertilization.

1.1. Fertilization in Sustainable Ecological Agriculture

Ecological agriculture is all kinds of agricultural activities carried out by preserving soil parent material, water resources, and climatic inputs to grow healthy products. Fertilization methods have special importance in ecological agriculture. Because in sustainable agriculture, protecting the soil parent material and transferring its functionality from generation to generation can be realized with organic fertilization and methods. For this purpose, it can be provided with organic-based materials that will support or even replace the inorganic structure as much as possible to preserve the natural balance (Leventoğlu, 2022).

1.2. Fertilizer

Fertilizer is one of the inputs used to meet the food and agricultural products required to meet the increasing nutritional and shelter needs due to the rapidly increasing population and rising living standards and to obtain more and higher quality products from the unit area. Fertilizer is a substance obtained both naturally and artificially with organic and/or inorganic components that enable plants to grow and increase their yield. In other words, fertilizers are divided into 2 groups natural (organic) and inorganic (commercial or artificial). They contain

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organic materials such as natural fertilizers, animal feces, and various plant residues. The plant nutrient content of natural fertilizers is less than artificial fertilizers, but it is very important in terms of improving the physical structure of the soil and water retention. The most important natural fertilizers; are barnyard manure, compost, and green manure (Kaçar, 1982; Karaöz, 1992**;** Gürlevik & Gültekin, 2009).

1.3. Negative Effects of Fertilization

The negative effects of fertilization can be summarized as follows; (Tisdale & Nelson,1982; Karaöz, 1992; Dinç, 2008; Gürlevik & Gültekin, 2009).

- In case of excessive use, negative effects on product quality, development, and quantity and decrease in product quality,
- Effects on soil structure (e.g. surface erosion, erosion, barrenness, salinization, etc.)
- Effects on underground water resources, (e.g. mixing of chemical fertilizers with water, increasing the amount of phosphate in streams and rivers, etc.)
- Concentration and increase of harmful substances in crop plants as a result of excessive chemical fertilization,
- The emission of gases such as nitrous oxide released into the atmosphere,
- Decreased microbial activity, Increasing economic cost as a result of unconscious and excessive fertilization without soil analysis effects on human and animal health.

1.4. Using Fertilizer in Our Country

Table 1. The amount of plant nutrients used annually in our Country (Tarım ve Orman Bakanlığı, 2021).

The Amount of Plant Nutrients Used Annually in Our Country					
Years	Total Consumption.	Total (N)	Total (P_2O_5)	Total (K_2O)	Total BBM
2017	6,332,872	1,764,638	754,749	124,945	2,644,333
2018	5,411,881	1,527,588	521,058	115,512	2,164,158
2019	6,087,714	1,682,549	667,367	116,501	2,466,416
2020	7,143,144	2,052,685	763,639	114,565	2,930,889
2021	6,480,101	1,787,348	633,575	154,223	2,575,147

- In our country, the consumption of fertilizers for agricultural purposes is increasing every year.
- According to the data for 2020 and 2021, the amount of chemical fertilizers used in our country is approximately 6.5-7.2 million tons.

ISBN: 978-625-8246-12-4

- Considering the amounts used by the European and American manufacturers, it can be thought that these usage amounts should be even higher. However, when the issue is examined in more depth, it will be realized that this is not the case.
- The amount of fertilizer used in Europe is 2.5-3 times more than we use per decare. This means that approximately 18-22 million tons of fertilizer are used in a European country with an equal amount of agricultural land.
- However, when examined, the yield per decare of our country's land is so low that it cannot be compared with some European Countries' soils.

1.5. Statistical data on fertilizer use in our country

- Fertilizer use is one of the most important cultural measures to increase the amount of yield per unit area in agricultural production.
- However, to obtain the desired amount and quality of product, it is necessary to provide the nutrients needed by the plants in a balanced way. Among agricultural inputs, fertilizer constitutes an important cost after fuel and energy (electricity, thermal resources, etc.).
- This rate is approximately 33-38% of the costs. Chemical fertilizer consumption in our country is 2.575.147 tons as plant nutrients (For example, 69.4% nitrogen, 24.6% phosphorus, and 5.9% potassium).
- Turkey's fertilizer consumption in 2021 is approximately 63,5 kg. nitrogen, 22.5 kg. phosphorus and 5.4 kg. potassium, a total of 91.4 kg of nutrients (Tarım ve Orman Bakanlığı, 2021).
- In our country, the rate of producers who fertilize according to the results of soil analysis in the fertilization process is approximately 17%.

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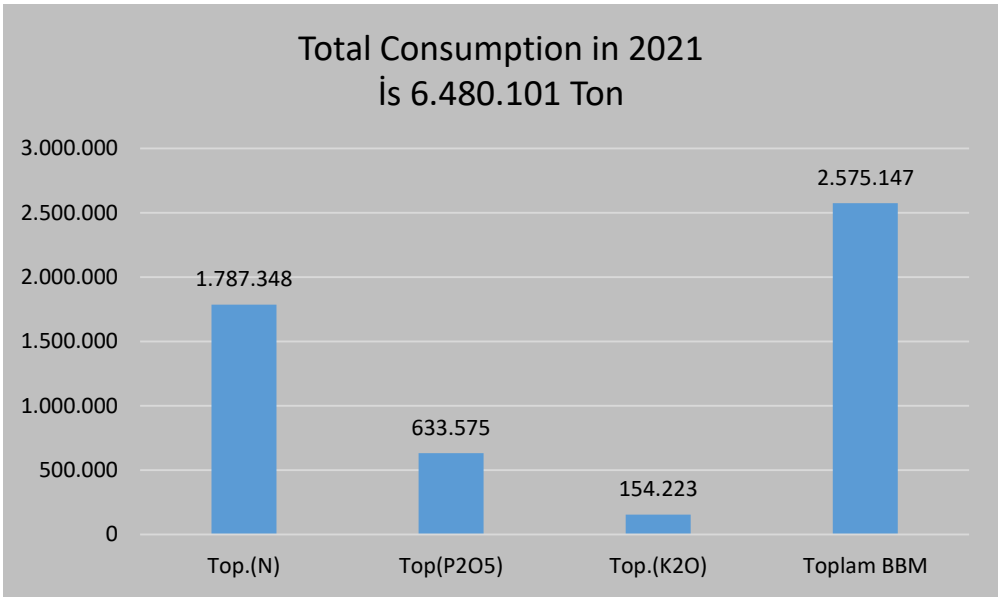


Figure 1. Fertilizer Consumption Amounts in Turkey in 2021 (Tarım ve Orman Bakanlığı, 2021)

1.6. Comparison of Fertilizer Amounts Used in Our Country With Western Countries

Fertilizers are of inorganic and organic origin. In recent years, "organo-mineral fertilizers", which contain organic and mineral substances together, have been used for intensive agriculture. However, the increase in such fertilizers has not reduced the amount of use of classical fertilizers called "Generic", on the contrary, it has encouraged their use. The reason for the high yield in Europe and America is not due to the use of more fertilizers. The amount of fertilizer used in Europe is 2.5-3 times more than we use per decare. This means that approximately 18-22 million tons of fertilizer are used in a European country with an equal amount of agricultural land. However, when examined, the yield per decare of our country's land is so low that it cannot be compared with some European countries' soils. The rate of total plant nutrients consumed worldwide is 0,0085% in our country.

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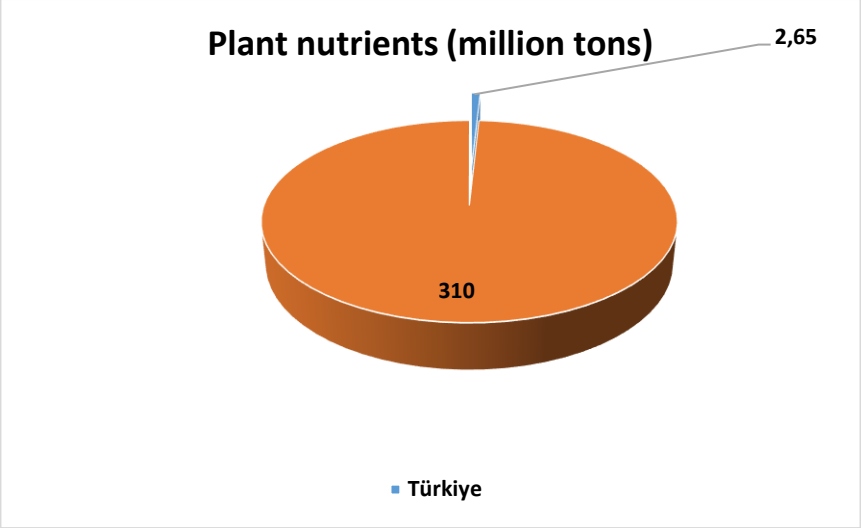


Figure 2. Plant nutrients amounts used in our country with around the World

Although the amount of unconsciously used fertilizer in our country is less than in some European countries, it is observed that our soils are heavier in texture, poor in organic matter, and have a barren structure.

It has been determined that manure is mixed with drinking water and there are residues in many produced products.

In this sense, it is a known fact that many fresh vegetables and fruits that we export are returned by the countries they are exported to, due to the excessive amount of residues in the products.

If we continue to feed and fertilize unconsciously in this way, serious problems are expected in terms of health and food safety for the next generations.

2. Material and Method

In the study, locations with different product patterns were determined in our 6 geographical regions. Plant feeding and fertilization methods (fertilizer types, amounts and application methods, etc.) carried out by the producers determined in these locations during the agricultural production process were observed at periodic intervals. The data obtained according to the observation results were evaluated

ISBN: 978-625-8246-12-4



Figure 3. Working Regions In Our Country

- The Mediterranean region; Greenhouse-Vegetable Agriculture: Fertilizers Used (Ammonium Sulfate, Diamonium Phosphate, Urea, Potassium Nitrate, 20-20-0+Zn, UAN, 18-18-18, 20-20-20, 16-8-24, 13-18 -15, 10-30-10
- Black Sea region; Tea-Hazelnut: Fertilizers Used (Ammonium Sulfate, Diamonium Phosphate, Urea, 25-5-10, UAN, 15-15-15+ Zn, 20, 20, 0, 18-18-18, CAN 26%
- Central Anatolia Region; Cool Climate Cereals-Tuber Crops: Fertilizers Used (Diammonium Phosphate, Urea, 20-20-0+Zn, 15-15-15+ Zn, 25.5.10
- Marmara Region; Olive, Sunflower, Rice: Fertilizers Used (Ammonıum Sulfate, Diamonıum Phosphate, Urea, Potassium Nitrate, 20-20-0+ Zn, UAN)
- Southeastern Anatolia-Pistachio-Cotton-Cool Climate Cereals: Fertilizers Used; (Ammonium Sulfate, Diamonium Phosphate, Urea, Uan, 15-15-15+ Zn, 20,20.0+ Zn, 18-18-18), CAN 26%
- Aegean Region; Corn-Fruit Growing-Open Field Vegetable Growing: Fertilizers Used (Ammonium Sulfate, Dıamonıum Phosphate, Urea, Potassium Nitrate, 20-20-0+Zn, UAN,18-18-18, 20-20-20, 13-18-15

3. Findings and Discussion

In line with the data obtained from the producers in the location and some literature, the current situation was determined by SWOT Analysis for the fertilization process in our country.

ISBN: 978-625-8246-12-4

3.1. (SWOT Analyse)

Strengths

- Organic fertilizer raw material resources are sufficient.
- There are agricultural support policies for farmers registered in the Farmer Registration System (FRS).
- It has a variety of agricultural products.
- It is easy to obtain Leonardite, Humate, Humic, and Fulvic acids in mine locations.
- It is suitable for Inventive Agriculture depending on regional and climatic diversity.
- It has a variety of seasonal sustainable agricultural activities. It has a land density suitable for agriculture.
- It has population density and labor capacity in regions suitable for agriculture.
- The number of multinational firms offering agricultural inputs is very large.

Weaknesses

- Chemical fertilizer raw material resources are insufficient.
- The chemical fertilizer industry is foreign-dependent over 90%.
- Traditional fertilization approaches continue in agricultural activities.
- Input costs increase with imported fertilizers.
- Investments made by State-Owned Enterprises have been transferred to the private sector since 2005.
- There is price instability in the fertilizer market, which is monopolized by the private sector.
- Excessive and unbalanced commercial fertilizers are used in agricultural products and between regions.
- The organic matter ratio of the country's agricultural soils is low.
- In the national fertilizer policy, only fertilizer use is encouraged.
- The environmental aspect of nitrate fertilization is not taken into account
- The use of organic fertilizers is insufficient
- Soil and leaf analyze are not taken into account for fertilization.
- Crop and final output prices are below their costs.
- The basic inputs and raw materials used in agricultural activities are foreign-dependent.

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- Since it is not a member of the European Union, there are problems with import and export issues.
- There are obstacles related to the scattered structure and investments in the public sector.
- There is no specific law on fertilizers.
- The international brand is insufficient.
- Public-private sector R&D projects are insufficient.
- Improvement of soil structure and productivity of soil conditioner use is insufficient.

Opportunities

- Turkey is in the position of agricultural logistics base region in terms of geographical location. (It is the gateway of multinational companies offering agricultural inputs to the Middle East)
- It is a transition zone of Asian-European integration.
- There are many agricultural incentives and support projects.
- It has cheap labor costs. The rate of conscious producers increases over time and depending on the developing technology.
- The desire of Turkic republics and Arab countries to integrate into agricultural activities is increasing in terms of fertilizer and fertilization.

Threats

- The use of commercial fertilizers puts human health and food safety at risk.
- Excessive and unconscious fertilization negatively affects soil texture and yield.
- People migrate from rural areas to cities.
- Agricultural areas are shrinking due to population growth and urbanization.
- Underground and surface water resources are decreasing, and their quality is deteriorating.
- Depending on the income level, agricultural activities are avoided.
- The new generation is indifferent to the agricultural sector.
- Usage is affected by increased costs and fluctuations in exchange rates.

3.2. Strategic Goals and Actions

Insufficient use of chemical fertilizers used in agricultural activities in our country leads to multifaceted negativities in terms of soil, water, plant, and human health. In general, fertilization increases agricultural production and visual quality, and its excessive use reduces

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agricultural production and yield. In this context, our soils are heavier in texture, poor in organic matter, and barren, resulting in residues in drinking water from fertilization and many produced products. Especially many exported fresh vegetables and fruits are returned by the countries to which they are exported, due to the excessive amount of residues in the products. This issue, which has become a multidimensional problem, should be urgently brought to the agenda to reveal and implement effective and sustainable solutions. Otherwise, in the future, we may encounter much greater negativities and costs. In this context, the correct and effective use of fertilizers, type, amount, application method, time, etc. for environmental protection and sustainable agriculture.

There is an urgent need for state policy and implementation of measures on these issues.

- **Strategic Goal 1:** Developing fertilizer production and use policies and practices for Sustainable Agriculture.
- **Strategic Goal 2:** Dissemination of Educational and Awareness Studies for Sustainable Agriculture

Strategic Goal 1: Developing fertilizer production and use policies and practices for Sustainable Agriculture.

- Compost fertilizer production should be expanded
- The fertilizer industry should be developed.
- Scientific studies on fertilization should be done for each plant pattern.
- Fertilizer, pesticide, and irrigation processes should be handled as a whole for each agricultural product.
- Soil and plant analysis laboratories should be expanded and made compulsory.
- Farmers who do not have a soil analysis report should not benefit from support and incentive programs.
- If necessary, the producer who wants to buy fertilizer should be obliged to bring the results of the analysis.
- Natural manure should be kept on farms in a diluted form and should be used intensively in production.
- The green manuring technique should be expanded.
- The use of materials to be used in organic agriculture, especially as organo-mineral, compost products, and organic fertilizers, should be expanded and standards should be set.

ISBN: 978-625-8246-12-4

- The use of chemical fertilizers, which is the main subject of agricultural activities and which we are completely dependent on, should be used with proper methods and methods.
- Fertilizer Law should be enacted. Investment and cooperation with countries with raw material resources should be encouraged.
- The development and use of new highly effective fertilizers should be ensured.
- An effective market control mechanism should be developed.
- New fertilizers should be developed by the soil and climatic conditions of

Strategic Goal 2: Dissemination of Educational and Awareness Studies for Sustainable Agriculture

- Producers should be given courses on correct and effective fertilizer use, type, amount, application method, time, etc.
- Written and visual documents should be prepared. An Integrated Plant Nutrient Management Unit should be established.
- Competitions and festivals should be organized for fertilizer production. Academic events should be organized.
- Social media and public service broadcasts should be given continuously by state and private media organizations.
- Pilot locations should be determined by agricultural institutions and organizations, universities, and NGOs, and the results of the study should be shared.

4.Conclusion and Suggestion

In sustainable ecological agricultural activities, the first goal should be to turn to organic fertilizers that will not harm the environment and natural resources as much as possible.

The problems related to fertilizers and fertilization will vary according to the climate of each country, soil characteristics, plant species grown, the condition of rotation, irrigation opportunities, and the adequacy of the institutions, organizations, non-governmental organizations, and organizations that will lead in fertilization, their working methods, and control mechanism.

The basic approach in plant production, after determining which nutrients the product to be produced needs according to the results of soil and leaf analysis, the type of fertilizer suitable for soil and climate characteristics and the amount of fertilizer to be applied should be determined. Considering the chemical properties of the fertilizers to be applied, it should be decided how in which dose and when to apply. In determining the fertilization method,

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besides the fertility of the soil, the plant production system and irrigation method are also important. Implementing and disseminating agroforestry systems in urban and rural areas, which provide versatile utilization of the land to improve and develop the chemical, physical and biological properties of the soil, may play an important role in increasing the organic matter ratio of the soil (Gül et al., 2011)

It has been emphasized in all the scientific studies and literature that the fertilization process is very important for the grown product material. The basis of success in fertilization is to understand the fertilization processes well, analyze them well, use the proper methods, and follow the basic rules.

For the health and safety of sustainable agriculture and food products, it should be the main target that the soils are healthy and of high quality, and that the plant material to be used (seed, steel, etc.) is healthy and of high quality.

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Evaluation of the Effects of Turkey's 11th Development Plan on Agricultural Landscape

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Abstract

The highest level of legal guidance on the sustainability of agricultural landscapes is the Development Plans. The highest level of legal guidance on the sustainability of agricultural landscapes is the Development Plans. The development plan has been prepared by the state in Turkey since 1963, covering the economy, health, education, transportation, social security, justice, etc. It is a plan that aims to improve and develop on issues and determines the policy to be implemented. The aim of this study is to evaluate Turkey's Eleventh Development Plan (2019-2023) on the basis of agricultural landscapes. For the evaluation, 17 Sustainable Development Principles adopted at the 70th Session of the United Nations General Assembly were taken as reference. In this context; Policies regarding agriculture and rural areas in the 11th Development Plan and 17 Sustainable Development Principles were interpreted holistically. The findings revealed that some issues need to be addressed in more detail and comprehensively for the sustainability of the agricultural landscape. As a result, recommendations have been developed on these issues.

Keywords: Agriculture ecosystems, agricultural land use, rural landscape.

Introduction

According to the Food and Agriculture Organization (FAO), one third of the world's soils are infertile due to erosion, salinity, loss of plant nutrients and organic matter, pollution and concretization. 1.2 billion hectares of land, which corresponds to 26 percent of the world's land, has faced deterioration as a result of improper agricultural activities and use. Water erosion in 55.7% of these deteriorated areas, wind erosion in 27.6%, chemical changes such as nutrient loss, salinity, pollution, acidity in 12.5%, flooding, compaction in 4.2%, There have been physical changes such as the collapse problem. International experts state that the top soil layer is enough for only 60 years. For these and many other reasons don't mention here, sustainable management and effective use of soil resources; is becoming increasingly important strategically on a global scale. Because of food security for the whole world, agriculture is the main element of life (T.R. Presidential Strategy and Budget Department, 2022a).

Agricultural landscape is a landscape that emerges as a result of people's efforts based on productivity principles and serving their productive purposes (Jackson, 1984). Louloudis et al. (2005) characterized the agricultural landscape as "palimpsest" of interactions between the efforts of farmers and the natural setting in a region (Kizos & Vlahos, 2012). Forman and

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Gordron (1986) agricultural landscapes; defined as mosaics whose size, shape and order change with human management. Agricultural landscapes, which constitute an important part of the cultural landscape, are among the landscapes that contribute to sustainability (Gülçin, 2019). Agricultural landscapes offer important opportunities not only for the production of agricultural products, but also for the socio-economic development of rural areas (Shaller et. al., 2014).

In Antrop (2006), Farina (2006), Wylie (2007) that in its present form, it reflects present-day practices and management systems, but also includes practices and systems of the past, with their features, characteristics, form of landmarks and landforms. It also serves as a memory tank for symbols, ideologies, beliefs and attitudes and therefore is part of the collective identity of societies and individual identities of people (Kizos & Vlahos, 2012). Agricultural landscapes are also important in reading and examining the development policies and philosophies of societies.

The starting point of this study is "agricultural policies related to society and the effects of these policies on agricultural landscapes". The aim of this study is to evaluate Turkey's Eleventh Development Plan (2019-2023) on the basis of agricultural landscapes.

Development plans are the plans produced by the state in Turkey with the goal of development, which include policies to be implemented in various subjects (economy, health, education, transportation, social security, justice, etc.) and in the public sector. The latest development plan is the 11th Development Plan, which covers the period of 2019-2023. When the objectives of the previous Development Plans of Turkey are examined, it is seen that the 1-7. Development Plans especially aim to increase productivity and organize producers. In 8-10 plans, in addition to these purposes; The objectives of food security, demand, rural development, protection of natural resources-environment and biological resources have come to the fore (Table 1). Thus, the ecological balance has been moved to an important point.

Table 1. Objectives of Turkey's previous Development Plans (Bozoğlu, 2022).

	Development Plan									
Purposes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Increasing productivity*	+	+	+	+	+	+	+	+	+	+
Increasing quality*					+	+				
Income growth and stability				+		+	+	+	+	
Price stability	+	+	+		+	+	+			
Considering world prices			+	+	+	+	+			
Preventing inflation and balancing the budget	+	+	+	+	+	+	+			

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Reducing the production of supported products and oversupply products			+			+	+				
Increasing exports*		+				+	+				
Improving the data infrastructure*					+	+	+	+			
Organize producers and strengthen organizations*	+						+	+	+	+	
Developing marketing services*	+						+	+	+		
Developing broadcasting services*			+	+		+		+	+		
Food safety and security								+	+	+	
Directing production according to demand & Strengthening agricultural markets								+	+	+	
Increasing the competitiveness of businesses*								+	+		
Compliance with the Common Agricultural Policy of the European Union and the World Trade Organization								+	+		
Privatization of Agricultural State Economic Enterprises and restructuring of Agricultural Sales Cooperatives Unions.								+	+		
Realizing the rural development								+	+	+	
Conservation and development of natural resources, environment and biological resources*								+	+	+	

The study area is the agricultural areas of Turkey and the agricultural landscapes in which it is located. 62% of Turkey has a slope of more than 12% and consists of steep, very steep and steep lands. This provides important information about the situation of agricultural lands in the country. The main problems of agricultural lands in Turkey; It is seen as not using the land according to soil capabilities, not developing agricultural practices, not making use of new agricultural technologies sufficiently. However, the most important problem is the fragmentation and disorganization of the lands in agricultural enterprises. It is stated that this situation negatively affects the yield. According to 2017 data, agricultural lands (24 million hectares) consist of 32.5 million agricultural parcels. According to the land registry records, 32.5 million agricultural parcels are registered in the name of 40 million people. There are roughly 3 million farmers, although it varies every year according to the Farmer Registration System. The number of farmers who are not registered in the Farmer Registration System is also significant. Those who are not registered in the system carry the problem to another point. However, on an international scale, the most important problem of Turkey's agricultural lands is expressed as drought and desertification. FAO reports reported that Turkey is among the 7 countries most affected by drought and desertification. Turkey has been exposed to water scarcity and low productivity during the dry periods since the 1990s. Especially in the Mediterranean Region, the sensitivity to extreme conditions in the climate has increased even more. Agricultural production is greatly affected by specific climatic conditions. All these

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situations have revealed the necessity of the state to strengthen its policies on agricultural areas (T.R. Presidential Strategy and Budget Department, 2022a).

Material and Methods

Material

The main material of the study is Eleventh Development Plan (2019-2023). The Eleventh Development Plan (2019-2023) was approved in the 105th Meeting of the General Assembly of the Grand National Assembly of Turkey, dated 18.07.2019, in accordance with the Law No. 3067 dated 30.10.1984. The text of the plan consists of 2 parts. In Chapter 1, "global developments and trends" and "economic and social developments in Turkey in the pre-plan period" are discussed. In the second part, "the vision of the plan, its main aims and principles" and "the goals and policies of the plan" are given. It is given under the headings of targets and policies: stable and strong economy, competitive production and productivity, qualified people-strong society, livable cities-sustainable environment, rule of law-democratization and good governance (T.R. Presidential Strategy and Budget Department, 2022b).

The other material of the study is the Sustainable Development Principles (Figure 1). The Sustainable Development Goals were brought to the agenda at the 70th Session of the United Nations General Assembly held in September 2015. As a result; Within 15 years, 17 Global Goals have been agreed to end extreme poverty, tackle inequality and injustice, and fix climate change. These targets are given below (UNESCO, 2022).

1. Ending all kinds of poverty everywhere (End poverty),

2. End hunger, ensure food security, improve nutrition opportunities and support sustainable agriculture (End hunger),

3. To ensure the healthy life of people and the well-being of all at all ages (Healthy individuals),

4. To provide inclusive and equitable education for all and to promote lifelong learning opportunities for all (Quality education),

5. Ensuring gender equality and strengthening the social position of women and girls (Gender equality)

6. Ensure accessibility and sustainable management of water and sanitation services for all (Clean water, sanitary conditions)

7. To provide accessible, reliable, sustainable and modern energy for all (Accessible and clean energy)

ISBN: 978-625-8246-12-4

8. Ensuring sustainable and inclusive economic development, promoting full and productive employment and decent work (Decent work and economic growth)

9. Building resilient infrastructures, promoting sustainable and inclusive industrialization and promoting innovation (Industry, Innovation and infrastructure)

10. Reducing inequalities within and between countries (Reducing inequalities),

11. Making cities and settlements inclusive, safe, strong and sustainable (Sustainable city and life)

12. To provide sustainable consumption and production models (Responsible consumption and production)

13. Take urgent action to combat climate change and its effects (Climate action)

14. To conserve and sustainably use the oceans, seas and marine resources for sustainable development (Life in Water)

15. Protect, regenerate and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse the loss of soil fertility and halt biodiversity loss (Terrestrial life)

16. Promote peaceful and inclusive societies for sustainable development, ensure everyone has access to justice, and build effective, accountable and inclusive institutions at all levels (Peace and Justice)

17. Strengthening the means of implementation and invigorating global cooperation for sustainable development (Partnership for Goals)

Methods

The title of this study was developed on the basis of the effects of the 11th Development Plan on the agricultural landscape. The aim of the study is to interpret the policies that will affect the agricultural landscape in the 11th Development Plan. For this reason, the policies that can affect the agricultural landscape in the 11th Development Plan were evaluated in the study. Sustainable development principles were used as an assessment tool. In this context, the study was developed in two stages.

The study was developed on the basis of two important phases. First stage; The objectives/policies regarding agricultural landscapes in the Eleventh Development Plan are grouped on the basis of 17 titles that make up the Sustainable Development Goals. In the grouping process, all the policies related to "agricultural areas" and "rural landscape" in the text of the Eleventh Development Plan were put forward. Later, these policies were put under

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the relevant sustainable development goal title. After the grouping, the effects of the relevant policies on the agricultural landscape were interpreted subjectively.



Figure 1. 17 Sustainable Development Goals (UN, 2022).

Findings

The targets/policies regarding agricultural landscapes which Eleventh Development Plan; when examined on the basis of 17 titles that make up the Sustainable Development Goals, the following findings (Table 2) were reached.

- In terms of end poverty; In particular, it is aimed to include agriculture among the priority sectors in development. In this context; Policies have been adopted to increase agricultural support, reduce rural poverty and improve the quality of life.
- In terms of end hunger; Policies have been developed on the development of agricultural enterprises, the protection and sustainable use of agricultural lands, meeting the demand for food with less resources, increasing the quality standard, and transitioning to good and organic farming practices.
- In terms of healthy individuals; Policies have been developed for home care only for migrant agricultural workers and rural elderly people.
- In terms of provide quality education; Policies have been developed to increase agricultural extension and certification, to develop projects on rural development and to train mobile agricultural workers.
- In terms of provide gender equality; Policies regarding education were produced only for women and young farmers.

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- In order to provide clean water and sanitary conditions; Policies for irrigation in agriculture and the use of treated water in agriculture are emphasized.
- In terms of provide accessible and clean energy; Policies have been developed for the development of new applications regarding only energy use.
- In terms of providing decent work and economic growth; Providing rural development support, increasing workforce and competition, improving business ethics, etc. topics A wide variety of policies have been developed.
- In terms of Industry, Innovation and infrastructure; Policies regarding the integration of agriculture and industry and the solution of the infrastructure problem have been developed.
- In terms of reducing inequalities; Policies have been developed to give importance only to the measures to preserve the agricultural population in place.
- In terms of developing sustainable cities and societies; Policies have been developed to protect and develop only local life-rural culture.
- In terms of developing a responsible consumption and production approach; In particular, policies aimed at reducing food loss were targeted.
- In terms of combating climate change; In particular, policies have been developed for the use of products compatible with the changing climate, the fight against invasive species-pathogens, the protection of water resources due to climate change, and the determination of agricultural greenhouse gas emissions.
- In terms of protecting and maintaining aquatic life; Only the policies related to water scarcity, fish production and export were put on the agenda.
- In terms of protecting and sustaining terrestrial life; Policies have been developed to protect livestock and agriculture, to protect soil, to protect pastures, to protect biodiversity, and to conduct R&D studies on these issues.
- In terms of peace, justice and strong institution; Only the legal regulations on the division of agricultural lands and policies for inter-institutional coordination have been developed.
- The issue of building partnerships for Goals has not been mentioned much.

It is included a lot of isues about agriculture in the 11th Deelopment Plan; ending hunger and poverty, quality education, equal opportunity, agricultural quality, increase in production and competition, development of technology, economic stability in the agricultural sector,

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development of rural investment, ensuring food security, modernization of agricultural enterprises, education of agricultural workers, gender equality, justice, etc. It has many decisions from national scale to local scale and even from field to seed in the Plan. The main purpose of the Plan; It is the creation of a highly productive and sustainable agriculture sector, where adequate and balanced nutrition is provided, advanced technology, infrastructure problems are solved. The policies on the protection of terrestrial and aquatic ecosystems, protection of biological diversity, support of organic agriculture and good agriculture, protection of water and soil resources, combating global warming, and sustainability of agricultural ecosystems included in the plan are mostly about sustainable living. However, these policies have little place next to quality-of-life-based policies. Many of the policies included in the previous development plans are developed and detailed in the plan. However, their applicability is more important than these policies. In the plan, on the other hand, does not contain a policy for control, supervision and monitoring of applicability.

Table 2. Policies of the Eleventh Development Plan on Sustainable Development Principles

Sustainable Development Goals	Major Policies Regarding Agricultural Landscape Included in the Eleventh Development Plan
1. End poverty	The fact that agriculture is one of the priority sectors in development, Increasing rural development supports, Making impact analysis of agricultural supports, Ensuring food safety, Giving priority to households where disabled, poor and elderly people live and to households engaged in seasonal migratory agricultural work in activities aimed at fighting poverty in villages, Making statistical studies to measure the socio-economic level of rural areas such as rural poverty, production, employment, Facilitating access to social assistance in rural areas, Improving the quality of life of the rural population.
2. End hunger	Meeting the food demand with less resources The demand for healthy, organic and good agricultural products is increasing, and the direct delivery of pure and local products to consumers through different marketing channels Strengthening the organized structure in agricultural production Protection, effective use and management of agricultural lands Reducing the pressure of non-agricultural use of agricultural lands Bringing idle lands to agricultural production Supporting good agricultural practices, organic farming, contract production, clustering, research, marketing and branding activities Enabling controls to ensure food safety
3. Healthy individuals	Developing practices to facilitate itinerant agricultural workers to benefit from social services. Expanding home health services offered to the elderly, especially those living in rural areas, facilitating access to health services, strengthening preventive and curative services for the elderly.
4. Quality education	Increasing the efficiency and dissemination of agricultural training and extension activities Improving the capacity of producer organizations to provide training and extension services Strengthening R&D and extension relations by increasing the participation of academicians and research personnel in training and extension programs Increasing supervision and training on unconscious pesticide use in herbal production Making regular and continuous activities that will contribute to the development of children of families working in seasonal mobile agriculture and increasing children's access to these opportunities Strengthening activities on farmer training and agricultural consultancy Programming vocational training programs based on local products with high added value Supporting women and young farmers living in rural areas in agricultural education-extension activities, rural support projects and occupational health and safety trainings in agriculture Implementation of training and support programs aimed at making innovative and high value-added production attractive among young people living in rural areas Developing coordination and cooperation between public, university, private and industry sectors in agricultural research activities Sharing the results of agricultural research projects with relevant institutions
5. Gender equality	Providing training on reducing production costs, using technology, producing quality and healthy products, especially for women and young farmers, organizing

	courses for the development of agricultural skills with extension and certificate programs
6.Clean water, sanitary conditions	Increasing the areas to be opened for agricultural irrigation Dissemination of modern irrigation systems such as water-saving sprinkler and drip irrigation for efficient use of water in agriculture Dissemination of measures to prevent agricultural water pollution Dissemination of modern irrigation systems such as water-saving sprinkler and drip irrigation for efficient use of water in agriculture Basin-based planning to reuse treated wastewater, especially for agriculture, and to reduce pressure on water resources
7.Accessible and clean energy	Developing new applications on energy and establishing domestic standards
8.Decent work and economic growth	Using qualified workforce and technology Increasing rural development supports Increasing the share of agriculture sector in GNP Allocating agricultural supports in a way that takes into account the increase in added value Demonstrating a manufacturing industry-oriented approach for competitive production and productivity gains Establishing a market information and monitoring system for the protection of competition and the elimination of market failures Providing input support to ensure the sustainability of crop production Making regulations for the effective and safe execution of e-commerce in agricultural products Reducing the number of intermediaries in the distribution chain in the marketing of agricultural products, providing the consumer with access to the product at reasonable prices and establishing a direct link between the producer and the consumer Providing agricultural products to the market faster and at affordable prices with a distribution model with a strong control and management infrastructure Establishing mechanisms that will bring the agricultural products produced at local and regional level to the added value they deserve Ensuring that local products, geographically indicated agricultural products, medical and aromatic products are traded by increasing the product value through improvements in promotion, marketing and branding In agricultural insurance, the scope will be expanded on the basis of product and risk, and efforts will be continued for the transition to income insurance Elimination of the problems that may be encountered in the market operation in the wholesale and retail trade sector by considering the developments in the agriculture and manufacturing industry sectors and the benefit of the consumers Combating child labor, including in temporary agricultural work Providing support mechanisms to increase women's entrepreneurship in rural areas Maintaining the quality image of agricultural products in export markets Meeting international quality standards Development of rural investment and support programs
9. Industry, Innovation and infrastructure	Solving infrastructure problems Implementation of incentive production models for the development of agriculture-industry integration and cooperation Incentive production models are implemented for the development of agriculture-industry integration and cooperation Development of R&D Modernization of agricultural enterprises Preparation of the institutional infrastructure of a planning planning on the basis of region and product in agriculture
10. Reducing	Maintaining the agricultural population in situ

in equalities	Prevention of division of agricultural lands by inheritance and sale
11.Sustainable city and life	Preservation of local culture In order to ensure the sustainability of production and lifestyles inthe countryside, the preservation of the rural heritage and the protection of the natural and cultural assets are ensured
12.Responsible consumption and production	Increasing consumer awareness to prevent food loss and waste Developing professional management, supervision and organization infrastructures, which will facilitate access to finance in order to increase producer organization and to improve its functioning Facilitating producer associations to engage in commercial activities
13. Climate action	Development of plant and animal species suitable for the changing climate Preparation of action plans to combat invasive species and agricultural pathogens in connection with climate change Establishment of underground water basins and dams in order to prevent water losses due to evaporation, taking into account the effects of climate change Creating product pattern change scenarios in agriculture to adapt to climate change Monitoring of greenhouse gas emissions based on agriculture
14. Life in Water	Sustainable use of water resources Observance of water constraint Increasing production and exports in aquaculture Ensuring the sustainability of fish stocks by considering the balance of protection and use of resources
15. Terrestrial life	Protection of the environment and biodiversity Sustainable use of soil resources Development of livestock Supporting the improvement of pastures and forage crops production Our biodiversity will be protected and sustainable in the field of local animal breeds and seeds in agricultural production. Biodiversity inventory will be completed, important species and specialty areas will be monitored, and a mechanism will be established for sharing the benefits derived from genetic resources and related traditional information Recording traditional information based on biodiversity and making it available for R&D purposes Making arrangements for the establishment of accredited nature farms in order to ensure that the presence of local breed animals and seeds reaches sufficient quantity In nature farms, local seeds and local animal breeds of fruits, grains, medicinal and aromatic plants, especially winter vegetables, will be reproduced and transformed into sustainable value-added products Supporting and disseminating alternative biological and biotechnical control applications to chemical applications Preparation of agricultural land use plans based on soil information system Development of services to combat plant and animal diseases and pests
16. Peace, justice and strong institution	Ensuring inter-agency coordination New legal regulations on agricultural lands Respect for the rights of other living things through policies for the protection of biodiversity Respect for the rights of the next generation and the living system through sustainable approach policies
17. Partnership for Goals	-

Conclusion and Recommendations

For the sustainable development of agricultural landscapes; The 11th Development Plan should focus on the following issues sensitively and develop more comprehensive and detailed policies.

- Farmers should be taught not only in agricultural techniques but also in the natural system in agricultural extension,
- Policies encouraging the use of renewable energy should be increased.
- The rights, health and economic problems of the workers who came with the problem of migration and employed in the agricultural field remained unclaimed.
- No policy on agricultural landscape could be reached.
- Policies regarding the preservation of rural culture are insufficient.Policies in agricultural areas related to combating climate change have been insufficient.
- Measures, sanctions, etc. in agricultural areas from the point of protection of terrestrial and aquatic life has not been given much attention.
- Policies on partnerships and the size of these partnerships at the point of reaching the targets are not given.
- Raising public awareness on climate change and encouraging practices for the new order,
- More serious targets should be set for the protection of water wells and water resources.
- The waterfront, in-water lives, the protection and use of wetlands are not mentioned.
- The principles of conservation and use based on ecosystem services in agricultural landscapes have not been found.
- Policies on measures and penal sanctions related to problems related to the implementation of agricultural inputs have not been focused on.
- The limitations in the legal regulations regarding the misuse of agricultural lands have not been addressed.

The highest level legal guide on the sustainable use of agricultural landscapes is the Development Plan. Development Plan; economic, health, education, transportation, social security, justice, etc. of agricultural landscapes. It ensures the development of the issues, and the determination of the policy to be applied in the public sector. For this reason development

plans; should be put forward sensitively at the point of reaching each item of the sustainable development goals accepted on a global and national scale.

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Recreational Opportunities in Urban Agricultural Areas

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Abstract

Urban agricultural areas (community gardens, allotment gardens, hobby gardens, roof gardens, edible landscapes, etc.) refer to areas of limited size where various agricultural activities are carried out within the city borders. Offering the use of an alternative area to integrate multiple functions in cities, urban agricultural areas have become an important element of cities in developed and developing countries in the historical process. In addition to serving primarily food production and safety, it is a tool that enables various activities aimed at increasing individual and public health in the city. Recreation areas in cities are no longer limited to the creation of parks and sports fields, but are increasingly transformed into different forms. Therefore, urban agricultural areas gain more functions and meaning in this sense. In this paper, the historical development of urban agricultural practices in the world and the recreational opportunities offered by reviewing the relevant literature on urban agricultural areas and recreational practices in these areas are revealed. It is considered that the study can help integrate urban agricultural areas into urban area use planning studies. In addition, it emphasizes the importance of contributing to the development of sustainable healthy cities, developing urban agricultural areas as part of initiatives to improve the quality of life in the city and ensuring their sustainability. After all; with this study, it is aimed to contribute to the studies for urban recreation area planning as well as to increase the recreational diversity in the cities.

Keywords: Urban agriculture, urban agricultural areas, recreation, recreation opportunities.

Kentsel Tarım Alanlarında Rekreasyonel Fırsatlar

Öz

Kentsel tarım alanları (toplum bahçeleri, tahsisli bahçeler, hobi bahçeleri, çatı bahçeleri, yenilebilir peyzajlar vb.) şehir sınırları içinde çeşitli tarımsal faaliyetlerin yapıldığı sınırlı büyüklükteki alanları ifade etmektedir. Kentlerde birden fazla işlevi entegre etmek için alternatif bir alan kullanımı sunan kentsel tarım alanları, tarihsel süreçte gelişmiş ve gelişmekte olan ülkelerde kentlerin önemli bir unsuru haline gelmiştir. Öncelikli olarak gıda üretimine ve güvenliğine hizmet etmenin yanı sıra kentte bireysel ve toplumsal sağlığı arttırmaya yönelik çeşitli faaliyetlere olanak sağlayan bir araçtır. Kentlerde rekreasyon alanları artık sadece parkların ve spor alanlarının oluşturulmasıyla sınırlı kalmayıp giderek farklı biçimlere dönüşmektedir. Bu nedenle, kentsel tarım alanları bu anlamda daha fazla işlev ve anlam kazanmaktadır. Bu bildiride, kentsel tarım alanları ve bu alanlardaki rekreasyonel uygulamalara yönelik ilgili literatür incelemesi yapılarak, dünyadaki kentsel tarım uygulamalarının tarihi gelişimi ve sunduğu rekreasyonel fırsatları ortaya konulmaktadır. Çalışmanın kentsel tarım alanlarının kentsel alan kullanım planlama çalışmalarına entegre edilmesine yardımcı olabileceği değerlendirilmektedir. Ayrıca, sürdürülebilir sağlıklı kentlerin gelişimine katkı sağlaması, kentsel tarım alanlarının kentteki yaşam kalitesini arttırmaya yönelik girişimlerin bir parçası olarak geliştirilmesi ve sürdürülebilirliğinin sağlanmasının önemine vurgu yapmaktadır. Sonuçta; yapılan çalışma ile kent içi rekreasyon alan planlamasına yönelik çalışmalara ve bunun yanı sıra kentlerdeki rekreasyonel çeşitliliğinin arttırılmasına katkı sağlanması hedeflenmektedir.

Anahtar Kelimeler: Kentsel tarım, kentsel tarım alanları, rekreasyon, rekreasyon fırsatları.

1. Giriş

Kentsel tarım toplumda sosyal denge ve uyumu saplamada ve yeşil bilinci kazandırmada önemli bir kaynak, dünya genelinde bir eğlence hobisi haline gelmiş kültürel kavram ve arazi kullanım modası konumuna gelmiştir (Coles & Costra, 2018; Robineau & Dugue, 2018). Son yıllarda dünya çapında yaşanan gıda kıtlığı sorunu ve toplumun karşı karşıya kaldığı salgın hastalık çeşidi ile birlikte insanların yaşam biçimleri ve eğlence-hobi şekilleri değişime uğramış bulunmaktadır. Ülkemizde kentsel tarım uygulamaları, özellikle hobi bahçeleri ve belediyeler kapsamında halka tahsis edilen topluluk bahçeleri son birkaç sene içerisinde hızlı bir artış göstermekte ve toplum tarafından büyük bir rağbet görmektedir. Bu koşullara bağlı olarak sürdürülebilir kentsel gelişme kapsamında kentsel tarım stratejileri önem kazanmıştır.

Ülkemizde son dönemlerde popüler bir kavram olan kentsel tarım; kent alanlarında yoksullukla mücadelede, gıda güvenliğini sağlamada, hava kirliliğini önlemede, atık yönetimi sağlamada biyoçeşitliliği arttırma ve istihdam sağlama gibi birçok sosyo-kültürel, ekonomik ve ekolojik sorunların çözümünü sağlamaktadır. Bunun yanında sürdürülebilir ve yeşil kentler oluşturulmasında önemli katkıda bulunmaktadır. Kırsal tarım alanları ile sürekli etkileşim içinde olan ve gıda sisteminin bir parçası olan kentsel tarım, günümüz dünyasında gelişen teknolojiyle birlikte farklı üretim teknikleri ve farklı amaçlarla uygulanmaktadır. Kentsel tarım kente ekolojik, ekonomik ve sosyal anlamda birçok fayda sağlamakta ve alan kullanımı üzerinde planlamacılar ve bu alanları yöneten yerel yöneticiler için önemli bir araç sunmaktadır. Özellikle kentlerdeki boş ve âtıl alanlar kentsel tarım için önemli derecede alan kullanım potansiyeli oluşturmaktadır. Bu alanların sosyo-demografik, doğal ve kentsel faktörler dikkate alınarak bütüncül ve sürdürülebilir bir yaklaşımla uygulanması ve planlanmasıyla kentler için önemli boyutlarda yararlar sağlayacağı bazı araştırmalarla kanıtlanmıştır (Türker, 2020).

Dünya çapında 800 milyon insan kentsel tarım yapmaktadır (Smit et al., 1996). Bunların iki yüz milyonu piyasa üretimine katkı sağlamakta ve 150 milyonu tam zamanlı olarak istihdam sağlamaktadır. Bu insanlar dünyadaki gıda ürünlerinin yaklaşık %15'ini üretmektedir. Kentsel tarım uygulayan insanlar çoğunlukla gelişmekte olan ülkelerde bulunsa da sanayileşmiş ülkelerde, New York, Chicago, Berlin, Montreal, Toronto ve Vancouver gibi büyük şehirlerde de bulunurlar. Berlin'de yaklaşık 80.000 kişi kentsel tarımla ilgilenmektedir ve New York'ta kamu arazisinde yaklaşık 1.000 topluluk bahçesi var. Boston'da, Boston Natural Areas

Network, 10.000'den fazla insanı bir araya getiren 150'den fazla topluluk bahçesinden sorumludur (Éric, 2009).

18. Yüzyılın sonlarında İtalya savaş sonrası kentsel tarım bahçeleri alanlarına tenis kortları inşa ederek kentsel tarım bahçelerine farklı bir boyut getiren ülke olmuştur. Kentsel tarım bahçeleri, kentlere sağladığı gıda stokunun yanında kent iklimini iyileştirmede ve halkın tarımsal faaliyetlerde bulunmasıyla bu konuda iyileşme ve terapi amaçlı faydalar edinmelerine ve bunların yanında sosyal ve kültürel anlamda kent toplumunun yenilenmesi katkı sağlamaktadır (Akdeniz, 2022). Bu kapsamda kentsel tarım bahçeleri (hobi bahçeleri, topluluk bahçeleri, terapi bahçeleri, kentsel çiftlikler vb.) tasarım aşamasında odak noktası olarak sadece gıda üretimine dönük değil aynı zamanda sosyal faaliyetlere yer verilmeli ve alanın durum, konum ve koşullarına göre iyi analiz edilerek tasarımlar geliştirilmeli, bu şekilde topluma en iyi şekilde fayda sağlanacağı düşünülmektedir.

2. Dünyada Kentsel Tarım Bahçeleri Kapsamındaki Çeşitli Etkinlik Alanları

Adachi Ward Kentsel Tarım Parkı





Japonya'da bulunan Adachi Ward kentsel tarım parkı "doğayla oyna, doğadan öğren ve doğayla yaşa" teması altında, tarım ilacı veya kimyasal gübre kullanmadan yetiştiricilik yapılarak hasat edilen ürünleri kendi bünyesinde satışa sunmaktadır. 50 tür ağacı, 290 tür çiçeği ve 35.000 adet lale tarlalarını izleyebileceğiniz gözlem üç gözlem kulesinin yanında, insan ve doğa arasındaki simbiyoz salonu, eski tarım aletleri sergi salonu ve atölye binası, çocuk oyun alanı ve restoran gibi birçok etkinlik alanı mevcuttur. Parkta tur programları hazırlanmakta ve ücretsiz şekilde katılım sağlanabilmektedir (Anonim 1). Park alanınca kullanıcıların faydalanabileceği ayrıca;

- Emzirme odası
- Piknik alanları
- Canlı ve doğa arasındaki bağlantı gözlem merkezi
- Kağıt yapımı ve boyama odası
- Eski tarihi evler
- Pirinç tarlaları
- Dinlenme evleri gibi etkinlik alanlarıda mevcuttur.

Columbia's Agriculture Park







Columbia, Missouri sakinleri, 2015 yılında mahallelerini park ve yeşil alanlarla canlandırmak için 'Columbia Çiftçi Pazarı' projesini başlattılar. Dört yıl sonra, "Çiftliğin Dostları" ortaklığı, park ve altyapıya sahip son teknoloji bir Çiftçi Pazarı pavyonu, özel bir çiftlik temalı oyun alanı ve konukların eğlenmesi için yürüyüş parkurları içeren Columbia Tarım Parkı'nın 1. Aşamasını tanıttılar.

Columbia Tarım Parkı, Columbia, Missouri'de gıda üretimi ve dağıtımına odaklanan halka açık bir parktır. Columbia Farmers Market'e ev sahipliği yapmakta ve 98 satıcı için alana

sahiptir. 2019'da açılan ve 2021'de ki projenin 2. Aşaması ile interaktif bir şehir çiftliği, gösteri bahçeleri ve meyve bahçeleri, ticari bir mutfak, etkinlik alanı, eğlence parkuru, amfitiyatro, açık hava sınıfı ve oyun alanı yer alacak sürdürülebilir çiftlik olmayı hedeflemiştirler. Ayrıca Columbia Kentsel Tarım Merkezi'nin ofislerine ve bir kaynak merkezine ev sahipliği yapacaktır. Park, Columbia Parks and Recreation, Columbia Farmers Market, Columbia Kentsel Tarım Merkezi ve Sürdürülebilir Çiftlikler ve Topluluklar arasındaki bir kamu-özel ortaklığıyla oluşturuldu. [9][10] Missouri'de türünün ilk örneğidir. Tarım Park'ın misyonu; daha sağlıklı, daha canlı bir topluluk yaratarak sevilen bir Tarım Parkı inşa etmektir.

Pazar pavyonunu bitirmek için yakın zamanda 1 milyon dolar toplandı, böylece 98 kabinin tamamı kapalı ve yıl boyunca satışlar için uygun hale getirildi. Bugüne kadar park iyileştirmeleri için kamu ve özel kaynaklardan 5,5 milyon dolar toplandı (Anonim 2).

- 2019'da 109.304 müşteri CFM'yi ziyaret etti
- 2018'e kıyasla %56 artış, Columbia's Tarım Parkı'na taşındığından beri %72 artış
- 2019'da 2.213,825 ABD doları tahmini satıcı satışı (2018'e göre %39 artış)
- Pandemi ve doluluk sınırlarına rağmen 2020'de 2.208.260 USD tahmini satıcı satışı





The Michigan Urban Farming Initiative (MUFI)

Amerika'nın Michagen eyaletindeki Michigan Urban Farming Initiative (topluluk bahçesi), kentsel toplulukları güçlendirmek, Detroit'in karşı karşıya olduğu birçok sosyal sorunu çözmek ve potansiyel olarak diğer kentsel topluluklar için daha geniş bir yeniden geliştirme modeli geliştirmek amacıyla eğitimi, sürdürülebilirliği ve toplumu teşvik eden bir platform olarak kentsel tarımı kullanmaktadır. MUFI topluluk bahçesinde aynı zamanda toplantıların, teknik eğitimlerin, atölyelerin ve yoga derslerinin yapıldığı çok amaçlı alan, üretim & paketleme mutfağı ve pazar satış alanları mevcuttur (Anonim 3).

3. Sonuç

29/12/2019 tarihinde resmî gazetede yayımlanan genelgede kentlerde hizmet kalitesini ve verimliliğini arttırmak, sosyal yaşamı geliştirmek, insan hayatına değer katan ve maksimum enerji etkinliği sağlayan çözümler üretmek, vatandaşların kent yönetimine katılımlarını arttıracak "akıllı şehir uygulamaları" 2020-2023 Akıllı Şehirler Stratejisi ve Eylem Planı Çevre Şehircilik Bakanlığı koordinasyonunda hazırlanarak ilk adımı atılmıştır.

Kentlerdeki hizmet kalitesini arttırmaya ve aynı zamanda sosyal yaşamı destekleyerek zamanda tarımsal ürün yetiştiriciliğinde kente, bölgeye ve ülkeye katkı sağlayacak olan kentsel tarım günümüz dünyasında ve ülkemizde kent ve yakın çeperlerinde yaygınlaşan tarımsal eylemler olarak adlandırılan popüler bir kavram olarak karşımıza çıkmaktadır. Bunun önemli göstergesi olarak son yıllarda kent alanlarında gün geçtikçe sayısı artan ve geniş yer kaplayan hobi bahçeleri, topluluk bahçeleri örnek gösterilebilir. Kent alanlarındaki atıl ve sınırlı büyüklükte tarım etkinliklerinin yapılabileceği alanlarda hobi amaçlı yetiştiricilik faaliyetleri olarak yaygın bir eğilim olarak gözlemlenmektedir. Ne var ki bireysel olarak yapılan bu tür faaliyetlerin kent makro formu içinde daha geniş kesimleri de içinde barındıracak biçimde herkesi kapsayıcı kent planlamanın bir parçası olarak ele alınması geniş çaplı holistik bir çerçeve sunacak çok yönlü boyutları olan bir girişim olarak değerlendirilebilir.

Kent içerisinde ve çeperlerinde kentsel yeşil alan bir parçası olarak da geliştirilecek olan kentsel tarım bahçeleri kentin iklimlendirmesini sağlaması yanı sıra kentin ekolojik yönden yenilenmesine de katkı sağlayacak olan anahtar ekosistemler olarak değer kazanacaktır. Kentin ekolojik, ekonomik ve sosyal sürdürülebilirliği temelinde çok yönlü ve çok farklı kullanımlarla zenginleştirilebilecek kentsel tarım bahçeleri kentte eğitim, bilimsel araştırma, sosyal yenilenme ve ekonomik faaliyetlerinde beraberinde odak noktası olacak yerleşmeler gibi bir işlev üstlenecektir. Kentler salt geçirimsiz yüzeylerin ağırlıklı olduğu sert zeminlerin ve kirliliklerin insan doğasına aykırı bir biçimde kent yaşamını yaşana bilirlikten uzaklaştıran olumsuzluk bertarafına yönelik çareler üretmek ve devamında bu olumsuzlukları önlemeye yönelik arayışların içerisine girmek ve alternatif alanlar yaratmak gerekmektedir. Yoğun kent yerleşimleri bulundukları coğrafi konum, topoğrafya, temsil edildikleri iklim bölgeleri, sahip oldukları ekolojik değerler, biyolojik çeşitlilikleri ile kültürel varlık değerleri, o kenti bölgeyi çevreyi tanımlayan ve dikkate alınması gereken önemli bilişenlerdir. Kentsel tarım bahçeleri farklı coğrafyalarda faklı iklim şartlarında farklı ekolojik koşulların hüküm sürdüğü

bölgelerde sahip oldukları biyolojik çeşitliliğe bağlı olarak çok farklı ürün çeşitliliğine, yetiştiricilik kültürüne ve bunlara bağlı bir biçimde gelişen teknolojik yeniliklere ve sosyal dokuya bağlı bir biçimde değişmekte, çeşitlenmekte ve birbirleri arasında farklılıklar yaratacak bir şekilde farklı karakteristiklerle belirginleşmektedir.

Son yıllarda kentsel tarım alanlarına olan ilgi insanlığın sosyal eğlence ve etkinlik anlayışının değiştiğini göstermektedir. Toplumlar bireysel ya da yakın çevreleriyle birlikte güven çerçevesinde zaman geçirme eğilimindedir. Gelişen teknolojinin getirisi olan fabrikalaşma ve kimyasal katkılı ürünlere karşın toplulukların kendi gıda güvenliği sağlama ve sağlıklı gıdaya ulaşım kapsamında organik ürün arayışı son zamanlarda artış göstermektedir. Kentsel tarım alanları toplulukların bazı sosyal aktivite ve gıda güvenliği arayışlarını karşılayabildiği düşünülmektedir. Bu alanlar kar amacı gütmeye tarım ve etkinlik alanları olarak değerlendirilmektedir. Literatür incelendiği zaman kentsel tarım alanları bünyesinde barındırdığı sosyal faydaların yanı sıra farklı etkinlik alanları ile kombine edildiği zaman daha ilgi çekici, kullanışlı ve fayda sağlayan birer tarım faaliyet alanı haline geldiği görülmektedir. Büyük ölçekte ve farklı fonksiyon ve faaliyetleri bünyesinde barındıran tarım çiftlikleri veya kentsel tarım alanları kent halkına sağladığı faydaların yanı sıra turist çekerek bölge ve ülke ekonomisine de büyük ölçekte katkı sağlayabilmektedir. Bu kapsamda kentsel tarım alanlarına yönelik geliştirilen ve planlanan projeler, toplumun istek ve ihtiyaçları doğrultusunda farklı rekreasyon alanları ile kombine edilip tasarlanması, bu alanlardan alınacak potansiyel verimi maksimize etmede önemli bir rol oynayacağı düşünülmektedir.

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Legislations Affecting Türkiye's Agricultural Landscape

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Abstract

Agricultural landscapes, where our basic food resources are produced, offer important ecological, economic and socio-cultural opportunities at local, regional and global scales. Today, however, these areas are under great pressure due to some anthropological factors such as population growth, unplanned urbanization and industrialization. Written norms (laws, statutes, regulations, circulars, directives) that give power to the management at the point of protection and development of agricultural landscapes are at key points. The aim of this study is to reveal the managerial approach to the protection of agricultural landscapes in today's Türkiye. In the study, the approaches of the important legal regulations that direct agricultural landscapes in Türkiye in recent years, on the basis of protection and development of agricultural landscapes in the country were evaluated. Within the scope of the study, "Soil Conservation and Land Use Law" numbered 5403, The Law No. 6360, also known as the Integrated Municipality Law, "on the Establishment of Metropolitan Municipalities and Twenty-Seven Districts in Fourteen Provinces, and the Amendment of Some Laws and Decrees with the Force of Law", and the "Regulation for the Construction of Spatial Plans" have been examined. It has been concluded that the legislations examined in the study contain deficiencies and uncertainties at the point of protection-development of the country's agricultural landscapes and this situation will accelerate the process of misuse of agricultural lands, which is one of the most important components of the agricultural landscape.

Keywords: Sustainability, agricultural landscape, agricultural policies, Türkiye.

Introduction

Agricultural landscapes, the ecosystems in which our primary food sources are produced, are a mosaic of farmers' fields, areas of human infrastructure (e.g. roads) and semi-natural habitats. (Chopin et al., 2019). The main elements that make up the agricultural landscape are agricultural settlements and agricultural areas (Açıksöz & Tanrıvermiş, 2000). In addition to this, the customs and cultures of diverse people, which vary from country to country and/or from one place to another, constitute another element of agricultural landscapes (Gül, 2000).

Agricultural landscapes are indispensable areas that provide important resources for the sustainable development and development of both cities and rural areas with their vital, economic, social and ecological characteristics throughout history (Forman & Godron, 1986; Cengiz et al., 2014; Çolak, 2018). Agricultural landscapes, which are one of the most dominant landscapes in the terrestrial area, provide basic food products and contribute to the protection of global biodiversity by providing shelter, food and breeding places for animals and the continuity of biodiversity (Lin et al., 2015; Chopin et al., 2019). They are important habitats that ensure the continuity of ecological processes such as the carbon cycle and the hydrological cycle (MEA 2005, Estrada-Carmona et al., 2014; Lin et al., 2015). In addition to

providing environmental, cultural, economic and public benefits to the society (Bürgi, 2004); They also offer other non-market goods and services, such as the aesthetic value of the landscape. (MEA, 2005; Novikova et al., 2019).

The sustainability of such important landscapes depends on natural conditions such as climate, soil, water and biodiversity (Primdahl, 2014). However, it is emphasized that the natural resource base of the soil, water, land and ecosystem on which food production is based in many regions is either under stress or deformed or is already significantly depleted. (FAO, 2017). It is predicted that these areas, which are broadly defined as the productive systems of crops, livestock, forestry, fisheries and aquaculture, and the main source on which they are based, will undergo an unprecedented change by the end of the century (FAO, 2017). Today, agricultural landscapes and the ecosystem in which they are located are under great pressure due to global environmental changes such as population growth, climate change, land degradation and rapid urbanization (Foley et al., 2005; Chen, 2007; McKenzie & Williams 2015; Rótolo et al. 2015; FAO 2021)

As a result of this stress and deformation, agricultural areas in the world have tended to decrease especially after 2000. Global agricultural areas decreased by 3% (0.13 billion ha) in 2019 compared to 2000, reaching 4.8 billion ha (FAO, 2021). When the change of agricultural lands between 2001-2021 in Türkiye is examined, it is understood that there is a similar picture. It has been determined that there was a 7.09% decrease in agricultural areas in the country between the years 2001-2021 (TURKSTAT, 2021a). In this case, it is extremely important to protect and develop agricultural landscapes, which are among the most important landscapes that contribute to sustainable development and development with their socio-economic, cultural and ecological aspects and at this point, the written norms (law, statute, regulation, circular, directive) that give the power to the management are at key points in terms of the sustainability of these areas.

In this context, the aim of the study is to interpret some written norms, which are among the important legal regulations in recent years (Law No. 5403 "*Soil Conservation and Land Use Law"*, Law No. 6360, also known as the Integrated Municipality Law, "*Law on Establishment of Metropolitan Municipalities and Twenty-Seven Districts in Fourteen Provinces and Amending Some Laws and Decrees" and "Spatial Plans Construction Regulation"*) in terms of planning and protection of agricultural lands in Türkiye on the basis of the protection and development of agricultural landscapes in the country.

Materials and Methods

The main materials of the study are "*Soil Conservation and Land Use Law*" No. 5403 (Official Gazette (OG, 2005); Law No. 6360 on *Establishing Metropolitan Municipality and Twenty-Seven Districts in Fourteen Provinces and Amending Some Laws and Decree Laws"* (OG, 2012) and *Spatial Plans Construction Regulation* (OG, 2014).

"Soil Conservation and Land Use Law" No. 5403: It is the most up-to-date and comprehensive law on the protection of agricultural lands in Türkiye. It entered into force on 19 July 2005. (OG, 2005). The law consists of 6 sections and 29 articles. The purpose of the law: *«to protect and develop the soil, to classify agricultural lands, to determine the minimum agricultural land and agricultural land with sufficient income and to prevent their division, to determine the procedures and principles that will ensure the planned use of agricultural land and agricultural lands with sufficient income in accordance with the principle of sustainable development with environmental priority.»*

The Integrated Municipality Law No. 6360: It was published in the relevant official gazette on 6.12.2012, on the condition that it enters into force after the 30 March 2014 local elections. With this law, in addition to the currently 16 metropolitan municipalities, in the provinces of Aydın, Balıkesir, Denizli, Hatay, Malatya, Manisa, Kahramanmaraş, Mardin, Muğla, Ordu, Tekirdağ, Trabzon, Şanlıurfa and Van, there is a metropolitan municipality with the same name, including the provincial administrative borders was established and thus the number of metropolitan cities in Türkiye increased to 30. It consists of 36 basic and 2 temporary items. With the law, the borders of metropolitan cities were extended to the provincial borders in all provinces with a population of over 750 000, and the legal entities of many villages and towns were abolished and turned into quarters of the province or district municipalities in which they live. Thus, a very large agricultural area, which constitutes the resource values of the agricultural landscape, has been included in the metropolitan municipality boundaries. (OG, 2012).

Spatial Plans Construction Regulation: It is the basic implementation regulation of planning and zoning legislation. It entered into force with the Official Gazette No. 29030 and dated 14.06.2014. The purpose of the regulation; *«to the construction of spatial plans that bring land use and construction decisions to protect and develop physical, natural, historical and cultural values, to ensure the balance of protection and use, to support sustainable development at the country, region and city level, to create healthy and safe environments*

with high quality of life, and to determine the procedures and principles regarding its implementation". The regulation consists of 13 chapters and 40 articles. The regulation consists of 13 chapters and 40 articles (OG, 2014).

In the study, the basic approach-philosophy of the relevant legislation was evaluated on the basis of the protection-development of the country's agricultural landscapes. Content analysis, which is one of the indirect research methods, was used in the evaluation.

Findings and Discussion

Law No. 5403; It is the first legal regulation on the protection of agricultural lands in Türkiye. The law deals with the protection and development of agricultural lands within the scope of environmental priority sustainable development. However, it is seen that the content of the law does not act within the framework of this purpose, and there is a very broad non-purpose use permission in the law.

Although it is stated that absolute, special crop, planted and irrigated agricultural areas cannot be used for purposes other than agricultural production in accordance with the law, the reasons for the non-purpose use of these areas are also regulated in the same law. In case of legal reasons (strategic requirements for defense, temporary settlement requirement after natural disasters, oil and natural gas exploration and operation activities, mining activities with public benefit decision by the relevant ministry, plans and investments made with public benefit decision by ministries, investments to be made in road infrastructure and superstructure activities by considering the public interest, investments related to the use of renewable energy resource areas, geothermal-sourced technological greenhouse investments) allow the misuse of agricultural lands.

The law has a wide content of misuse, including plans and investments for which public benefit decision has been taken by the Ministries, and other non-purpose use requests. Gün (2006), Gün (2014) and Sönmez (2018) stated that the expression of public interest in the relevant law and regulation is vague and quite comprehensive and this may pave the way for the misuse of agricultural lands.

The biggest proof of this is that agricultural lands in Türkiye decreased from approximately 266 million decares to 235 million decares (10,75%) between 2005-2021, when the Law No. 5403 was in force (TURKSTAT, 2022a). This situation shows that the law does not fulfill the purpose of *"protecting the soil by preventing the loss of natural or artificial means and loss of its qualities"*.

The 2017 regulation of Law No. 5403 also adopts a rule that is not protective for agricultural lands and can trigger the conversion of agricultural lands into artificial areas in the need for land and housing for urban settlements. In accordance with the regulation, it has been decided that the Ministry or governorships may give permission for the preparation and modification of zoning and environmental plans of all scales, with the approval of the "*Soil Conservation Board"* established in the provinces (OG, 2017). It is a controversial issue to reduce the use of agricultural lands for the purpose of urban settlement to the level of the governorship. In addition, the professional and scientific competence of the members of the board is another question mark on the subject (Topçu, 2012; Gün, 2014).

In addition, while the Municipal Law No. 5393 of 2005 (OG, 2005) excludes agricultural lands in land production; The fact that Law No. 5403 has such a broad understanding of permission is a threat to agricultural landscapes. Bayar (2018), in the study aiming to reveal the recent changes in agricultural areas in Türkiye, found that the agricultural areas in the country have decreased and these areas have turned into more artificial areas. It has been stated that the basis of such misuse is the relevant law and related policies.

Karadağ et al. (2022) examined the two important written norms that have the most effective power in the protection and use of agricultural lands in Türkiye, the "Soil Conservation and Land Use Law" and the implementing regulation of the law on the basis of agricultural sustainability principles. In the study, it has been determined that there is not enough sensitivity and awareness about the sustainable use and protection of agricultural lands in the relevant legislation.

With the law numbered 6360, the legal entities of 1580 town municipalities and 16 140 villages were abolished and these settlements became neighborhoods affiliated to metropolitan municipalities.The possible effects of this administrative change, which eliminates the rural-urban distinction in Türkiye, on the rural population, the protection of agricultural lands, agricultural production, agricultural employment, agricultural policies, the use of village common goods, and agricultural services are very important.

This new restructuring has changed the balance between the rural population and the urban population in the country. Since most of the village and town statuses were abolished with the law, the urban population ratio of the country reached 94% from 77%. Because the rural population of all the provinces declared as metropolitan cities within the scope of the law

numbered 6360 was above the average of Türkiye. Therefore, with the law, nearly 11 million people living in rural areas were included in the urban population (TURKSTAT, 2022b).

Majority of the areas covered by metropolitan municipalities consist of rural areas such as agriculture, forest, heathland, meadow and pasture. The law numbered 6360 is likely to cause problems in the management of agricultural areas, which are among the main elements of the agricultural landscape.

The biggest threat of the law is that these rural areas carry the risk of being opened to development activities. In these areas, it is possible that a danger such as the transformation of the natural environment seen in today's cities into artificial form will occur. In addition, with the inclusion of rural areas in zoning activities, the attractiveness of these areas will decrease and the possibility of disappearance of their local values and identities will increase.

In addition, the agricultural employment rate in the majority of the relevant municipalities is above the Türkiye average (TURKSTAT, 2022c). In addition, the majority of metropolitan cities (Konya, İzmir, Manisa, Balıkesir, Ankara, Mersin, Samsun, Adana, Antalya, Şanlıurfa, Aydın are in the top ranks) have very high plant and animal production potentials. (TURKSTAT, 2022a). It is likely that both agricultural employment and agricultural production will suffer in provinces that are metropolitan municipalities, where the population and the entire area gain urban status.

The law has a high potential to have negative effects on rural policies as well. As a matter of fact, the villages that have become a part of the city as a neighborhood with the law will be prevented from benefiting from rural landscape projects (such as Agriculture and Rural Development Supports and EU funds).

With the law numbered 6360, additional financial obligations were brought to the rural population. Village residents, which have turned into neighborhoods with the law, will now have additional financial obligations such as property tax, environmental cleaning tax, water and waste water fees, just like the urban population. The villagers will have to pay various project costs for the structures (such as barn, water tank) to be built in the village with the transformation of the villages into neighborhoods. These financial burdens will reduce the attractiveness of living in the countryside, and migration from rural to urban will be triggered, and as a result, this will negatively affect the rural landscape areas, the people living here and the production in these areas.

According to the law, the villagers will continue to benefit from the pastures, pastures and winter quarters, which are among the common property of the village. However, with the transfer of all property belonging to the village legal entity to the municipalities by law, these properties will cease to be the common property of the village. There is a high probability that these lands will be sold or leased in the coming years, leading to a decrease in rural activity areas and the efficiency of these areas.

It is stated in the law that metropolitan and district municipalities can support agriculture and animal husbandry. However, metropolitan and district municipalities do not have technical and administrative infrastructure for agricultural services. In this case, it is obvious that many problems in rural development cannot be solved in the long run.

Üçer et al., (2014) stated that it is quite clear that the law will adversely affect rural activities, that the demographic, social and economic structure of the country will be affected with the change in related activities, that agricultural lands will be weak against urban rent, and that there will be negative effects on rural areas and rural life. Demiroğlu et al. (2014) stated that the environmental, economic, social and cultural effects of the changes within the scope of the law on rural areas are worrisome in their study evaluating the possible reflections of the relevant law on rural tourism areas in Türkiye. In addition, Gün (2014) stated that the risk of using a large rural area, which was included in the metropolitan borders with the law, for non-agricultural purposes is quite high.

In the purpose section of the Spatial Plans Construction Regulation, there is the statement *"…to determine the procedures and principles regarding the construction and implementation of spatial plans that bring land use and structuring decisions ….. at the country, regional and city level".* The regulation does not bring any regulation regarding rural areas and natural areas that surround the cities. No regulation has been introduced in the Regulation regarding new rural areas whose village status has been abolished with the Integrated Municipality law. No definition, foresight and use of the countryside are included in the upper scale plan types such as Spatial Strategy Plan, Integrated Coastal Areas Plan, Environmental Plan, which also includes rural landscape elements. Because the regulation as a whole rural, rural area definitions, rights, protection, etc. lacks in subjects.

In the title of planning and principles of spatial strategy plans, there is the expression *"…Strengthening spatial relations between urban and rural areas…".* This statement indicates that rural areas will be under the pressure of urbanization. There is a statement in the

regulation: "*It is essential that **large projects** that require decisions at the country and regional level are evaluated in the spatial strategy plan or environmental plan."* It is understood that even the upper plan decisions can be easily changed with a definition such as ***"large project"*** whose size, scale and scope are not clear. Such vague expressions in a legal norm include the possibility of changing/transforming/destroying the country's natural, cultural and historical resource values.

When we look at the whole regulation, it is striking that there are new developments and land use demands based on new data as the justification for revision in the plans. However, what the new development might be, its importance and necessity has not been explained. It is not clear what is meant by new data. Such open-ended expressions are expressions that can trigger the unintended planning and use of all natural resources, including rural landscape elements.

In the regulation, the *"integrated coastal plan",* which is not included in the planning stratification and the nature of which is not fully understood, is defined. This situation raises concerns about the holistic planning and protection of agricultural lands located on the coasts.

As a matter of fact, it has been stated by the relevant professional organizations that the regulation contains many negativities in terms of planning stratification, language and standards. For these reasons and the concern of the related regulation to increase the pressure on the rural areas of the country, an application was made to the Council of State with a comprehensive report for the stay of execution. In the reasoned report, it was emphasized that the regulation should be re-evaluated *"with the awareness that protecting our natural assets is protecting our lives"*. (Union of Chamber of Engineers and Architects of Turkey, 2014).

Karadağ et al., (2018) also revealed that the relevant regulation will adversely affect the spatial transformation in Turkey in terms of protecting the country's natural and cultural resource values. They underlined that the regulation, which serves as a guide for practices, should be re-evaluated in the light of ecological principles. Also in the related study of Demiroğlu et al., (2019), the applicability of green infrastructure systems in Turkey at the point of protecting the areas constituting the components of green infrastructure systems, including agricultural landscape elements, was examined on the basis of the Spatial Plans Construction Regulation and the Integrated Municipality Law. Researchers stated that there are many mistakes and/or inadequacies in the applicability of green infrastructure systems of the relevant jurisdictions and provisions in both legislations.

In addition to all these, Yörür (2010) in his study in which they examined all the legislation related to agriculture, revealed that the problems in agricultural employment and agricultural production in the country were shaped on the basis of the relevant legislation. In addition, Akseki and Meşhur (2013) emphasized the need to develop tools and policies that reveal multi-dimensional protection principles for the protection of agricultural lands in Turkey; at this point, they underlined that it is very important to define the planning-policy and legal instruments in a holistic way.

Conclusion and Recommendations

One of the most important tools in the protection of agricultural landscape elements of a country is legal regulations. In this study, three important written norms that have the most effective power in the protection and use of agricultural landscape in Turkey are examined.

It can be stated clearly that the non-protective rules of Law No. 5403 in areas defined as urban areas by removing them from the scope of rural areas in 16 provinces in addition to the Law No. 6360, and the absence of any regulation regarding rural areas in the "Spatial Plans Construction Regulation" , in particular, it will accelerate the process of misuse of agricultural lands, which is one of the most important components of the agricultural landscape.

It is also obvious that Turkey needs a holistic legal infrastructure that will reconsider the issue of agricultural lands from the perspective of natural resources, food production and multi-faceted protection. In this context, it is extremely important to reconsider the relevant written norms in an interdisciplinary environment with an approach that holistically protects, observes and supervises the agricultural landscape elements of the country.

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Model Identification with Performance Evaluation Approach for Indoor-Outdoor Sports Venues in Primary Education Buildings

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Abstract

In today's world where we need movement the most, the concept of sport has made its importance even more pronounced. The contribution of physical education and sports on the road from infancy to old age shows its effect throughout life. Physical activity that is important for children in their development and growth processes; With the rapid development of technology and the intensification of urbanization, it has gradually decreased. As a result, educational buildings where they can perform physical activities become an important issue for children who spend a long part of their days at school. For school-age children dominated by the movement, design criteria that will positively affect their development should be taken into account. Indoor and outdoor sports areas should be designed in educational buildings, taking into account the physical, cognitive, social and emotional development of children. For this reason, performance evaluations should be carried out to regulate the physical conditions of sports venues in primary education buildings and to determine the quality of the venue. In the research, it is aimed to focus on the design process of sports spaces in primary education buildings and to create a model proposal by defining the steps that will serve the indoor-outdoor sports space design process depending on the spatial performance categories. In this context, a two-step path was followed. In the first step, the concept of performance and accordingly the categories set forth in the literature were determined. In the second step, in order to create the model fiction, 12 experts consisting of sports teachers, sports coaches, school administrators, groups of academicians in sports sciences and architects, interior architects and landscape architects, practitioners and academicians were surveyed because the building efficiency will be studied. When the obtained data are evaluated, it is seen that functional performance, technical performance, environmental performance and safety performance come to the fore clearly. In this direction, the most detailed information to be known in the design of the indoor-outdoor sports spaces in primary education buildings in terms of space performance was examined and the factors affecting the design process and their relationships with each other were schematized and the model was developed.

Keywords: Children, sports, school, performance.

Introduction

While the movement dominated for many years in the history of humanity, espcially in the 20th and 21st centuries, as a result of the rapid developments in technology and accordingly the changing lifestyles of individuals, people have moved to a more inactive order today. Today, human power is replaced by technology; while revealing the increase in long-term desk work, intense work tempo, negative environmental factors such as pressure and fatigue; The intensification of television and computer use also plays a major role in the formation of a stable life culture. (İlhan, 2010). The stagnation and inactivity that has become a lifestyle resulting from the changes and developments experienced cause a lack of physical activity in

individuals (Orhan,2019), which causes physical, mental and social problems. Movement, and therefore sport, is at the center of people's development processes. In the concept of sport, besides the effects of physical activity, cognitive, emotional and spiritual effects play an important role in the development of individuals.

Today, when we need movement the most, movement and therefore sports are among the basic conditions of people's development processes (Gohla, 2010). The phenomenon of movement and sports in childhood has important contributions to the development of individuals and shows its effect throughout their lives. Development; is a broad concept that includes the concepts of growth, maturation, readiness and learning; It is handled under a broader discipline called developmental psychology, which deals with the changes people experience throughout their lives (Berk, 2006). The principles of the human species, with its distinctive developmental process, give a general view of how man as a whole develops. There are also many ideas and theories for child development. But with the most general perspective, the models established for human development; It has been handled as four categories as physical, cognitive, social and emotional (Yavuzer, 2016).

Childhood, which is defined as the developmental period of the individual starting from the birth period until the adolescence stage; According to age groups, sensory-motor development (0-2 years old), pre-operational period (2-7 years), concrete operational period (7-11/12 years), abstract operational period (11/12 years and above) consists of four stages consists of (Ertaş Beşir, 2012). Sport, which is of great importance for child development, affects the development of the individual from childhood to old age in different ways (Baltacı, 2008; Ertaş, 2013). Sports activities that enable the individual to use his/her energy, muscles, mental abilities, perceptions, quick decision making and social qualities have positive effects on the physical, cognitive, social and emotional development of the child (Özdogru, 2018; Orhan, 2019; Er et al., 1999). In addition to being physical activities that meet the movement needs of individuals, have certain rules, and entertain (Heper et al., 2012), sports also have competitive, solidarity and cultural aspects that socialize, organize with society, develop spirit and physique (Koçtürk, 1969). Psycho-social, which is a combination of the words "psychology" and "social"; It refers to the life of a person, which is affected by environmental factors and divided into various stages spiritually. The interaction of people with each other and the social development of individuals have a positive relationship with the sport phenomenon. While doing sports together with this unity shows its effects on the body in a

physical sense, it is also a set of actions that facilitate socialization and adaptation to society. While it provides social development among people, it also creates a language of communication. From the end of the 19th century to the 21st century we are in, the concept of sports can be considered as a topic of vital importance in terms of child development, with the theories of approach starting from the child-environment relationship and evolving into the child-technology relationship. For the child, who will exist as an adult in the following years, sports are not only physical, but also effective on cognitive development by enabling the individual to understand and learn the world around him, and by covering all of the active mental work. All these positive effects of sports on children; Sports and mobility skills vary according to the developmental characteristics of children. In this direction, the criteria for the sports and movement space offered for the user should be determined with the recognition of the child and the design should be created in the light of this information.

People do sports to live healthy. However, their purpose should not only be this, but also the use of sports for educational purposes under the name of physical education and sports (Akyüz, 1981). In order for children to show a healthy development, they must receive a well-prepared general education suitable for their developmental characteristics. In accordance with the modern understanding of education, the realization of the goals in education is possible with the physical education of the student as well as the mental education of the student (Güneş, 2001). One of the important periods of child development; In the stage called early childhood and middle childhood, sports play the most effective role on the child physically, mentally and socially. In the period also known as school age, the child spends a long part of his day at school as a field of action. Schools are organizations that train people and bring them into society. Environmental factors in childhood; The school structure, learning space directly or indirectly affects the child throughout his/her life (David et al., 1987; Tapkı & Türkyılmaz, 2018). School building designs are of great importance for children where the act of movement is most loved and practiced, where curiosity and perceptions are intensely dominant.

As of 2012, the 12-year compulsory education system, 4+4+4, has been introduced in Turkey. It has been argued that it is aimed to guide children early according to their abilities and to revitalize vocational education (Odabaşı, 2014), and with this system, 1st, 2nd, 3rd and 4th grades are primary school, 5th, 6th, 7th and 8th grades between the ages of 6-9. In the 10-13 age range, middle school and 9th, 10th, 11th and 12th grades are categorized as high school in

the 14-17 age range. It is an important process in which children aged 10-13, especially in the secondary school period, discover themselves more and begin to determine what they want. In this period, the guidance to be made according to the abilities and interests of the children will determine their lives and choices in the future. In this respect, schools are at a critical point for the future of children. Children who are followed and interested in school should be able to be directed to education structures such as science high school, social science high school, Anatolian high school, fine arts high school, vocational high school or sports high schools according to their abilities and interests during the transition to high school.

During the child's self-discovery period; to find answers to psychological behaviors, character, learning style, where to learn; constitute the most important references in the planning of educational structures (Gür, 2002; Tapkı & Türkyılmaz, 2018). These references will also guide the design in the creation of indoor and outdoor sports venues in primary schools. Educational buildings and sports venues are at an important point today in order to help children develop by receiving the right sports education and to bring sports into their lives (Ertaş and Özdemir, 2010). Sports training; "Physical Education and Play" in 1st, 2nd, 3rd and 4th grades according to the curriculum of the MEB; It is given under the name of "Physical Education and Sports" in 5th, 6th, 7th and 8th grades (MEB, 2018a; MEB, 2018b). Opportunities offered in school buildings for Physical Education and Sports; sports facilities and materials, teaching materials and teaching staff should be at a sufficient level (Pepe, 2003). Primary education structures should be designed considering the child's developmental stages and anthropometric measures in terms of physical, cognitive and spiritual development of children, awareness of sports high schools and directing children who will choose sports as a profession.

The uniform school structures applied today and the changes in the education system necessitate the revision and change of school building designs. Schools that are not designed with a flexible design approach cause them to turn into ergonomic, useful and not suitable for child development structures that children can use over time. It is important to evaluate the performance of sports venues in order to determine the arrangement of physical conditions, quality of space and user tendency. The research focuses on the design process of sports venues in primary school buildings, and it is aimed to create a model proposal by defining the steps that will serve the design process of indoor and outdoor sports venues depending on the spatial performance categories. In this context, a two-step path has been followed. In the first

step, the concept of performance and related categories in the literature were determined. In the second step, 12 experts, consisting of architects, interior architects and landscape architects, practitioners and academics, were surveyed, since the building efficiency would be studied with sports teachers, sports coaches, school administrators, academic groups working in sports sciences, in order to create the model setup. In line with the data obtained, the most detailed information that needs to be known in the design of indoor and outdoor sports venues in primary education buildings in terms of space performance has been examined and a model has been developed by schematizing the factors affecting the design process and their relations with each other.

Performance Concept

The concept of performance, with its most general expression, is a concept that reveals the result of a predetermined activity to achieve a certain goal, numerically and in terms of quality. (Akal, 1998). In architecture and other design-related fields, 'use satisfaction' is defined as 'use-related behavior'. Performance approach started to be used in buildings in the 1970s, and then performance-based design terms began to be used in studies for the application and dissemination of this approach (Sayın, 2014).

The performance approach is not with the description of how the structure will be built; he is interested in what he needs (Ulukavak Harputlugil & Bedir, 2008). Design approaches should be according to the user, the function to be used and the purpose. In addition to the user requirements in the design, what features the design should have to meet the user needs should also be determined. These specifications represent performance requirements.

Performance requirements define different approaches for the level of quality required during the use of spaces. The performance requirements of the venues are of great importance in order to produce future measures and solutions. To ensure that these solutions meet performance requirements, it is necessary to evaluate them. This is done on the basis of "performance indicators (PG)". Performance indicators are studies to clearly reveal the performance targets of buildings using quantitative criteria and are used to determine the performance targets of the building more clearly and quantitatively. The presentation of performance data provides "value" throughout the entire existence of the building, starting from the planning stage of the building to its use and operation after the design and construction stages (Ulukavak Harputlugil, 2009).

In order to determine the problems, to create the evaluation stages and to measure the performance in the indoor and outdoor sports venues in primary schools, first of all, the performance dimensions should be determined. Performance dimensions, user requirements, performance determinants and building performance evaluation methods differ according to many researchers. Preiser and Vischer (2005) group performance criteria as environmental, economic, functional, physical and service performance. Lutzekendorf et al. (2005) examined performance levels in 6 different categories: functional, technical, economic, environmental, social and process performance. Sanoff (1977) mentions 4 different performance levels as functional, economic, symbolic and structural. Preiser et al. (1988) stated that performance dimensions consist of three components: technical, functional and behavioral (Yaldız, 2013). Kutlu and Ergün (2021) analyzed functional performance, process performance and environmental performance. Aydın &Uysal (2009) examined the performance dimensions of performance variables under three headings: technical, functional and aesthetic. Yaldız and Asatekin (2016) discussed them under five headings as environmental, functional, technical, perceptual and cultural perception. Colquhoun (2004) talks about safety performance (Table 1).

Table 1. Performance Categories by Researchers

Researcher	Performance Categories
Sanoff 1977	• Functional Performance • Economic Performance • Iconic Performance • Structural Performance
Preiser vd. 1988	• Technical Performance • Functional Performance • Behavioral Performance
Colquhoun 2004	• Safety Performance
Preiser and Vischer 2005	• Environmental Performance • Economic Performance • Functional Performance • Physical Performance • Service Performance
Lutzkendorf vd. 2005	• Technical Performance • Economic Performance • Environmental Performance • Social Performance • Process Performance
Aydın and Uysal 2009	• Technical Performance • Functional Performance • Aesthetic Performance

Yaldız and Asatekin 2016	• Environmental Performance • Functional Performance • Technical Performance • Perceptual Performance • Cultural Perception Performance
Kutlu and Ergün 2021	• Functional performance • Process performance • Environmental performance

Technical performance from performance categories; It is also considered as structural performance. It is an evaluation that expresses the extent to which the building components and elements meet the needs according to their intended use and to what extent their purposes are effective (Yaldız, 2013) functional performance; It is a performance evaluation that measures the relations in which the indoor organization of the building is constructed and how the user and the space are affected as a result. Environmental Performance; These are performance evaluations related to the physical environment of the building, and it deals with the features affecting the immediate environment such as circulation areas, access opportunities, land use, building density around, harmony with the environment, resource use, traffic density and the number of parking lots in the formation of the physical environment (Dikmen & Özçetin, 2016; Yaldız, 2013; Ergün & Halaç, 2021). Safety performance; It is the performance item that should be evaluated for the structure to ensure that the users are in a physically and psychologically healthy area. Creating an environment that people think they belong to and considering security as a need in this environment is the idea that helps to achieve the goals and objectives in terms of health and safety and emerges in this direction (Colquhoun, 2004). Aesthetic Performance; It is an evaluation on the materials used in space design such as color, lighting, equipment and the harmony of these materials with each other. Space designs can be perceived in different ways according to users and can be shaped according to their perceptions behavioral performance; health, comfort and safety of use (Lutzkendorf et al., 2005; Yaldız, 2013) are the determinants of behavioral performance evaluation. Since this evaluation is based on techniques related to human behavior, it requires interdisciplinary work. It includes details such as privacy and interaction, crowd, building use, spatial selection, image meaning and environmental perception. Many techniques such as interview and observation are used in the analysis of these details (Göktekin, 2002) social performance; The proximity of the spaces in the building and their frequency of use, the provision of a sufficient level for both privacy and social interaction of the users who use the building, whether the arrangement of the circulations affect the social interaction are examined (Yaldız & Asatekin, 2016) and analyzes and evaluations are presented with the

techniques used. Economic performance; It is divided into two as real building performance and cost performance and covers the issues such as investment, design and planning, building and construction, demolition, cost of ownership (Lutzkendorf et al., 2005) of the project, as well as income flow and return on investment (Yaldız & Asatekin, 2016). Economic performance has a decisive impact on the progress of the design and manufacturing areas of the project. Perceptual performance; The attractiveness, spaciousness and pleasantness of the spaces, the geometric form of the interior, its dimensions and the relationship of the space with open/circulation or closed spaces, size, material properties are discussed in this performance evaluation content. Components of performance are defined as the effects of the spaces used on the user (Yaldız & Asatekin, 2016). Process performance; Planning, design, construction, operation, maintenance, management and usage levels play an active role in examining process performance. Within the process performance evaluations, the validity and effectiveness of the design are evaluated by considering the planning and construction stages, management of building services, monitoring of technical systems, waste management (Lutzkendorf et al., 2005) iconic performance; It is an item that evaluates the building and its surroundings. The environment and how the building is perceived by the users are examined (Karagenç & Ünügür, 2011; Yaldız & Asatekin, 2016). Issues such as symbolic performance, perceptual values that users acquire from the environment, and the effect of the building symbol on users and non-users are taken into account.

The user requirement may require several performance requirements to be met. The user needs approach is an approach that the user understands well and that mostly reveals the necessity for the function. On the other hand, performance requirement is an expert language that does not make sense for an ordinary user, and it is a job that requires expertise to translate user needs into performance requirements (Ulukavak Harputlugil, 2009). Each structure should be approached to determine its own performance indicators.

In order to reveal and measure the efficiency of indoor and outdoor sports fields in primary education structures, it is necessary to determine their own performance.

Material and Method

The research focuses on the design process of sports venues in primary school buildings, and it is aimed to create a model proposal by defining the steps that will serve the design process of indoor and outdoor sports venues depending on the spatial performance categories. In this context, a two-step path was followed (Figure 1).

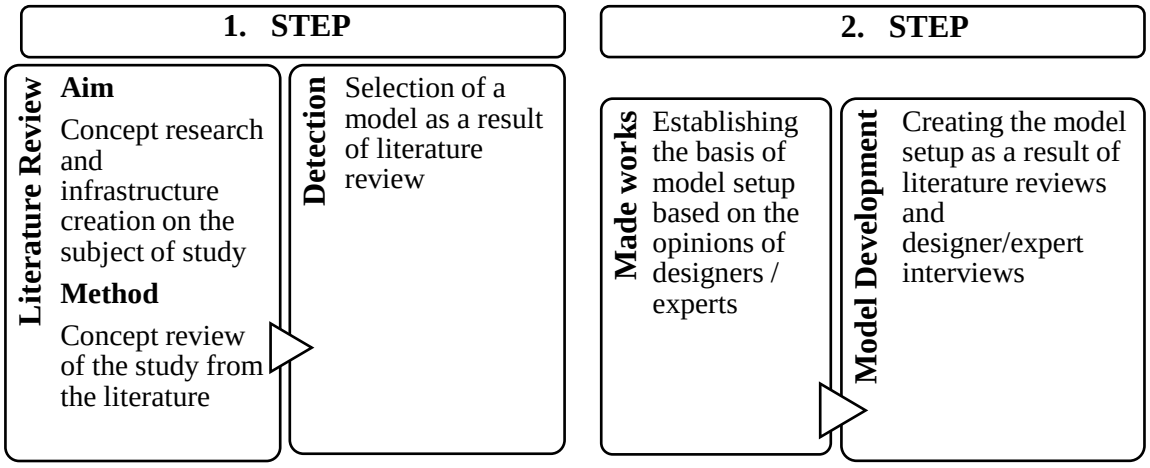


Figure 1. Methods and steps used in the study

In the first step, a literature review was conducted to map the research, and an infrastructure was created about the study subject. The concept of performance and, accordingly, the categories put forward in the literature were determined. Sports venues in existing primary school buildings were examined.

The second step covers a process based on the opinions of designers/experts, which is one of the first methods determined by Cross (1999) to form the basis for model setup (Sönmez, 2016). Cross (2008) accepts that the design process consists of the stages of discovery, creation, evaluation and communic ation, respectively, and emphasizes that there is a cyclical structure between the stages of creation and evaluation (Sönmez, 2016) (Figure 2).

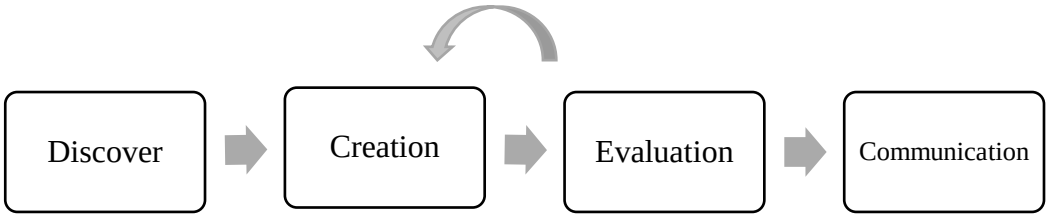


Figure 2. The design process according to Cross (1999) (Sönmez, 2016)

In this step, sports teachers, sports coaches, school administrators, academic groups working in sports sciences will work on building efficiency, so 12 experts, consisting of architects, interior architects and landscape architects, practitioners and academicians, and the criteria for revealing the efficiency of indoor and outdoor spaces in primary school buildings. It is aimed to determine the performance categories. In this direction, all classifications made in the literature regarding performance categories were presented to the expert group and they were asked to rate the first 5 of them, which they considered the most important, between 1 and 5

(5 being the most important). The results obtained were collected separately for each performance category and the performance categories with the highest scores were revealed. Since each architectural design product has different problems and solutions, the tool, method and process followed in order to reach the product are also different. For this reason, a single and fixed definition of design processes cannot be made. It is important to make the design processes of designers as schematic and perceptible by others as possible (Sönmez, 2015). In this direction, the most detailed information that needs to be known in the design of indoor and outdoor sports venues in primary education buildings in terms of space performance has been examined, and the factors affecting the design process and their relations with each other have been developed and schematized by Cross's (1999) design process model.

Results

Performance Categories for Outdoor-Indoor Sports Venues in Primary Education Buildings

The criteria required for the efficiency of indoor and outdoor sports venues in primary school buildings will be studied by sports teachers, sports coaches, school administrators, academic groups working in sports sciences, and 12 experts in Trabzon, consisting of architects, interior architects and landscape architects, practitioners and academics. performance categories were determined for the open and closed areas in primary schools. When the data obtained are evaluated, it is seen that functional performance, technical performance, environmental performance and safety performance come to the forefront (Figure 3).

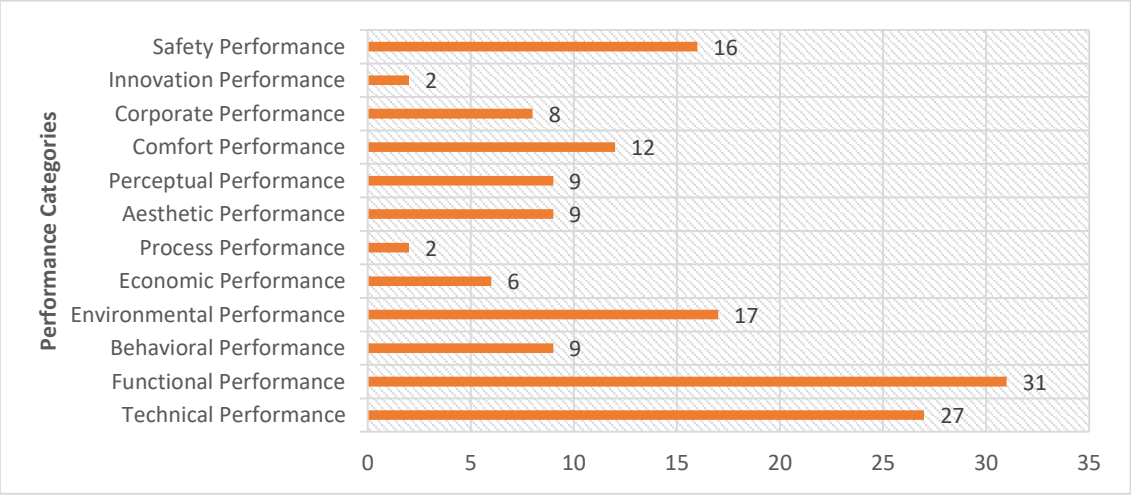


Figure 3. Results on Spatial Performance Categories in Primary Schools

Functional Performance

Functional performance; It is defined as a performance evaluation that measures the relations with which the interior design of the building is created and how the user and the space are affected as a result. It includes subjects such as the space's suitability for the needs program,

functional accessibility, changing user requirements and adapting to flexible uses (Lutzkendorf et al., 2005; Yaldız, 2013). The relations between the spaces in the building, the circulation areas, the provision of certain dimensional criteria for the users (security, flexibility, communication, the movement and placement of the equipment, etc.), the needs for special use are the main subject of functional performance evaluation (Dinç, 1999; Yaldız, 2013). Functional performance also reveals the level of user satisfaction (Karagenç, 2002). Functional performances can be examined with various techniques such as direct observation of user actions, measurement of workflow and user movements, indirect measurements, examination of records (Dinç, 1999; Yaldız, 2013), action analysis and space analysis.

Within the scope of the functional performance of indoor and outdoor sports venues in primary education buildings, the user should be considered as a child and the space setup should be created in this direction. Need programs should be determined in sports venues and designs should be realized with user-oriented criteria.

Technical Performance

Technical performance includes the structural, physical and other technical features of the building (Lutzkendorf et al., 2005; Yaldız & Asatekin, 2016). Within the scope of this performance, features such as the strength of the structural components in the building, natural-artificial lighting, ventilation, heating, installation, acoustics, resistance to fire, structural integrity and durability, the suitability of the techniques and materials used reveal the technical performance of the building (Yaldız & Asatekin, 2016).

It is necessary to determine the technical conditions of indoor and outdoor sports venues in primary education buildings in accordance with the function, and in this direction, decisions and applications should be made according to the needs of the building.

Environmental Performance

Environmental performance; It is a performance evaluation related to the physical environment of the building. In shaping the physical environment, it deals with the features affecting the immediate environment such as circulation areas, access opportunities, land use, building density in the surrounding, condition and density of green areas, harmony of the building with the environment, resource use, traffic situation, number of parking lots (Yaldız, 2013; Dikmen & Özçetin, 2016; Tuğluer & Çakır, 2021; Ergün & Halaç, 2021). The building's role as a means of describing and describing the environment, being a reference point, being a center for the city, being a meeting point, pedestrian and vehicle accessibility,

parking facility, visual integration-harmony with the surrounding texture, use of green space, outdoor relationship, etc. covers the subjects (Yaldız Asatekin, 2013).

Safety Performance

Safety performance; It is the performance item that should be evaluated for the structure to ensure that the users are in a physically and psychologically healthy area. Creating an environment that people think they belong to and considering security as a need in this environment is the idea that helps to achieve the goals and objectives in terms of health and safety and emerges in this direction (Colquhoun, 2004). It covers issues such as the safety and security of the design and expresses the safe behavior of the users.

Necessary safety measures should be considered for children who are users of indoor and outdoor sports venues in primary education buildings. It is of great importance to provide children with healthy and safe spaces, taking into account the safety performance in sports fields during the childhood phase when the movement is most experienced.

Developing a Model for Determining the Performance of Outdoor-Indoor Sports Venues in Primary Education Buildings

Taking the design process model stated by Cross (1999) as an example, the steps to determine the indoor-indoor sports indoor performance of primary school buildings were revealed. Steps; It was determined to determine the space efficiency of sports venues, to identify problems, to make evaluations and to produce solutions. In this context, the relationship of the steps with each other is schematized (Figure 4), and the stages of discovery, creation, evaluation and communication and their places in the model are determined and the applications that the designers should do during the design process are defined. In this way, it can be ensured that the performance of the sports venues in the primary school buildings can be monitored with appropriate indicators and improvement strategies can be determined in line with the results obtained. Steps defining the model; It can enable the formation of a mechanism where primary education structures can be self-monitored and evaluated by the relevant public units or school administrators, and measures can be taken against problems before it is too late.

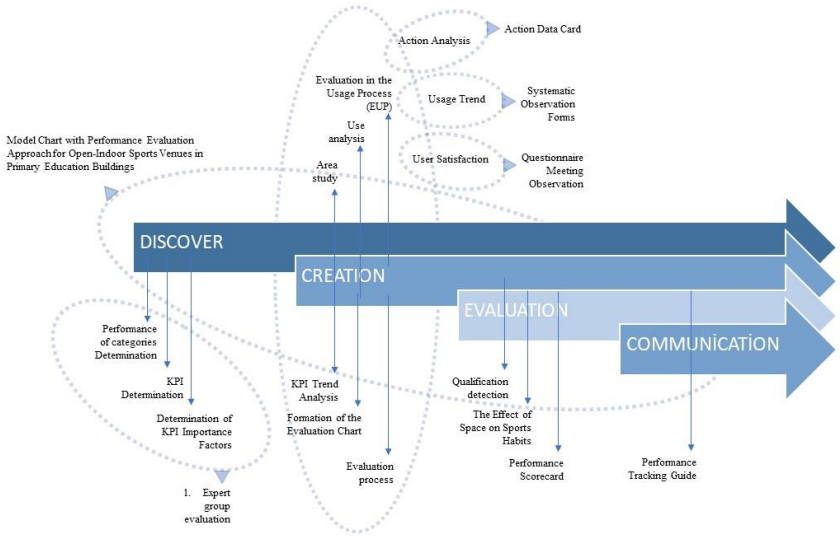


Figure 4. Model for determining the performance of indoor and outdoor sports venues in primary education buildings

Discovery phase; It includes research and investigations in the field of open and closed sports venues in primary education buildings. At this stage, space criteria should be determined in primary education buildings, and anthropometric evaluations of the usage spaces whose users are children should be made according to the required function. As a result of literature research for educational buildings and primary school buildings, sports venues; The criteria (spatial circulation, materials and equipment, functional criteria, etc.) that should be in educational buildings and sports venues should be revealed. Performance categories for primary school sports venues and key performance indicators (functional performance, technical performance, environmental performance, safety performance) should be established in the evaluations to be made with 12 experts in their fields. Key performance indicator: values/criteria that measure the goal to be achieved. It allows the process to be evaluated with the determined criteria and to see the success status. It guides in reaching the target as it provides feedback based on the data of the current situation ("Key Performance Indicator", 2020). The evaluations they will make for the performance criteria determined together with the expert group (a scoring system between 1-5) and the FPG importance coefficients should be created.

At the stage of creation; A trend analysis should be created with the determined APG importance coefficients and an evaluation chart should be prepared to determine the performance levels in the light of key performance indicators for each of the performance dimensions of the indoor and outdoor sports fields of primary education buildings. Evaluation

chart is the evaluation system used to reveal the spatial performance level of the building in the usage process. Then, depending on this scale, the evaluation process of schools for indoor and outdoor sports areas should be completed by applying to field experts at least 5 times the number of performance indicators in each performance category (Muthén & Muthén, 2002; Stevens, 2002). Usage analysis should be made for the sports venues of the primary education structure to be evaluated in the analysis phase, and in this direction, analysis data should be collected with evaluation (KSD) during the usage process in KSD; Based on spatial data for the functional and spatial characteristics of the current function of the spaces, analyzes for quality determination (action data card and action analysis), analyzes for usage trends (systematic observation and observation forms) and analyzes for satisfaction of use (manager, teacher, observers) are created. Usage trends and user satisfaction levels in primary school sports venues should be revealed through subjective evaluations (surveys, interviews and observations in the field) that measure user satisfaction.

In the evaluation phase; For the information obtained for the primary school sports venues determined by the study data revealed during the information gathering and analysis stages, the collected data should be described in a systematic and clear way, these descriptions should be explained and interpreted, and cause-effect relationships should be examined (Yıldırım & Şimşek, 2016). In line with the data obtained from the usage analysis, the quality of the building and the effect of the space on the sports habits should be revealed. A performance scorecard should be created in line with the data obtained from the APG trend analysis. The performance scorecard is a tool that shows the performance of the building after use as a result of the evaluations made. Solution proposals should be created for the performance levels determined for each performance dimension revealed in the performance scorecard. While developing performance improvement strategies, quality determination and the effects of space on sports habits should be taken into account.

At the communication stage; A performance tracking guide can be created with the connections formed in line with all the obtained data. In addition to the physical data of the space, the follow-up guide should also include information about how the space is perceived by the users and the satisfaction level of the user. Sustainability can be ensured by defining the processes of how the spatial performance of primary education buildings should be with the created model. In this direction, the guide describing what the process should consist of is

not sufficient. These design processes should be supported by a web-based system that can be followed.

Conclusion

In the model definition for indoor-outdoor sports venues in primary school buildings, the performance of sports areas that shape the child-sports relationship has been determined and the steps that enable to reveal the effects of these spaces on students' sports habits have been revealed. Indoor and outdoor sports venues in primary education buildings; It is affected by 4 basic performance categories: functional, technical, environmental and safety performance. With the design process model put forward in this direction, the performance/efficiency of the sports venues in the primary school buildings and what should be done for the remedial arrangements to increase the efficiency were determined according to these performance categories. In this context, the effects of the performance evaluation model and the requirements to be determined for sports venues are as follows.

• The performance evaluation model provides forward-looking solutions and helps to take the necessary precautions by providing performance monitoring of indoor and outdoor sports venues in primary education buildings. The performance appraisal model reveals the difference between the current state and the desired future state.

• The key performance indicator is the criteria that measure the target to be achieved. It allows the process to be evaluated with the determined criteria and to see the success status. It guides in reaching the goal as it provides feedback based on the data of the current situation.

• By means of the KSD method, it will be possible to reveal how the sports areas in primary school buildings should be structured and the effects of the spaces on the user, and to develop the space.

• For each performance dimension revealed in the performance scorecard, solutions can be created by discovering the problems related to the performance levels determined.

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The Effect of Using 3D Printing Technology on the Productıon of Furniture Joining Details

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Abstract

Technological advances and innovations bring different developments and changes. These changes aim to make human life easier. The importance of 3D printer technology is increasing day by day, especially in the fields of interior architecture and design, which closely follow technological changes and constantly renew themselves, and gain a very important place for themselves. One of the most important areas where this technology, which is used in different professions of interior architecture, should be used is furniture design and production. This technology brings flexibility and practicality to the furniture production stage. With the effective use of computer-aided design, more efficient furniture design and production, as well as economic gain, time savings, and ease of production are provided. 3D printer technology also makes the use of materials effective for sustainable life and prevents unnecessary material consumption. The benefits that interior architecture will provide only in the field of furniture production sheds light on the future, sustainability, and practicality. In this study, information will be provided on what three-dimensional printer technology is, its historical development, types, use in the sector, materials in use, benefits, and advantages, and its relationship with furniture production will be discussed. In this context, the relationship between the production of furniture joint details and the use of 3D printer technology will be revealed through six examples from world literature. As a result of this relationship, it is also aimed to contribute to the use of 3D printer technology in the future.

Keywords: 3D printing, furniture, production, technology, interior architecture.

Introduction

At the beginning of the 20th century, modernist pioneers, inspired by the development of production technologies with the industrial revolution, changed their ideas about design. Similarly, the rapid development of digital design tools and 3D printer technologies is changing our design concept with experimental studies revealed by the possibilities of the digital revolution. The beginning of the 21st century is the experimental era of design and computer technology. Furniture designs have gained importance in the creation of products using 3D printer technologies (Canbolat & Aydın, 2019). The production process is always in motion and developing with the development of technology. It is essential to follow technical and technological developments in order to optimize organizational costs. The concept of rapid prototyping focuses on the greatest reflections of this transformation and makes a great contribution to structuring the production phase correctly (Sahin & Turan, 2018).

Different names are used for 3D printing technologies such as additive manufacturing and rapid prototyping. Production with 3D printing technology is based on the conversion of

computer and computer aided design (CAD) drawings into a 3D product by printing the material in layers with the data transferred to the machine using a 3D printer.

The first 3D printers (Figure 1) were produced under the name of "Rapid Prototyping", and the definitions of "Additive Manufacturing" and "3D Printer" emerged later. In 1984, Charles Hulls invented the technique that he called "stereolithography", a combination of the Greek words stereo (solid body), litho (stone), and graphien (to write), whose method overlaps with that in David Jones' article (Biehler, 2014). The term "3D printing" includes different technologies, however behind all of them lies the same basic rule: to build an object by pouring layers of material. Each method has its own advantages in terms of cost, speed, accuracy, and material used. (Pham & Gauth, 1998).



Figure 1. The first stereolithography 3D printer named SLA-1

Rapid Prototyping (RP) is additive manufacturing (AM) technology that was rapidly developed during the 1980s and 1990s. Additive manufacturing is a technology that allows the rapid production of prototypes or parts on demand and allows for any design modifications at no extra cost (Hull, 1986; Lim at al., 2003; Cooper, 2001; Rosen at al., 2010; Knill & Slavkovskt, 2013).

3D printer technology has been used since the early 1980s (Schubert et al., 2014). The costs of 3D printers, which were an expensive technology at first, have now decreased (Çallı & Taşkın, 2015). The usage areas have also expanded with decreasing costs (Gartner, 2015; Demir et al., 2016). While Kuneinen (2012) lists the positive aspects of 3D printers in terms of time-cost and geometric freedom (Eisenberg, 2013); also mentioned its negative aspects with features such as raw material limit, unauthorized production, and malicious use.

It is important to note that the 21st century is called the digital age alongside many new technological developments. The development of digital technologies also enables the use of new techniques in architectural modeling and the presentation of architectural projects.

Physical 3D models play an important role in architectural education (Kristianova et al., 2018).

Draft models or working models used in the early stages of a design process are important to the development of design thinking (Voulgarelis & Morkel, 2018). Model making is a method of learning by doing and experiencing, and it includes using specific materials to create the physical model, which is a combination of structural features and form (Abdelhameed, 2011).

The use of 3D printers is seen as a tool especially for architects to create prototypes of original and creative project works and to transform their abstract thoughts into concrete (Seelow, 2017). Every stage of the design that turns into numerical models can be kept under control by making the design on the computer and production can be made thanks to these models. With the spread of 3D printers, important changes and transformations are experienced in the field of architecture. One of the most important of these is the "potential of test models (mock-ups) to be result-products" and the change in the building actions of architecture (Mitchell, 2005).

Real modeling, prototype making, mold design, analysis, reducing time in the design cycle, developing products, reducing production costs, introducing new products, changing existing product features, producing complex parts, design, and ensuring the integration of manufacturing is one of the usage purposes of 3D printers (Celik et al., 2013).

3D Printer Technology and Material Usage

3D printer technology is used in manufacturing applications, medical/dental implant construction, conceptual modeling, direct casting mold, and part production, metal parts and prototype production with precision casting technique, architectural applications, aerospace/automotive industry, rapid mold manufacturing, and all kinds of educational equipment. It is used in a variety of areas such as the jewelry industry. The first step in producing a rapid prototype is to create a 3D CAD model of the part by reverse engineering with any CAD software or with the help of a laser or an optical scanner. A data interface is needed to enable data transfer between CAD software and rapid prototyping machines. This data interface is in STL (STereoLithography) format.

It has been emphasized that it is possible to create a suitable model for 3D printers using many different modeling programs and the STL format (Url-1).

The materials used in 3D printers vary widely. Various materials such as plastic, metal, ceramics, cement, and sand are used in 3D printers. Commonly used materials in 3D printers

are ABS (Acrylonitrile Butadiene Styrene) and PLA (Polylactic Acid). ABS is a petroleum-based material, whereas PLA is a plant-based material (Karaarslan, 2015).

Techniques such as laser sintering, FDM (melting deposition), polymer curing are used in 3D printers. The most used technology is FDM melt deposition technology. To begin, a 3D drawing of the imagined object should be created. Paid software such as SolidWorks, AutoCad, Rhino3B, and Bonzai, as well as free software such as Google Sketchup and FreeCad, can be used for 3D drawing. The drawing is then converted to STL (Stereolithography) format using a different piece of software. (Marcincin et al., 2012; Manovich, 2013; Nevarez et al., 2017). ABS, PLA, and similar thermoplastic materials are generally used in composite stacking technology. In order for the thermoplastic material to stack properly, it must be extruded through a nozzle heated to its melting temperature. This nozzle is controlled by the computer and moved to simulate the geometry of the part, and together with the stacking of the thermoplastic material, the part is stacked on the table in 2D layers and produced. When melt deposition technology is used, the layers are stacked to create a 3D model (Karabulut, 2019).

There are printers with 'SLA- Stereolitografi', 'SLS- Selective Laser Sintering', and 'FDM- Fused Deposition Modeling' on the basis of 3D printing technologies that can be used in the furniture industry.

Stereolithography (SLA); is a layered production method in which the liquid photopolymer material in a tank is cured with light activation and brought together. **Selective Laser Sintering (SLS);** is a layered production method in which the object is formed by the selective penetration of thermal energy into the powder bed. **Fused Deposition Modeling (FDM);** is an additive manufacturing method in which material is dispersed by a nozzle.

The possibilities provided by 3D printing systems when considered within the framework of material, form, and production method are;

• Supporting product development in the design process

• Providing time management in the design process with prototype construction and real modeling

• Allowing new forms with new structural possibilities provided by material alternatives

• Allowing to benefit from the structural order of the forms found in nature

• Allowing color and pattern diversity in visual perception

• Allowing forms that cannot be produced by traditional methods

• Allows the production of complex and detailed forms

• Supporting the parametric design approach

• Offering the opportunity to be disassembled, transported, and recycled with traditional materials and the 3D production method

• Giving the designer the opportunity for originality and freedom

With the innovative production possibilities it provides, 3D printing systems point to innovative designs that will redefine the user-space-furniture relationship in the future (Canbolat & Aydın, 2019).

Materials and Methods

In this study, a literature review was conducted. In this regard, information will be provided on what three-dimensional printer technology is, its historical development, types, use in the sector, materials in use, benefits, and advantages, and its relationship with furniture production will be discussed. In this context, the relationship between the production of furniture joint details and the use of 3D printer technology will be revealed through six examples from world literature.

Findings and Discussion

With the increased use of 3D printer technology in conjunction with technology in the fields of furniture design and interior architecture production, a wider range of free and fast production will be available in furniture production. While 3D printer technology is used in furniture production, it varies depending on where it is used. Those that are entirely produced with a 3D printer, those that are partially produced with a 3D printer, and the joint elements produced with a 3D printer represent 3 different areas of use in furniture production.

Furniture products, which are obtained by combining technology and design, come with many benefits and advantages. Advantages of 3D Printer The manufacturing process is highly reactive and versatile. Designs can be quickly printed, tested, modified, and reprinted (Chua, Wong, & Yeong, 2017). The designed parts are produced directly without the need for unique and expensive equipment. Separate components can be produced to respond to specific requirements (Bañón & Raspall, 2021). The ability of additive manufacturing to produce complex structures that are difficult has given this fabrication technique much popularity. Such materials include hard metals, ceramics, and composites (Chua, Wong, & Yeong, 2017). This technology has some advantages as well as some disadvantages. One of the main disadvantages is typically slower manufacturing speed than other industrial processes such as

injection molding. Additive manufacturing equipment and consumables are generally more expensive. Although higher-performance materials such as metals, technical ceramics, and fiber-reinforced polymers can be printed on high-end machines, the mechanical performance of printed materials is often weaker than when processed in conventional manufacturing processes (Bañón & Raspall, 2021).

To examine the effect of the use of 3D printer technology on the production of furniture joining details, furniture from the world literature was examined. The relationship between the production of furniture combination details and the use of 3D printer technology has been evaluated.

Figure 2 and Figure 3 show the furniture that are designed by Dutch Jesse Howard and Jesse Kirschener. Using wood as the main material in their furniture, they obtained the fittings from a 3D printer. This design series has attracted great attention with its easy assembly and disassembly, easy transportation, and being budget friendly (Eke, 2019).



Figure 2. Joining detail produced with a 3D printer (Url-2)



Figure 3. Joining detail produced with a 3D printer (Url-3)

Figure 4 shows a furniture system designed by product designer Olle Gelert. The designed system consists of connecting elements produced from 3D printers and tables made out of 8mm plywood at 45-90-120 degree angles. The furniture can be installed in the desired combination without the need for screws, screwdrivers, or any other assembly tool. The

connection parts produced with a 3D printer are designed according to different angles, and the heaviest parts weigh approximately 30g (Eke, 2019).



Figure 4. Joining detail produced with a 3D printer (Url-4)

The chair form called 'Bits & Parts' (Figure 5), produced with the puzzle logic, was divided into separate parts thanks to a computer-aided program. The parts that make up the chair are made ready for printing with the slicing program. The parts that were printed separately in the FDM, 3D printing printer are mounted together. The chair that is called 'Bits & Parts' consists of 87 puzzle pieces. The interlocking wooden legs of the product are mounted on the puzzle shell that forms the sitting and resting surface. In this manner, it is possible for the user to mount the product without the need for any screws or tools (Eke, 2019). The joint parts that allow the wooden legs to hold on to each other are also produced with a 3D printer.



Figure 5. 'Bits & Parts' Chair - Application scheme (Url-5, Url-6)

The Icosa (Figure 6) gemstone-shaped lamp combines a passion for modeling with 3D printing technologies. Easily available at DIY stores, standard wooden sticks are connected with 3D-printed connections. It is a 3D puzzle that turns into a great design object. ICOSA

can be a floor, table, or ceiling lamp. Its clear, transparent structure will enrich any interior (Url-7).



Figure 6. ICOSA "gem shaped lamp'' (Url-7)

It consists of a 3D-printed joint system and a series of self-made objects constructed with some readily available elements of wood or plastic (Figure 7). Each object can be easily assembled and disassembled for easier shipping and end-of-cycle recycling (Url-8).



Figure 7. DESIGN 3.0 "hybrid-production" (Url-8)

The use of 3D printer technology has led to convenience and advantages in furniture production. While it sped up the production phase and improved quality, it also allowed for the creation of practical and adaptable designs. It has increased creativity more with original and free thoughts. Technology has aided in the production of furniture that could not be produced using traditional methods. It has provided productions that are more beneficial to the future, protect the ecological balance, and contribute to a sustainable life through the use of materials.

Conclusion and Recommendations

Continuous innovations affect designs as well as many other fields. 3D printing and printer technologies have become an opportunity used and developed by the fields of architecture. Technologies have both affected financial opportunities and influenced the creative process. Traditional techniques and materials that have fallen out of favor in recent years are used with

the connections and developments established with technology. Material and technique support each other, and connections between traditional and new are established. In recent years, 3D printers have started to be used in every field and have enabled the development and change of production techniques in society. The development of production has led to an increase in the use of 3D printers in the field of furniture, where technique is important.

More flexible and practical production has been achieved by using traditional materials and 3D printer technology together in the furniture produced. The production of joint elements with a 3D printers has positively affected the functionality and production process of the furniture. At the same time, it promoted the use of traditional materials while also promoting sustainability through new techniques.

Considering all these developments, it is expected that 3D printers will be used more in the furniture industry in the future. As a result, the examinations show that 3D printer technology has a very important place in terms of sustainability in the furniture industry now and in the future. The development of production has led to an increase in the use of 3D printers in the field of furniture, where technique is important.

The current benefits of 3D printing technology on furniture can be listed as follows:

Contribution to Design

- Using as much material as necessary for the design,
- Use of various raw materials,
- High sensitivity,
- Ability to use multiple materials,
- Making complex shapes,
- Ensuring ease of production,
- Saving time,

Contribution to the Economy

- Reduction in transportation and labor costs

Contribution to the Environment

- Reducing health and safety risks,
- Generating less waste,
- Use of recyclable materials

3D printer technology must evolve in order to be used more actively in the furniture industry.

The subjects that need to be developed and renewed in the field of furniture production in architecture are as follows:

- Limited technology
- Being an expensive technology according to material and preference
- Insufficient knowledge of 3D printing technology

3D printer technology demonstrates the importance of architecture in terms of sustainability.

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Examination of Antalya Akseki Traditional Dwelling Examples in Terms of Energy-Efficient Building Design

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Abstract

Anatolia, which has been a settlement area since ancient times, has many traditional structures designed according to environmental factors. Traditional dwellings located in various geographical locations of Turkey exhibit original architecture with the most appropriate design examples for their environment and climatic conditions. These traditional dwellings, which are in different climatic zones and have very low energy expenditures have the qualifications to transfer a lot of information about the design understandings obtained with years of experience to the designers and structures of today and the future. In this context, the study aims to examine the energy-efficient architectural solutions of traditional dwellings. For this purpose, it is aimed to investigate the energy-efficient features of "Button Houses", which are examples of traditional dwellings belonging to the Antalya/Akseki region and has hosted different civilizations for centuries. The energy activities of traditional structures specific to the region were analyzed and evaluated in terms of land placement and orientation, formation, appropriate volume organization, building shell properties, and material properties within the scope of the examinations.

Keywords: Antalya/Akseki, Traditional Dwelling, Düğmeli Evler[1], Energy Efficient Building Design, Sustainable Architecture.

Introduction

Energy-effective structures can be defined as structures that are responsible for the environment, which are sensitive to ecosystems, encourage the use of natural and non-waste materials, and consumed as much as the need for climatic data and the conditions of the place. Therefore, designing energy effective structure requires designing to reduce the loyalty to energy sources, be the most utilized of environmental resources, and obtain the most efficiency from extinct energy sources (Tokuç 2004; Kantaroğlu, 2011). In this regard, it is important to design energy-effective structures today.

There are two important objectives that must be included in the design process to reduce energy losses and increase energy gains in energy-effective design (Dörter, 1994). The basis of energy-effective building design is designing the elements that will reduce the heating, cooling, and lighting loads of the structure in climatic conditions of the outdoor environment (Göksal & Ülgen, 2000).

The features that distinguish energy-efficient building designs from other design approaches can be listed as follows (Utkutuğ, 1999):

[1] The name was given to Akseki traditional dwelling

- Manufacturing of all materials and components that comprise the building, usage of the structure as well as its design, maintenance, operation, and selection and management of air-conditioning systems, without lessening the building's standard, while minimizing the amount and cost of energy inputs for individual and social benefit,
- Design, production, and operation with the aim of adapting the building to the environment and benefiting from self-renewing energy sources, as well as taking measures to protect and prevent energy waste.

The concept of energy efficiency in buildings is related to the energy supply required to achieve the desired environmental conditions (Pacheco et al., 2012). The design parameters, which are effective in creating an energy-efficient sustainable environment, can be listed as follows (Tönük, 2001; Soysal 2008; Mert & Saygın 2016; Canan 2008; Küçükdoğu, 2007):

- Settlement and direction on the land (location selection and direction of the structure),
- Forming (form, positioning, and physical properties of the structure),
- Space Organization (Space Programs and Organization of Functions),
- Structural shell properties (dimensional and structural features of building elements such as walls, roofs, flooring, windows, and doors),
- Material selection and construction technique.

When evaluated within the framework of the life cycle starting from the land selection, it is observed that traditional structures are designed with a holistic approach. Like other traditional buildings in our country, it has practices that can be an example in the traditional Akseki Dwellings. In this context, it is aimed to investigate the energy-efficient features of "Düğmeli Evler", which are examples of traditional dwellings belonging to the Antalya/Akseki region, which has hosted different civilizations for centuries.

Materials and Methods

Akseki is a district of Antalya Province of Turkey (Figure 1). It was founded in the southern foothills of the Western Taurus Mountains and is the oldest settlement in the region after Alanya (Yıldız, 1999).



Figure 1. The geographical location of the Antalya-Akseki region

In addition to being home to trade routes throughout history, Akseki and its surroundings are also transition regions in terms of their climatic features. The fact that this environment is the transition area between the temperate and inland continental climates of the Mediterranean has led to the emergence of this original architectural technique (Tümertekin & Özgüç, 1997). The distribution characteristics of "Düğmeli Evler," whose original examples are only found in the western part of the Taurus, can be seen in Antalya province's "Akseki Mountainous Environment" in a local framework.

The traditional dwelling of Akseki is known as "Düğmeli Evler". Although the exact date of the first examples of "Düğmeli Evler" is unknown, it is currently usable, and the construction dates of the oldest surviving specimens are dated to 330 years ago (Manav & Çalışkan, 2017) (Figure 2).



Figure 2. Examples of dwelling with Düğmeli Ev" in the Akseki region

The fact that "Düğmeli Ev" have a limited distribution only in the Akseki-İbradı region in the Taurus Mountains makes this example of traditional housing impressive (Figure 3). The biggest reason why these traditional dwellings, which are observed in the settlements established in the settlements located at the highest above sea level of Antalya province and in the settlements established in the areas adjacent to the lower border of the forest, have

survived to the present day is hidden in the geographical features of the region. The high and rugged terrain conditions of the region have adversely affected the transportation facilities, causing the region to later meet the modern construction materials and new-modern construction techniques. Natural environmental conditions have helped preserve the housing tradition unique to the region for many years (Manav & Çalışkan, 2017).

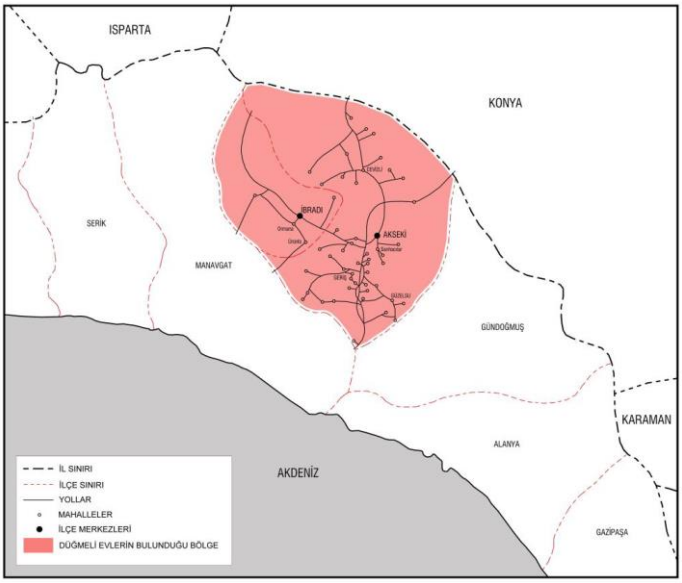


Figure 3. The area where the "Düğmeli Ev" are located (Bakışlı, 2019)

Akseki traditional dwellings are designed on two stories. In general, the entrance is from the ground floor and there are also those designed to receive entrance from each floor according to the topography (Karayazı, 2015). They are usually formed in the middle of the garden or on one or two sides of the garden, facing the street.

In residential dwellings, the ground floor is divided into animal and storage areas. The space that connects the other spaces and is created in the projection of the "sofa[2]" on the upper floor is called "evöğün[3]" or barn in the region at the entrance of the ground floor. In this section, there are haystacks, cellars, woodsheds, rarely coops, pens, and barns. This space also has a staircase entrance or the staircase itself (Figure 4).

[2] The name was given to the common area on the upper floor of the dwellings
[3] The common one to which the ground floor rooms of the dwellings are connected

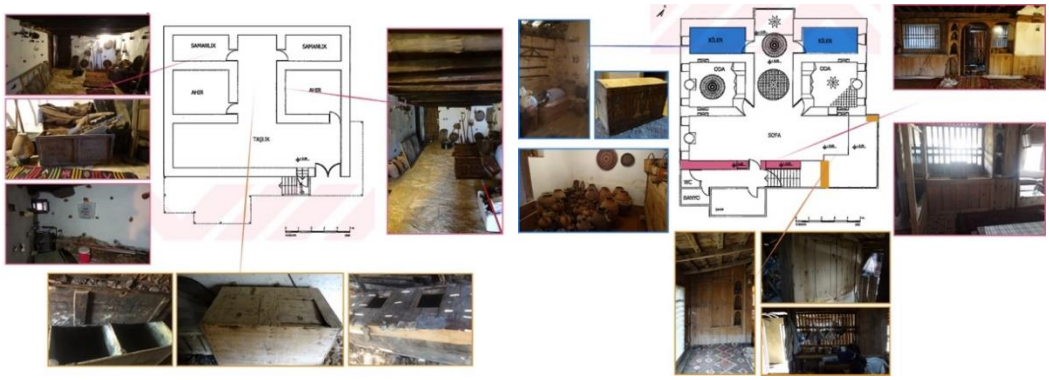


Figure 4. Example of the ground floor and upper floor layout

Its open ups into the living room or to the sofa on the living floor in dwellings with stairs. The rooms on the living floor are designed in two ways: cellar and rooms (Figure 4). On the living floor, there is a café area raised with "seki[4]" on one side of the sofa. Distribution is provided from the sofa area to the rooms. Rooms feature original rural architectural features. Doorways are available when moving into rooms. There is a single window in the cellars and a "sergen[5]" with a shelf system on the walls. Each of the other rooms on the living floor includes the equipment that a nuclear family can sustain, and which is called fireplace, "başmak[6]", "yüklük[7]", "musandıra[8]", "gusülhane[9]", "lambalık[10]" and "sergen" (Figure 5).



Figure 5. Room and sofa layout in the upper floor layout

The energy efficiency of traditional Akseki Dwellings was examined in the study technique within the scope of the literature by taking into account the criteria of settlement and

[4] The wooden element is located on the sofa and sitting on the ground between 15 cm and 20 cm.
[5] In traditional dwelling rooms, the shelf system, which surrounds all the room walls except the 'load' and around the surrounding area, is at a certain height
[6] The name was given to the region's wooden hood on the stove.
[7] Cabinet system for storage purposes in the rooms
[8] A wooden grille in front of it is designed on the '" yüklük' in the region, intended for storage or fruit drying, without covering the 'yüklük' section.
[9] In the local dwellings, the single lid washing section, forms the farthest part of the entrance door of the load cabinet.
[10] We used to put candlesticks, gas lamps, candles, or frequently used small ornaments in the region; A wooden niche with a carved board in front of it, designed in front of the wall alone, in the cupboard, or as a part of the load.

orientation, formation, space organization, building envelope characteristics, and material selection-construction (Yavaşcan et al., 2016; Pacheco et al., 2012; Utkutuğ, 1999; Tönük 2001; Soysal 2008; Mert & Saygın 2016; Canan 2008; Küçükdoğu, 2007).

Findings and Discussion

Settlement and Direction to the Land

Akseki is built in a mountainous and rugged area. The texture created by the traditional dwellings shows an organic formation suitable for the topography, considering the prevailing wind direction. The prevailing wind in Akseki blows from the northeast. The prevailing wind effect was considered in the construction orientation. The houses were built respectfully of each other in a way that would not interrupt each other's light, sun, and view with the effect of topography, and they had the opportunity to benefit more from the sun by using the sloping land (Figure 6).



Figure 6. Land Settlement Example

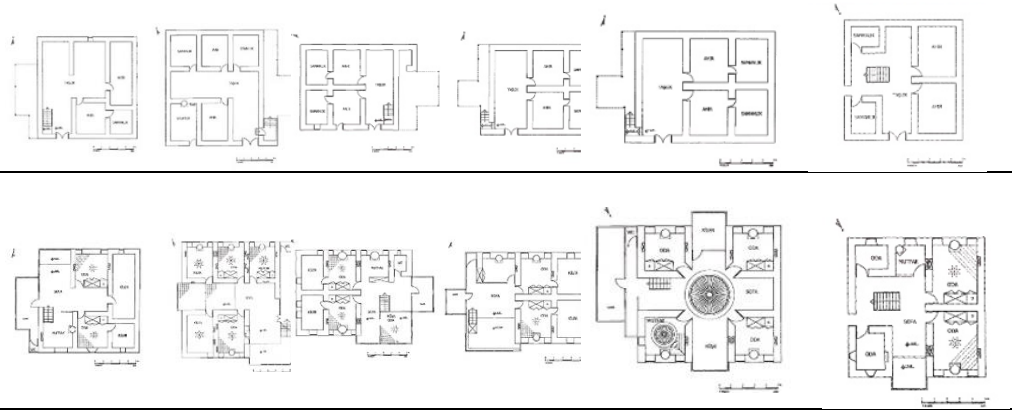
Formation

When considering Eldem's (1954) classification of Turkish house plan types, three types of plan schemes emerge in the dwellings in the Akseki district center: outer sofa, inner sofa, and middle sofa (Başarır, 2001).

The houses in the villages are generally designed with outer sofas. This sofa can be rectangular or "L" shaped. Akkaya (2005) defines the arrangement with an outer sofa created in the shape of an "L" "outer sofa with an eyvan[11]" and evaluates them in two separate groups based on whether or not they have an “eyvan” (Table 1).

[11] In the Sofa settlement of traditional dwellings, one of the facades is a seating area.

Table 1. Plan typology of traditional residences in the Akseki region (Akkaya, 2005)

	"Eyvan" with outer sofa	"Eyvansız" with outer sofa	with central sofa	with inner sofa
				

The windows are produced in small sizes on the ground floors of the buildings. The lower floors, which can be called almost completely deaf, are the floors where the barn and haystack places are located. In the dwellings, the façade that dominates the view and opens to the external environment the most is the south façade. Wooden outcomes in buildings are also usually located on this façade. Since the north façade usually faces the slope, window and door openings are very rare (Figure 7).



Figure 7. Example of summer use in sofa layout

The main element that forms the façade in Akseki dwellings is the overhangs. In addition, the dry-stone wall with wooden lines is the determining element that forms the façade texture. The overhangs in the buildings are sheathed with wood. In the buildings where there is no exit, the section where the sofa is reflected on the façade is again closed with wood (Başarır, 2001). Since there are windows along the exits in the buildings, the place where the exit is located is bright.

The ground floor of the traditional Akseki dwelling has almost no windows. On this floor, traditional dry masonry comes to the fore (Figure 8a). The buildings are perceived as single-

story from the north façade. Since these facades usually face the slope, window and door openings are very rare (Başarır, 2001). There are no overhangs on the north façade of the buildings (Figure 8b).

a.  b. 

Figure 8a. Example of overhang in Akseki dwelling (Sağıroğlu et al., 2016); 8b. Facade example in Akseki dwelling (Karayazı, 2015)

Spatial Organization

Sofas and rooms, which are among the places in the house where the sun is required, have been solved on the south-facing facades. Service spaces such as toilet, bathroom, kitchen, tandoor house, granary, and outbuildings are located on the north-facing facades with less sun.

In the traditional rural dwellings of the Akseki region, the places used extensively in the summer and winter months are separated from each other due to the climatic characteristics of the region. In the summer, the bench is used, which is generally positioned in the direction of the prevailing wind, whereas in the winter, rooms positioned in the south, west, and east are used (Figure 9).



Figure 9. Summer Usage Example

The stables on the ground floors of the dwellings are located under the rooms used in the winter months and the heat emitted by the animals is utilized. Orienting the parts of the building that are heavily used during the winter months to the south, east, and west, prevents

the energy gained during the winter from being destroyed by the wind effect. The building is ventilated and cooled without consuming energy by positioning parts of the building, such as "seki" and "pergola", which are mostly used during the summer months, so that the prevailing wind is inside the building (Figure 10).



Figure 10. "Pergola" and "Seki" example

The cages are mostly concentrated on the upper floors of the dwellings in the direction of the prevailing wind, between "console", "sofa", "ayazlık, and aralık[12]" sections called 'kafesönü[13]' in the" selamlık[14]" sofa, which is mostly used in the summer months (Figure 11).

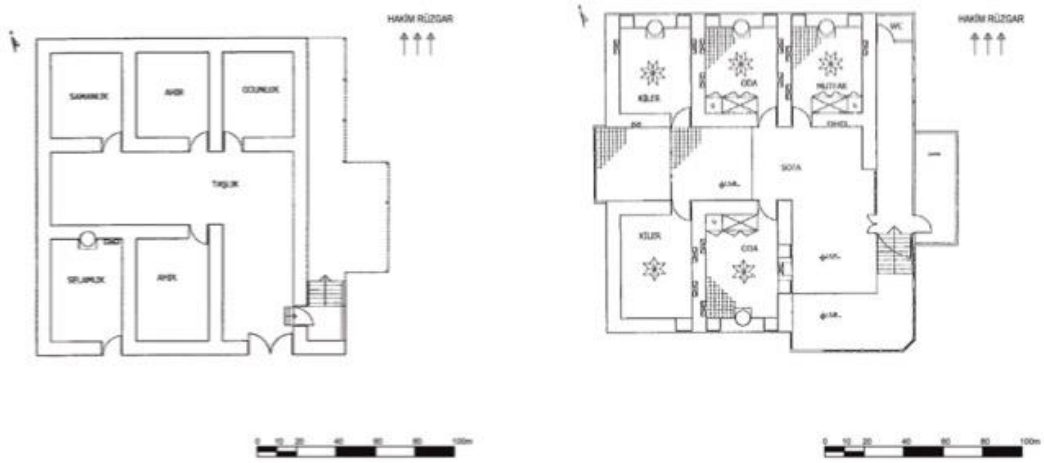


Figure 11. The prevailing wind direction in the traditional residential settlement of Akseki

Structural Shell Features

The use of local materials in traditional Akseki dwellings reduces the energy of transport and gives the structures an important ecological feature. The first floor of the structures has wooden beam flooring. The floor structure is composed of beams that run from wall to wall as carriers to the short sides of the spaces. Many of the traditional Akseki dwellings feature wooden overhangs. These overhangs were carried by wooden supports that are called 'Eli

[12] The section connecting the upper floor entrance of the houses to the sofa venue, intermediate transition area
[13] The wooden section that forms a part of the sofa in the region also includes the eight. It took this name because it was closed around with wooden bite windows.
[14] The seating area in the 'sofa' venue in the residences and hosted guests is the area called 'kafesönü'

Böğründe[15]'. The top of the overhang is covered with tiles independent from the roof (Çelebi, 2012).

The gazebos in the houses were supported by cedar wood posts. Wooden elements are arranged at regular intervals on wooden beams that run from post to post. Nail floorboards to these elements to create wooden gazebos. The roofs of Akseki dwellings are either gable or hipped in shape. In the area, there is no flat roof form (Çelebi, 2012). The roof form and material are shaped by the region's geography under the influence of cold and rainy winter months and dry and harsh summer months. In this regard, the efficiency of energy is achieved.

The gardens of the Akseki dwellings are covered with stone. The walls surrounding the garden are built with the wooden carpeted stone wall technique. The wooden elements that are called "semerkandi[16]" are placed on the garden walls (Çelebi, 2012). This system provides privacy while also ensuring a balance of cold and hot air caused by the effect of the prevailing wind (Figure 12).



Figure 12. An example of the garden wall "semarkandi" (Sağıroğlu et al., 2016)

The material used in the doors of Akseki dwellings is wood. It is observed that the main entrance gate and the garden gate of the dwellingsare double-winged (Yeşildal, 2008). W When looking at the windows of the dwellings in the area, it is clear that the use of wood is extensive. On the ground floors, where the cellar and barn spaces are located, the windows were made in small sizes (Yıldız, 1999). In this framework, the ground floors are cooler by taking sunlight less. In the use of these spaces, energy efficiency was obtained in the storage and protection of goods such as food and beverage (Figure 13).

[15] The name was given to the pads where wooden systems in the housing front order are supported
[16] A wood fence system made on the upper part of the garden walls



Figure 13. View from the Garden and Ground Floor Entrance, which is the main entrance gate (Çelebi, 2012)

On the upper floor, the windows in the "kafesönü" space are seen in large sizes and quite frequently. The windows of the exit are shutting down from the outside. At the same time, these windows have wood or iron bars that started to be used in the 19th century (Başarır, 2001). The upper floor rooms include wooden windows on both sides of the hood. These windows are the original windows with internal shutters from the outside. The cellar rooms also have original wooden windows that open out. With the formation of doors and windows in the upper floor settlement, summer usage areas and cellar rooms are cooler and winter usage areas are warmer (Figure 14a, 14b).

a.  b. 

Figure 14a. Example of an overhang window (Şenocak 2016); **14b.** Cellar room window example (Şenocak 2016)

Material Selection and Construction Technique

The geographical conditions in and around Akseki have been decisive elements in the traditional material and construction technique used in the region. Unlike the Mediterranean coast, the harsh winter climate in Akseki separated this district from Antalya, resulting in the development of a regional architectural understanding.

Stone was used with the effect of geography in Akseki, which was established at the foot of the Taurus Mountains. Pine and cedar forests, which cover large areas of the same geography,

are also a source of wood material. One of the most distinguishing features of traditional architecture in Akseki is the harmonious combination of stone and wood (Çelebi, 2012). The stone material is used as a flooring material in some locations such as the ground and also in the body walls, garden walls, and in certain places.

The majority of the materials used in summer buildings were made of wood. Stone material was used on the walls of the winter spaces, and the walls were kept quite thick. Thus, heat losses were prevented (Figure 15).



Figure 15. The use of stone and wood in Akseki dwelling

In Akseki traditional architecture, mortar is not used when building the walls of the structure. These carrier walls, which are built with the drywall technique, are placed inside and outside the wall every 40-60 cm (Başarır, 2001). The beams are connected to each other with wooden elements called "Düğmeli Evler". The buttons used along the wall as needed are left out about 15-20 cm from the wall (Kaya & Güvenç, 2001).

In traditional Akseki dwellings, there are not many examples where the outward-facing surfaces of the walls are plastered. The dry-stone walls of some buildings were plastered with lime-based mortar called "sakar sıva[17]" (Çelebi, 2012). An energy-efficient structure is created with the stone and wood used as sustainable materials in the carrier system. The workmanship in the masonry technique provides a unique energy efficiency to these structures (Figure 16a, 16b).

[17] The name was given to a traditional plaster process applied on housing walls

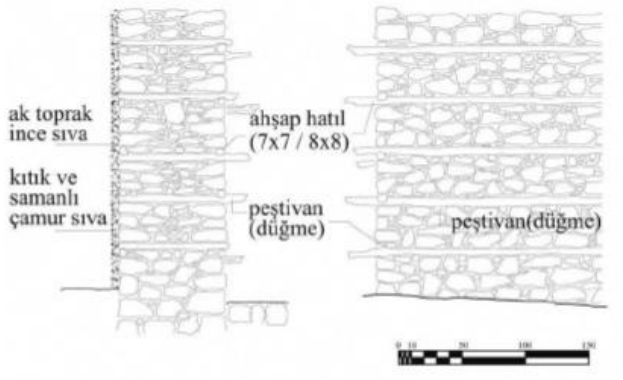
a.  b. 

Figure 16a. Drywall building technique (Kavas, 2011); **16b.** Traditional Wall Lining (Tayla, 2007)

Some of the houses have 50-60 cm windows on the ground floors, and some have no windows at all. In houses with windows on the ground floor, the windows are kept both narrow and small in size (Figure 17). Windows are usually more in summer spaces on the upper floors of the structures. Windows were used extensively in the sequences in the summer spaces and even shutters were used. The number of windows is kept small in the places used in winter. The windows in this place have the inside of the cage from the outside. Thanks to these shutters, it has provided the protection of the structure from the heat in the summer and from the cold in winter.



Figure 17. Window with external fence and internal shutter

In the windows, sun breakers are used to protect them from the sun. With this approach, the effect of the sun is reduced during the summer months, and the interior space is kept from overheating. Because the sun is more inclined in the winter, the sunshades become ineffective, and the interior is heated by the penetration of the sun's rays into the building.

Beams, flooring, ceilings, carrier and coating material, windows and doors of the safes and joinery, cabinets, and cedar wood materials are used in traditional Akseki dwellings. Wood is a natural material obtained from renewable sources. Natural materials cause less damage to the environment., the use of these materials in structures has great importance in terms of energy efficiency.

Conclusion and Recommendations

Traditional dwellings are structures that are sensitive to the environment, consume less energy, produce practical solutions, and have ecological sensitivity. Traditional Akseki Dwellings are designed to have an understanding that can create comfortable interiors thanks to the ecological sensitivity in the facade systems, which are responsible for protecting environmental resources.

In addition to building with natural and sustainable materials readily available in the environment, the combination of these materials with rational detail solutions provided a rational space design and a compact building form. The necessary heat, light, and ventilation are provided by passive system solutions and directing, physical, ecological, and economic sustainability. The occupancy-divide rates in traditional Akseki dwellings also make a positive contribution to the natural lighting and ventilation in the interior.

Great importance has been given to the prevention of heat losses in the design of the building element. For this purpose, thermal insulation is provided by using natural materials such as stone, soil, and wood, which have good heat properties. Their placement of interior spaces against heat losses has also saved energy by preventing heat losses. Fewer windows and doors were taken on the north-facing facades of the structures and heat losses were reduced from these openings.

In order to benefit from solar energy in structures, more windows were opened to the southern fronts than other facades. Thus, the amount of energy required by the structure for heating has decreased. Besides, thanks to frequently intermittent windows, natural lighting, and natural ventilation are saved additional energy to be spent on lighting and ventilation.

The maximum benefit from solar energy is provided in buildings. The direction was well calculated, and the structures were placed in accordance with the land slope. The houses are located in the best way to use the slope of the land.

Energy effective design criteria taken into consideration in the examined traditional structures can be an example of today's structures. These design criteria can be adapted to today's technology and user expectations.

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Interior Granaries and Cabinets in Traditional Dwelling Use as a Local Identity Component: The Case of Antalya Akseki[18]

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Abstract

Warehouses are cultural assets that are a product of hundreds of years of architectural tradition in the geography of Antalya with their very different settlement, construction technique, material, craft, and usage qualities. The grain warehouses investigated in this direction represent the local identity components unique to the region. These warehouses, whose numbers are rapidly decreasing; a large part of it has disappeared due to reasons such as rural-to-urban migration, socio-economic reasons, lack of conservation awareness, and ignoring of interior reinforcement elements in conservation approaches. In this study, grain warehouses and cabinets from the reinforcement elements in the interior use of Antalya Akseki traditional residences; Within the scope of local identity components, functional forms of formation were analyzed in terms of construction technique and material use. With this study, it has been revealed that the granaries and cabinets in the use of interior space, which is one of our local identity elements, should be protected without disappearing and evaluated in terms of sustainable qualities and transferred to future generations.

Keywords: Antalya/Akseki, Traditional Dwelling, Interior, Local Identity, Granaries and Cabinets.

Introduction

Cereal, which is as valuable as water for the continuation of human life, has a very important place in the history of humanity. There should be a place where the crops obtained from the soil will be maintained. Mankind has revealed the warehouses that will maintain cereals by using the experiences and existing production techniques in nature. The techniques used in agricultural activities have been used for centuries as well as warehouses for centuries, perhaps even thousands of years.

The word warehouse has passed from Persian "Anbar" to our language. Due to the "n-b" incompatibility in Turkish, it is pronounced in our language as "storage". Warehouses are mostly defined as the place where foods are stored in the type of cereal (TDK, 2005), cereal warehouses are used for the storage of cereals such as wheat, barley, and rye, especially in rural architecture. Warehouses are a sine qua non of agriculture, which is the source of livelihood for the people. In this respect, many households have a warehouse. The more crop from the landowners, the more crops they built, has built a warehouse to hide next to her

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house. These formations, which are built in traditional houses as part of our local identity, provide much data to humanity in storage areas.

Local identity can be defined as a concept that shows the formation of traditional settlements, defines the character of a place, and gives meaning to that place. For this reason, local borders are defined by societies that share the same culture and geography, physical form formations, and cultural factors that constitute the local identity (Koç, 2018). Location and local identity become concrete by historically existing architectural spaces. Thus, these local elements, which affect the formation of building and building elements as an architectural process, shape the reinforcement formations used in the interior of the building.

As a part of local identity, the use of traditional houses; The family structure of the people living in the region is shaped by the influence of religion, culture, social relations, climate, and topography. The storage (cereal) action, which defines an important service action in traditional houses, has a local approach that is inspired by both the socio-cultural and natural environments in terms of interior reinforcement fiction. In this context, the storage areas, which are traditional houses as the fruit of centuries of experience from past to present, have original qualifications, as well as protecting, recording, and sustainability of these areas is very important for cultural identity (Açıkel & Elinç, 2020).

In this context, the Antalya Akseki region, which is selected as a research area, has also hosted many different civilizations since ancient times and has a very rich cultural diversity. The fact that the region is an intensive settlement and production area since ancient times has brought a great variety of rural architecture. Traditional houses examined in the region of the region contain fixed and moving warehouses in the building. Although they have lost their qualifications, most of these warehouses are still used. Although it is thought that these warehouses are 100-150 years old in the light of the information obtained in the interviews with the local people, unfortunately, their numbers are gradually decreasing and defeating time.

It is also seen that these warehouses in the interior of the traditional houses are far from a legal and conscious protection framework. Grain warehouses, which offer the most advanced form of natural and cultural heritage, live with traditional space use and rural architectural texture and offer the most interesting examples of experiences, knowledge, and harmony with the natural environment.

The aim of this study is to contribute to the transport of cereal warehouses, which are proof of thousands of years of rich agricultural production history and evidence of civil architectural culture. In this context, in ensuring the protection and sustainability of cereal warehouses that shed light on a period with their historical functions and cultural characteristics; It is important to reveal the typical characters and to determine the visual, ecological, and architectural characteristics.

Materials and Methods

In this study, cereal warehouses, a component of rural architecture within the scope of the Akseki region of Antalya province, were discussed in the study (Figure 1). In this context, the cereal warehouses in the interior of the traditional residences of the Akseki region are examined and the purpose of use and physical, social, cultural, and so on. features have been tried to be put forward. Scientific written sources were scanned as a research method and cereal warehouses were determined by using observation and one-to-one interview techniques with the local people for field studies. Detected grain warehouse and cabinets; Original qualities, architectural and technical details were drawn.

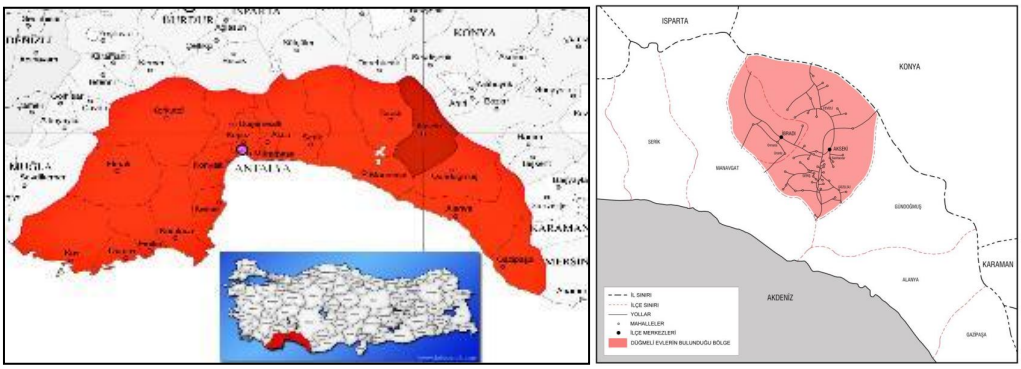


Figure 1. Antalya-Akseki region and the region where traditional residences are seen (Bakışlı, 2019)

Akseki traditional residence is known as "button houses ". Although it is not known exactly which date the first examples of "buttoned houses özen are available, and the construction dates of the oldest examples that have survived to the present day are dated 330 years ago. Residences that are representative of the oldest examples are still widely used (Manav & Çalışkan 2017). The fact that "button houses" have a limited distribution only in the Akseki-İbradı region in the Taurus Mountains makes this traditional dwelling example very interesting (Figure 2a).

a.   b.



Figure 2a. Akseki traditional housing example; **2b.** Dry wall building technique (Kavas, 2011)

The main materials in the traditional architecture of Akseki consist of stone and wood materials. In Akseki, located at the foot of the Taurus Mountains, the stone was used with the influence of geography. Pine and cedar forests spread over large areas in the same geography also constitute the source of wood material. The name 'Button House' comes from the dry wall-building technique applied in the masonry+carcass system (Figure 2b).

Rural dwellings are designed for two floors. The entrance of the general one is from the ground floor and there are also those designed to receive entrance from each floor depending on the topography (Karayazı, 2015). They are usually located in the middle of the garden or on one or both sides of the garden, facing the street.

In residential buildings, the ground floor is divided into fattening and storage sections. At the entrance of the ground floor, the projection of the sofa is called "evöğün" or "ahıraltı" in the region. In this part, there are haystacks, cellars, woodsheds, rarely poultry, pens, and barns. This space also includes the staircase entrance or the staircase itself (Figure 3).



Figure 3. Akseki Button House Ground Floor Layout

The living floor is designed in 2 ways: cellars and rooms. On the living floor, there is a "kafeönü" space raised with seki on one side of the sofa. Distribution is provided from the sofa space to the rooms. Each of the other rooms on the living floor includes the equipment named "başmak (fireplace)", "dolap", "yüklük", "musandıra", "gusülhane", "lambalık", and "terek" (Figure 4) where a nuclear family can sustain its life (Figure 4).



Figure 4. "Kafesönü", Sofa and Room Settlement

When an observation is made by considering the classification of Eldem (1954) on Turkish House Plan Types, three types of plan schemes, which are outer sofas, inner sofas, and middle sofa in the residences in the Akseki district center, emerge. The type of plan-free plan is not found in the Akseki district center today (Başarır, 2001). In general, the houses in the villages are designed with outer sofa. This sofa can be rectangular or 'L'. The outer sofa fiction formed in the form of 'L' is called 'outer sofa' and such sofas are evaluated in two separate groups according to whether or not it is an "eyvan" (Table 1).

Table 1. Plan typology of traditional residences in the Akseki region (Akkaya, 2005)

	"Eyvan" with outer sofa	"Eyvansız" with outer sofa	with center sofa	with inner sofa
				
				

In the traditional residence of Akseki, the interior reinforcement elements are usually fixed elements and are fixed to the wall and located in the sofa or room, which is the main space. These units include "yüklük", "cabinets (niches)", "warehouses", "rack (sergen)", fireplaces, etc. There are also movable reinforcements used in sofa, room, pantry room, and storage spaces. These are stored units where items and food such as "chests", "warehouses", "stumps", "jugs", "baskets", "sini (tray)", cradles, etc. are placed (Figure 5).



Figure 5**.** Furniture usage examples

One of the original uses in the formation of traditional housing reinforcement is the fixed and moving grain warehouse and cabinets that constitute the subject of the study. These reinforcement formations and use have regional unique qualities in the traditional Anatolian residence (Figure 6a, 6b).

a.  b.  

Figure 6a**.** Use of six grain storage; **6b.** Fixed and moving grain warehouses

Warehouses are cultural assets, which are a product of hundreds of years of architectural tradition in Antalya geography with their very different settlements, construction techniques, materials, workmanship, and usage qualifications. In this direction, the grain warehouses investigated represent the original local identity components of the region.

In this context, Akseki traditional residence is examined by the cereal warehouses in the use of interior use, cultural, social, and physical, and so on. its qualifications have been tried to be put forward. Cereal warehouse and cabinets detected; Within the scope of local identity components, functionally shaped forms have been analyzed in terms of construction technique and use of materials.

Findings and Discussion

Natural Environment and Grain Warehouses Relationship

Geographical factors are primarily effective in the images and usage forms are taken from region from region to region (Elibüyük and Güzel, 2000). However, the effect of cultural, historical, and social variables is seen. The dwellings that follow the geographical environment and carry the influence of their environment are more rural dwellings (Denker, 1960). It carries the traces of the geographical environment in which the materials, shapes, and different parts of the rural dwellings are in the form of organizations (Tanoğlu, 1969).

It is possible to easily understand the effect of the natural environment on the dwelling from the materials used. The abundance of the material in the environment, easy to reach and supplying cheaply led to the local people turning to the natural environment (Polat, 2016). Therefore, we can say that the warehouses are concentrated in the mountainous mass rich in forest and in the settlements located on the sides of this mass. The fact that the warehouses are completely made of the wood shows this situation. Cedrus Libani (Lebanese cedar or Taurus Cedar) and Juniperus Communis (Juniper Tree) trees were generally used as wood materials. Features such as not being curved, durability, and not being wolfed are among the reasons for the selection of Cedrus Libaninin (cedar tree) (Figure 7).



Figure 7. Cedar and Juniper Tree Images (Danacı, 2012)

In the Eastern countryside, there are fixed and moving warehouses that are described as - domestic warehouses in the settlements where agricultural land is not sufficient, such as the Akseki basin, but the commercial activities in cereal products are active.

The insulation of the products stored in the warehouses from moisture and outdoors is also built by raising from the ground plane in order to prevent the wooden material from wear. In this way, the raised floors provide ventilation, as well as prevent the inside of the warehouses from receiving moisture (Figure 8).



Figure 8. Grain Warehouse built on wooden feet

Relationship Between Human and Economic Activities and Cereal Warehouses

Just as human (social) factors are a strong factor in indicating the characteristics of the resident of the residence, the economic factors have such a strong effect in indicating the characteristics of the house add -ons (Tunçdilek, 1967).

The basic economic activity in the rural area of Antalya is based on agriculture, animal husbandry, and forestry. In these settlements, the people of the region produced or purchased on the trade axis with the tubing structure fictionalized with the storage areas. The formation and use of this furniture come from storage for needy purposes contrary to known fiction (Figure 9).



Figure 9. Large -sized cereal warehouse images

Place Selection in Cereal Warehouses

Akseki-İbradı basin traditional houses, which we examine in the Eastern countryside, cereal warehouses; It is seen that the building is used in the sections separated as a cellar room on the ground floor and in the entrance halls called stony. There are also warehouses positioned in sofas, which are part of the living floor in the structures. It has also been found that the lower part of many loads, which are also used in the room, is used for storage purposes (Figure 10). In the selection of the location of the warehouses, it is seen that the places that are easy to reach in the space and the northern sections that receive little light due to the storage conditions of the grain are preferred.

a.  b.

Figure 10a**.** Cereal warehouse in the use of "sofa" and "taşlık"; **10b.** Grain warehouse in the use of "Yüklük (cabinet)"

Structural and Functional Features of Granaries

Inside the home, cereal warehouses show rectangular and square plan schemes. Their dimensions are shaped according to their location. These warehouses in the housing can be classified as fixed and moving. Fixed Sofa, cellar rooms in the rooms, and storage areas in the use of under-load use. Mobile formations generally in the use of the ground floor are generally noticeable (Figure 11).



Figure 11. Fixed and moving warehouse samples

It has been seen that the warehouses, which are large and more in number in structure, are probably found in the structures where we have lived in common with wealthy families or several families. The warehouses on the ground and upper floor of the houses are placed in the north direction. Grain is poured and taken from the square-sized caps opened to the upper part of the warehouses. In the use of the load, it has the same characteristics as fixed and moving warehouse masses (Figure 12).



Figure 12. Structural and Functional Features of Warehouses

When the plan and architectural features are examined,

The warehouses are placed on a platform raised from the ground in "sofa" and "taşlık" that do not show ornamental properties and are created with a completely wooden material passing system. It is seen that it is supported by a horizontal and vertical bar in wooden junctions on the front surface. It is thought that the planning scheme is constructed by considering the place where the housing will be placed in the first construction stages of the moving wide-mass warehouses in the use of the ground floor (Figure 13).

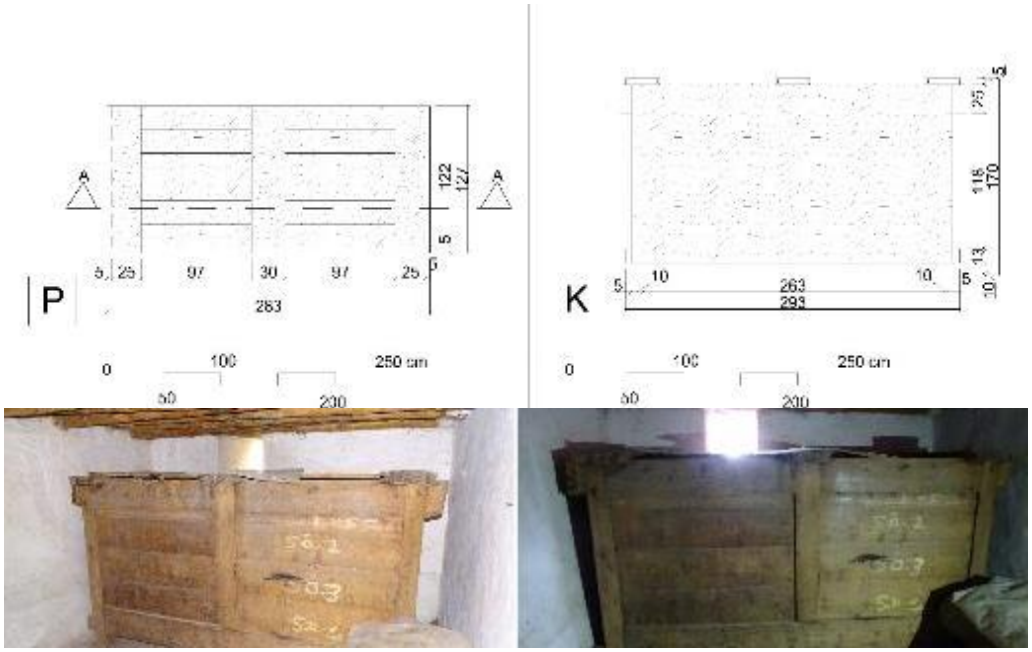


Figure 13. Moving Warehouse Drawing

When the fixed grain warehouses are examined, the rectangular plan scheme is featured. The upper part consists of 3 pieces of lids. The covers are designed in 55 centimeters square size. It does not show ornamental properties, vertical wooden slats appear on the front surface. The warehouse is in the Sofa space, which is the floor of life of the mansion. It is positioned on the northern part of the sofa to the platform raised from the ground. The warehouse equipped a functional equipping completely with the passage system. Due to its location and function, it is classified as a fixed grain warehouse. In this context, it can be said that cereal warehouses have an important function in the organization of domestic space in traditional houses (Figure 14).

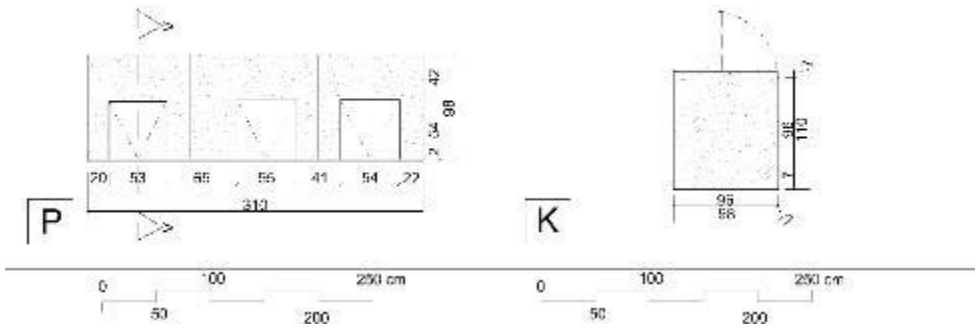




Figure 14. Fixed Warehouse Drawing

When the size and location of these warehouses in the space were examined, it was found that the assets were found in the housing of families. When the storage capacities, function, and usage details were examined, the warehouses were used within the scope of storage rather than commercial activities.

Material-Technical and Decoration in Cereal Warehouses

The home warehouses, which we examined in the traditional residences of the Akseki region, were made with the technique of passing completely wooden materials. The cedar tree and juniper tree were used as material in the home warehouses. In the construction of warehouses, the timber obtained from the cedar tree is shaped in the hands of the master with the stacking and passing technique. The warehouses were formed with the combination details called "wolf mouth" and "swallow tail" in of the cedar trees (Figure 15).

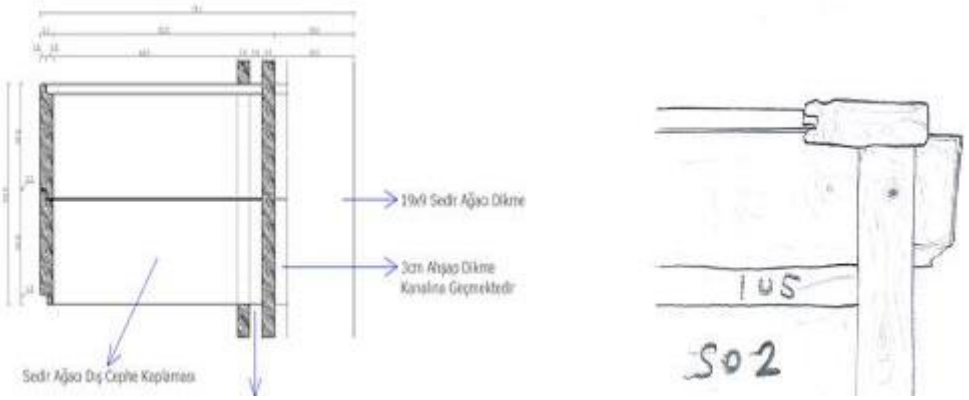


Figure 15. Drawing of Wooden Moving Details

The warehouses we examine in the countryside of the Akseki region do not show decoration properties. All the warehouses were made for functional purposes. Regular rhythm and aesthetic visuals were gained in the warehouses, horizontally and vertical wood, and regular rhythm and aesthetic visuals (Figure 16). These could not go beyond creating rectangular deletions. During the oral interviews in the study area, it was also found that the masters who made these warehouses were not grown and that there were very few known warehouses.



Figure 16. Decorating qualities of warehouses

Conclusion and Recommendations

The Akseki Region of Antalya Province has had an important place in the Mediterranean Basin from ancient times to the present day in terms of its natural and cultural riches. Although a wide variety of agricultural products are grown due to the advantages of the Mediterranean climate of Antalya Province, the unsuitability of the geography of the region has shaped the residential interiors and the equipment used.

Everything local with its cultural values and natural beauties covers traditional architecture and determines the character of the region with all these features. Traditional dwellings reflect social and social life; With their users, designers, spatial structure, and organization, it is an important example of local architectural expressions. The interior action areas and the reinforcements used in the local architectural expressions also carry traces of the architectural identity of the geography where it is located and enable us to have information about that region. The need for storage, which is the action of residential interior space, and the space and reinforcement formations shaped by this need are also part of our local architectural identity.

The most important of these is the furniture that stands out as the storage and protection of grain, which is our basic need. These products have regional and original features in terms of traditional Anatolian housing as well as archival quality. The identified granaries and cabinets contain many components of local identity as part of our cultural identity.

When the local identity elements and problems for the domestic granaries examined within the scope of the study are evaluated:

- These warehouses are important examples of civil architecture,
- That the warehouses were made with the technique of passing without using nails,
- As a material, the fact that they were obtained with the cedar tree is considered sacred in our culture,

- Forgetting the construction-technical and qualifications of these products made by traditional methods, the fact that it is succumbed to the natural conditions and disappears,
- In the approaches to protection, the interiors do not see enough attention, dismantling these products and selling them unconsciously in various places,
- As a furniture element, the necessary awareness and cultural consciousness cannot be created for the protection and sustainability of these warehouses.

Today, when the value of agriculture and agricultural products can be stored for a long time increases all over the world, it should be evaluated in terms of protection, sustainable storage, and storage conditions and transferred to future generations as our local identity components.

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The Relationship Between Earthquake and Non-Structural Elements in Departments of Architecture and Interior Architecture in Educational Programs

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Abstract

Although most of the risks caused by the earthquake are dependent on structural elements; the effect of non - structural elements is also quite high. In the face of these risks, as well as measures that can be taken by the society, the measures taken by architects and interior designers who are actively involved in building design, production, and control are very important. Their ability to take these measures can be provided with sufficient and effective information that they can take during their training process. Therefore, the earthquake in architecture and interior architecture education is an important issue. Within the scope of the study because the earthquake in architecture and interior architecture education is an important issue; earthquake-disaster courses in the world and in Turkey were examined. These courses; "undergraduate/graduate, compulsory/elective, theoretical/application/laboratory, earthquake-structural element/earthquake-non-structured element relationship" criteria were analyzed according to the criteria. As a result of the analysis; in both the world and in Turkey, it is revealed how serious the deficiency in the education program for earthquake and non-structural element relationship in architecture and interior architecture education.

Keywords: Earthquake, non-structural elements, education program.

1. Introduction

Disasters date back to the past as much as the past of humanity; in its most general definition, it includes dangerous events and situations that can cause injuries or loss of life and property which can damage the environment (FEMA, 2002). Earthquakes are one of the most devastating disasters in which these losses occur. Earthquakes are one of the most occurring natural disasters in Turkey; it causes great dangers and risks due to the location of the country on the active faults and the concentration of the population on these active faults.

The effect of the earthquake on structures causes various risks such as losing life and property, injuries, stopping ongoing activities, and causing a fire (FEMA, 2011). These risks are classified as structural and non-structural elements. The elements that cover the building's structural system are defined as structural, while the elements that are not covered by the structural system are defined as non-structural. And earthquake damage varies depending on these elements.

Damages caused by structural elements can be minimized by using appropriate materials, quality workmanship, and proper engineering practices. There is no national technical

specification or regulation for non-structural element damages, and regulations and standards governing these damages are constantly evolving (Akbalık, 2020). In addition, while the hazards and risks associated with structural elements can be reduced by developing engineering technology and regulations (Winkler & Meguro, 1996), those connected with non-structural elements remain small in terms of ways to avoid, such as the falling of unfixed goods on people, blocking the road by falling objects, and preventing escape, but remain big in terms of the dangers and risks it may create.

According to research on earthquakes in the past although the loss of life and property and injuries are generally due to structural factors; it is observed that the effect of non-structural factors is also underestimated. It is stated that the simplest and the most profitable measures to be taken before the earthquake is the reduction of damage due to non-structural elements (Kadıoğlu, 2009). To minimize these damages, it is very important to be aware of small interventions and space arrangements that can be made in the interior. In addition, in earthquake-resistant space design, it is necessary to develop the level of knowledge and awareness of architects/interior designers on this subject, as well as measures that can be taken by interior users.

Recent studies reveal the importance of architects/interior architects in building design against earthquake hazards and risks. Ersoy (1999) stated these factors that cause 90% of earthquake damages as unsuitable architectural or structural systems for earthquakes, insufficient and incorrect reinforcement details, and a lack of supervision during construction. Architecture or structural system that is not suitable for an earthquake is one of the factors that concern architects/interior architects (Ayyıldız & Özbayraktar, 2005). Erman (2002) considers that the architect/interior architect, whom he defines as a coordinator in the design process, does not receive any education or receives incomplete training in the name of earthquakes as one of the reasons why earthquakes turn into disasters.

Architecture/interior design has an important place in earthquake-resistant building design because of the creation of structure by the architect/interior designer. The effort to improve the structure created with an earthquake-incompatible geometry by supporting the carrier system can lead to highly costly and difficult solutions. Therefore, the earthquake movement and the effects of the earthquake on building design should be considered by architects/interior designers (Ersoy & Ersoy, 1992).

In this direction, the purpose of the study is to examine the curriculum of architecture and interior architecture departments around the world and in Turkey, to identify earthquake-disaster courses, and assess the relationship of these courses to non-structural elements. Thus, it is aimed to evaluate to what extent the scope of the earthquake & disaster courses of these departments in the world and in Turkey covers non-structural elements.

1.1. The Role of Earthquake in Architecture and Interior Architecture Education

Architecture which includes many branches of science and art is expressed as a profession associated with the design, production and use of the structure and environment. In addition, the essence and form, science and technique, art, thought, and practice are brought together. In other words, it is defined as a discipline based on art-science and theory-application. The general purpose of architectural education is the creation of the most appropriate artificial environment that is focused on individual and society (Küçük, 2006); another important aim is to train responsible, knowledgeable, creative, and conscious individuals (Ayyıldız & Özbayraktar, 2005).

Architecture education is determined in line with national/regional needs and problems with international decisions and practices. The aim of architectural education, which is shaped according to the conditions of the time by demonstrating development and change, is to consider the country's conditions, problems, and uniqueness alongside current conditions. In other words, architectural design should not only remain within the framework of space design but must be competent to meet the needs of society. In this direction, not only the process but also the formation process of the product is important. This process has been even more questioned with disasters experienced in recent years and required the determination of the earthquake as an important factor in the evaluation of architectural discipline training (Aydın & Korkmaz, 2004). The results of the earthquakes happened in the time show that three conditions should be together in earthquake-resistant building design. These conditions (Önel & Akbulut, 2003) are;

- Earthquake safe architecture understanding (considering the effects of floor in design and application, appropriate structure shaping, structural details, carrier system selection)
- Compliance with laws and regulations (structural and dimensional regulations)
- Qualified application and inspection (appropriate material selection and use, construction method in accordance with the rules)

In earthquake-resistant building design, architectural design decisions as well as compliance with laws and regulations affect the behavior of the structure at the time of the earthquake (Akbulut, 2005). Earthquake-resistant design and construction of buildings require having a solid and realistic knowledge of building behavior, having more knowledge of the relevant regulations than superficial knowledge, and being an individual who knows and assimilates the reasons behind these regulations. Due to the complexity of the contents of the regulation and the fact that they may cause some problems in the design/application phase, this consciousness should be compulsory for architecture/interior architecture students with a special education process (Akbulut, 2005). For architecture/interior architecture students to involve in design, production and audit activities before the earthquake "disaster preparation" and "reconstruction" and "restructuring" studies after the earthquake, planning and earthquake in training programs, education programs, system design, ground sciences and disaster management courses related to issues such as specific scope and quality are very important (Metin, 2018). For this reason, the aim of the courses in the architecture/interior architecture education programs should be to give students these characteristics.

2. Materıals and Methods

2.1. Materials

The material of the study consists of the earthquake-disaster courses of architecture and interior architecture departments in the world and in Turkey. There are 20 departments of architecture in Asia, Europe, and America in the world. There are no courses on earthquake-disaster in the interior architecture departments. In Turkey, there were 39 architecture departments and 3 interior architecture/interior architecture and environmental design departments.

Current earthquake-disaster courses in architectural education of some countries in the world are shown in Table 1.

Table 1: Earthquake-Disaster Courses of Some Architecture Departments in the World

Course Code	University Name	Course Name
1	University of California, Berkeley (America)	Architectural Design for Seismic Forces
2	University of California, Berkeley (America)	Seismic Design and Construction
3	University of Southern California (America)	Seismic Design
4	University of Southern California (America)	Structure Systems and Seismic Design
5	California Polytechnic State	Seismic Analysis and Design

	University (America)	
6	Universidad Nacional Autónoma de México (Mexico)	Diseño Sísmico
7	National University of Singapore (Singapore)	Architectural Tectonics
8	Singapore Polytechnic (Singapore)	Resisting Earthquake - The Challenge
9	University of the Philippines Diliman (Philippines)	Disaster Risk Mitigation, Adaptation and Preparedness Strategies
10	SRM University (India)	Earthquake Resistant Architecture
11	Seoul National University (South Korea)	Earthquake Engineering for Building Structures
12	Kyoto University (Japan)	Structural Engineering of Buildings
13	Kyoto University (Japan)	Earthquake Resistant Engineering
14	Kyoto University (Japan)	Earthquake Engineering for Seismic Safe Design of Structures
15	Kyoto Institute of Technology (Japan)	Structural Engineering of Architecture
16	Chiba University (Japan)	Environmental Change and Natural Disaster
17	Mesarya Technical University (TRNC)	Earthquake Resistant Buildings
18	Politecnico di Milano (Italy)	Earthquake Engineering
19	Universitat Politècnica de Catalunya (Spain)	Seismic Design and Retrofit of Buildings and Bridges
20	University of Southampton (England)	Earthquake Engineering and Seismic Design of Steel Buildings

When these courses are examined; it is seen that the courses focusing on structural subjects such as "Seismic Design", "Structural Engineering of Buildings", "Earthquake Resistant Buildings", "Seismic Analysis and Design" are a part of the curriculum. In interior architecture education, it is revealed that there is no training program on earthquake-disaster.

The courses on earthquake-disaster in the architecture departments of all universities in Turkey are shown in Table 2.

Table 2: Earthquake-Disaster Courses of Architecture Departments in Turkey

Course Code	University Name	Course Name
1	Adana Alparslan Türkeş of Science and Technology University	The Behavior of Traditional Masonry Structures Against Seismic Effects
2	Alanya Alaaddin Keykubat University	Disaster Consciousness
3	Artvin Çoruh University	Earthquake Resistant Building Design
4	Balıkesir University	Earthquake Resistant Building Design
5	Beykent University	Structural Problems and Earthquakes in Historical Buildings
6	Bolu Abant İzzet Baysal University	Earthquake Architecture
7	Burdur Mehmet Akif Ersoy University	Earthquake Factor in Architectural

		Design
8	Bursa Uludağ University	Earthquake Security Architectural Design
9	Bursa Uludağ University	Earthquake and Housing
10	Bursa Uludağ University	Earthquake and Fire Safety in the Structure
11	Bursa Uludağ University	Risk Assessment for Reducing Earthquake Damages
12	Bursa Uludağ University	Earthquake Safe Building Production
13	Bursa Uludağ University	Post-Disaster Shelter
14	Çukurova University	Earthquake Resistant Carrier System Design
15	Doğuş University	Earthquake Resistant Construction Systems
16	Dokuz Eylül University	Architectural Design Principles of Structures Against Earthquakes
17	Düzce University	Earthquake Factor in Design
18	Erciyes University	Earthquake Performance of Buildings
19	Eskişehir Osmangazi University	Earthquake Resistant Building Design and Materials
20	Fırat University	Disaster Consciousness
21	Gazi University	Earthquake Resistant Architectural Design
22	Gazi University	Earthquake Regulations and Effects on Architectural Design
23	Gazi University	Earthquake Resistant Building Design Principles
24	Gazi University	Earthquake Resistant Building Design
25	Gebze Technical University	Earthquake Resistant Building Design Principles
26	Gebze Technical University	Earthquake Resistant Building Design Principles
27	Haliç University	Earthquake Design Principles of Structures
28	Hasan Kalyoncu University	Earthquake Resistant Building Design
29	Işık University	Urban and Architectural Design Resistant to Disasters
30	İstanbul Aydın University	Planning and Design Principles in Seismic Regions
31	İstanbul Kültür University	Earthquake Resistant Building Design
32	İstanbul Kültür University	Disaster and Housing Design
33	İstanbul Kültür University	Alternative Approaches in Housing Design After Disaster
34	İstanbul Sabahattin Zaim University	Earthquake Resistant Building Design
35	İstinye University	Earthquake Resistant Building Design
36	İzmir University of Economics	Disaster Resistant Building Design
37	İzmir Institute of Technology	Earthquake Resistant Building Design
38	İzmir Institute of Technology	Earthquake and Structure Behavior
39	Karabük University	Architectural Design Principles by Earthquake
40	Kırklareli University	Earthquake Resistant Building Design
41	Konya Technical University	Earthquake Behavior in Building Systems
42	KTO Karatay University	Earthquake Resistant Building Design
43	Manisa Celal Bayar University	Earthquake Resistant Building Design
44	Niğde Ömer Halisdemir University	Architectural Design Earthquake Factor

45	Ondokuz Mayıs University	Earthquake Resistant Building Design
46	Pamukkale University	Disaster Planning
47	Tekirdağ Namık Kemal University	Earthquake Resistant Building Design
48	Toros University	Earthquake Resistant Design
49	Trakya University	Earthquake Resistant Building Production
50	Van Yüzüncü Yıl University	Earthquake Resistant Building Design
51	Yıldız Technical University	Earthquake Resistant Building Design
52	Yıldız Technical University	Earthquake Factor in Design

When these courses of architecture departments in Turkey are examined; it is seen that there are 52 courses that mostly deal with structural issues such as "Earthquake Resistant Structure Design", "Earthquake Architecture", "Earthquake Resistant Architectural Design", "Disaster Resistant Structure Design".

The courses on earthquake-disaster in the interior architecture/interior architecture and environmental design departments of all universities in Turkey are shown in Table 3.

Table 3: Earthquake-Disaster Courses of Interior Architecture/Interior Architecture and Environmental Design Departments in Turkey

Course Code	University Name	Course Name
1	Çankaya University	Building Safety
2	İstanbul Kültür University	Disaster Protection
3	Toros University	Earthquake Resistant Design

When the earthquake-disaster courses of interior architecture/interior architecture and environmental design departments in Turkey are examined (Table 3); it is seen that there are only 3 courses.

2.2. Methods

For the method of the study, the literature screening method was used from screening models. In the screening models, this information is analyzed by accessing the information contained in the literature in line with the current problem and used to solve the problem within a certain systematic (Kaptan, 1995). In this regard, the curriculum of all architecture and interior architecture/interior architecture and environmental design departments in the world are scanned from their websites.

3. Fiındings and Discussion

It is very important that earthquake-disaster courses in architecture and interior architecture education are given in undergraduate education, are included in the mandatory curriculum, are transferred in the theoretical and practical unity, and have content related to the earthquake-nonstructural element relationship. For this reason, the earthquake-disaster-themed courses determined by the architecture and interior architecture/interior architecture and environmental design departments in the world and in Turkey are shown as "undergraduate

(U.G.)/graduate (G.), compulsory (C.)/elective (E.), theoretical (T.)/practice (P.)/laboratory (L.), earthquake (E.Q.) -structural element (S.E.)/earthquake (E.Q)-non-structural element (N.S.E.) relationship" criteria. The data that could not be reached from the criteria are shown as "Data Not Available (D.N.A.)" in the form.

3.1. The Role of Earthquake in Architecture and Interior Architecture Education in the World

The following table was created as a result of scanning the earthquake-disaster courses in the architecture and interior architecture/interior architecture and environmental design departm ents in the world (Table 4).

Table 4: Analysis of Earthquake-Disaster Courses in Some Architecture Departments in the World

Course Code	Undergraduate/Graduate		Compulsory/ Elective		Theoretical/Practice/Laboratory			Course Contents	
	U.G.	G.	C.	E.	T.	P.	L.	E.Q. -S.E.	E.Q.-N.S.E.
1	✓		D.N.A.			✓		✓	
2	✓		D.N.A.		D.N.A.			✓	
3		✓	D.N.A.		✓			✓	✓
4	✓	✓	D.N.A.		✓		✓	✓	
5	D.N.A.		D.N.A.		✓		✓	✓	
6	✓		✓		✓	✓		✓	✓
7	✓		✓		✓			✓	✓
8	✓			✓	D.N.A.			D.N.A.	
9	✓			✓	✓				✓
10	✓		✓		D.N.A.			✓	✓
11		✓	D.N.A.		D.N.A.			✓	
12	D.N.A.		D.N.A.				✓	✓	
13	D.N.A.		D.N.A.				✓	✓	
14	D.N.A.		D.N.A.				✓	✓	
15	✓	✓	D.N.A.				✓	✓	
16	✓			✓	D.N.A.			✓	✓
17	✓			✓	✓			✓	
18		✓	D.N.A.		D.N.A.			✓	
19		✓	D.N.A.		D.N.A.			✓	
20	✓		✓		✓		✓	✓	

When the 20 courses on earthquake-disaster of the architectural departments of 20 universities in the world were analyzed (Table 4);

- 12 courses in undergraduate education,
- 6 courses in graduate education,
- 4 compulsory courses,
- 4 elective courses,

- 8 theoretical courses,
- 2 practical courses,
- 7 laboratory environment courses,
- 18 courses on the earthquake-structural element relationship,
- 6 courses on the earthquake-nonstructural element relationship were identified.

3.2. The Role of Earthquake in Architecture and Interior Architecture Educations in Turkey

The following table was created as a result of scanning the earthquake-disaster courses of the architecture departments in Turkey (Table 5).

Table 5: Analysis of Earthquake-Disaster Courses in Architecture Departments in Turkey

Course Code	Undergraduate/ Graduate		Compulsory/ Elective		Theoretical/Practice/Laboratory			Course Contents	
	U.G.	G.	C.	E.	T.	P.	L.	E.Q.-S.E.	E.Q.-N.S.E.
1		✓		✓	✓			✓	
2	✓			✓	✓			D.N.A.	
3	✓			✓	✓			✓	
4	✓			✓	✓			✓	
5		✓	✓		✓			✓	
6	✓			✓	✓			✓	
7	✓			✓	✓			D.N.A.	
8	✓			✓	✓			✓	
9	✓			✓	✓			-	-
10		✓		✓	✓			✓	
11		✓		✓	✓			-	-
12		✓		✓	✓			✓	
13		✓		✓	✓			-	-
14		✓		✓	D.N.A.			✓	
15		✓		✓	✓	✓		✓	
16	✓			✓	✓			✓	
17	✓			✓	✓			✓	
18	✓			✓	D.N.A.			✓	
19		✓		✓	✓			✓	
20	✓			✓	✓			✓	✓
21	✓		✓		✓			✓	
22	✓			✓	✓			✓	✓
23		✓		✓	✓	✓		✓	
24		✓		✓	✓	✓		✓	
25	✓		✓		✓			✓	✓
26		✓		✓	✓			✓	✓
27	✓			✓	✓			✓	✓
28	✓			✓	✓			✓	
29	✓			✓	✓			✓	
30		✓		✓	✓			✓	

31	✓			✓	✓		✓	
32	✓			✓	✓		-	-
33		✓		✓	✓		-	-
34		✓		✓	✓		✓	
35	✓			✓	✓	✓	✓	
36	✓			✓	✓		✓	
37	✓			✓	✓		✓	
38	✓			✓	✓		✓	
39	✓		✓		✓	✓	✓	
40	✓			✓	✓		D.N.A.	
41	✓			✓	✓		✓	
42	✓			✓	✓		✓	
43	✓			✓	✓	✓	D.N.A.	
44	✓			✓	✓		✓	
45	✓			✓	✓	✓	D.N.A.	
46	✓			✓	✓		-	-
47	✓			✓	✓		✓	
48	✓		✓		✓		✓	
49	✓			✓	✓		✓	
50	✓			✓	✓		D.N.A.	
51	✓			✓	✓		✓	
52		✓	✓		✓		✓	

When the 52 courses on earthquake-disaster of the architectural departments of 39 universities in Turkey were analyzed (Table 5);

- 3 courses in undergraduate education,
- 16 courses in graduate education,
- 6 compulsory courses,
- 46 elective courses,
- 49 theoretical courses,
- 7 practical courses,
- 0 laboratory environment courses,
- 40 courses on the earthquake-structural element relationship,
- 5 courses on the earthquake-nonstructural element relationship were identified.

The following table was created as a result of scanning the earthquake-disaster courses of interior architecture/interior architecture and environmental design departments in Turkey (Table 6).

Table 6: Analysis of Earthquake-Disaster Courses in Interior Architecture/Interior Architecture and Environmental Design Departments in Turkey

Course Code	Undergraduate/ Graduate		Compulsory/ Elective		Theoretical/ Laboratory			Course Contents	
	U.G.	G.	C.	E.	T.	P.	L.	E.Q.-S.E.	E.Q.-N.S.E.
1		✓		✓	✓			✓	✓
2	✓			✓	✓			-	-
3	✓			✓	✓			✓	

When the 3 courses on earthquake-disaster of the interior architecture/interior architecture and environmental design departments of 3 universities in Turkey were analyzed (Table 6);

- 2 courses in undergraduate education,
- 1 course in graduate education,
- 0 compulsory course,
- 3 elective courses,
- 3 theoretical courses,
- 0 practical course,
- 0 laboratory environment course,
- 2 courses on the earthquake-structural element relationship,
- 1 course on the earthquake-nonstructural element relationship were identified.

4. Conclusion and Recommendations

Earthquakes are one of the most destructive disasters materially and morally. It brings many risks such as losing life and property, injuring, stopping activities, and causing a fire. These risks vary depending on the structural elements and non-structural elements of the structures. However, although most of the factors causing risks depend on structural elements; the impact of non-structural elements is also quite high. As well as the measures that can be taken by society against these risks, the measures to be taken by architects and interior architects who take an active role in building design, production and supervision are also very important. The ability to take these measures will be ensured by the sufficient and effective information they can obtain during their education. Therefore, the place of earthquake in architecture and interior architecture education is an important issue.

Since earthquake is an important issue in architecture and interior architecture education, within the scope of this study the courses on earthquake-disaster in the world and in Turkey were examined. These courses were analyzed according to the criteria of "undergraduate/graduate, compulsory/elective, theoretical/practical/laboratory, earthquake-

structural element/earthquake-non-structural element relationship". According to the findings obtained as a result of the analysis;

In the departments of architecture in the world;

- The number of courses in undergraduate education is higher than in graduate education,
- The number of compulsory and elective courses is equal,
- The courses are mostly given in the theoretical and laboratory environment, while the number of practical courses is less,
- The number of courses on the earthquake-structural element relationship is higher than the course on the earthquake-nonstructural element relationship was found as a conclusion of the findings of the analysis.

In the interior architecture departments of the world, it was not taken into consideration due to the lack of an education program for non-structural elements.

In architecture departments in Turkey;

- The number of courses in undergraduate education is higher than in graduate education,
- The number of elective courses is more than the number of compulsory courses,
- The number of theoretical courses is more than the number of practical courses; there is no course in the laboratory environment,
- It was found that the number of courses on the earthquake-structural element relationship is higher than the course on the earthquake-nonstructural element relationship was found as a conclusion of the findings of the analysis.

In the interior architecture/interior architecture and environmental design departments in Turkey;

- The number of courses in undergraduate education is higher than in graduate education,
- All courses are elective, no compulsory courses,
- All courses are theoretical, there are no practical and laboratory courses,
- It was found that the number of courses on the earthquake-structural element relationship is higher than the course on the earthquake-nonstructural element relationship was found as a conclusion of the findings of the analysis.

In this regard, it is observed how serious the deficiency in the education program regarding the relationship between earthquake and non-structural elements is in architecture and interior architecture education both in the world and in Turkey.

Information Notes

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Türkiye'de 2000 Yılı Sonrası Tasarlanmış Sanat Müzeleri Üzerine Bir Araştırma

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Öz

1990'lardan itibaren dünya genelinde sanat müzesi inşasında hızlı bir artış yaşanmıştır. Bu artışta, 1997'de Frank O. Gehry tarafından tasarlanan ve İspanya'nın Bilbao kentinde inşa edilen Guggenheim Müzesi tetikleyici olmuştur. İkonik tasarımıyla Guggenheim Müzesi, 1997 sonrasında bir sanayi kenti olan Bilbao'nun sanat ve mimarlık etkileşimi ile yeniden işlev kazanmasını sağlamıştır. Bu doğrultuda Guggenheim Müzesi'nin ortaya çıkardığı ve kendinden sonra tasarlanacak olan yapılara da yön veren, 'Bilbao etkisi' ile başta Avrupa ve Amerika olmak üzere dünya çapında sanat müzesi tasarımı ve inşasında bir artış meydana gelmiştir. Dünyada 'Bilbao etkisi' altında gelişen bu seyre kıyasla; Türkiye'de sanat müzelerinin tasarımı ve inşasındaki artış görece daha yavaş bir seyir göstermiş ve 2000'li yıllar itibariyle kendisini göstermeye başlamıştır. Öte yandan, Türkiye'de tasarlanmış müze yapıları sayısı, dönüştürülmüş müze yapıları sayısına oranla daha azdır. Her ne kadar, Türkiye'de tasarlanmış müze yapılarının sayıları az olsa da 2000'ler ve sonrasında Türkiye'de sanat müzelerinin inşasında bir artış gözlemlenmektedir. Bu sebeple bu çalışma, zamansal olarak 2000'ler ve sonrasına konumlanır. Türkiye'de 2000 yılı sonrasında tasarlanmış sanat müzeleri mimarlık camiasında hangi kavramlarla ve nasıl tartışılmaktadır sorusunu yanıtlamaya çalışır. Çalışma, Türkiye'nin en uzun süreli yayınlanan meslek dergisi olan Mimarlık Dergisi'nde seçilen makaleler üzerinden, ülkemizde tasarlanan sanat müzesi yapılarının nasıl değerlendirildiği, ne şekilde aktarıldığı ve hangi kavramlarla ele alındığını içerik analizi yöntemi ile anlamayı ve deşifre etmeyi amaçlar.

Anahtar Kelimeler: Sanat müzesi, Bilbao etkisi, Mimarlık Dergisi, İçerik analizi

Giriş

Sanat Müzesinin Ortaya Çıkışı ve Gelişimi

''Müze'' kelimesi kökeni Yunanca'da *mouseion*'dan gelmekte olup; herhangi bir maddi çıkar gözetmeden, halkın ilerlemesinde katkı sunan, kültürel ve yaşamsal mirasın korunmasını, aktarılmasını, halka açık şekilde gözlemlenebilmesini sağlayan kurum olarak tanımlanabilmektedir (ICOM, 2007 akt. Kandemir & Uçar, 2015).

Müzelerin oluşumu, ilk olarak fetih sonrası elde edilen ganimetlerin depolanması ve güç gösterisinin bir sembolü olarak eserlerin sunulması düşüncesiyle ortaya çıkmıştır. M.Ö. 4. yüzyılda kurulmuş olan ilk müze İskenderiye Müzesi'dir ve bu ilk müzenin toplumsal işlevi imparatorlukların gücünü sergilemektir.

15. yüzyıl itibariyle ise nadire kabineleri ortaya çıkmıştır (Artun, 2017). Nadire kabinelerinin işlevi imparatorlukların gücünü sergilemekten uzaklaşarak; nadir bulunan, tuhaf, sıra dışı nesnelerin biriktirilmesi ile koleksiyonerlerin ne kadar zengin ve güç sahibi olduğunu vurgulamak olmuştur. Nadire kabineleri, biriktirdiği bu tuhaf eserlere göre; *naturalia,*

artificalia, scientifica, mirabilia, bibliotheca gibi kategorilere ayrılmaktadır (Köksal, 2021). Aynı dönem içerisinde inşa edilmiş olan ve nadire kabinelerinden daha farklı bir yaklaşım sergileyen Medici Sarayı, sanat müzelerinin ilk örneği olarak kabul edilmiş, döneminin en nitelikli bilginlerini, sanatçılarını bünyesinde bulundurarak ‘‘müzenin akademik bir işlev üstlendiğinin’’ bir temsili olmuştur. (Artun, 2017, 24).



Şekil 1. Ole Worm'un nadire kabinesi, Kopenhag (Göle, 2016)



Şekil 2.Medici Sarayı (Florence Choral, 2022)

18. yüzyıl-19. yüzyıl arası döneme gelindiğinde; bu süreçte akılcılık, bilim ve mantık kavramlarının hakim olduğu aydınlanma çağında modern müzeler kurulmaya başlamış, 1793'te "ilk kamusal müze" unvanını taşıyan Louvre Müzesi, Louvre Sarayı'ndan müzeye dönüştürülerek açılmıştır (Sade, 2005). Louvre gibi modern müzelerin işlevi ‘‘ulusa devletin gücünü sergilemek ve ulusu müzede eğitmektir’’ (Artun, 2017, 49-87).

19. yüzyıl sonlarına doğru, Louvre Müzesi'nin de etkisi ile, Avrupa'da başka ülkelerde de sanat müzeleri açılmaya başlamıştır (Sade, 2005). İlerleyen zamanla birlikte sanat müzesindeki işlevler de gelişim ve değişim göstermeye başlamıştır. 20. yüzyılda açılan New York Modern Sanat Müzesi (MoMA) ile birlikte sanat müzelerinde ziyaretçi sayısını artırmak için "eğlence, eğitim, alışveriş" gibi işlevleri de barındıracak birimler ile eklemlenmiştir (Camgöz, 1996).



Şekil 3. New York Modern Sanat Müzesi-MoMA (Archdaily, 2022)



Şekil 4. Louvre Müzesi (Archdaily, 2022)

1990'lı yıllara gelindiğinde müze inşasında hızlı bir artış olmuştur (Sade, 2005; Kervankıran, 2014). Sanat müzelerinde mimari tasarım ön plana çıkmaya başlamış ve bu yaklaşımın öncüsü olan Bilbao Guggenheim Müzesi, Frank O. Gehry tarafından tasarlanarak, 1997'de İspanya'nın sanayi kenti Bilbao'da inşa edilmiştir (Gökalp, 2018). "24.000 m2 alana sahip" Guggenheim Müzesi; sergi alanları, kamusal alan, atriyum, oditoryum, depo, restoran ve kafeterya birimlerini barındırmaktadır (Uyar, 2021).

Sanayileşememiş ve zaman içerisinde bozulmaya uğramış Bilbao kenti bir liman kentiydi (Plaza ve Haarich, 2009 akt. Plaza, Tironi ve Haarich, 2009; Uyar, 2021). Kentin yeniden canlanması için Frank Gehry, kentte "ikonik bir yapı" tasarlamış; başka mimarların da kente katkıda bulunacak yapılar tasarlamasına yol açmasıyla birlikte Bilbao, yeniden canlanmıştır (Uyar, 2021). Kenti dönüştüren bu hareket Guggenheim veya Bilbao etkisi olarak isimlendirilmektedir (Polat, 2020). Bu etki ile müzelerde vurgulanan düşünce; sergilenen nesnelerin yerine "kenti temsil etmeye" ve "kentin simgesi olma" yaklaşımına dönüşmüştür (Göl, 2022). Küreselleşen kapitalist düzende, rekabet içerisindeki şirketler ve devletler tarafından ekonominin canlanması, kentin simgelenmesi, dikkat çeken bir odak haline gelmesi ve turist sayısını artırılması amacıyla, 1990'lardan sonra çok sayıda sanat müzesi inşa edilmeye başlamıştır (Artun, 2017).



Şekil 5. Bilbao Guggenheim Müzesi (Archdaily, 2022)

Guggenheim Etkisinde Sanat Müzesi İnşasındaki Artış

1990 sonrası "Guggenheim etkisi" ile sanat müzesi inşası hızla artmıştır. Bilbao Guggenheim Müzesi kendinden sonra inşa edilecek olan sanat müzelerinin mimari stilini de etkilemiştir. Dikkat çekici bir formda tasarlanan cepheler ve ikonik tasarımlar ile sanat müzelerindeki yapı; sergilenen eseri bastırarak ön plana çıkmıştır (Göl, 2022). Louvre Lens, Centre

Pompidou-Metz, MAXXI- 21. Yüzyıl Sanat Eserleri Müzesi, Fondation Louis Vuitton, Tate Modern Switch House ve Louvre Abu Dhabi Müzesi bu dönemde inşa edilen sanat müzelerin örnek gösterilebilir.



Şekil 6. Louvre Lens (Archdaily, 2022)



Şekil 7. Louvre Abu Dhabi Müzesi (Archdaily, 2022)



Şekil 8. Centre Pompidou-Metz (Archdaily, 2022)



Şekil 9. Fondation Louis Vuitton, Paris (Archdaily, 2022)



Şekil 10. MAXXI/ Roma (Archdaily, 2022)

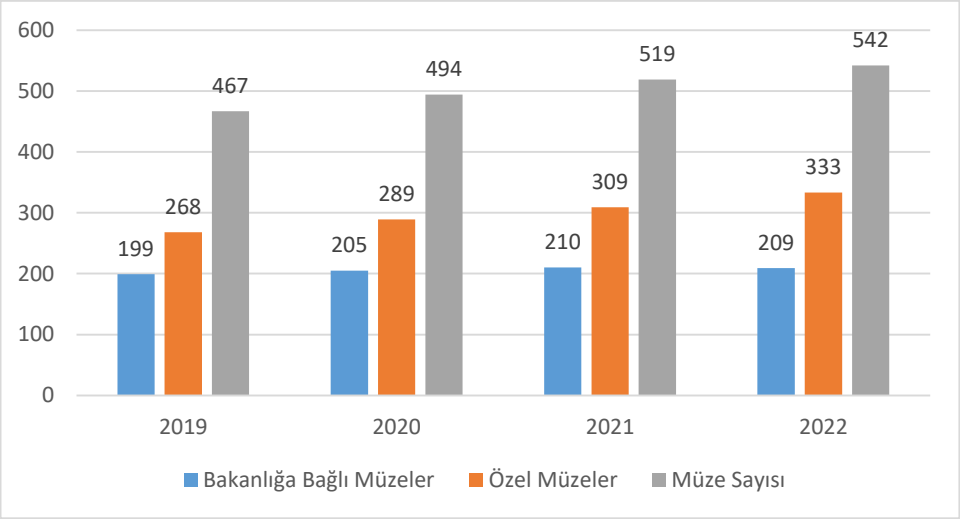


Şekil 11. Tate Modern Switch House, Londra (Archdaily, 2022)

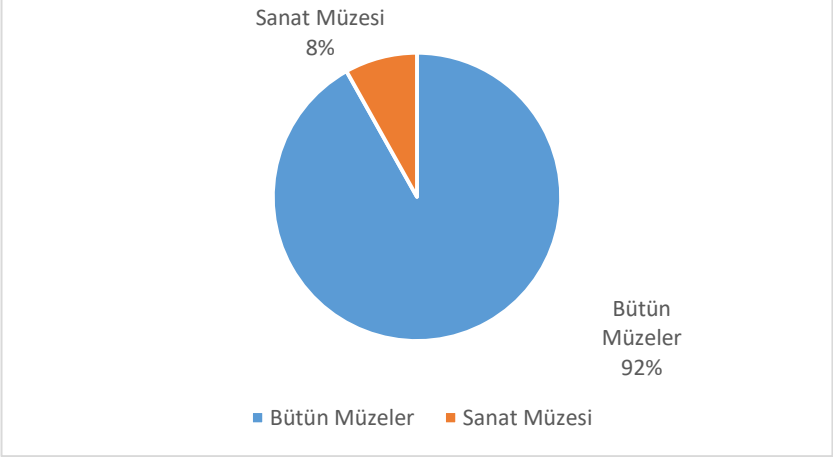
Türkiye'de Tasarlanan Sanat Müzesi Sayısının Az Olması

Türkiye'de müze artışı ise 2000'li yılların başı itibariyle kendini göstermeye başlamıştır (Artun, 2017). Türkiye İstatistik Kurumu'nda yer alan verilere göre 2019 yılında Türkiye'deki müze sayısı 467 iken 2020 yılında 494'e ve 2021 yılında 519'a yükselmiştir (TÜİK, 2022a;

TÜİK, 2022b). Kültür Varlıkları ve Müzeler Genel Müdürlüğü'ne göre ise 2022 yılı itibariyle bu sayı 542'ye çıkmıştır (Kültür Varlıkları ve Müzeler Genel Müdürlüğü, 2022b). Bu müzelerden 333'ü özel müze ve 209'u devlet müzesidir (Kültür Varlıkları ve Müzeler Genel Müdürlüğü, 2022a; Kültür Varlıkları ve Müzeler Genel Müdürlüğü, 2022b). 542 adet müze içerisinde ağırlıklı olarak arkeoloji ve etnografya müzeleri yer almaktayken; sadece 48 tanesi sanat müzesidir. (Grafik 1 ve Grafik 2'de veriler belirtilmiştir.)



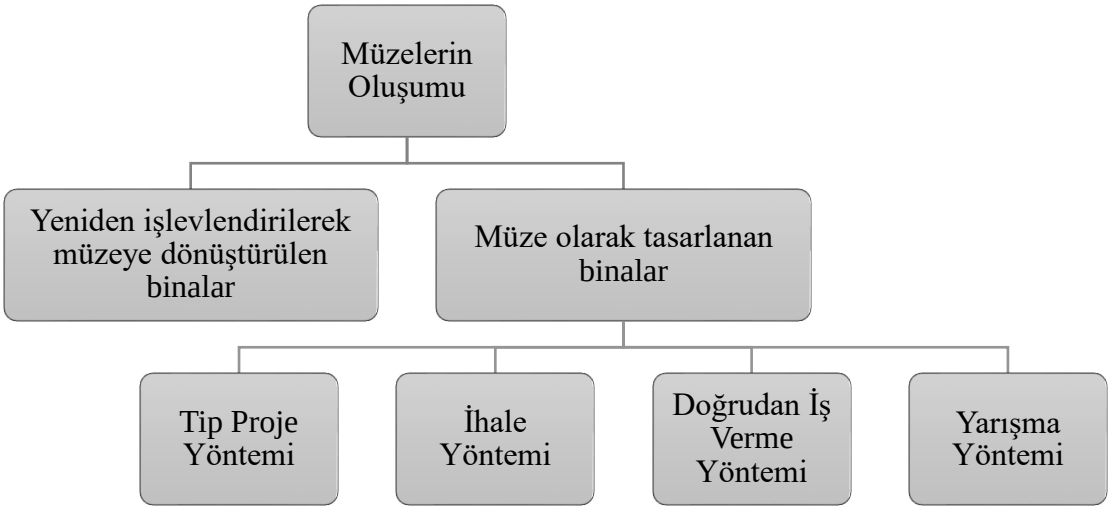
Grafik 1. Türkiye'de Bakanlığa Bağlı Müze ve Özel Müze Sayıları



Grafik 2. Türkiye'deki Tüm Müzelerin Sanat Müzesine Oranı

Türkiye'deki sanat müzelerini incelendiğinde, oluşumlarında farklı biçimlerin olduğu görülmektedir. Gültaş, müzelerin oluşumunu iki gruba ayırarak; "Yeniden işlevlendirilerek müzeye dönüştürülen binalar" ve "müze olarak tasarlanan binalar" şeklinde ifade etmiştir (Gültaş, 2019). Grafik 3'te Türkiye'deki müzelerin oluşum biçimleri diyagramına; Tablo 1'de yeniden işlevlendirilerek dönüştürülen müze binalarına ve Tablo 2'de tasarlanarak oluşturulmuş müze yapılarına örnekler yer verilmiştir. Tablo ve grafiklerde belirtilen

verilerden de görüldüğü üzere; Türkiye'de müzelerin oluşumunda yeniden işlevlendirilmiş, dönüştürülmüş yapıların daha yaygın olduğu ve tasarlanarak yapılan müze sayısının az olduğu görülmektedir (Sade, 2005; Gültaş, 2019).



Grafik 3. Türkiye'deki Müzelerin Oluşum Biçimleri

Tablo 1. Yeniden İşlevlendirilerek Dönüştürülen Müze Binaları Örnekleri

Dönüştürülen Müze Binaları	Önceki Yapı
Ankara Resim ve Heykel Müzesi (1980)	(1927) Türk Ocakları Merkez Binası
Sadberk Hanım Müzesi (1980)	Azeryan yalısı
Sakıp Sabancı Müzesi (2002)	Atlı Köşk
İstanbul Modern Sanat Müzesi (2004)	4 No.lu antrepo binası
Pera Müzesi (2005)	(1893) Bristol Oteli
Salt Galata (2011)	(1892) Bank-ı Osmanî-i Şahane
İstanbul Resim ve Heykel Müzesi (2011)	Tophane /5 No.lu antrepo binası

Tablo 2. Tasarlanarak Oluşturulan Müze Binaları Örnekleri

Tasarlanan Müze Binaları
Çanakkale Arkeoloji Müzesi (1911)
İzmir Arkeoloji Müzesi (1927)
Kars Müzesi (1964)
Tarsus Müzesi (1971)
Elgiz Müzesi (2001)
Odunpazarı Modern Müzesi OMM (2019)

Türkiye'deki Akademik Literatürde Tasarlanmış Sanat Müzelerine İlginin Az Olması

Türkiye'de tasarlanan müze sayısı az olduğu gibi, bu çalışmada Ulusal Yök Tez Merkezi üzerinden yapılmış taramayla, literatürde de Türkiye'de tasarlanmış müze binalarına ilginin az olduğu saptanmıştır. Türkiye'de literatür araştırması sonucunda; Ulusal YÖK Tez Merkezi içerisinde, Mimarlık alanında, başlığında ''müze'' veya ''museum'' içeren toplam 107 adet tez olduğu ve bu tezlerden 15 tanesinin doktora, kalan 92 tanesinin de yüksek lisans çalışması olduğu saptanmıştır. Sanat müzeleri üzerine çalışılmış 27 adet tez olduğu saptanmıştır. 27 adet tez içerisinde de Türkiye'de tasarlanmış sanat müzelerini ele alan sadece 5 adet çalışma olduğu tespit edilmiştir.

Tablo 3**.** Müze başlığında bulunan 107 tezden sanat müzesini ele alan çalışmalar

ELE ALINAN KONU	YAZAR, TARİH
Sanat müzesinde mimari konsept ve kent markalaşması ilişkisi	(Peker, 2006; Erpamukçu, 2019; Polat, 2020; Uyar, 2021)
Çağdaş sanatta ve müzecilikteki değişimler ve mekân organizasyonu ilişkisi	(Camgöz, 1996; Akmehmet, 2002; Ebadian, 2015; Karayılanoğlu, 2016; Firouzkouhi, 2019)
Çağdaş sanatta ve müzecilikteki değişimler ve ziyaretçi deneyimi ilişkisi	(Yılmazsoy, 2005; Balık, 2009; Karayılanoğlu, 2020)
Sergi mekânlarında aydınlatma ve ziyaretçi deneyimi ilişkisi	(Şener, 2009; Erdemir, 2014; Rodop, 2014; Foolady, 2017; Çevik, 2019)
Sanat müzesinde sergileme teknolojileri ve dijital mekân ilişkisi	(Ünal, 1999; Deniz, 2008; Bunsuz, 2019)
Müzelerinin tarihsel gelişimi ve müze mimarisi ilişkisi	(Sade, 2005; Gökalp, 2018)
Çağdaş sanatta ve müzecilikteki değişimler ve sergileme ilişkisi	(Parlak, 1997; Erkaya, 2008; Moussazadehhajiabadi, 2015; Akkaya, 2017; Göl, 2022)

Tablo 4. Türkiye'deki sanat müzesini çalışan tezlerde odaklanılan konular

ELE ALINAN KONU	YAZAR, TARİH
Türkiye'deki müze mimarlığı tarihi ve ''müze olarak tasarlanmış binaların'' mekân okuması	(Sade, 2005)
Çağdaş sanatta ve müzecilikteki değişimler ve mekân organizasyonu ilişkisi	(Karayılanoğlu, 2016)
Sanat müzesinde ziyaretçi farklılıkları ve ziyaretçi davranışları ilişkisi	(Yılmazsoy, 2005)
Sanat müzesinde mimari konsept ve kent markalaşması ilişkisi	(Uyar, 2021)
Sergi mekânlarında aydınlatma ve ziyaretçi deneyimi ilişkisi	(Erdemir, 2014)

Tablo 3'te yer alan verilerde görüldüğü üzere; başlığında müze sözcüğü bulunan 107 adet tez içerisinde sanat müzelerini araştıran 27 adet çalışmada ele alınan konular gruplandırılmıştır. Mimari konsept ve kent markalaşması, çağdaş sanatta ve müzecilikte değişiklikler ile mekân organizasyonu, ziyaretçi deneyimi, sergileme mekânında aydınlatma, sergileme teknolojileri, müzelerin tarihsel gelişimi, müze mimarisi gibi kavramların ele alındığı, birbirleriyle kurdukları etkileşimlerin değerlendirildiği saptanmıştır. Tablo 4'te ise Türkiye'deki sanat

müzesini çalışan tezlerde odaklanılan konulara yer verilmiştir. Bu tabloda yer alan 5 tezde; Türkiye'deki müze mimarlığı tarihi, Türkiye'de tasarlanmış müzelerin mekân okuması, çağdaş sanattaki ve müzecilikteki değişimler, mekân organizasyonu, ziyaretçi farklılıkları, ziyaretçi davranışları, konsept ve kent markalaşması ilişkisi ile aydınlatma gibi kavramların incelenmiş olup, birbirleriyle kurdukları etkileşimlerin ele alındığı tespit edilmiştir.

Araştırmanın Amacı, Yöntemi ve Önemi

Bu çalışmada; sayıları az olan, Türkiye'de tasarlanan sanat müzelerinin, ülkemizin en uzun süreli yayınlanan Mimarlık Dergisi'nde 2000 ve sonrasındaki yıllarda, hangi kavramlarla ele alındığını ve nasıl tartışıldığını anlamak, tespit etmek amaçlanmıştır. Mimarlık Dergisi'nde, Türkiye'de tasarlanan sanat müzelerinden en çok hangisinin inceleniyor olduğu ve hangi kavramlar üzerinden yorumlandığı sorularının yanıtlarını bulmak hedeflenmiştir.

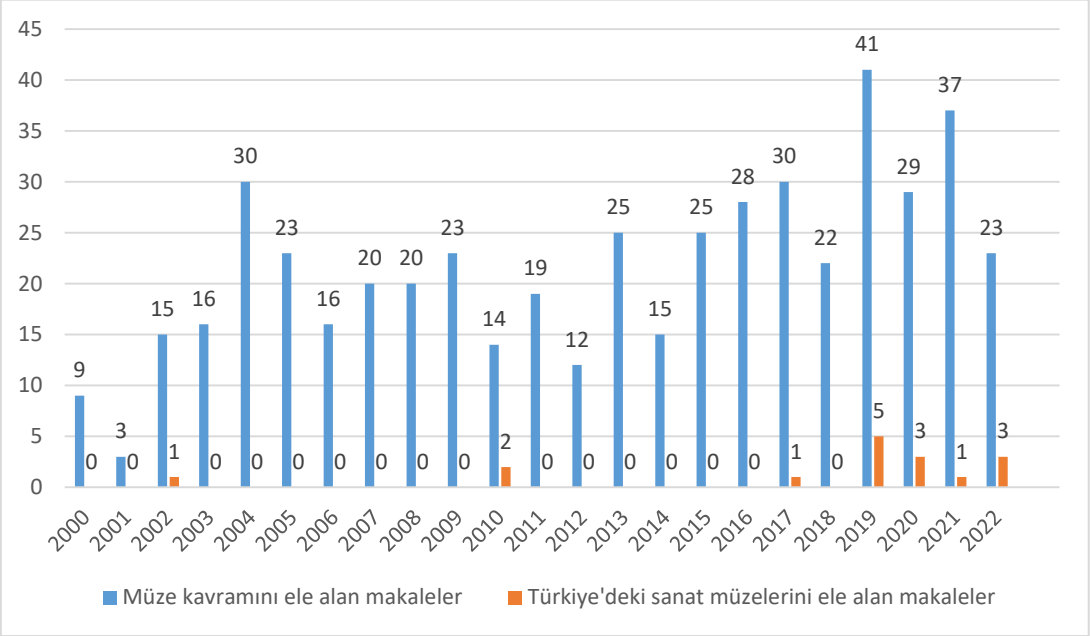
Araştırma nesnesi olarak Mimarlık Dergisi seçilmiştir. Çalışmada, bir mesleki dergi üzerinden ilerlemenin tercih edilmesi nedenleri şöyle sıralanabilir; dergilerin güncel bir ortamda veriye ulaşım imkânı sunması, basılı veya dijital ortamda yazılı olarak bulunmasının bilginin kalıcılığını desteklemesi, bilgi paylaşımı ve aktarımında meslektaşlar için ortak payda oluşturması ve bir iletişim yolu kurması (Tanyeli, 2001). Spesifik olarak Mimarlık Dergisi'nin seçilme nedeni ise ilk sayısını 1963'te yayınlayan derginin Türkiye mimarlık yazınında köklü ve uzun soluklu bir yayın hayatına sahip olmasıdır.

Yöntem olarak bu çalışma çerçevesinde; Mimarlık Dergisi üzerinden, 2000 ve sonrası için yapılan taramada toplanan makalelerde ''Yorumlayıcı İçerik Analizi'' yapılmıştır. Yorumlayıcı içerik analizi ile metinlerde açıkça veya ima yoluyla aktarılmak istenilenler deşifre edilmeye çalışılmıştır. Makaleler incelenirken, ''ne, nasıl, ne için, hangi sebeple veya amaçla'' gibi sorular yardımıyla Türkiye'de tasarlanmış olan sanat müzelerinin nasıl ve hangi kavramlar aracılığıyla değerlendirildiği tespit edilmek istenmiştir.

Türkiye'de tasarlanmış sanat müzeleri üzerine akademide ilginin az olması ve sanat müzesi olarak tasarlanmış binaların sayısının da az olması sebebiyle; mimar veya mimar adaylarına hitap eden mesleki bir dergide sanat müzelerinin nasıl tanımlandığı ve hangi kelimeler aracılığıyla ele alındığının çözümlenmesi; bunun sonucunda da ülkemizde tasarlanmış sanat müzelerine dikkat çekilerek bu yapılara gösterilen odak ve ilginin artırılması bakımından bu çalışmanın yapılması önemlidir.

Yorumlayıcı İçerik Analizi ve Bulguları

Mimarlık Dergisi'nde 2000 yılı itibariyle son 23 yılda, içerisinde ''müze'' kavramı ele alınan toplam 495 adet makale bulunduğu tespit edilmiştir. Türkiye'de tasarlanmış sanat müzesini konu alan 16 adet makale olduğu saptanmıştır. Yıllara göre dağılım bağlamında incelendiğinde; Mimarlık Dergisi'nde, son 23 yılda ortalama 22 adet makale çalışmasının müzeleri konu olarak ele aldığı ve 2010 yılı sonrasında yapılan çalışma sayılarında (önceki yıllara görece) artış olduğu tespit edilmiştir. Türkiye'de tasarlanan sanat müzelerini konu olarak çalışan makaleler ise Mimarlık Dergisi'nde 2002-2010 ve 2017 yılında çok az sayıda olmasına karşın; 2019 yılı itibariyle ani bir artış göstermiştir. Mimarlık Dergisi'nde yer alan makale sayıları verilerine Grafik 4'te yer verilmiştir.



Grafik 4. Mimarlık Dergisi Müze ve Türkiye'de Tasarlanan Sanat Müzelerini Çalışan Makale Sayıları

Mimarlık Dergisi'nde, Türkiye'de tasarlanan sanat müzeleri veya galerilerini inceleyen makalelerde en çok tartışılan sanat müzesi veya galeriler Tablo 5'te tartışma sıklığına göre sıralanmıştır.

Tablo 5'te görüldüğü üzere, Mimarlık Dergisi'nde en çok tartışılan sanat müzesi Kengo Kuma tarafından 2019 yılında Eskişehir'de tasarlanan Odunpazarı Modern Müzesi (OMM)'dir. Ayrıca Grafik 4'ün de işaret ettiği üzere, 2019 yılında Türkiye'de tasarlanan sanat müzeleri ile ilgili makalelerdeki sayının artışı, Odunpazarı Modern Müze (OMM)'nin açılış tarihi ile örtüşmektedir. Bu durum da Türkiye'de sanat müzesi tasarlanmasının oluşturduğu ilginin aynı zaman diliminde, mimarlık gündemine yansıdığını göstermektedir.

Tablo 5. Mimarlık Dergisi'nde seçilen makalelerde ele alınan kültür merkezi/galeri/sanat müzeleri

Müze Bilgisi (Müze adı, mimarı, yapım yılı, yeri)	Metin Sayısı
Odunpazarı Modern Müze (OMM), Kengo Kuma, 2019, Eskişehir, Türkiye.	4 kez tartışılmış (Mimarlık Dergisi)
Yapı Kredi Kültür Sanat (YKKS), TEGET Mimarlık, 2017, İstanbul, Türkiye.	3 kez tartışılmış (Mimarlık Dergisi)
İzmir Resim Heykel Müzesi ve Galerisi, Bruno Taut, 1938-1952, İzmir, Türkiye.	2 kez tartışılmış (Mimarlık Dergisi)
Atatürk Kültür Merkezi, İnal Göral, 1980, İzmir, Türkiye.	2 kez tartışılmış (Mimarlık Dergisi)
Ahşap Heykel Müzesi, Şevki Pekin, 2002, Değirmendere, İzmit	1 kez tartışılmış (Mimarlık Dergisi)
Atatürk Kültür Merkezi, Filiz Erkal; Coşkun Erkal ve Yüksel Öztan, 1987, Ankara, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)
Ankara Cer Modern Çağdaş Sanatlar Müzesi, Semra Uygur, 2010, Ankara, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)
Elgiz Çağdaş Sanat Müzesi, Can Elgiz, 2001, İstanbul, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)
İstanbul Maçka Sanat Galerisi, Rabia Çapa (kurucu), 1974, İstanbul, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)
Ankara Erimtan Arkeoloji ve Sanat Müzesi, Ayşen Savaş; Can Aker ve Onur Yüncü, 2015, Ankara, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)
Lucien Arkas Sanat Galerisi, ARTI3 Mimarlık, 2019, İzmir, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)
Baksı Müzesi, Sinan Genim, 2010, Bayburt, Türkiye.	1 kez tartışılmış (Mimarlık Dergisi)

Mimarlık Dergisi üzerinden yapılan tarama sonucu seçilen 16 adet makale; Sergileme & Etkinlik, Ziyaretçi Deneyimi, Mekân Organizasyonu, Mimari Program, Konsept ve Tasarım, Arazi ile İlişki, İlham Alınan Örnek Müzeler, Oluşturulma Biçimleri ve Güncel Kullanım ve Koruma olmak üzere 9 kategori üzerinden incelenmiştir. Kategoriler seçilirken öncelikle sanat müzesinin başlıca işlevleri yol gösterici olmuştur. Bu işlevler arasında; sergileme yaklaşımı ve bununla bağlantılı olarak, mekânda gezerken ziyaretçinin edindiği deneyim ön plana çıkmaktadır. Görsel sunumun, sergilenen nesnenin algılanması ve anlaşılmasında rolü büyüktür. Bunun yanı sıra sanat müzesinde mekân organizasyonunun nasıl sağlandığı, konsept ve tasarım anlayışının nasıl ilerlediği gibi noktalar hem sergileme yaklaşımını hem de ziyaretçi deneyimini etkileyen etmenlerdendir. İç ve dış mekânda kullanılan renkler, malzeme, doku, mekânın sınırları ve açıklıkları hatta günümüz gelişen teknolojileri yardımıyla popülerliği artan artırılmış gerçeklik imkânı ile birlikte sergileme tekniklerinin değişim göstermesi sanat müzesi ve sergilemenin bağlamını şekillendirmektedir. Sadece sergi ve ziyaretçi deneyimi odaklı değil; aynı zamanda sanat müzesi veya galerisinin araziyle kurduğu etkileşimin de incelenmesi, ilham alınan diğer sanat müzesi yapılarıyla bağlantısı, yapının oluşturulma biçimleri ve güncel durumdaki kullanımı ile koruma odaklı nasıl değerlendirildiğinin tespiti; mimarlık bağlamında sanat müzelerinin nasıl ele alındığının görülmesi amacıyla incelenmelidir.

İlk kategori olan Sergileme ve Etkinlik başlığı altında yapılan çıkarımlar şunlar olmuştur: Elgiz Çağdaş Sanat Müzesi'ni inceleyen metinde (Mimarlık Dünyasından, 2010); müzedeki fotoğraf, video ve resim gibi eserlerin iç mekânın yanı sıra dış mekâna da yerleştirilmiş olmasının sergilemenin sınırlarını ortadan kaldırdığına ve sergi özelinde müze ile bütünleşmeyi sağlayarak iç mekân ve dış mekân etkileşimine değinilmiştir.

Maçka Sanat Galerisi'ni inceleyen metinde (Mimarlık Dünyasından, 2017); galerinin açılması ile birlikte kentteki ''durgun sanatın'' canlanmaya başlamış olduğuna ve galerinin yayımladığı broşür, materyaller vs. aracılığıyla çocukların sanata ilgisinin artması amaçlanarak müzenin eğitici yönünün de ön plana çıkarılmasının istendiğine yer verilmiştir.

Ankara Erimtan Arkeoloji ve Sanat Müzesi'ni inceleyen metinde (Mimarlık Dünyasından, 2019); ''Türkiye'nin en kapsamlı sanat koleksiyonuna sahip olan Türkiye Cumhuriyeti Merkez Bankası'' sergisi ile Cumhuriyet döneminde sanatta görülen gelişimlerin yansıtılmak istendiğine değinilmiştir.

Odunpazarı Modern Müzesi (OMM)'ni inceleyen metinde (Mimarlık Müzesine Doğru, 2019); müzenin ilk sergileri arasında, ''müzeye özel olarak tasarlanan enstalasyon çalışması ve Marshmallow Laser Feast'in sanal gerçeklik deneyimi ile ilgili sergisinin'' yer alıyor oluşuna değinilmiştir.

Odunpazarı Modern Müzesi (OMM)'ni inceleyen bir başka metinde (Savaş, 2019); Önemli ölçüdeki yatırımların birçoğunun İstanbul'a yapıldığı bir zamanda sergi koleksiyonu için Eskişehir'in tercih edilmesinin ''vuslat'' kavramının anlamını ifade ediyor oluşu belirtilmiştir. Bambu sanatçısı Tanabe Chikuunsai'nin müzenin açılışı için tasarladığı çalışması da ''duvar, kiriş ve zemin'' ilişkilerinin tekrardan dikkat çekmesine yol açmıştır. Nihai ürünün ''yapısal karmaşıklığı'' eserin ''geleneksel'' yerine güncel olmaya yatkınlığını yansıtmaktadır.

Odunpazarı Modern Müzesi (OMM)'ni inceleyen diğer metinde (MİMARLIK'tan, 2019); ikinci katta yer alan ana sergi salonuna ulaşımın rampa/merdiven ile sağlandığı ve üçüncü kattaki sergi için ikinci kat üzerinden sirkülasyonun sağlandığı belirtilmiştir. Bu nedenle ikinci ve üçüncü katta yer alan sergi mekânlarının kullanımlarının ortak olması gerektiği veya iyice planlanmış olması gerekliliği belirtilmiştir.

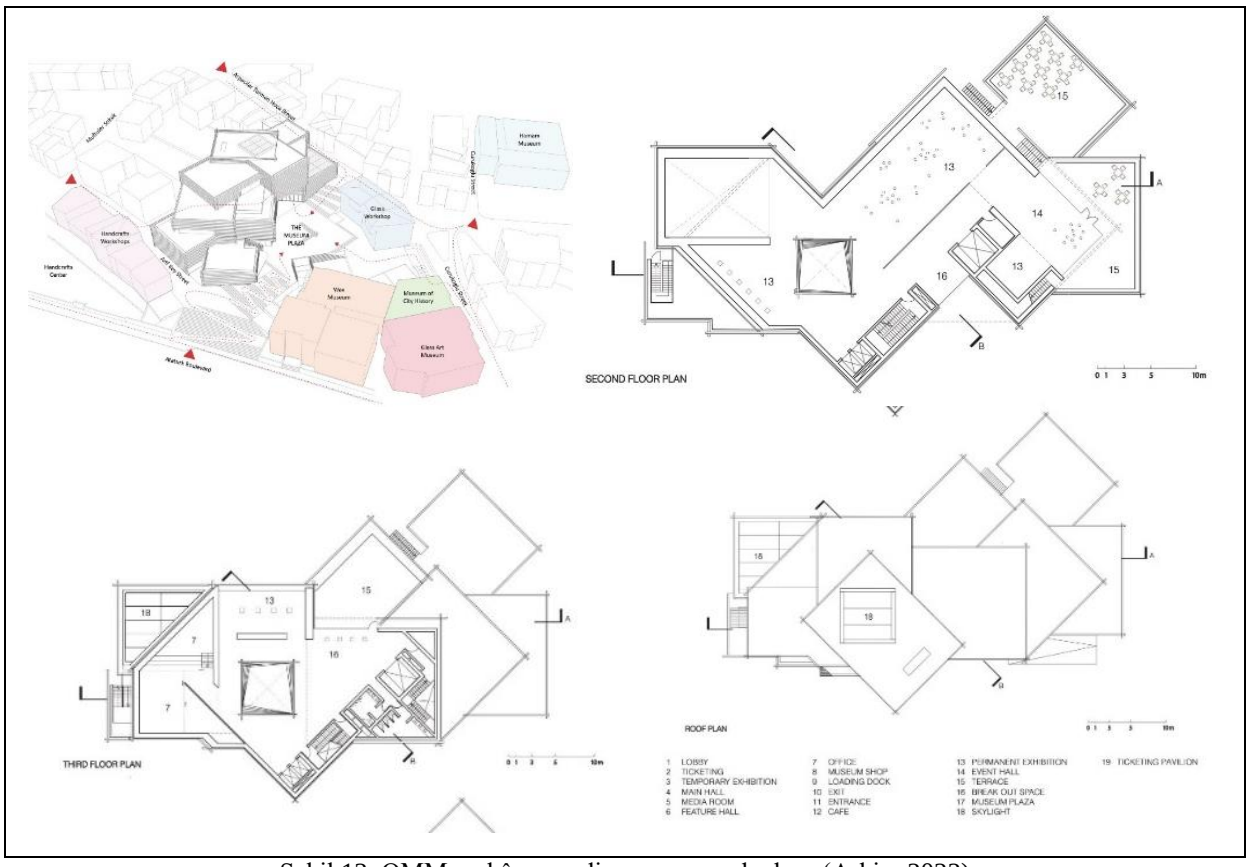
Yapı Kredi Kültür Sanat Merkezi'ni inceleyen metinde (Mimarlık Dünyasından, 2020); YKKS'nin ilk katında ''Sagalassos kazıları'' ve bölgeye ait birçok eserin sunulduğu; ikinci katına gelindiğinde, daha eski çağlara, ''Bronz Çağı, Roma Dönemi, Selçuklu Dönemi'' gibi,

ait eserlerin sergilendiği ve üçüncü katta ise yaşam ve ölüm temaları ağırlıklı eserlerin sunulduğu belirtilmiştir.

Yapı Kredi Kültür Sanat Merkezi'ni inceleyen bir diğer metinde (Etkinlik, 2020); pandeminin etkisiyle karantina süresi boyunca, müzelerin sanal turlarının artış gösterdiği bilgisine değinilmiştir. Sanal ortamda erişime elverişli müzelere ''Louvre Müzesi, Orsay Müzesi, Rijksmuseum, Van Gogh Müzesi, British Museum, Doğal Tarih Müzesi, Metropolitan Müzesi, Solomon R. Guggenheim Müzesi, Pinacoteca di Brera Müzesi, Napoli Ulusal Arkeoloji Müzesi, Vatikan Müzesi, Ermitaj Müzesi ve Ulusal Modern ve Çağdaş Sanat Müzesi'' örnek gösterilebilmektedir. Türkiye'de de ''Pera Müzesi, İstanbul Araştırmaları Enstitüsü, Arkas Sanat Merkezi, Aydın Doğan Vakfı Sanal Müzesi, Sakıp Sabancı Müzesi, Yapı Kredi Sanal Müzesi'' gibi birçok özel müzenin sergilerine internet yoluyla ulaşabilmenin mümkün olduğu belirtilmiştir.

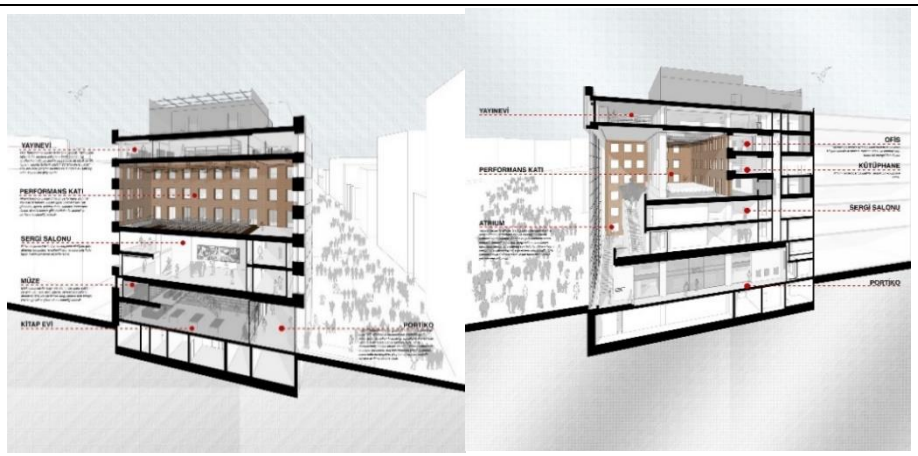
İkinci kategori olan Ziyaretçi Deneyimi başlığı altında yapılan çıkarımlar şunlar olmuştur: Lucien Arkas Sanat Galerisi'ni inceleyen metinde (Pasin, 2022); yapının ''çevresel görme'' olarak değerlendirildiği ''çok-duyusal görme biçimlerinin'' gün içerisinde ve serginin deneyimlendiği süreç boyunca etkisini sürdürmesinin ve ziyaretçilere ''zamansız bir mimarlık deneyimi yaşatmasının'' mekânı hem ''kalıcı'' hem de ''geçici sergiler'' için önemli bir etken haline getirdiği ifade edilmiştir.

Üçüncü kategori olan Mekân Organizasyonu başlığı altında yapılan çıkarımlar şunlar olmuştur: Odunpazarı Modern Müzesi (OMM)'ni inceleyen metinde (Savaş, 2019); OMM planında, alt kat ile üst katta bulunan birimlerin üst üste gelmemesinin, çakışmamasının mekân yerleşimini sıkıcı olmaktan uzaklaştırmış olduğu belirtilmiştir. Mekân dağılımlarına yönelik diyagram ve plan şemalarına Şekil 12'de yer verilmiştir.



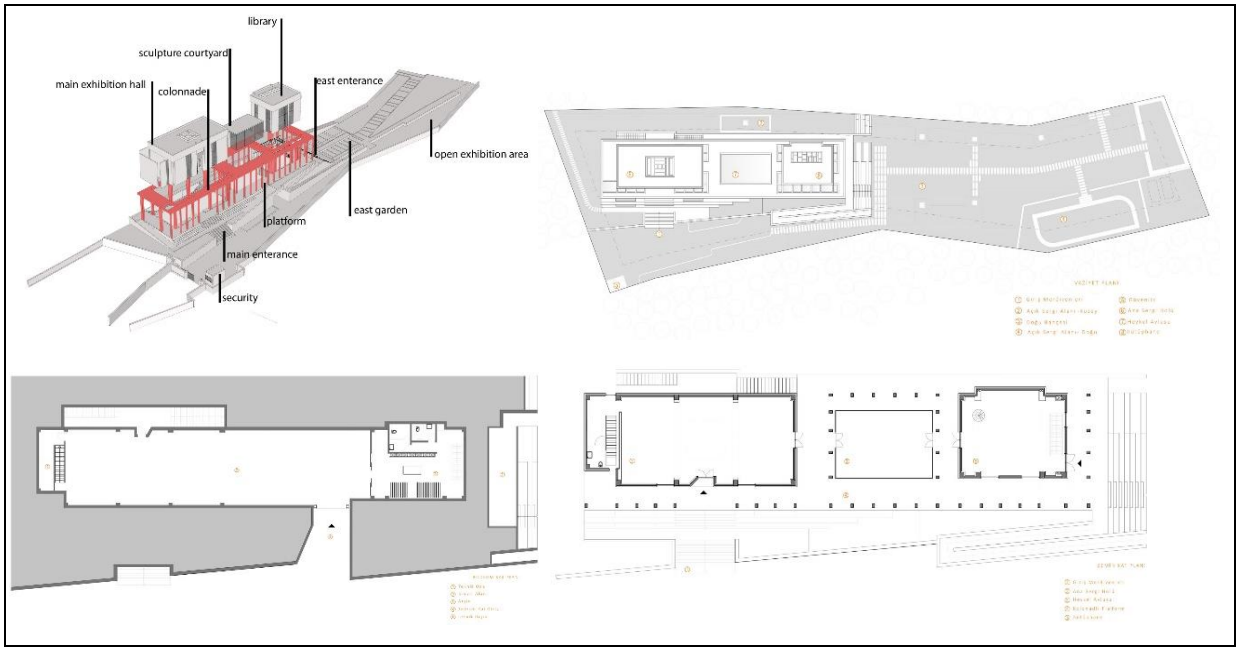
Şekil 12. OMM mekân org. diyagramı ve planları, (Arkiv, 2022)

Yapı Kredi Kültür Sanat Merkezi'ni inceleyen metinde (Eyüce, 2020); YKKS'nin 1958 yılına ait mevcut binası üzerinden yeniden tasarlanarak kütlesini koruduğu belirtilmiştir. Ancak ''meydan ile ilişkisi'' yetersiz görülmüş ve bu nedenle yapı içerisinde en alt kattan en üst kata kadar ilerleyen bir düşey dolaşım mekânı tanımlanmıştır. Dış çevre ile etkileşim kurmak amacıyla, meydana bakan cephede makas sisteminden faydalanılarak, tamamen cam cephe ile bölücü bir unsur olmaksızın kentin sanatla bütünleşmesini hedefleyen, şeffaf bir yüzey oluşturulmuştur. Mekânın organizasyonunda giriş kat itibariyle üst katlara doğru; kitabevi, müze, sergi salonu, performans alanı ve yayınevine ait ofis/çalışma alanları dağılım göstermiştir. (Şekil 13'te diyagramlar ile ifadesi yer almaktadır.)



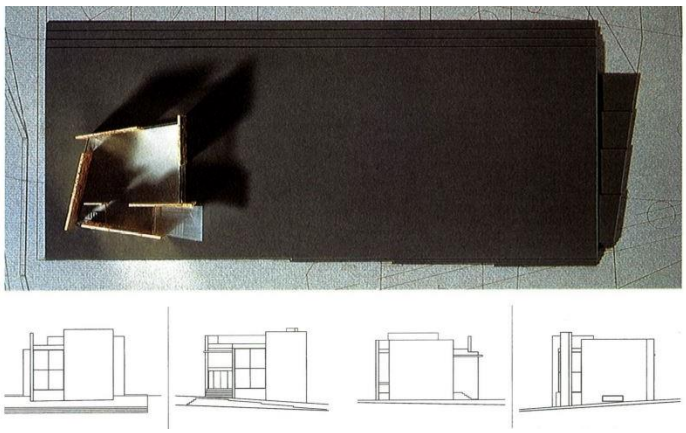
Şekil 13. YKKS mekân org. diyagramı (Arkiv, 2022)

Lucien Arkas Sanat Galerisi'ni inceleyen metinde (Pasin, 2022); galerinin, içinde ''sergi mekânları, kütüphane ve heykel avlusu'' bulundurduğuna ve mekân bakımından oldukça açık, anlaşılabilir bir yapıya sahip olduğuna değinilmiştir. Ancak çevre ile etkileşiminde ise ''çok boyutlu ve derin'' bir yaklaşıma sahip olduğu bilgisine yer verilmektedir. (Şekil 14'te galerinin planları ve diyagramı yer almaktadır.)



Şekil 14. LA Sanat Galerisi (Arkiv, 2022)

Dördüncü kategori olan Mimari Program başlığı altında yapılan çıkarım şudur; Ahşap Heykel Müzesi'ni inceleyen metinde (Pekin, 2002); ''Düşler Düşünceler Başarı Ödülü'' ile Şevki Pekin'in tasarlamış olduğu Ahşap Heykel Müzesi'nin, Değirmendere mevkiinde (İzmit), heykelleri sergilemek için bir mekâna ihtiyaç duyulması sonucunda ortaya çıktığı belirtilmiştir.



Şekil 15. Ahşap Heykel Müzesi (Mimarlık, 2002)

Beşinci kategori olan Konsept ve Tasarım başlığı altında yapılan çıkarımlar şunlardır; Ahşap Heykel Müzesi'ni inceleyen metinde (Pekin, 2002); müzenin tasarım kararları içerisinde gün ışığından en yüksek verim alınabilmesi amacıyla duvarların mozaik ile kaplanmış olduğuna değinilmiştir.

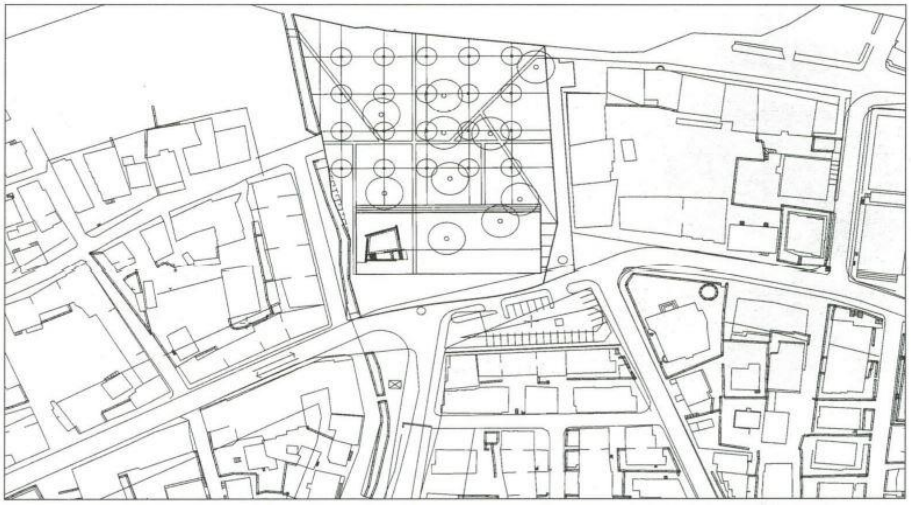
Maçka Sanat Galerisi'ni inceleyen metinde (Mimarlık Dünyasından, 2017); galerinin zemini ve duvarlarının ''fildişi rengi seramikler'' ile kaplı oluşuna ve diğer sanat müzeleri veya galerilerdeki ''beyaz küp'' yaklaşımından oldukça farklı bir tavır sergilediğine yer verilmektedir. Burada yer alan ''beyaz küp'' kavramı; O'Doherty'nin 1970'te ortaya koyduğu ve ''sanat galerilerinin has kabuğu'' olarak açıkladığı, 20. yüzyıl sanat galerileri /müzelerine ait bir tasarım yaklaşımıdır (Gökalp, 2018). ''Beyaz küp'' sanat eserinin ulaşılmazlığı ile sadece o nesnenin ön planda tutularak sergilenmesinde benimsenen bir tutum olmakla birlikte ''modernizm'' anlayışı çerçevesinde, sergilenen nesnenin sunumu/ görsel anlamdaki ifadesinde en önemli kriter olmaktayken; postmodern anlayışta ''müze ve modern sanata'' karşı bir ''eleştiri'' olarak nitelendirilmektedir (Tomsuk ve Yücel, 2021).

Odunpazarı Modern Müzesi (OMM)'ni inceleyen metinde (Mimarlık Dünyasından, 2019); OMM için Tanabe'nin Eskişehir'de gözlemlediği doku, geçmiş ve geleneklerle olan bağlantısının kendi ülkesinin gelenekleriyle benzerlik gösterdiğine ve bu uyumun sağlanmasında müzenin ve Eskişehir'in dokusuna paralel olması için enstalasyon çalışmasında bambuyu kullanmayı tercih ettiğine yer verilmektedir.



Şekil 16. OMM (Arkiv, 2022)

Altıncı kategori olan Arazi ile İlişki başlığı altında yapılan çıkarımlar şunlardır; Ahşap Heykel Müzesi'ni inceleyen metinde (Pekin, 2002); müzenin bulunduğu arazide, meydanı sınırlayan eğimli düzlemdeki tören alanının, sanat müzesinin/galerinin devam eden bir uzantısı olarak sınırlandırılmış olduğu ve bu alan üzerindeki kapalı hacmin sembolik bir yapı olarak düşünüldüğü belirtilmiştir.



Şekil 17. Ahşap Heykel Müzesi Araziye Yerleşimi (Mimarlık, 2002)

Ankara Atatürk Kültür Merkezi (AKM)'ni inceleyen metinde (Özgönül, 2010); AKM'de yer alan ''Müze -Sergi -Folklor ve Kütüphane kompleksinin'' dönemin Kültür ve Turizm Bakanı tarafından estetik olmayışını ve yapının yıkım işlemine girmesiyle birlikte ''yeni uygarlıklar müzesinin'' kurulacağını ifade ettiğine yer verilmiştir. Metinde yazar, yapının yalnızca estetik unsur üzerinden ele alınarak yıkılmasının etik olmadığını; bundan ziyade kamuya katkısının sorgulanmasının daha uygun olacağını savunan bir tutum sergilemiştir. Hatta Ankara Modern Çağdaş Sanatlar Müzesi'nin ve çevresindeki ''kentsel parkın'' da AKM'ye ivedilikle dahil edilmesinin gerektiğini vurgulamıştır.

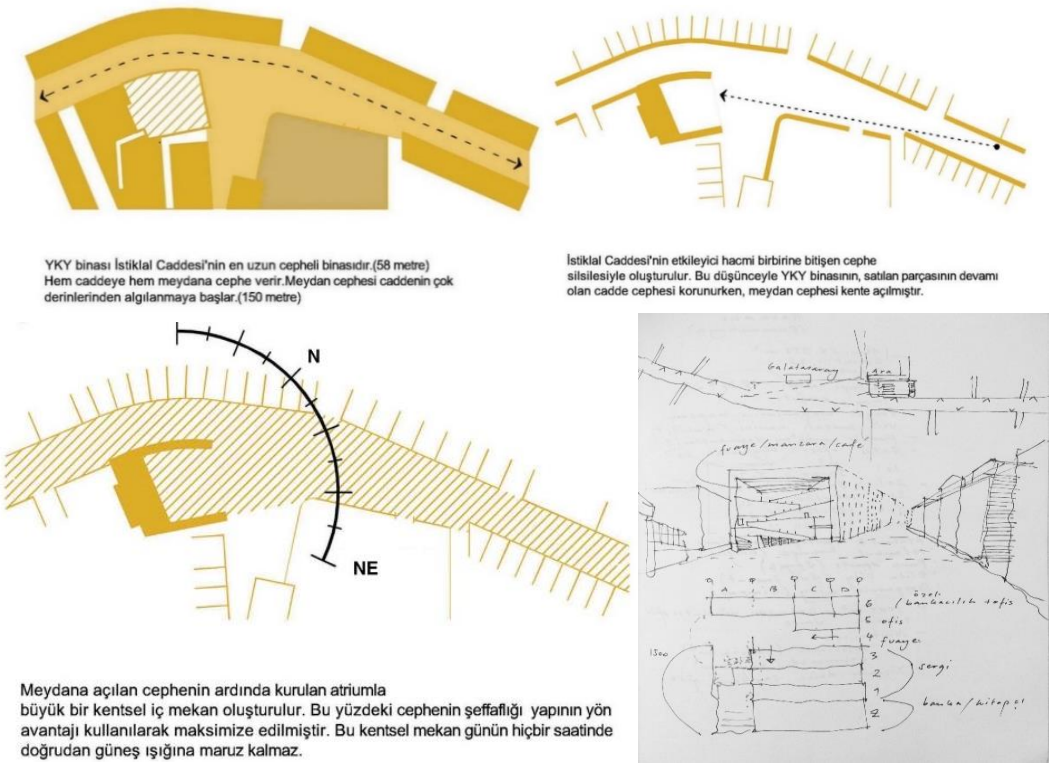


Şekil 18. Ankara Atatürk Kültür Merkezi ve Araziye Yerleşimi (Arkiv, 2022)

Elgiz Çağdaş Sanatlar Müzesi'ni inceleyen metinde (Mimarlık Dünyasından, 2010); müzenin, ''Kaotik metamorfoz'' sergisi aracılığıyla kentin modern ve tarihsel bağlamına ilişkili olarak sanatta yaşanan değişimleri aktardığını ve müzenin bulunduğu konuma (Maslak) yansıttığı enerjiyi ifade etmiştir.

Odunpazarı Modern Müzesi (OMM)'ni inceleyen metinde (Savaş 2019); yazar, Odunpazarı Modern Müze (OMM)'nin araziyle ilişkisini ele alırken özellikle de isminde yer aldığı gibi Odunpazarı için özel olduğunu, herhangi bir yer için tasarlanmadığını, yalnızca müze veya modern müze olarak isimlendirilmediğini ifade ederek OMM'nin yer ile kurduğu ilişkisini takdir ederek açıklamaktadır. OMM'nin ismindeki yer ilişkisini ele alırken ufak bir kıyaslama yaparak; MoMA'nın ilk kurulduğu zamanlarda isminde yerin bir öneminin pek olmadığına da yer vermiştir. OMM'de kullanılan malzemenin ahşap olmasının da kente özgü doku ile bağlantılı olduğuna dikkat çekmiştir.

Yapı Kredi Kültür Sanat Merkezi'ni inceleyen metinde (Eyüce, 2020); YKKS'nin, yeni binası için tasarıma başlarken, yapının bulunduğu konumla ilişkisine, ''bağlamına'' önem verildiği belirtilmiştir. Özellikle Galatasaray meydanı ile yapı arasındaki etkileşimin göz önünde bulundurulduğu; fakat yapının meydan ile kurduğu bu ilişkinin yeterli olmadığı ifade edilmiştir. Buradan yola çıkılarak tasarım kararında mevcut bina yeniden tasarlanırken meydan ve kentle bir hale gelmesi yaklaşımı ön plana çıkmıştır.



Şekil 19. Yapı Kredi Kültür Sanat Merkezi Araziye Yerleşimi (Arkiv, 2022)

Baksı Müzesi'ni inceleyen metinde (Mimarlık Dünyasından, 2021); müzede yer alan ''Kıraçta Heykel'' sergisi ile açık mekâna yerleşen heykellerin, Çoruh Nehri ile uyum sağladığına ve bu eserler ile bulundukları araziye farklı bir görünüm getirdiğine yer verilmiştir.

Lucien Arkas Sanat Galerisi'ni inceleyen metinde (Pasin, 2022); yapının tasarımında sadelik söz konusu olduğu belirtilmiş, yapının tasarlanma evrelerinin en başında, yoğun bir şekilde ağaçların yerleşmiş olduğu araziye ne şekilde konumlanacağı düşüncesi üzerinde durulmuştur. Buna rağmen tasarımın en çok düşündürücü noktasından birisi ''kütlesel imge'' olmuştur. Yapının etrafında konumlanan sıralı kolonlar hem kütlenin masif etkisini kırmış hem de yapıya ışık ve havanın teması kesmeden kütlenin tanımlanmasına olanak vermiştir.

Yedinci kategori olan İlham Alınan Örnek Müzeler başlığı altında yapılan çıkarımlar şunlardır; Odunpazarı Modern Müzesi (OMM)'ni inceleyen metinde (Savaş 2019); yazar, ''modern müze'' kavramını ve müzenin ''moderne ev sahipliği'' yapmasını OMM aracılığıyla ele almıştır. Bu görevi yerine getirirken de Museum of Modern Art (MoMA) yapısı ve Guggenheim Müzesi ile benzerlik gösterdiğini belirtmiştir.

Lucien Arkas Sanat Galerisi'ni inceleyen metinde (Pasin, 2022); müze yapılarında iç mekân ile dış mekân ilişkisinin birbirleriyle kurduğu bağlamın kimi mimarlar tarafından daha net bir şekilde ayrı olarak belirginleştirildiği ki bu aşamada özellikle cephede malzeme kullanımından faydalanıldığı; kimi mimarlar tarafından ise bu ikiliğin kırılmaya çalışıldığı

belirtilerek Frank Gehry'nin Bilbao Guggenheim Müzesi, Kengo Kuma'nın tasarlamış olduğu Odunpazarı Modern Müzesi, Bernard Tschumi'nin Yeni Akropolis Müzesi ve Teğet Mimarlık tarafından tasarlanan Yapı Kredi Kültür Sanat Merkezi binalarıyla örneklendirilmek istenilmiştir.



Şekil 20. Bilbao Guggenheim Müzesi/Odunpazarı Modern Müze/ Yeni Akropolis Müzesi/ Yapı Kredi Kültür Sanat Merkezi (Archdaily, 2022)

Sekizinci kategori olan Oluşturulma Biçimleri başlığı altında yapılan çıkarımlar şunlardır; Odunpazarı Modern Müzesi (OMM)'ni inceleyen metinde (Mimarlık Dünyasından, 2019); Kengo Kuma tarafından, birden çok disiplini içerisinde barındıracak, farklı ve yeniliğe açık sergileriyle sanat müzeleri bağlamından farklılaşan bir yapı olması amacıyla tasarlanan OMM'ye, açılışına ve Tanabe'nin müze için özel olarak tasarladığı bambu malzemesinden üretilen enstalasyon çalışmasına yer verilmiştir.

Odunpazarı Modern Müzesi (OMM)'ni inceleyen bir başka metinde (Savaş, 2019) ise; yazar, OMM'nin sanat müzesi olarak ve tasarlanarak ortaya çıkmasının mimarlık alanında önemli bir yere sahip olduğuna değinmiştir. Ülkemizde tasarlanan sanat müzelerinin sayısının az olduğuna, daha ziyade dönüştürülmüş yapıların var olduğuna dikkat çeken Savaş hem tasarlanarak oluşturulması hem de Kengo Kuma gibi tecrübeli bir mimar tarafından kaleme alınması sebebiyle OMM'nin oldukça dikkat çekici ve değerli bir rol üstlendiğini belirtmiştir (Savaş, 2019). Aynı zamanda sanat müzesinde ''sıfırdan tasarlanan'' yapıların müzede sergilenecek olan uzun soluklu koleksiyonlar ile ilişkisinin de oldukça kıymetli olduğu ifade edilmiştir. Sergilenecek nesneler ile mekân ilişkisi müze yapısında iç mekân ve dış mekânda kullanılan malzeme (doku uyumu), renk tercihi ve sergilemeye yardımcı elemanlar (duvarlar,

bölücü paneller, açık hava için platformlar vs.) gibi kriterler de sanat müzesinin tasarlanma aşamasının başında belirlenerek ilerlendiğinde; oluşturulma biçimlerinin sanat müzesindeki etkilerini anlamakta yardımcı olabilmektedir.

Odunpazarı Modern Müzesi (OMM)'ni inceleyen yine bir başka metinde (Mimarlık'tan, 2019); OMM'yi ele alan diğer metinlerdeki gibi binanın 'modern müze' olarak tasarlanmış olduğuna ve şehrin sanat anlayışına katkı sunduğuna dikkat çekmiştir.

Yapı Kredi Kültür Sanat Merkezi'ni inceleyen metinde (Eyüce, 2020); oldukça yoğun ve kalabalık olan İstiklal Caddesi'ne cephesi olan YKKS binasının, dönüştürülerek yeniden tasarlanmasının başarılı olduğunu belirtmiştir. Aynı zamanda yapının tasarlanmasında korunacak kısımların temelden çatıya olarak ilerlemediğini, öncelikle yukarıdan aşağı daha sonrasında aşağıdan yukarı yönlenme yaparak geliştiğini ifade etmiştir.

Dokuzuncu kategori olan Güncel Kullanım ve Koruma başlığı altında yapılan çıkarımlar şunlardır; İzmir Atatürk Kültür Merkezi ve İzmir Resim Heykel Müzesi'ni inceleyen metinde (Alatlı ve Aşık, 2022); ''Mimarlar Odası İzmir Şubesi Yönetim Kurulu Başkanı İlker Kahraman'ın'' İzmir AKM ve İzmir Resim ve Heykel Müzesi hakkında vermiş olduğu bilgiler aktarılmış, İzmir için bu iki yapının önemine değinilmiştir. İzmir AKM için şehirdeki diğer binalara esin kaynağı olduğu ve kent belleği açısından önemli bir rol üstlendiği belirtilmiştir. Binanın İzmir İl Emniyet Müdürlüğü'nün kullanımına verileceğine yönelik tartışmalara karşı Emniyet Müdürlüğü için başka bir yapının verileceği açıklanmıştır. Bir diğer önemli yapı, İzmir Resim ve Heykel Müzesi ile ilgili metinde; deprem nedeni öne sürülerek boşaltıldığının ve ardından yaşanan gelişmelere Kahraman'ın konuşmasında yer verdiği aktarılmış, İzmir için oldukça önemli olan iki yapı -hem İzmir Resim Heykel Müzesi hem de AKM binası- için koruma ve güçlendirmenin gerekliliğine değinilmiştir.

Benzer şekilde, İzmir Atatürk Kültür Merkezi ve İzmir Resim Heykel Müzesi'ni inceleyen metinde (Tunçağ, 2022); yazar, özellikle modern kentler için büyük önem arz eden resim heykel müzelerinin göz ardı edilmemesi gerektiğine değinerek, İzmir Resim ve Heykel Müzesi'nin deprem gerekçesiyle boşaltılmasına şiddetle karşı olduğunu yansıtmıştır. ''Güçlendirme'' yapılabilecekken yıkmanın doğru olmadığını savunan yazar, neden bu tutumun sergilendiğini sorgularken benzer şekilde endişelerini İzmir Atatürk Kültür Merkezi için de dile getirmiştir. İzmir İl Emniyet Müdürlüğü'ne verileceği söylentilerine karşı eleştirel tutum sergileyen yazar, AKM'nin kent ve sanat için değerli olduğunu, korunması gerektiğini belirtmiştir.

Değerlendirme ve Sonuç

Mimarlık Dergisi'nde 2000 yılı itibariyle taranan makaleler, 9 kategori üzerinden incelenmiş ve dördüncü bölümde elde edilen bulgular açıklanmaya çalışılmıştır. İncelenen makalelerde, sanat müzeleri veya galerilerinin sıklıkla Sergileme ve Etkinlik kategorisinde ele alındığı; onun takibinde Arazi ile İlişki ve Oluşturulma Biçimleri kategorisinde değerlendirildiği saptanmıştır. Sergileme ve Etkinlik başlığında; nesnelerin sergilenmesi için gerekli alanlarda iç mekân ile dış mekân ilişkisinin bütünleşmesi, sergileme teknikleri ve özellikle Odunpazarı Modern Müzesi (OMM) dahilinde sanat müzesine özel olarak enstalasyon çalışmasının tasarlanması makalelerde işlenmiştir. Sergilemenin yanı sıra sanat müzesinin Arazi ile İlişki başlığı altında işlenen konuları; yapının araziye oturumu, çevre ile kurduğu ilişki ile yakın mesafelerde bulunan mekânlarla ve/veya meydanlarla etkileşimi ve kentin hafızasında edindiği yer olmuştur. Bir diğer kategori olan ve diğerlerine göre nispeten daha çok ele alınan başlık Oluşturulma Biçimleri'nde ise; YKKS binasının mevcut binası üzerinde yeniden tasarlanması ve meydanla kurulan ilişkinin yetersizliğine çözüm getirilmek amacıyla caddeye bakan cephesinde değişiklik yapıldığı ele alınırken; esasında makalelerin Odunpazarı Modern Müzesi (OMM)'ne yoğunlaştığı saptanmıştır. Özellikle Ayşen Savaş'ın kaleme aldığı metinde vurgulamış olduğu noktalarla; Eskişehir'e yani yere özgü olması, Kengo Kuma gibi nitelikli ve tecrübeli bir mimar tarafından kaleme alınması ve belki de en can alıcı nokta olan ''Türkiye'de tasarlanarak oluşturulmasına'' yer vererek OMM'nin, ülkemizde dönüştürülerek üretilen diğer sanat müzeleri arasında farklılaştığını göstermiştir (Savaş, 2015).

Mimarlık Dergisi'nde, Türkiye'de tasarlanan sanat müzeleri arasında en çok Odunpazarı Modern Müzesi (OMM)'nin tartışıldığı tespit edilmiştir. Çalışma kapsamında taranan 16 adet makale içerisinde, en çok tartışılan sanat müzesinin OMM olmasının sebebi, dünyaca ünlü bir mimar tarafından Türkiye'de tasarlanan ilk sanat müzesi olması olarak yorumlanabilir. Aynı zamanda çalışmada incelenen 16 makalede ele alınan toplamda 12 adet yapının olması da Türkiye'de tasarlanarak oluşturulmuş sanat müzelerinin sayısının az olduğunun göstermektedir. Dolayısıyla hem sayılarının az olması hem de dergide ilginin az olması; Türkiye'de hem mimarlık yazınında hem de platformlarda ülkemizde tasarlanmış sanat müzeleri/ galerileri hakkında daha fazla çalışma üretilmesi gerektiğini ortaya koymaktadır.

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Environmental and Economic Comparison of Facade Insulation Alternatives by Building Information Modeling

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Abstract

From past to present, the concept of 'sustainability' has emerged in order to find solutions to problems such as rapid consumption of natural resources, environmental pollution and global warming. The concept of sustainability can be defined as the transfer of current resource consumption to future generations in a controlled manner. The construction sector is responsible for 40% of carbon emissions, 14% of water consumption and 60% of waste generation. It is necessary to design environmentally friendly structures in order to reduce the high energy consumption in the sector and to ensure sustainability. Life Cycle Assessment (LCA) is a technique that serves this purpose and reveals the environmental effects of the product from the production stage to its disposal. Life Cycle Analyzes (LCA) for environmentally sensitive building designs should be systematically prepared and ensured in the implementation process. In this context, the Building Information Modeling (BIM) system is an innovation that facilitates and deals with many stages in the building sector, and it can also produce quantitative results by keeping sustainable building production under control from the design stage. It provides this with the "Environmental Product Declaration (EPD)" defined for the materials to be used in the BIM tool. The aim of this study is to change the insulation materials of the exterior wall elements on a sample building model, to make cost analyzes according to the construction item numbers and to compare these two parameters. The aim of this study is to change the insulation materials of the exterior wall elements on a sample building model, to make cost analyzes according to the construction item numbers and to compare these two parameters in terms of EPS, XPS and stone wool board insulation materials. As a result of the study, it has been understood that the most environmentally friendly insulation material is EPS, and the XPS product has the highest value in primary energy and CO_2 emissions. When considered from an economic point of view, it has been seen that EPS insulation material is more economical and XPS and stone wool board have higher costs.

Keywords: Life Cycle Assessment (LCA), Building Information Modeling (BIM), Sustainability, Life Cycle Cost (LCC).

Introduction

Due to the rapid population growth and urbanization in the world, natural resources have come to the point of exhaustion. However, the carbon released to nature as a result of the activities carried out by people has created the problem of climate change (Duru, Koç, 2021). Research of the environment was the first worldwide with the 1972 Stockholm Proclamation. In this declaration, it is aimed that people live in prosperity in the world ecosystem and leave a livable world to future generations. From past to present, the concept of 'sustainability' has emerged in order to find solutions to problems such as rapid consumption of natural resources, environmental pollution and global warming. The concept of sustainability can be defined as the realization of the current consumption of resources in a controlled way and the transfer of them to future generations. Sustainability, with its current definition, is included in the report titled "Our Common Future" prepared by the United Nations Environment and

Development Commission in 1987 for the first time. In the report, also known as the Bruntland report, sustainability was defined as "meeting the needs and expectations of the present without compromising the ability of future generations to meet their own needs" (World Commission for Environment and Development, 1987). With the concept of sustainability gaining importance, the concept of 'Sustainable Development' emerged at the 'Rio Summit' held in 1992 and aimed to achieve certain goals. These purposes (Demiral, 2005):

- Bringing the economy and ecology together on a common ground, and presenting the use of resources to both today's people and future generations
- Preservation of ecological balance intact, protection of life support systems, protection of genetic versatility, protection of places and ecosystems
- Controlling the growth rate by stimulating growth, enriching natural resources, considering the environment and the economy together in the decisions to be taken, reorienting the technological development appropriately.
- Increasing the harmony of man with nature

In order to achieve a sustainable development plan, economic, ecological and social development, known as the triple bottom line, must be realized together (Fig.1) (Taşdemir, Gazo, Quesada, 2020).

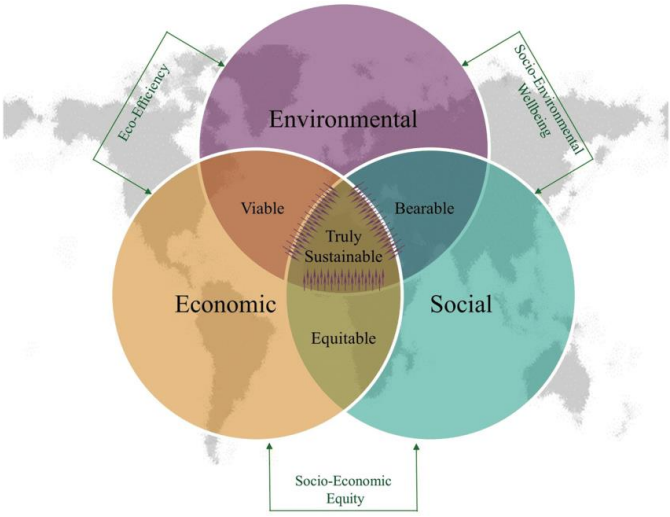


Figure 1. Triple Bottom Line (Taşdemir, Gazo, Quesada, 2020)

The Place of Sustainability in the Structure

Buildings are at the forefront of the factors that have the greatest impact on these negative changes in nature. According to the statistics made in 2020, buildings are responsible for 30% of raw material consumption, 35% of carbon dioxide emissions and 40% of energy resources,

and these rates continue to increase every year. (Kaplan et al., 2020) In this context, the concept of sustainable building has emerged in order to minimize the damage of buildings to the environment. Buildings that minimize the damage to the environment and the energy consumed, choose the materials used from life-cycle analyzes, have low carbon emissions, and consider environmental sensitivity in the construction, use and disposal of the building as well as before the construction of the building are defined as 'sustainable buildings'. (Yılmaz, 2012). It provides for a sustainable building by taking into account many criteria from the selection of the land on which the building will be built, to its settlement, construction, design, maintenance, repair and demolition (Fig. 2). Thus, by reducing the negative effects on both human health and the environment, it enabled the effective use of the material by controlling energy and water consumption. (Cassidy & Wright, 2009).

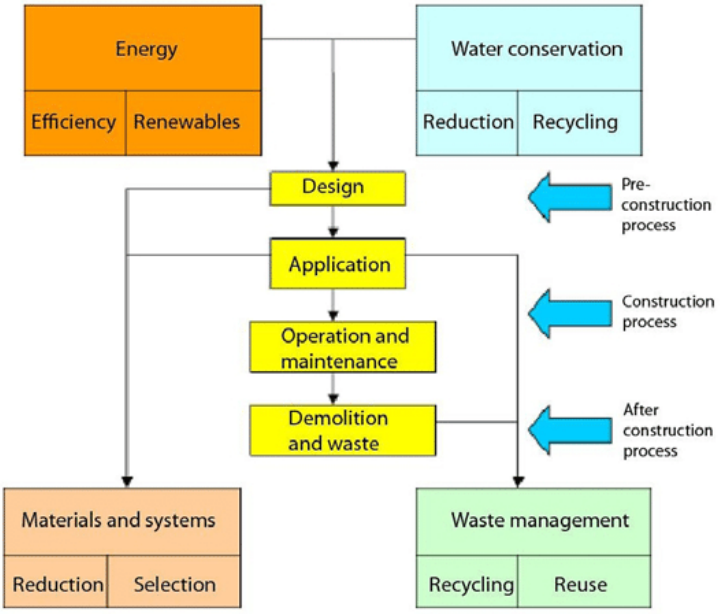


Figure 2. Lifetime Flow Chart for Buildings (Langmald, 2004, Yılmaz, 2009)

Organizations that emerged with the spread of the sustainable-green building concept in the world have determined certain criteria for environmentally sensitive buildings and have created certification and rating systems for them. The aim here was to 'create green buildings with the use of universal certification systems worldwide' (Kanter Otçu & Oğuz, 2015). While it has a universal evaluation system in BREEAM and LEED certificates, the certificate systems created by other countries are created according to the countries' own climates and living standards (Table 1) (Saka, 2011).

Table 1: Researched Green Building Certification Systems and General Information

Certificate System	Definition	Date	Establishment	Country
BREEAM	Building Research Institute (BRE) Environmental Assessment Method	1990	Building Research Institute	England
LEED	Leadership Program in Energy and Environmental Design	1998	American Green Building Council (USGBC)	USA
GREEN STAR	Building Lifecycle Assessment Program	2003	Australian Green Building Council (GBCA)	Australia
ÇEDBİK - B.E.S.T	Ecological and Sustainable Building Design	2013	ÇEDBİK Environmentally Friendly Green Buildings Association	Turkey

Life Cycle Assessment (LCA)

Life cycle assessment is the method used to determine and minimize the damage to the environment from the raw material supply stage to the waste and recycling stage of products and services such as vehicles, equipment, building materials used from the pre-construction stage of the building to its construction, use, maintenance- repair and demolition (Commission of the European Communities, 2001)

Thanks to the LCA method, the energy data at all stages of the building can be examined before construction and the environmental impact of the building can be determined for each stage and intervened without delay (Gomaa, Farghaly, & El Sayad, 2021). Based on ISO 14040 standards, the LCA method consists of four stages. These: (Gomaa, Farghaly, & El Sayad, 2021)

- Definition of Purpose and Scope
- Life Cycle Inventory
- Life Cycle Impact assessment
- Interpretation

All specified LCA inventories must be processed correctly in order to conduct a healthy life cycle assessment analysis. The data entered at each stage directly affects the next stage. (Lasvaux ve et al., 2014).

In order to measure the environmental impacts of the building, life cycle impact categories have been determined. These are the factors that have the most impact on environmental analysis. The impact categories are basically as follows:

- Climate change (GWP) (Kg CO_2-equiv.)

- Ozone depletion (ODP) (Kg R11-equiv.)
- Soil and water acid determination (AP) (Kg SO_2-equiv.)
- Eutrophication (EP) (Kg $PO4^{3-}$ equiv.)
- Photooxidant formation (POCP) (Kg CH_4-equiv.)
- Abiotic resource depletion (ADPf) (Mj)

With the architect's effective material selection and planning, taking into account the above impact categories, the preliminary design phase of LCA analyzes will be completed as quickly as possible and environmentally friendly and economical structures will be built (Basbagill, Flager, Lepech, & Fischer, 2013).

Sustainable Building Design with BIM

BIM (Building Information Modeling) tools are systems that help determine the advantages and disadvantages of the building by revealing the technological, social, economic and environmental effects through the model in the preliminary design phase before the buildings are built. The use of BIM tools in sustainable building production will yield much more accurate results in the final result than traditional methods. For this reason, the use of BIM tools should be expanded. (Reizgevicius, Ustinovičius, Cibulskiene, Kutut & Nazarko, 2018).

Thanks to BIM, unlike traditional CAD programs, it provides decisions that affect the preliminary design with less human intervention, reducing the error rate that may occur in the next stages. In addition, thanks to the model prepared with detailed data inputs, it provides the opportunity to examine the building environmental analyzes in different parameters at the design stage, making it very easy to design environmentally friendly buildings among the design options (Ilhan & Yaman, 2016). Thanks to BIM's environmental sustainability capability and its ability to store data, process and share it with building elements, it enables the most environmentally sensitive design decisions to be made by determining the environmental effects of the building such as energy use, water consumption, material use and resource consumption, waste management, and carbon emissions. In the economic context, it reveals the entire life cycle costs of the building, from the material to be used in the early design phase, to the choice of the most economical one from the material to be used to the design decision, to the determination of the logistics costs, to the early detection of the usual mishaps that may occur during the construction and usage phases, and provides the opportunity for early intervention in economic decisions (Volk, Stengel, & Schultmann, 2014).

EPD (Environmental Product Declaration)

While it is responsible for 39% of the carbon dioxide emissions of the building sector, 11% of this is due to embedded carbon. Embedded carbon refers to the amount of carbon that the building material releases from the mining stage until it is ready for use (URL 1).

According to the 2019 report of the World Green Building Council, the first of the 2 targets is to reduce the embedded carbon rates of all newly built buildings, infrastructure works and renovation projects to a maximum of 40% by 2030, and there is a zero buried carbon target by 2050. ("Building a better future Annual report 2018/19 Contents").

With EPD documents, products can be compared in terms of environmental performance and their environmental impacts that change over time can be monitored. In addition, thanks to EPD data, it is possible to transfer the environmental information of a product (Manzini, Noci, Ostinelli & Pizzurno, 2006).

It has been classified as Type I, Type II and Type III by ISO (International Standards Organization) in order to evaluate environmental impacts with the Life Cycle Assessment method. In this classification system, Type III products are life cycle assessment tools that are prepared in accordance with ISO 14025 standards and cover EPDs of products in order to document the environmental impacts. (EPDTurkey, 2020).

Materials and Methods

Materials

The outer wall elements of the room volume modeled within the scope of the study are sheathed externally XPS (24), EPS (20) and stone wool board (50) were chosen as exterior wall insulation materials. In order for the life cycle evaluations of the insulation materials used to give accurate results, the layers of the wall section other than the insulation material were selected the same. Again, in order to obtain a healthy result, the thickness of the insulation materials was kept equal and 4 cm was taken. The thermal conductivity was taken from an academic study conducted in Düzce and 0,032 W/mK for XPS, 0.035 W/mK for EPS and 0.04 W/mK for stone wool board (ŞEN, 2020). The insulation materials selected within the scope of the study consist of XPS (Extruded Polystyrene Foam), EPS (Expanded Polystyrene Foam) and Stone wool board. The EPD values of the selected materials were obtained from the EPDTurkey platform. Again, the m_2 costs of the selected materials were obtained from the Construction General Price Analysis published by the Ministry of Environment, Urbanization and Climate Change for the year 2022.

Since the simulation will be carried out according to the climate values of Düzce, the climate values of Düzce were obtained from the 'climate. One building' database (URL 2).

Metot

In this study, different insulation materials of the building exterior wall element were made through the Archicad program, which includes the Building Information Modeling System. A 25 m^2 room was modeled using a single door and window element (Fig. 4). By changing only the insulation materials of the room building elements, 3 different spaces were created. Building parameters required for energy analysis are processed in the model in detail.

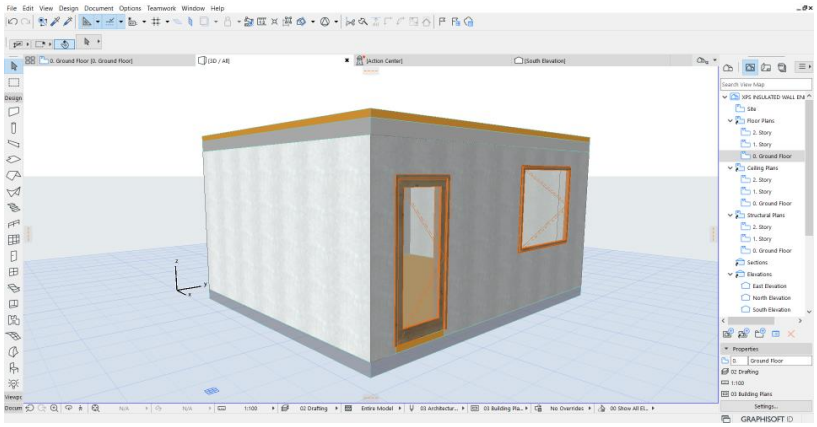


Figure 3. Model Built for Energy Analysis

Since the outer wall section details of the insulation materials are similar to each other, the study was created only according to the changing insulation material parameter, making it easier to evaluate the result according to a single variable (Fig 5).

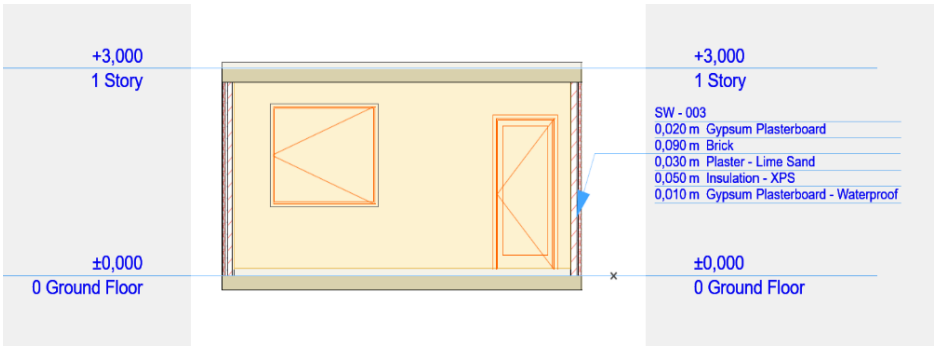


Figure 4. XPS insulated wall section

For the simulation, first of all, the thermal heat blocks of the model must be defined to the system. Since our model consists of a single volume, it was created separately for each different insulation material and defined to the system.

Energy Simulation Inputs:

Certain values need to be entered into the simulation to create the analysis. These:

- Process Profiles
- Environment settings
- Climate data
- Building systems
- Energy source factor
- Energy costs.

Operation Profiles:

At this stage, since the analysis will be made for the housing structure, the housing option has been activated and the per capita human heat gain, service hot water load and humidity load have been entered at appropriate values for the house.

In addition, the factors affecting the indoor temperature are specified by entering the maximum and minimum indoor temperature values from the daily profile editör (Fig 5).

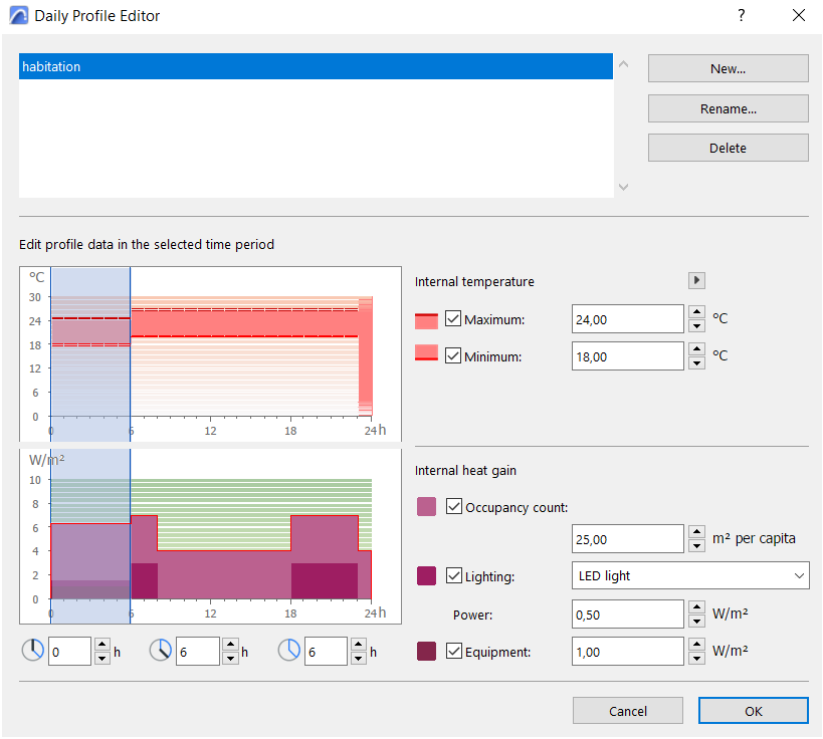


Figure 5. Intrinsic Values and Section Selectors

Environment settings:

Düzce climate data was obtained as epw file from the database in accordance with its coordinates, and the validity of the simulation to be made according to Düzce climate conditions was ensured.

Still;

Other factors that will affect the analysis such as surface heat transfer coefficients and soil type are defined in the simulation. Soil type drainage sand, paved floor option has been activated. In addition, an environment without wind protection and shading was created for the analysis.

Climate data:

The humid air type suitable for the climate type of Düzce has been selected, and the air temperature has been activated as the data type.

Building systems:

Central heating was chosen as the building heating system, and wall-mounted cooling with 3000 W power was chosen as the cooling system. Other parameters are not activated for this simulation.

Energy source factors:

The resources and primary energy and CO_2 emission values defined in the system have been validated.

Energy Costs:

The financial equivalents of the items used in the simulation from the energy cost values are defined in dollars.

Energy Simulation Results

The results of the analysis for 3 different insulation materials present the results of the energy performance evaluation with the data they presented (table 2). First, key values are expressed. Here, the U value of the building envelope is 0.88 W/m_2K in all 3 models. Specific annual values are as shown in the table. Specific annual values are as shown in the Table.

Table 2: Annual Energy Values

	Xps Insulated Wall	Eps Insulated Wall	Stone wool Insulated Wall
"	58,42 kWh/m²a	27,22 kWh/m²a	45,16 kWh/m²a
Net Cooling Energy	137,56 kWh/m²a	88,21 kWh/m²a	146,52 kWh/m²a
Total Net Energy	195,97 kWh/m²a	115,43 kWh/m²a	191,68 kWh/m²a
Energy Consumption	309,59 kWh/m²a	229,05 kWh/m²a	313,88 kWh/m²a
Fuel Consumption	213,74 kWh/m²a	166,02 kWh/m²a	208,95 kWh/m²a
Primary Energy	491,74 kWh/m²a	345,12 kWh/m²a	502,15 kWh/m²a

Fuel Cost	138,96 kWh/m²a	103,65 TL/m²a	139,19 TL/m²a
CO_2 Emission	1167,17 kWh/m²a	93,39 kg/m²a	48,51 kg/m²a

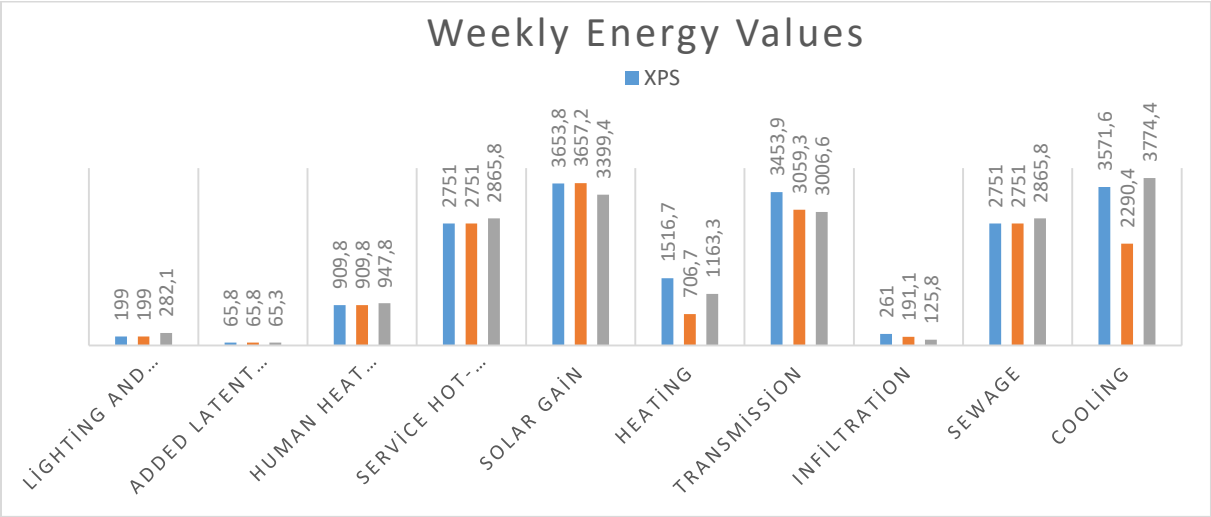


Figure 6. Weekly Energy Values

In the comparison of weekly energy values, the energy from lighting and equipment, added hidden energy, human heat gain, service hot water heating, solar gain, heating, transmission, infiltration, sewage and cooling can be seen. Here, the energy values that make the difference between insulation materials are heating, transfer and cooling. While the heating energy belongs to the XPS material the most, it belongs to the EPS material the least. While the transfer energy is mostly in XPS material, it belongs to stone wool board at least. While the cooling energy belongs to the stone wool board material the most, it is the least to the EPS material (Fig 6).

Energy Consumption By Targets:

In the weekly energy consumption quantitative comparison, the biggest factors that make up the difference are the consumptions originating from heating and cooling. Here, it is seen that EPS element is less in heating and cooling energy in both energy types compared to the other two insulation materials (Fig 7).

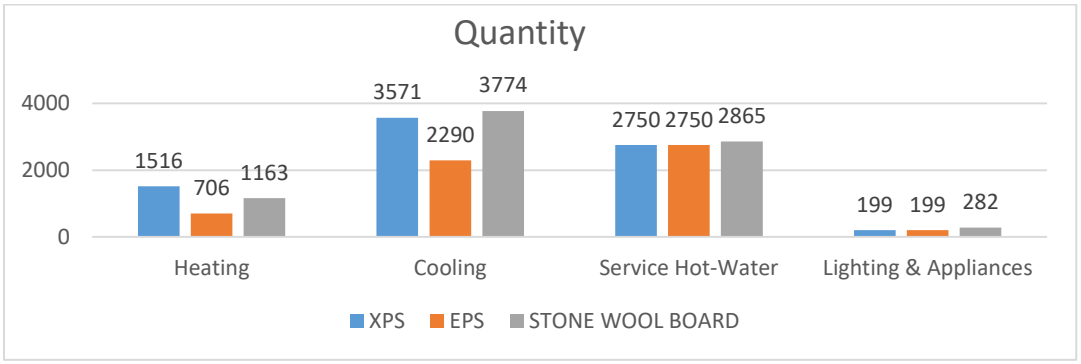


Figure 7. Quantitative Comparison by Goals

In the primary energy comparison, the heating and cooling consumptions are the most important factors that make up the difference between the materials. While EPS insulation material is the least in heating energy, XPS insulation material has the least value in cooling (Fig 8).

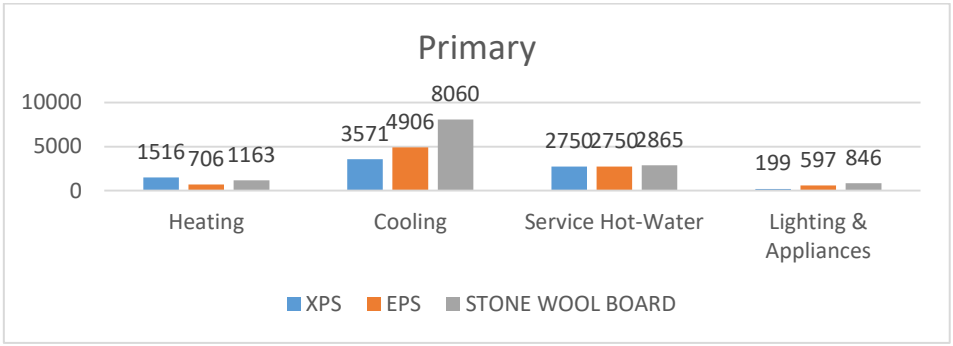


Figure 8. Primary Energy Comparison by Targets

Considering the energy costs, stone wool board has the least value and XPS has the highest value in heating energy. XPS has the highest value in cooling and EPS thermal insulation material has the lowest value. In terms of energy cost of service hot water, stone wool board has a very low cost compared to the other two insulation materials (Fig 9).

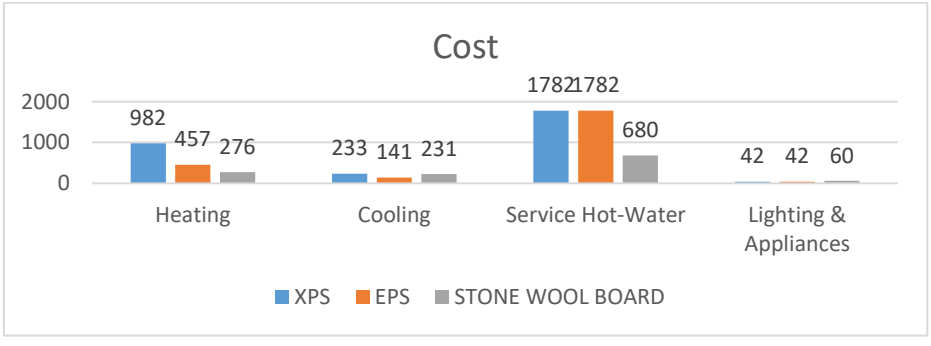


Figure 9. Comparison of Energy Costs by Targets

In the assessment of CO_2 emission, besides heating and cooling, there is also pollution caused by service hot water. While XPS has the highest emission in heating and cooling, stone wool board in service hot water has lower CO_2 emissions compared to XPS and EPS (Fig 10).

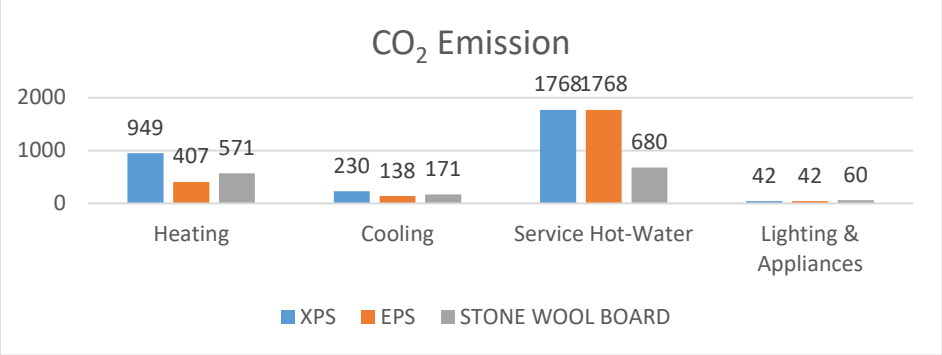


Figure 10. CO_2 Emission Comparison by Targets

Energy Consumption by Source:

According to sources, energy consumption has been evaluated under three main headings. These are the effects of outdoor air, electricity and central heating on energy consumption. In terms of quantity, while the effect of outdoor air on energy consumption is the highest in stone wool board insulation material, EPS is the least. While the consumption from electrical energy belongs to stone wool board the most, EPS material is the least. In central heating, XPS has the highest consumption and EPS has the least consumption (Fig 11).

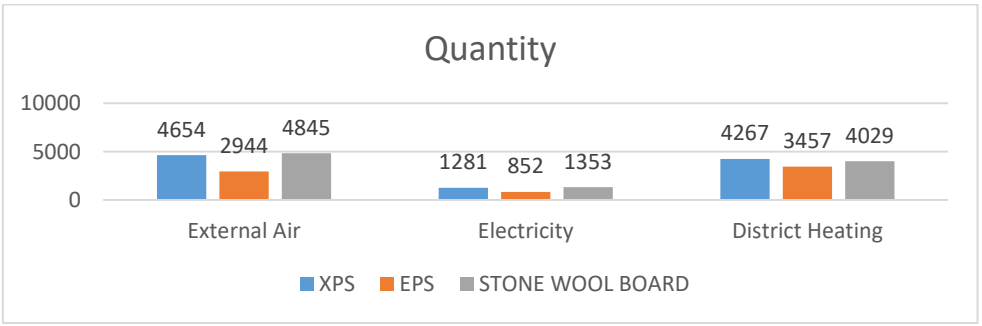


Figure 11. Quantity Comparison by Sources

In the primary energy comparison, the material that is most affected by the outside air and has the highest electrical energy consumption is stone wool board, while the material with the least value is EPS insulation material. In central heating, while XPS has the highest consumption, EPS has the least value in this factor (Fig 12).

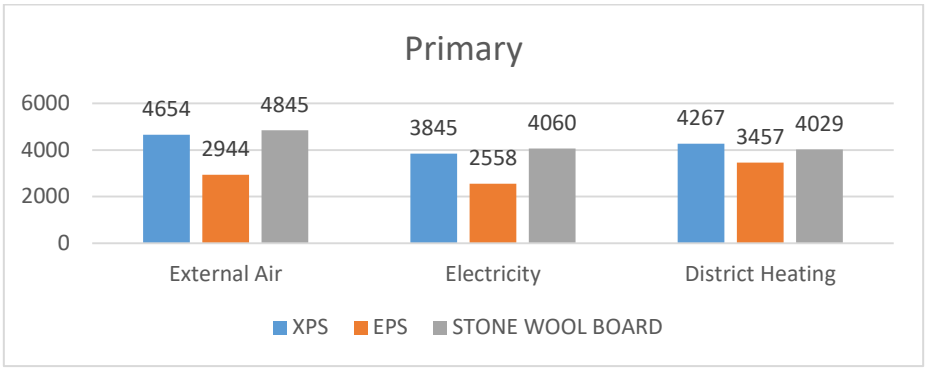


Figure 12. Primary Energy Comparison by Sources

XPS has the highest total energy cost and the model created with the lowest EPS insulation material (Fig 13).

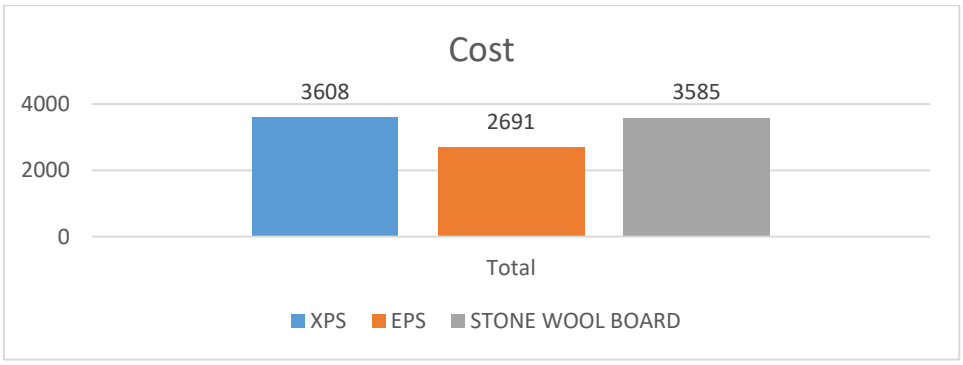


Figure 13. Comparison of Energy Costs by Resources

XPS insulation material has the highest CO_2 emission and the lowest stone wool board insulation material (Fig 14).

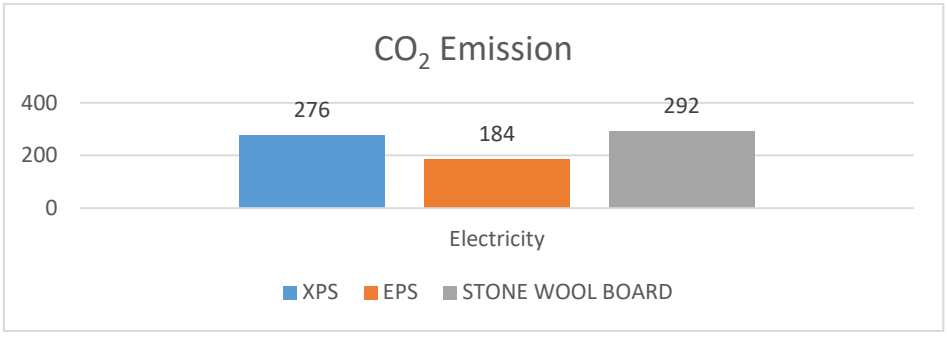


Figure 14. CO_2 Emissions Comparison by Source

Environmental Impact Assessment

The life cycle analyzes of different insulation materials modeled using BIM tools are expressed in graphics. Many inputs that affect the evaluation here differ for each insulation material. So, the EPD data included in the evaluation were limited to Global warming potential (GWP), Ozone layer depletion (ODP), Soil and water acid determination (AP), Eutrophication (EP), Photo-oxidant formation (POCP) and Abiotic resource depletion (ADPf)

values. As a result, the environmental effects of insulation materials were examined, while the titles of resource consumption and waste generation, which are important for life cycle assessment, are not included in the study. The results of the environmental impact assessment quantitatively reveal the effects of primary energy and CO_2 emissions (Fig 15,16).

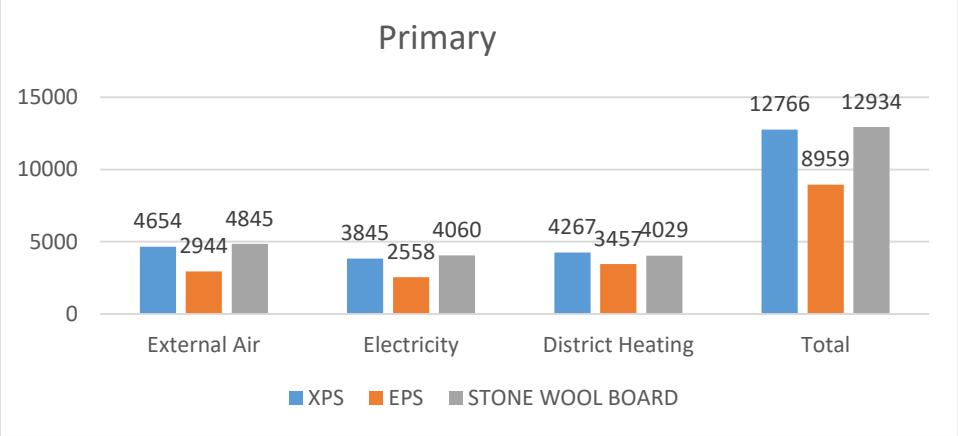


Figure 15. Primary Energy Comparison in Total

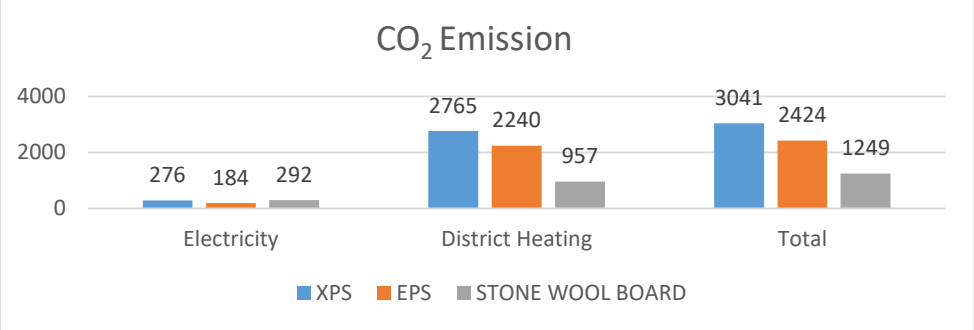


Figure 16. Total CO_2 Comparison

If we express the environmental impact results of each insulation material, the primary energy values are 12766 for XPS, 8959 for EPS and 12934 for stone wool board. As can be seen from the data, the lowest primary energy consumption belongs to EPS insulation material. XPS and stone wool board primary energy values show closeness.

CO_2 emissions are 3.041 for XPS, 2.424 for EPS and 1.249 for stone wool board. While the CO_2 emission is highest for XPS insulation material, stone wool board has the lowest.

Economic Evaluation

The costs of XPS, EPS and Stone wool board insulation materials used in the study for 1 m_2 of 4 cm thickness were taken according to the specified pose numbers from the July – 2022 Construction General Price Analysis resource published by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change. As the wall construction material, 85 mm horizontally perforated brick with the item number 15.220.1001 was used in all models. Here, while the unit cost of XPS material belonging to item number 15.335.1002 is 197.73 TL, the

total cost is 324.04 TL with jacketing on the outer wall. Likewise, while the unit cost of EPS insulation material belonging to item number 15,335.1102 is 306.97, the total cost is 299.1 TL with jacketing on the outer wall, while the unit cost of stone wool with item number 15.340.1102 is 342.31 and together with the outer wall. It reaches 331,81 TL. The costs were entered in the quantity study made in the Archicad program by converting the costs from TL to Dollars. The results were as stated below (Fig 17,18, 19).

Wall Schedule										
Element ID	2D Plan Preview	Wall Type	Height [m]	Thickness [m]	Area [m2]	Net Volume [m3]	Perimeter [m]	Classification	Cost Per Volume [USD/m3]	Total Cost of Volume [USD]
SW - 003		insulated wall (XPS)	3,000	0,19	0,92	2,59	10,16	Wall	17,60	45,58
SW - 004		insulated wall (XPS)	3,000	0,19	0,91	2,14	12,16	Wall	17,60	54,40
SW - 005		insulated wall (XPS)	3,000	0,19	0,91	2,56	10,16	Wall	17,60	45,04
SW - 006		insulated wall (XPS)	3,000	0,19	1,09	3,06	12,16	Wall	17,60	53,85
						10,35 m³				198,87

Figure 17. Cost of wall sheathed with XPS insulation material

Wall Schedule										
Element ID	2D Plan Preview	Wall Type	Height [m]	Thickness [m]	Area [m2]	Net Volume [m3]	Perimeter [m]	Classification	Cost Per Volume [USD/m3]	Total Cost of Volume [USD]
SW - 001		insulated wall (EPS)	3,000	0,19	0,92	2,59	10,16	Wall	16,24	42,06
SW - 002		insulated wall (EPS)	3,000	0,19	0,91	2,14	12,16	Wall	16,24	50,20
SW - 003		insulated wall (EPS)	3,000	0,19	0,91	2,56	10,16	Wall	16,24	41,56
SW - 004		insulated wall (EPS)	3,000	0,19	1,09	3,06	12,16	Wall	16,24	49,69
						10,35 m³				183,51

Figure 18. The cost of the wall sheathed with EPS insulation material

Wall Schedule										
Element ID	2D Plan Preview	Wall Type	Height [m]	Thickness [m]	Area [m2]	Net Volume [m3]	Perimeter [m]	Classification	Cost Per Volume [USD/m3]	Total Cost of Volume [USD]
SW - 006		Insulation Wall Stone...	3,000	0,19	0,92	2,59	10,16	Wall	18,02	46,67
SW - 007		Insulation Wall Stone...	3,000	0,19	0,93	2,20	12,16	Wall	18,02	55,70
SW - 008		Insulation Wall Stone...	3,000	0,19	0,91	2,56	10,16	Wall	18,02	46,11
SW - 009		Insulation Wall Stone...	3,000	0,19	1,09	3,06	12,16	Wall	18,02	55,14
						10,41 m³				203,62

Figure 19. The cost of the wall sheathed with stone wool insulation material

According to the cost studies, the wall cost of the XPS material model is $198,87, the wall cost of the EPS material model is $183,51, and the wall cost of the Stone wool board model is $203,62 (Fig 20).

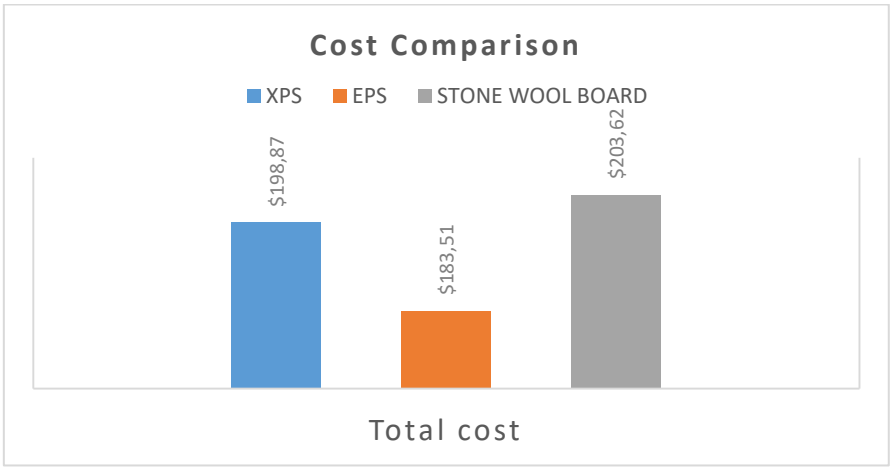


Figure 20. Cost Comparison

Primary Energy, CO_2 Emission And Cost Comparison

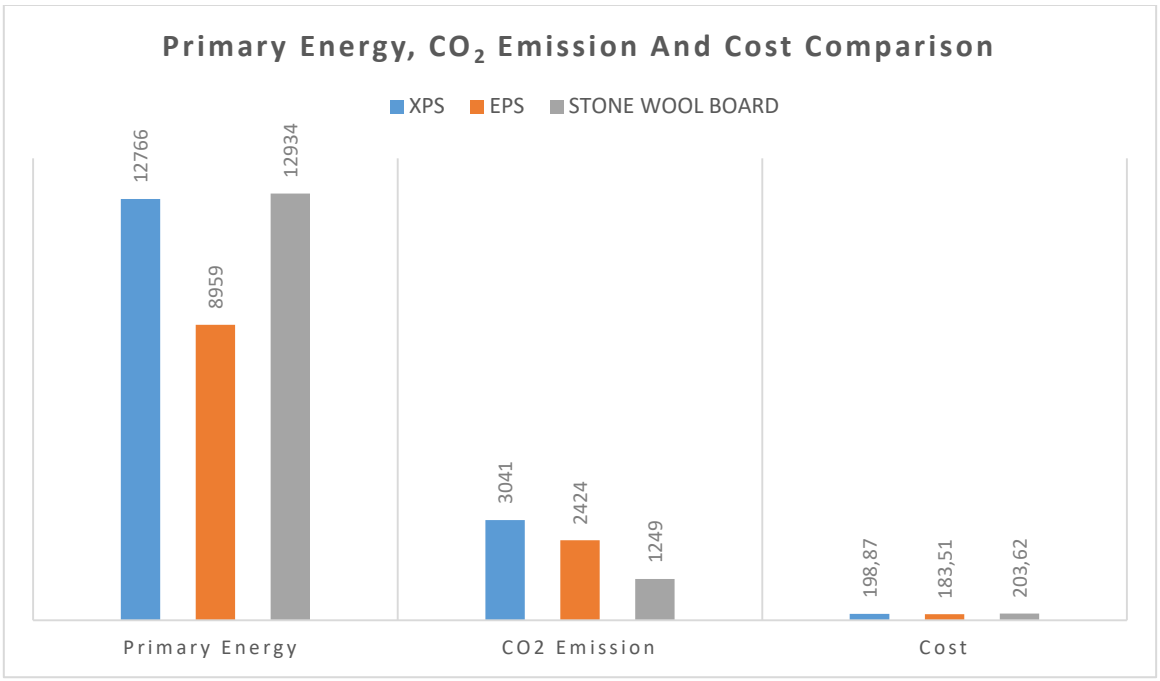


Figure 21. Primary Energy, CO_2 Emission And Cost Comparison

When all values are compared, it is seen that EPS insulation material with the lowest primary energy value is the insulation material with the lowest CO_2 emission, while stone wool board is the insulation material. In cost comparison, EPS insulation material has the lowest cost (Fig 21).

Conclusion and Recommendations

Today, insulation materials have a very diverse production range. With the importance of sustainability in the last century, the choice of environmentally friendly insulation materials is also in question. In doing so, it is possible to determine which material is more sustainable than another. In this context, today's BIM programs come to us as a tool that relaxes the

designer. In addition, by making a comparison in terms of cost, it is possible to choose the product that is both sustainable and economical.

Thanks to the simulation of XPS, EPS and Stone wool board insulation materials, which are considered within the scope of our study, on a model, primary energy and CO_2 emissions can be compared. Here, many criteria were evaluated, varying results were obtained at each stage, and when we look at the total values, it is seen that the insulation material with low primary energy value is the result of the model created with EPS insulation material with a value of 8.959. This value is 12.766 for XPS and 12.934 for Stone wool board. Thus, it is seen that EPS material has the lowest energy in terms of initial energy.

When we make an economic comparison, it is seen that EPS insulation material has the least value with 183.51 $. XPS and stone wool board insulation materials were produced at close costs, with values of $198.87 and $203.62, respectively.

In this case, it is seen that EPS insulation material among the 3 products analyzed is the most suitable product in environmental and economic terms. As a result, the points that were excluded from the research were as follows:

- Building simulation seems to be the right choice in terms of building environmental performance and obtaining economic data.
- Since most of the existing software can evaluate energy performance, in today's designs, results can be predicted by using these software and material-oriented changes can be made in the first stage. In this context, designers need to make these software a part of their business life.
- It is seen that the biggest losses in building insulation are in heating, cooling and hot water service. In this context, in order to prevent losses, the most suitable insulation material should be selected and more environmentally friendly buildings should be obtained. Within the scope of this study, the environmental sensitivity of EPS and stone wool board insulation materials is higher than XPS.
- In the economic framework, EPS material yielded results as the least costly insulation material in the quantity study.
- Among the insulation materials used in the model, although EPS insulation material can be preferred in terms of primary energy and cost, stone wool board insulation material can be preferred in terms of CO2 emission. In addition, the fact that the fire resistance and sound

insulation of the stone wool board insulation material is higher than the other two insulation materials is another reason for preference.

In these simulation studies, building energy performance is only examined in the context of primary energy and CO_2 emissions. Considering all the environmental effects of insulation materials, a more comprehensive study is recommended.

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September 09-10-11, 2022, Baku, Azerbaijan

The Effect of Window Position and Size on Visual Comfort Conditions

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Abstract

Building facades play an important role in issues such as aesthetics, structural and protection from external influences. Well-designed facades can help increase the comfort level of users, as well as increase the aesthetic value and energy efficiency of the building. Windows, which are part of the facades, are also important building elements in terms of providing comfort conditions and reducing energy consumption. In addition, the location, number and size of the windows are another important issue that should be considered in terms of space setup, space-equipment relationship, and space usage. Windows have functional features such as lighting, ventilation and communication with the external environment. Visual and thermal comfort in spaces depends on constantly changing environmental conditions. In particular, optimizing visual and thermal comfort at the same time is a difficult issue due to the mutual conflicts between them. In this respect, facade designs should be obtained by taking into account the climatic conditions and the use of space at the planning stage. In an office volume, which is considered as an example within the scope of the study, the size, number and positions of the windows were changed and evaluations were made in terms of the criteria stipulated by the lighting standards. The sample volume was simulated by the Dialux Evo program and daylight calculations were made. It is aimed to achieve optimum window design with different design alternatives by keeping the volume dimensions constant. The results revealed that window position and size have significant effects on the daylight performance of the space and the spatial organization of the interior volume.

Keywords: Daylight, Window location, Facade design, Transparency ratio.

Pencere Konum ve Büyüklüğünün Görsel Konfor Koşullarına Etkisi

Öz

Bina cepheleri, estetik, yapısal ve dış etkilerden korunma gibi konularda önemli bir rol oynar. Planlanarak iyi tasarlanmış cepheler, yapının estetik değerini ve enerji verimliliğini artırmanın yanı sıra kullanıcıların konfor seviyesini yükseltmeye yardımcı olabilir. Cephelerin bir parçası olan pencereler de konfor koşullarını sağlamak ve enerji tüketimini azaltmak açısından önemli yapı elemanlarıdır. Ayrıca, mekan kurgusu, mekan-donatı ilişkisi, alan kullanımı gibi açılardan da pencerelerin konum, sayı ve boyutu düşünülmesi gereken diğer önemli bir konudur. Pencere açıklıkları, aydınlatma, havalandırma ve dış çevreyle iletişim kurma gibi işlevsel özelliklere sahiptir. Mekanlardaki görsel ve ısısal konfor, sürekli değişen çevre koşullarına bağlıdır. Özellikle görsel ve ısısal konforun aynı anda optimize edilmesi, aralarındaki karşılıklı çatışmalar nedeniyle zor bir konudur. Bu açıdan planlama aşamasında iklim koşulları ve mekan kullanımı dikkate alınarak cephe tasarımları elde edilmelidir. Çalışma kapsamında örnek olarak ele alınan bir ofis hacminde pencere boyut, sayı ve konumları değiştirilerek aydınlatma standartlarının öngördüğü ölçütler açısından değerlendirmeler yapılmıştır. Örnek hacim Dialux Evo programı aracılığıyla simüle edilmiş ve günışığı hesaplamaları yapılmıştır. Hacim ölçüleri sabit tutularak farklı tasarım alternatifleriyle optimum pencere konumu elde etmek amaçlanmıştır. Sonuçlar, pencere konumu ve boyutunun mekanın günışığı performansı ve iç hacmin mekânsal organizasyonu üzerinde önemli etkileri olduğunu ortaya koymuştur.

Anahtar Kelimeler: Günışığı, Pencere konumu, Cephe tasarımı, Saydamlık oranı.

Giriş

Sürdürülebilirlik kavramı, küresel ısınma ve doğal çevredeki bozulmalar gibi büyük çevresel ve toplumsal zorluklarla mücadelede, tasarımcılara rehberlik eden bir araç olarak son otuz yılda yükselişe geçmiştir. Günümüzde küresel çaptaki karbon emisyonlarının yaklaşık olarak % 39' undan yapılı çevrenin sorumlu olduğu (UNEP, 2019) göz önünde tutulursa, yapıların sürdürülebilirlik çerçevesinde tasarlanmaları artık bir tercih değil zorunluluk olarak karşımıza

çıkmaktadır. Bu bağlamda tasarımcılar, yapıların tasarım ve üretim sürecinde yeni teknolojiler, yaklaşımlar ve yöntemler için sürekli bir arayış içindedir (Prieto, 2021). Yapıların her noktasının hem kullanıcılar açısından hem de çevre için uygun şekilde tasarlanmaları ve üretilmeleri gerekmektedir.

Yapı cepheleri, iç ve dış mekan arasındaki bağlantıyı kuran ve fiziksel çevreye karşı denetim sağlayan yapı yüzleri olarak tanımlanabilir. Yapı yüzlerinin en önemli bileşeni olan pencereler, bir binanın yatay veya düşey düzleminde doğal ışığın ve havanın içeriye girmesine izin veren, kullanıcıların dışarıyla görsel temasını sağlayan açıklıklar olarak tanımlanabilir (Philips, 2004). Başta yapay aydınlatma için harcanan enerji olmak üzere, kullanıcı konforunun sağlanması ve sirkadyen ritminin düzenlenmesi gibi konularla pencere tasarımının doğrudan ilişkisi bulunmaktadır (Moscoso vd., 2021). Bu nedenle, enerjiyi etkin kullanan binalara geçiş yapmak için, yapı elemanlarının boyutu ve şekli gibi tasarım seçeneklerini de tüm bu açılardan ele almak gereklidir. Örneğin, bir yapı elemanı olarak pencereler, aydınlık koşulları ve mekan algısı ile ayrılmaz bir şekilde ilişkilidir. Bir mekanın algısal performansında ışık koşullarının (gün ışığı veya yapay aydınlatma) önemi çeşitli çalışmalarda ele alınmıştır.

Bu çalışmada pencerelerin yapı yüzlerindeki farklı konum ve büyüklerde olmasının görsel konfor koşulları üzerinde ne gibi etkileri olduğunu anlamak amaçlanmıştır. Mekan boyutları sabit kalarak, farklı saydamlık oranlarına sahip cephelerin doğal aydınlatma performansları bilgisayar ortamında hesaplanarak değerlendirmeler yapılmıştır.

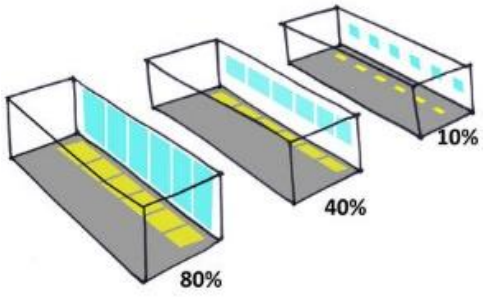
Pencere Tasarımı

Mimaride cephe terimi genellikle binanın ön görünüşünü ifade eder, ancak bu ifade yan ve arka görünüşleri de içine alabilir. Cepheler, bina kabuğunun bir parçasıdır ve binaların mimari özelliklerine destek sağlar. Çeşitli işlevsel ve iklimsel ihtiyaçları karşılamak için tarih boyunca kil, taş, ahşap ve tuğladan çelik ve cam gibi çeşitli malzemeler ve teknikler kullanılmıştır. Farklı malzemelerin ve yapım yöntemlerinin geliştirilmesi, farklı mimari tarzların ve cephe türlerinin ortaya çıkmasına neden olmuştur (Moghtadernejad vd., 2019).

Yapı kabuğu, estetik algıyı, kullanıcı konforunu ve kullanım maliyetlerini doğrudan etkileyen saydam ve opak alanlardan oluşmaktadır. Özellikle mekanın konfor koşullarını sağlamada saydam alanlar da ve opak alanlar kadar önemli görevlere sahiptir (Tekin, Ç. vd., 2018). Saydam alanların önemli kısmını oluşturan pencereler de özellikle yapıya günışığının alınması, dış mekanla görsel temasın sağlanması gibi konularla öne çıkmaktadır. Bir yapının

tasarım sürecinde, günışığının binanın temel biçim veren bir bileşeni olarak kabul edilmesi ne kadar erken süreçte olursa, günışığından faydalanma olasılığı o kadar artar. Doğal aydınlatma açısından düşünüldüğünde pencere açıklıkları iki farklı amaca hizmet eder: dışarıyı görmek ve iç mekan için gerekli işlevsel ortam ışığını sağlamak. Bu işlevler için tasarım yaklaşımları genellikle çatışır. Örneğin, en iyi dış görüşü sağlamak için pencerelerin göz hizasında yer alması gerekirken, günışığından daha fazla faydalanmak için kullanılan pencerelerin duvarın tavana yakın kısımlarında yer alması gerekir. Görüş ve günışığı için ayrı açıklıklar sağlamayı gerektirebilecek her bir açıklığın amaçlanan rolü ve işlevini belirlemek önemlidir (IESNA, 2000).

Pencerelerin boyutu ve oranı, görüş tipine, iç mekanın ölçülerine ve kullanıcıların konumu ile hareketliliğine göre düşünülmelidir. Pencerelerin yalnızca bir duvarla sınırlı olduğu derinliği yüksek hacimlerde, görüş imkanı kısıtlıdır. Bu durumda mekanın saydamlık oranı iyi düşünülmelidir. Saydamlık oranı bir odanın toplam camlı alanının, pencerenin bulunduğu duvar alanına oranı olarak tanımlanabilir (Şekil 1.).



Saydamlık oranı (Url 1)

Tablo 1'de ise pencerelerin bir duvarla sınırlı olduğu durumlarda, iyi bir dış görüş için önerilen minimum pencere alanları sunulmuştur.

Tablo 1. Dış görüş için tek duvarda yer alan pencereler için saydamlık oranları (SLL, 2012)

Dış duvardan max. oda derinliği (m)	Pencere alanının duvar alanına oranı (%) (min)
<8	20
≥8 ≤11	25
>11 ≤14	30
>14	35

İki veya daha fazla duvarda pencere olduğu durumlarda, toplam cam alanı, pencerelerin herhangi bir duvarla sınırlandırılması durumunda tavsiye edilen alandan az olmamalıdır. Pencere açıklıkları, odanın tüm noktalarından en iyi görüşü elde etmek adına farklı duvarlara dağıtılmalıdır. Gün ışığının içeri girmesinin istenmediği durumlar dışında pencere yüksekliği, göz hizasının üzerinde olmalıdır. Pencere parapet yüksekliği oturanların göz seviyesinin

altında olmalıdır. Kreş, okul, hastane ve bakım evleri gibi binalarda özellikle pencerelerin açılabileceği durumlarda pencere yüksekliklerine özellikle dikkat edilmelidir (SLL, 2012).

Dış görüş dışında diğer önemli konu da görsel konfor koşullarıdır. Gerçekleştirilecek işlevler için hem belirli bir aydınlık düzeyine ulaşmak hem de aydınlatma kalitesini belirleyen koşulları dikkate almak gerekir. Mekandaki işlevler için çoğunlukla doğal aydınlatmadan faydalanılması isteniyorsa aşağıdaki konular dikkate alınmalıdır (CIBSE, 2012).

- Çalışma alanı üzerinde sürekli sabit bir aydınlık düzeyi sağlanması olanaklı değildir. Gökyüzü daha parlak hale geldiğinde iç mekandaki aydınlık artarken, panjur, perde ve diğer yöntemlerle doğrudan güneş ışığı kontrol altında tutulduğunda aydınlık düzeyinde dalgalanmalar olabilir. Tam tersi durumlar için kapalı havalarda ve gündüz saatlerinin sonlarında, gün ışığının yapay aydınlatma ile desteklenmesi gerekir.
- Kullanıcıların yan tarafındaki pencerelerden gelen günışığının yönü iyi düşünülmeli, mekan kurgusu ve tefriş yerleşimi buna göre kurgulanmalıdır. Böyle durumlarda kamaşma nedeniyle konforsuz koşullar oluşabilir.
- Günışığının tayfsal dağılımı gün boyunca değişiklik göstermesine rağmen renksel geriverim her zaman üst düzeyde sağlanabilir.
- Çeşitli ileri günışığı sistemleriyle mekandaki temel işlevler için yeterli aydınlatma sağlanabilir, ancak genellikle daha karmaşık işlevler için doğal aydınlatmanın yapay aydınlatmayla desteklenmesi gerekebilir.

Yapıların cepheleri, dolayısıyla pencere tasarımları gerçekleştirirken sözü edilen tüm bu durumlar doğal aydınlatma, kullanıcı konforu ve enerji tüketimi açısından göz önüne alınmalı ve tasarım aşamasında alınacak kararlarla günışığından maksimum fayda sağlayan yapılar elde etmek amaçlanmalıdır.

Materyal ve Metot

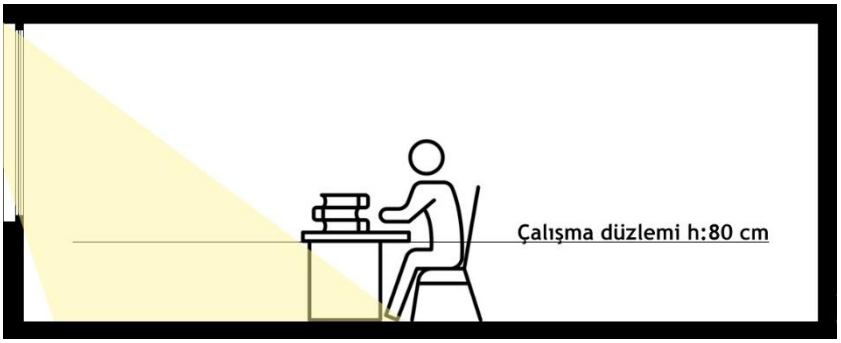
Çalışma kapsamında farklı pencere boyut ve konumlarının mekan boyutları sabit tutularak oluşturduğu görsel konfor koşulları üzerindeki etkileri incelenmiştir. Bu amaçla çalışmada izlenilen adımlar şu şekilde sıralanabilir:

- Pencere boyut ve konumlarının görsel konfor koşulları üzerindeki etkilerini ölçebilmek adına örnek olarak 4m x 8m x 3m ölçülerinde bir ofis hacmi ele alınmıştır.
- Hacmin cephesi 1x1 m boyutlarında pencere modülleri yerleştirilecek şekilde tasarlanmıştır.

- Ofis hacminin ölçüleri sabit tutularak pencere konum, sayı ve boyutları değiştirilerek cephe alternatifleri oluşturulmuş ve her bir alternatifin doğal aydınlatma performansı incelenmiştir. Her bir alternatifte pencere modüllerinin cephedeki yerleri ve sayısı değiştirilmiştir. Ayrıca, alternatif cephe önerilerinde %8.3, %16.6, %25, %33.6 ve %50 olmak üzere beş farklı saydamlık oranı kullanılmıştır.
- Söz konusu hacim, bilgisayar ortamında modellenmiş, doğal aydınlatma hesapları Dialux Evo 10.1 programı aracılığıyla gerçekleştirilmiştir. Aydınlatma hesaplarında standartlarda yer alan "Aydınlık düzeyi (E_m; lux) ve Aydınlığın dağılım düzgünlüğü (U_0)" ile Gün ışığı çarpanı (DF) değerleri dikkate alınmıştır.
- Hesap sonucu elde edilen veriler birbirleriyle karşılaştırılarak analiz edilmiştir.

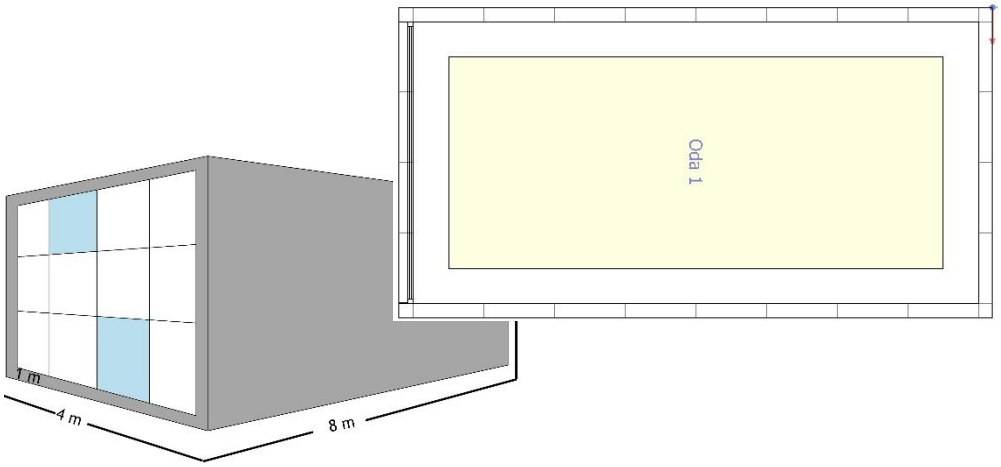
Çalışmada hacmin ölçüleri sabit tutulmuş ve 1m x 1m, 1m x 2m, 1m x 3m, 1 m x 4m ve 1.2 m x 3 m ölçülerinde ve 7 cm doğrama kalınlığına sahip çift cam pencereler kullanılmıştır. Örnek hacmin Adana ilinde, güneye yönelimli olduğu kabul edilmiş ve buna uygun olarak meteorolojik veriler kullanılmıştır. Doğal aydınlatma hesapları, doğal aydınlığın az olduğu 21 Aralık saat 12:00 ve Uluslararası Aydınlatma Komisyonunun (CIE) belirlediği kapalı gök koşulları altında gerçekleştirilmiştir.

Söz konusu hacmin Dialux Evo 10.1 programı ile elde edilen doğal aydınlatma değerleri, ülkemizde yürürlükte olan TS EN 12646-1: Işık ve Işıklandırma İş Mahallerinin Aydınlatılması-Bölüm 1: Kapalı Alandaki İş Mahalleri" standardında yer alan ortalama aydınlık düzeyi (E_m; lux) ve aydınlığın dağılım düzgünlüğü (U_0) ölçütleri ile karşılaştırılmıştır. Hesap yüzeyleri yerden 80 cm yükseklikte ve yan duvarlardan 50 cm içeride olacak şekilde yatay çalışma düzlemi dikkate alınarak oluşturulmuştur (Şekil 1.).



Şekil 1. Örnek hacme ait kesit ve çalışma düzlemi

Örnek hacmin cephesindeki modüler cepheyi ifade eden görsel ile hacmin planı Şekil 2'de sunulmuştur.

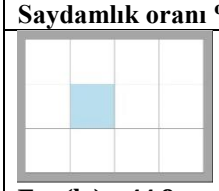
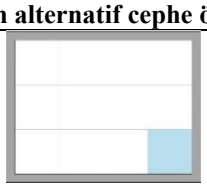
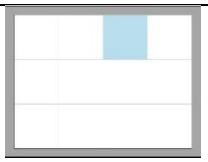
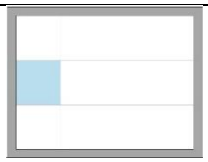
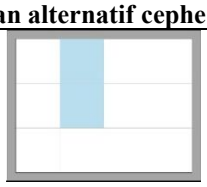
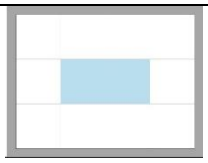
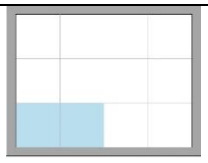
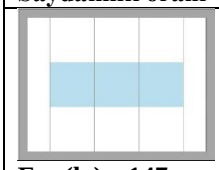
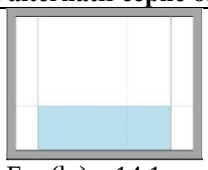
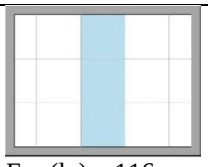
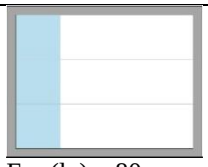
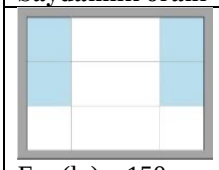
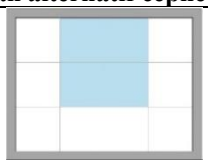
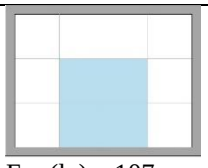
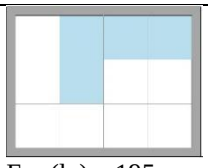
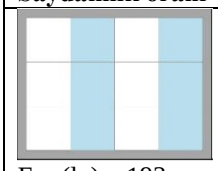
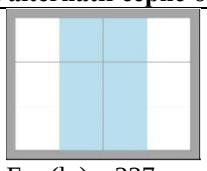
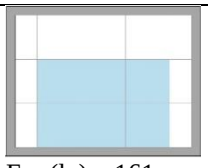
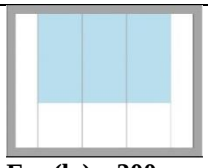


Şekil 2. Modüler cephe sistemi ve plan

Bulgular ve Tartışma

Çalışma kapsamında bilgisayar ortamında modellenerek Dialux Evo 10.1 aydınlatma hesap programıyla farklı saydamlık oranlarında doğal aydınlatma performansı ölçülen örnek ofis hacminin, TS EN 12464-1 standardına uygun olarak aydınlık düzeyi ve aydınlığın dağılım düzgünlüğü değerleri ile günışığı çarpanı değerleri Tablo 2'de sunulmuştur.

Tablo 2. Farklı saydamlık oranlarına göre cephelerin doğal aydınlatma performansları.

Saydamlık oranı %8.3 olan alternatif cephe örnekleri			
 **Em (lx) : 44,8** **U_0 : 0,11** **DF : %0,43**	 Em (lx) : 3,57 U_0 : 0,39 DF : %0,03	 Em (lx) : 44,3 U_0 : 0,21 DF : %0,42	 Em (lx) : 29,9 U_0 : 0,15 DF : %0,28
Saydamlık oranı %16.6 olan alternatif cephe örnekleri			
 Em (lx) : 36,2 U_0 : 0,18 DF : %0,35	 **Em (lx) : 106** **U_0 : 0,15** **DF : %1,01**	 Em (lx) : 101 U_0 : 0,11 DF : %0,97	 Em (lx) : 8,77 U_0 : 0,37 DF : %0,08
Saydamlık oranı %25 olan alternatif cephe örnekleri			
 **Em (lx) : 147** **U_0 : 0,11** **DF : %1,4**	 Em (lx) : 14,1 U_0 : 0,35 DF : %0,13	 Em (lx) : 116 U_0 : 0,16 DF : %1,11	 Em (lx) : 80 U_0 : 0,2 DF : %0,77
Saydamlık oranı %33.6 olan alternatif cephe örnekleri			
 Em (lx) : 150 U_0 : 0,2 DF : %1,43	 **Em (lx) : 213** **U_0 : 0,15** **DF : %2,04**	 Em (lx) : 107 U_0 : 0,13 DF : %1,02	 Em (lx) : 195 U_0 : 0,19 DF : %1,86
Saydamlık oranı %50 olan alternatif cephe örnekleri			
 Em (lx) : 193 U_0 : 0,17 DF : %1,84	 Em (lx) : 227 U_0 : 0,16 DF : %2,17	 Em (lx) : 161 U_0 : 0,14 DF : %1,54	 **Em (lx) : 300** **U_0 : 0,16** **DF : %2,87**

Çalışma sonucunda elde edilen bulgular pencere konumlarının ve boyutlarının, mekan içindeki aydınlatma koşullarını doğrudan etkilediğini göstermektedir. Bir mekanın içindeki doğal aydınlığın saydamlık oranının yanında pencere konumuyla da doğrudan ilişkili olduğu hesap sonuçlarından anlaşılmaktadır.

Saydamlık oranlarına göre değerlendirme yapılacak olursa, en iyi sonuçlar %50 saydamlık oranına sahip alternatiflerle elde edilmiştir.

Pencere konumları göze alındığında ise tüm saydamlık oranlarında tavana yakın pencereler, zemin döşemesine yakın olanlara göre daha iyi aydınlatma koşulları sağlamışlardır. Ayrıca, farklı saydamlık oranına sahip alternatiflerde pencere konumlarına bağlı olarak aydınlık düzeyinin birbirine yakın çıktığı durumlar görülmüştür.

Sonuç ve Öneriler

Çalışma kapsamında örnek bir ofis hacminde farklı konum, büyüklük ve sayıdaki pencerelerin görsel konfor koşullarına etkisi incelenmiştir.

Alternatifler kapalı gök koşulları ve yapay aydınlatma koşulları olmadan değerlendirildiği için saydamlık oranı %50 olan ve tavana yakın pencere sistemine sahip bir alternatifin dışında yeterli aydınlık düzeyi sağlanamamıştır. Ayrıca, aydınlığın dağılım düzgünlüğü değerleri de alternatiflerde standartlarda belirlenen değerlerde sağlanamamıştır. Bu koşullarda özellikle kapalı gök koşulları altında ve yetersiz gün ışığının olduğu durumlarda bütünleşik aydınlatma sistemlerinden yararlanılması gerektiği göz ardı edilmemelidir.

Dialux Evo programında yapılan doğal aydınlatma hesaplarına göre aynı boyutta olmasına rağmen farklı konumlardaki pencerelerin farklı aydınlatma koşulları sağladığı görülmüştür.

Özellikle tavana yakın konumlandırılan pencere açıklıklarının daha iyi aydınlık düzeyi değerleri sağladığı görülürken, tabana yakın konumlandırılan pencerelerin yeterli aydınlık düzeyleri sağlayamadığı görülmüştür.

Ayrıca, farklı boyuttaki saydamlık oranına sahip alternatiflerin farklı boyutta pencerelere sahip olmasına rağmen yaklaşık olarak aynı aydınlık değerlerine sahip olabildiği görülmüştür.

Çalışma sonuçları, tasarımcılar için doğal aydınlatma-cephe tasarımı, iç mekan-tefriş ilişkisi konularında yol gösterici olacaktır.

İlerleyen çalışmalarda açık gök koşullarında güneş denetim elemanları ve ısı kazanç-kayıp ilişkisi göz önünde tutularak yeni araştırmalar gerçekleştirilebilir.

Farklı doğrama büyüklükleri ve farklı cam türleri için de çalışma tekrarlanabilir.

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Determining the Spatial Transformation of Historic City Centres Using Solid-Void Analysis: The Case of Izmir Kemeralti

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Abstract

Ever since they were first formed, historic city centres have been the areas of cities which consolidate and mould the cultural, social and economic heritage of humanity. The character of these areas is peculiar to the city, and they are in a constant state of transformation and change. Changing social, cultural and economic factors combine with the capacities of cities for competitiveness and flexibility to shape them physically and socially with differing characteristics and qualities. Controlling these developments is important to maintain the sustainability of the city. From the 1980s onwards, the growth of the urban population, swollen by natural increase or internal or external migration, has created new needs for consumption, and the formation of consumption spaces, resulting in constant pressure for change and transformation in the city, and therefore in historic city centres. In this process, protectionist, rational and comprehensive planning is being replaced by strategic, fragile and fragmented approaches that result in forms of land use intended to generate speculative gains or monopoly rents. This trend causes tensions between the institution of planning and the institution of the market. The city is an integrated dynamic structure comprising solids, which are architectural objects, and voids, which are situated in between these objects. Controlling the formation and development of solids and voids is essential in order to manage the growth of the city and ensure sustainable urbanisation. A proper arrangement of urban solids and voids creates high-quality city areas which are also sustainable. Urban voids are open areas that give meaning to the city as a whole. Today, for various reasons, the solid and void areas of cities and city centres are undergoing changes of various types and scales. Solid-Void Analysis is used in order to determine the relationships between the solids and voids in historic city centres. This method makes it possible to reveal the history, the texture and the character of the settlement and the direction and nature of its transformation. Despite the importance for the discipline of planning of the relationship between solids and voids in defining space, and in determining the role of this relationship in spatial transformation, the literature contains few studies that make use of this method of analysis. In other words, the conduct of Solid-Void Analysis serves to document the nature of the transformation of the spatial structure of the city and to explain the influence of urban development plans in ensuring the sustainability of city centres. One of the oldest historic centres of Turkey is the Kemeraltı Historic City Centre in the Konak district of Izmir. There are several academic studies on this historic centre. However, it has not been possible to locate any studies which assess the nature of the spatial transformation of the historic city centre in question or the effectiveness of the implementation of urban development plans. This paper aims to determine the nature of the transformation of Kemeraltı Historic City Centre in the context of time and space. This area was selected as a case study on account of the gap in the literature mentioned above. The paper seeks to establish the level of the contribution which the change and spatial transformation of the Historic City Centre has made over the years to the sustainability of the city. The type and form of the transformation of the space will be determined using the Solid-Void Analysis method. The paper will compare the implementation plans for Kemeraltı Historic City Centre approved in 1984 and 2005 with the actual developments and the contemporary two-dimensional situation. The analysis will also make use of the master plans and an orthophoto map dating from 2004.

Keywords: City Planning, Historic City Centre, Solid-Void Analysis, Sustainability, Kemeraltı.

Introduction

Cities are human settlements which carry the social, cultural and economic patterns of previous periods forward from the past to the present. Since the dates when they were

founded, cities have changed and transformed under the influence of various phenomena, events and interactions. They are entities comprising functions, elements, structures and areas of various types and scales that have formed over initial settlement areas or by the merging of those areas with their surroundings.

Cities are planned so that living conditions will improve and a social order be formed. To meet the needs for access and social recreation and communication, cities have to be planned with voids. The city is a whole made up of various artificial sub-elements that may be referred to as "parts". The artificial sub-elements explain how physical space is structured and how the form of the city takes shape. They allow the users to gain a clearer awareness of their surroundings (Eren, 1995).

If cities are contemplated as a whole formed by the built environment, the elements that make up the physical whole may be defined as solids and the areas in between these elements as voids. A proper arrangement of solids and voids makes it possible to create high-quality, sustainable urban fabrics and urban areas. According to Trancik (1986), the urban solids which form the urban fabric include public buildings, construction blocks and structures built to mark borders, while crossings, the centres of construction blocks, the pattern of roads, streets and squares, parks and gardens, and linear open spaces like promenades constitute the urban voids. Thanks to these arrangements, the space becomes perceivable. Trancik (1986) sees undesigned voids in the city as areas which disrupt the city fabric and rarely contribute to their surroundings, and defines them as lost spaces.

The city fabric is formed when built structures and the voids in between them come together in a certain order. The solids in the city, together with the voids such as streets, squares and meeting places, are also among the main factors that form the identity and silhouette of the city and help to shape the social and spatial components of the built environment (Özkaraca & Arslan, 2020). While solids are architectural closed spaces, voids are open areas which gather people together and where social activities take place. Urban voids also ensure the social life and communication between structures (Balcı, 2017).

Over time, various actions are taken and events occur which cumulatively provide urban spaces with their own social significance. Within the urban fabric, urban voids come to the fore as the areas where the experiences of individuals and communities accumulate (Balcı, 2017). Experiences in the city develop in the context of spaces and voids and the emergence of social life is viewed as an experience of space and void (Erdönmez & Akı, 2005).

Today, the voids in cities, and especially in city centres, are diminishing, or coming under pressure, as a result of unbalanced urban growth and property speculation linked to rapid and uncontrolled population growth and migration. The decrease in voids and the pressure caused by speculation are most frequently observed in city centres. Through the phenomenon supported by sustainable growth, changes are occurring in the balance of solids and voids amid rising demand for the construction of buildings.

Aside from its registered cultural assets, a historic centre is also made up of the texture and character of the area and its socio-cultural structure (Özkaraca & Arslan, 2020). Voids located between historic structures must be preserved as a matter of priority, since they form the backbone of the area and highlight its urban identity and texture. However, while registered cultural assets are protected, there are no legal obligations to preserve urban voids.

The evolution of the urban space and the meaning attached to it can only be understood through an analysis of the artificial sub-elements involved in the development of the smallest and most concrete urban physical spaces (Eren, 1995). The continuity of historic city centres can only be grasped properly via the voids (Balcı, 2007). Cities can only be preserved in a sustainable manner through the preservation of their urban voids. In this context, Solid-Void Analysis is generally used in efforts to understand the urban space and its systemic structure.

While various academic studies of Izmir Kemeraltı Historic City Centre exist within the field of city planning, it has not been possible to locate any study which assess the nature of its spatial transformation or the effectiveness of the implementation of urban development plans. In the framework of this problem area, the present paper aims to determine the nature of the transformation of the historic city centre in the context of time and space in the case of Kemeraltı Historic City Centre, located in the Konak district of Izmir, which is one of the oldest historic centres.

The paper seeks to establish the level of the contribution which the change and spatial transformation of the Kemeraltı Historic City Centre has made over the years to the sustainability of the city, and to assess the effectiveness of city development plans in ensuring the sustainability of city centres. The nature and form of the transformation of the space will be determined using the Solid-Void Analysis method. First, the materials and method used in the research will be described. The second part of the paper will focus on the solid-void analysis encompassing the years 1984, 2005 and 2022. The conclusion will assess the findings concerning the transformation of the historic city centre.

Materials and Method

The main materials used in the study are the urban development plans of 1984 and 2005 and the current spatial data as of 2022 for the Kemeraltı Historic City Centre (HCC) Conservation Site in the Konak district of Izmir. Kemeraltı HCC was declared an urban conservation site in 1984. In 1991, the conservation sites of Kadifekale, the Agora, the Ancient Stadium and the Ancient Theatre, all situated around the Kemeraltı bazaar, were recognised as grade-one conservation sites. Kemeraltı is the historical centre of Izmir province (Çırak et al., 2015).

As part of the study, a conceptual analysis was carried out with respect to basic concepts and to Kemeraltı Historic City Centre, and a literature review was conducted. The keywords were used to screen the internet environment, national and international articles, theses, books, reports, and the publications of congresses, symposia and seminars were screened, along with the relevant legislation. The study also entailed oral interviews with private sector city planning and architecture offices and officials of local administrations. In addition to the information, documents and urban development plan sheets obtained from the said interviews, use was also made of data retrieved from the internet and from libraries.

The Solid-Void Analysis made use of: the organic street texture of Kemeraltı Historic City Centre; the urban development plan of 1984, which constitutes the earliest digital physical plan among all those drafted between 1856 and 2005; the urban development plan of 2005, which was the next plan to be approved, and an orthophoto map of 2004. In addition, the spatial arrangement of the site in its current situation as of June 2022 was identified with solid-void analysis and the nature of the spatial transformation stemming from the plans approved since 1984 was determined accordingly.

The analysis is based on documents obtained by the Metropolitan Municipality of Izmir and Municipality of Konak, the 1/1,000 scale Kemeraltı and Surroundings Implementation Plan for 1984, the 1/1,000 scale Kemeraltı Conservation Site Plan of 2002 and the 1/1,000 scale Kemeraltı Stage One Conservation Revision Plan of 2005. The orthophoto map of 2004 and, for control purposes, the current images from Google Earth Pro were used to determine the current situation. AutoCAD version 2022 was used to identify solids and voids. To establish the solid-void relationships in the Kemeraltı Conservation Site, the areas of solids and voids in the study area were expressed in square metres and percentage values were calculated for the spatial digital analysis. The study determined the extent to which the space has been

transformed in decisions taken concerning Kemeraltı HCC, and the extent to which this is sustainable.

This paper discusses the preliminary findings of a higher degree study carried out in the Department of Urban and City Planning of the Sciences Institute of Süleyman Demirel University.

Solid-Void Analysis of Kemeraltı Historic City Centre (HCC)

Kemeraltı Historic City Centre is located in the Konak district of Izmir and extends from the Mezarlıkbaşı Neighbourhood to Konak Square (Figure 1). The HCC lies on the coast of the Gulf of Izmir. Fevzipaşa Street and Eşrefpaşa Street constitute its terrestrial borders. Commercial activities are carried out intensively in the quarter and its bazaar (Malkoç et al., 2013). Today, however, the commercial functions of the locality have decreased: it has ceased to be the economic centre and become a smaller commercial area (Kılıç & Aydoğan, 2006).

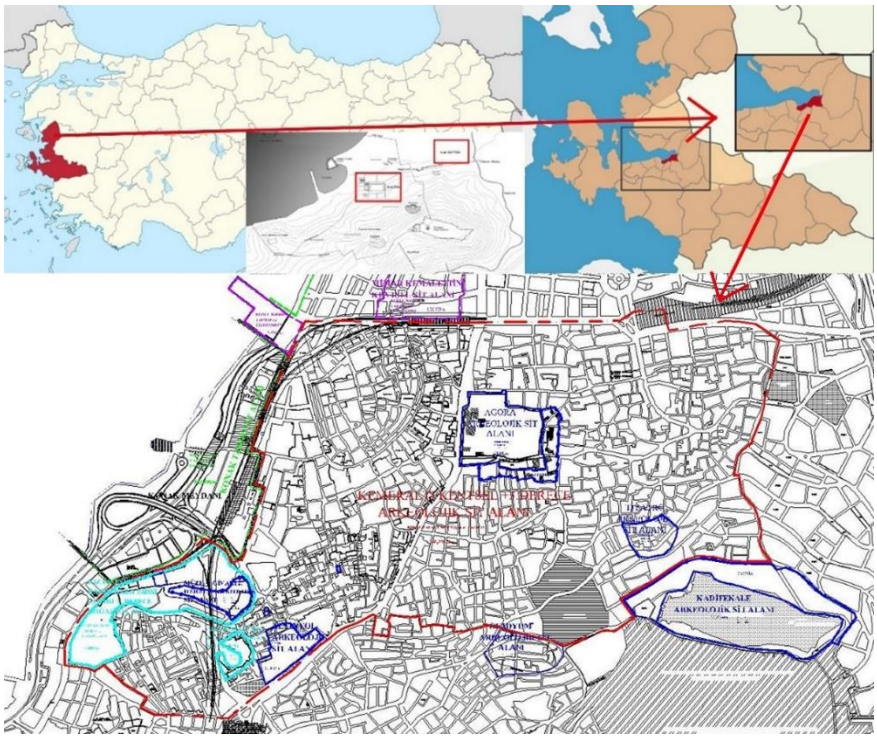


Figure 1 – Location of Kemeraltı Historic City Centre (Authors, 2022).

The Izmir Metropolitan Area Master Plan, which encompasses the whole of Izmir including Kemeraltı, was completed in 1973 by the Izmir Metropolitan Area Master Plan Bureau. The Kemeraltı Urban Conservation Site Development Plan was prepared by the Izmir Metropolitan Municipality (IMM) and approved by decision no. 348 of the High Council for the Protection of Cultural and Natural Assets dated July 27th 1984. (Figure 2). In addition, the Izmir Metropolitan Municipality Department of Historical Environmental and Cultural

Assets, in collaboration with the University, has prepared a Master Plan on a scale of 1/5,000 (270 ha), which was adopted by the Protection Council through decision no 10/38 dated October 14th 2002. This plan was approved under decision no. 5/32 of the Metropolitan Municipality dated May 3rd 2002. Subsequently, a partial master plan on a scale of 1/5,000 was approved with the title of the Izmir Konak Kemeraltı and Surrounding Conservation Site Master Plan Revision. This plan was adopted by decision no. 01.2360 of the Izmir Metropolitan Municipality Council Municipality dated November 22nd 2007 and decision no. 2958 of the Izmir No. I Regional Council on the Protection of Cultural and Natural Assets dated February 7th 2008. This plan was approved by the Mayor of the Metropolitan Municipality on March 12th 2008.

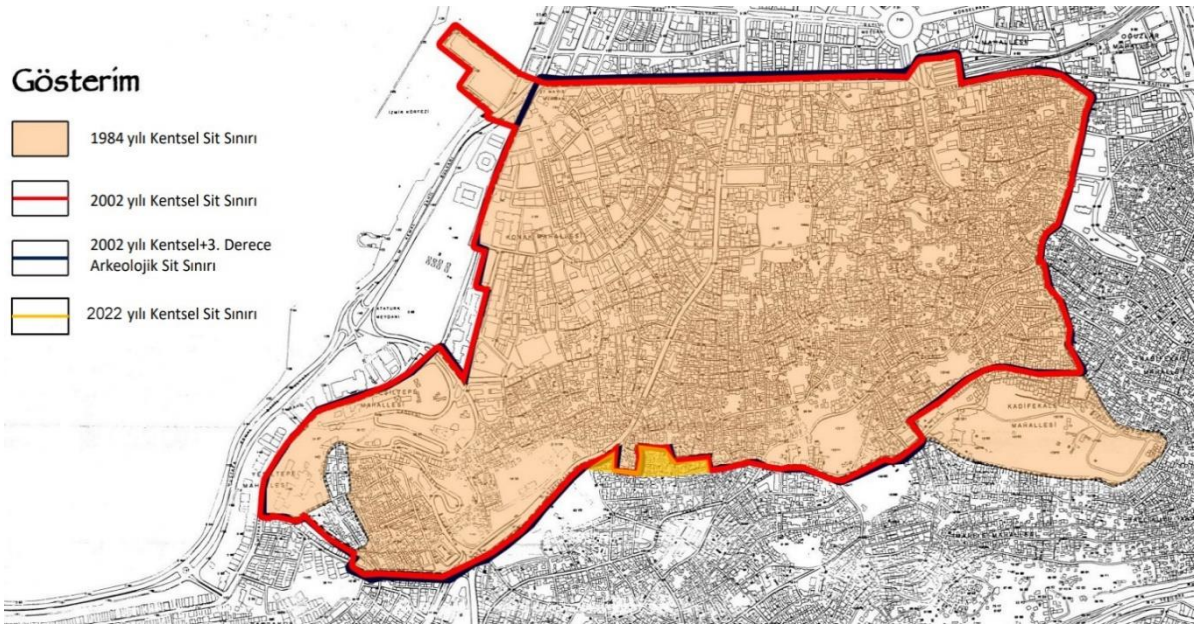


Figure 2 – Borders of the Urban Conservation Site by Year (Department of the Historic Port City, 2022). The pink area shows the limits of the Urban Conservation Site in 1984 and the red line its borders in 2002. The dark blue line indicates the border of the Grade-Three Urban Conservation Site in 2002. Yellow indicates the border of the Site in 2022.

The Kemeraltı Conservation Master Plan divided the planning area into two "stages": The first stage is an area of 88 ha bordered by Konak Meydanı, Fevzipaşa Bulvarı, İkiçeşmelik Caddesi and Bayramyeri Meydanı. The Stage One planning zone went into effect on November 17th 2005 with the approval of the Izmir Metropolitan Municipality. As of 2022, the planning of the Stage Two zone was still ongoing (Figure 3). There are also a number of other development plans – namely, the 1/1,000 scale Agora and Surroundings Conservation Development Plan Revision approved on July 15th 2005, the 1/1,000 scale Kemeraltı Stage Two Region I Stage Conservation Development Plan Revision dated March 13th 2009 and the

1/1,000 scale Kadifekale-Theatre and Surroundings Conservation Development Plan no. 01.684 dated February 15th 2008.

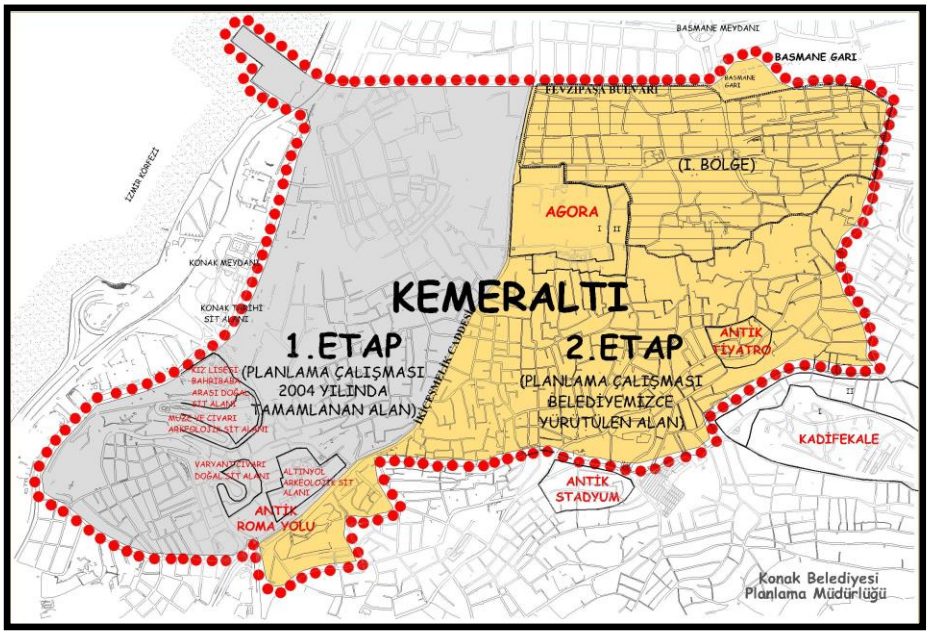


Figure 3 – Stages of the Kemeraltı Planning Zone (Municipality of Konak, 2022). The grey area indicates the First Stage area, the planning work for which was completed in 2004, and the brown area the Second Stage area, planning work on which is currently being carried out by the municipality.

The ratios of the areas of solids and voids were calculated in studies using the 1/1,000 scale Kemeraltı and Surroundings Implementation Plan of 1984, the 1/1,000 scale Kemeraltı Conservation Site Implementation Plan of 2005 and the orthophoto map of 2004. The results of these calculations are given in Table 1.

Table 1 – Solid-Void Change by Year in Kemeraltı, Izmir (Authors, 2022).

YEAR	SOLIDS (%)	VOIDS (%)
1984	90.72	9.28
2005	88.91	11.09
2022	82.90	17.10

The changes in the percentages of solids and voids since 1984 points to a decrease in the area of solids over the years and an increase in the areas used for circulation around the historic spaces and demolished or evacuated for purposes of urban transformation, car parks or excavation. Although the proportion of solids has declined overall, an examination of the current situation reveals an increase in solids except in the few specific locations where clearance work has been conducted.

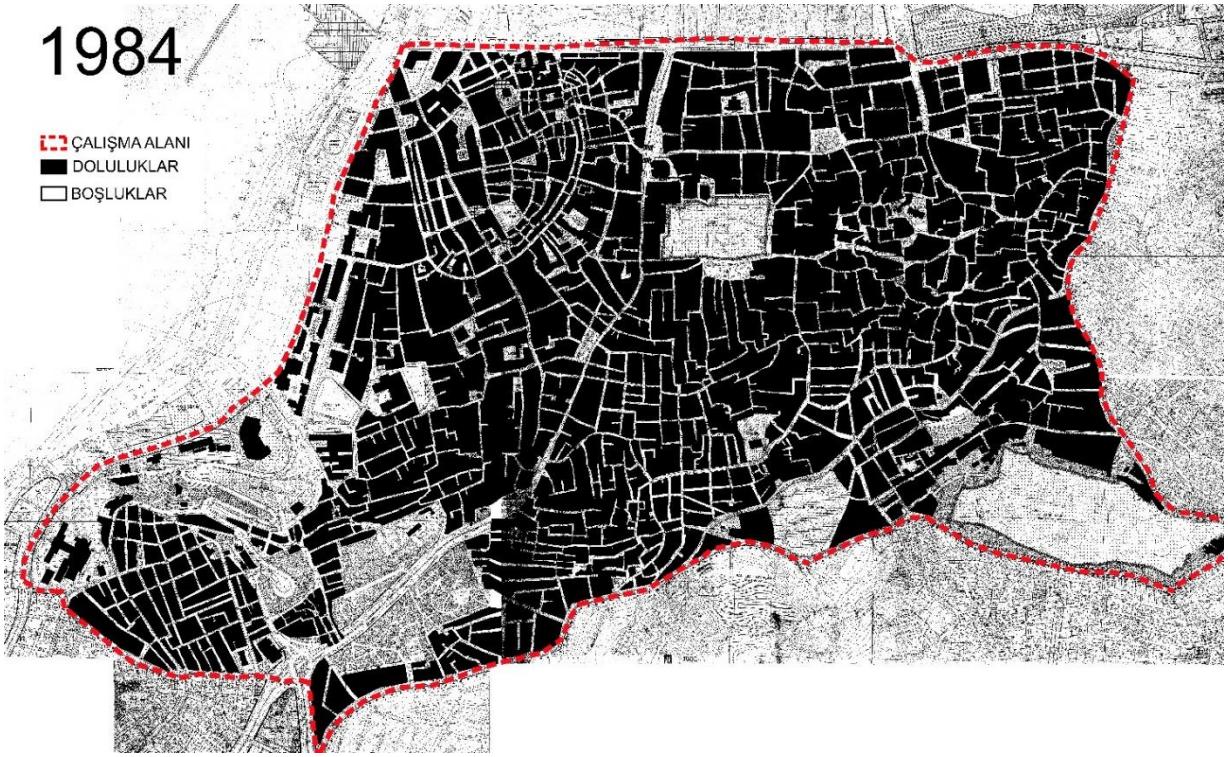


Figure 4 – Solid-Void Analysis of the Kemeraltı Conservation Site Implementation Plan, 1984 (Authors, 2022). The dotted red line shows the border of the study area. Black represents solids and white indicates voids.

The solid-void analysis of the 1/1,000 scale Kemeraltı Conservation Site Implementation Plan of 1984 concluded that 90.72% of the area was made up of solids and 9.28% made up of voids. The site is seen to contain construction blocks and footpaths. Relationships of connectedness can be detected between the urban voids and solids. The construction blocks are formed by the filling of whole parcels with architectural structures, and the parcels do not contain any voids. The Agora, a grade-one conservation site with larger blocks located inside the bazaar, is today in ruins. A complex fabric of buildings and streets is observed around the Agora. There are a large number of cul-de-sacs inside the bazaar. In the transport system, some streets are seen to broaden and others to narrow. The areas around the Varyant and Ancient Smyrna sites are found to be open green spaces.

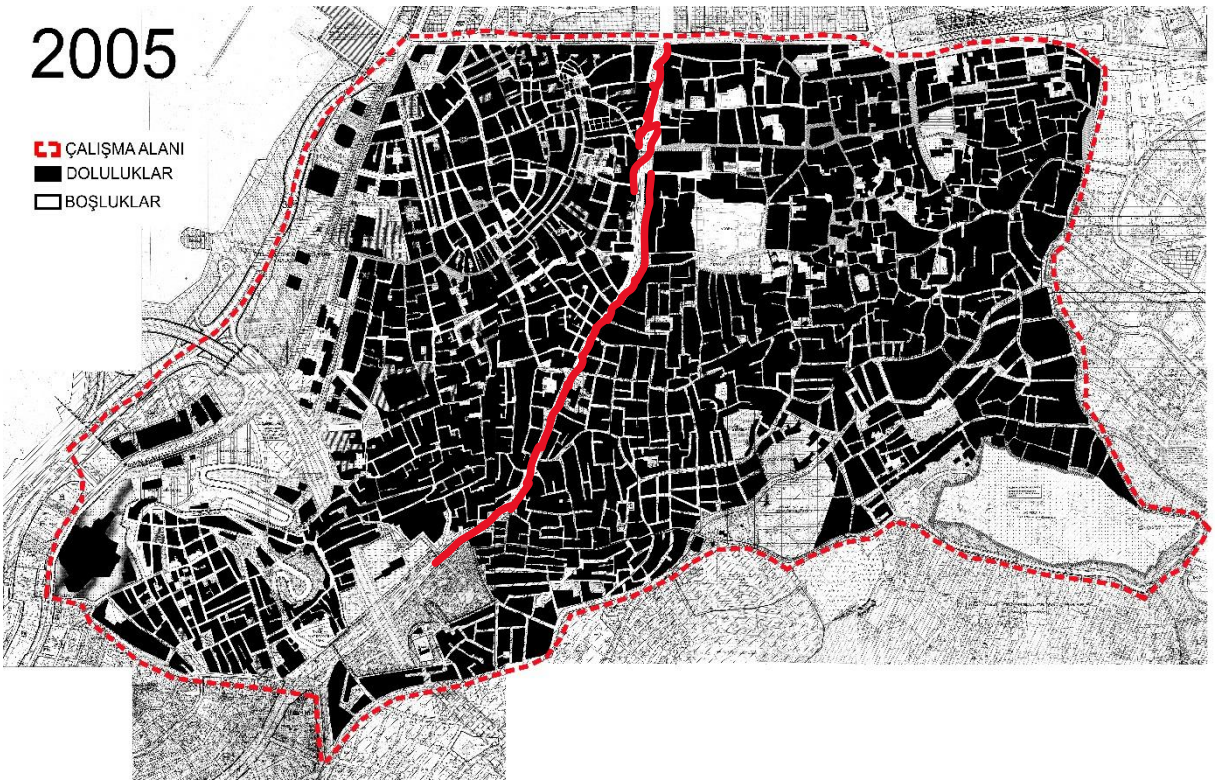


Figure 5 – Solid-Void Analysis of the Kemeraltı Conservation Site Implementation Plan, 2005 (Authors, 2022). The dotted red line shows the border of the study area. Black represents solids and white indicates voids.

A solid-void analysis of the 1/1,000 scale Kemeraltı Stage One Conservation Revision Implementation Plan of 2005 and the 1/1,000 scale Kemeraltı Stage One Conservation Revision Plan concluded that 88.91% of the area was made up of solids and 11.09% was made up of voids. When compared with 1984, it can be seen that the construction blocks had diminished and new footpaths and car parks had been created, as seen in Figure 5. İkiçeşmelik Avenue (marked with a red line) had been widened. The cul-de-sacs had not been resolved.

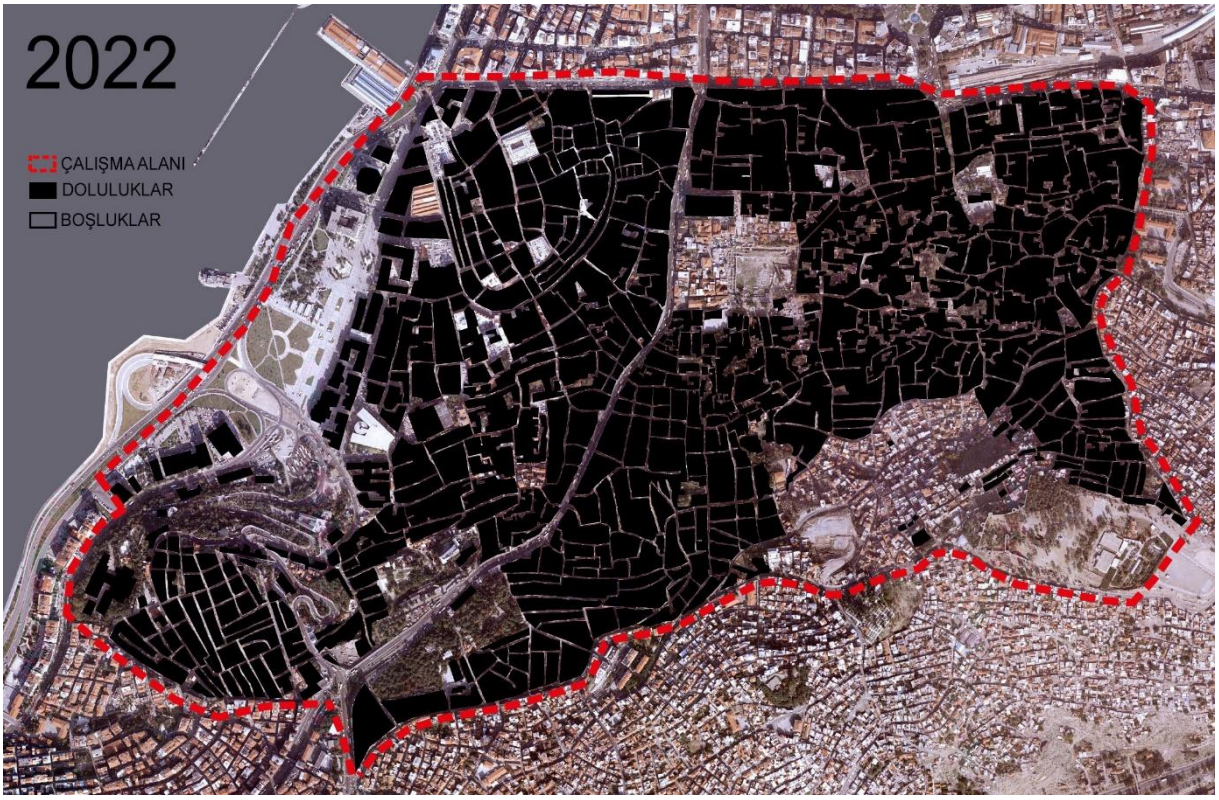


Figure 6 – Solid-Void Analysis of the Kemeraltı Conservation Site Urban Development Plan, 2022 (Authors, 2022). The dotted red line shows the border of the study area. Black represents solids and white indicates voids.

Since work on the plans for the Kemeraltı Conservation Site for 2022 are ongoing, and there are no land use analyses that reflect the current situation, the solid-void analysis was carried out using orthophoto maps. The orthophoto map dates back to 2004, so Google Earth Pro was used to check the current situation of the buildings while carrying out this analysis. The solid-void analysis shows that 82.90% of the area is made up of solids and 17.10% of voids.

The buildings around Kadifekale, a grade-one natural conservation site, were demolished in 2015 and the demolition zone was turned into a green open space. However, these structures can still be seen on the orthophoto map because it is not up to date. For the solid-void analysis, the area where buildings were demolished was considered as a void. Buildings in the area stretching from the Agora to İkiçeşmelik Avenue were demolished in 2005 and archaeological excavations are being conducted in this area. The size of the construction blocks in the area had increased and some cul-de-sacs were found to have been closed.

Conclusion

With the growth of cities there comes a need for settlement areas to develop in an orderly manner. In today's cities, voids are diminishing due to urban growth, congestion is increasing, and cities and city centres are subjected to constant, uncontrolled changes and transformations. In the alteration and transformation of spaces, city planners and decision-

making authorities needs to give priority to preserving their sustainability. While the filling of urban space is a prerequisite for sustainable urban growth, it has to be done in a controlled manner. As of 2022, it has been found that the majority of the existing construction blocks have been filled and that their density has increased. Although today there has been an increase in voids, the growth of the centre through a process of filling in appears to be contributing to the congestion and density of the space, rather than its sustainability. A need has emerged for additional research on this topic.

Physical plans for the Izmir Kemeraltı Historic City Centre ((HCC) conservation site), which was selected as the case study area for this paper, have been drawn up at various times. The Solid-Void Analysis concludes that shifts and alterations have continued occur in the historic city centre despite the existence of urban development plans, and that three different sets of spatial arrangements had developed as of 1984, 2005 and 2022. The drafting and constant revision of plans proves that the sustainability of the centre is not under control, and indicates that the influence of urban development plans on the transformation or preservation of spaces is low.

While investigating the change and transformation of the historic city centre and questioning how far it has been possible to implement urban development plans, the study also established that there has been an increase in the area of urban voids in Kemeraltı conservation site in 2022 when compared to 1984. With time, certain degraded areas have undergone change and been turned into green spaces. It is possible that these areas will either be used for urban transformation purposes or come to be sites of illegal housing or occupation in years to come. If the voids are to be filled, there can be no question of sustainable growth. It was also observed that there is a concentration of historical structures in the area and that the large construction blocks that had formed over time in accordance with the size of these structures had contracted; side streets were seen to have been created as well.

While Izmir Kemeraltı HCC is the oldest known bazaar in history, it has lost its former significance since 1984 due to a range of factors including the formation of sub-city centres, the development of shopping malls and the limited and difficult access to the area. Due to the high volume of commercial activities in the area, initial and subsequent planning efforts, carried out in line with the analyses and observations made and conclusions drawn over the years, have prioritised commercial functions and related forms of land use. Construction blocks and streets have been designed so as not to interfere with vehicle traffic. However, due

to the current pressures on the centre, the bazaar was later closed to vehicle traffic and certain areas have been pedestrianised, or access to certain roads has been controlled, as a requirement of sustainable urbanisation.

Besides aiming to revitalise the historic city centre and make it a commercial centre, planning work has also envisaged the preservation of the area. However, the pressure of changes and transformations which tend to enhance the density of the area is increasing. Once tools and financial capacities have been developed to prevent and overcome this pressure, it will then be possible to speak of ensuring the continuity of the centre by implementing the practices envisaged in urban development plans.

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Characterization of a Mortar Formulated with Granulated Slag and Metal Fibers

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Abstract

The building materials industry is booming in Algeria. For this reason, most research focuses on the development of new cementitious compounds with the aim of improving their mechanical and physical properties and the durability of cementitious materials. This work focuses on the effect of the incorporation of 10% slag on the mechanical resistance of cementitious biques based on metal fiber and its influence on the mechanical behavior. The properties studied include compressive strength (28 days), strength-tensile (28 days) and water absorption (28 days). The results show that the addition of 10% granulated slag with 1% metallic fiber considerably improves the mechanical properties.

Keywords: Mortar, granulated slag, steel fiber, mechanical behavior.

1.Introduction

Concrete has become one of the most preferred building materials in the world for civil engineering projects ranging from residential houses, tall structures, bridges and dams . As for the mortar, it can be widely used in the construction industry for different purposes. Its compressive strength is the main parameter which is brought under focus. Compressive strength of mortars depends upon many factors such as water-cement ratio, fine aggregates size, and different curing conditions [1].

The World Steel Association reported that global steel production increased from approximately 751 million tons in 1996 to more than 1630 million tons in 2017 [2]. Conventional concrete or mortar is generally strong in compression but not in tension.So the fiber-reinforced mortar or fibronizzata characterized by interior features millimetric size fiber**,** which will enhance its resistance.

The addition of fibers is considered one of the most important of these solutions because it prevents the spread of cracks and increases the overall strength of concrete. Many small fibers which are distributed randomly in the concrete or mortar during mixing, ameliorated concrete properties in all directions [3]. Fibres include steel fibres, glass fibres, synthetic fibres and natural fibres. In the current age, civil engineering structures have their own structural and durability requirements and so, it has necessity to modify conventional concrete [4,5].

Sandhu's research study about the characteristics of ground granulated blast furnace slag modified fiber reinforced concrete, the experimental results show that the fibres used in the concrete have been enhanced the flexural behaviour of the reinforced concrete [6].

Tebbal *et al*. confirme that that the tensile and bending properties of all different mixtures with fibers are significantly higher compared to the reference mortars. A remarkable decrease has been observed in water, density and compressive strength of mortar with chemical admixture. Moreover, the using 1% volume fraction of steel fibers and 10% glass sand, flexural strength of mortar was completely improved [7,8].

Mineral additives and amount by weight of total binder used in the blended cements like ground granulated blast furnace slag, silica fume and waste glass can be improve mortar or/and concrete workability, early and long term strength and long term durability [9,10]. Several researchers [11] concluded that the particle size and chemical composition of granulated slag control its pozzolanic activity and give higher strength.

Also, several literature studies the combination of cementitious additions like silica fume, metakaolin, fly ash and pozzolanic materials with three different types of the fibers in the mortar or concrete, to produce a reinforced mortar. The objectives of this research can be summarized into two parts:

- To analysis the behavior of mortar produced by granulated slag reinforced with steel fiber and cheap fibers.
- Selecting the best mortar based on its properties and cost.

2. Materials and Mix Proportions

2.1 Materials

Cement: CPJ 42.5 N cement from the Lafarge cement plant in Hammam Dalaa "M'sila"was used in this study.

The sand of siliceous origin coming from OUED MAITER of Boussaâda "M'sila" with particles ranging from 0.08 mm to 5 mm in size;

The adjuvant: high water-reducing super plasticizer (SIKAPLAST BV 40) from the company Granitex – Oued Smar;

The granulated slag comes from the El-Hadjar Annaba plant.

Metal fibres: from the Algerian company "Granitex". These are mineral fibers in the form of corrugated rods. The fibers are standardized and marketed under the Medafac label.

The characteristics and physico-mechanical properties of the fibers used indicated in the table (Table 1) and shown in the figure (Figure 1) [12].

Table 1. Characteristics of metallic fibers

Fusion (°C)	Length (mm)	Thickness (mm)	elongationL/D	Tensile strength (MPa)	Elasticity module (GPa)	Density (g/cm^3)
>1000	50	0.6±0.09	83.33	> 1000	200	7.8



Figure 1: Geometry of fibers used.

Mixing and conservation water: this is the drinking water of the laboratory. The mortar mixture proportions of the mixes are given in Table 2.

Table 2. Mixture proportions

Mix design	Sand	Slag (kg)	Cement (kg)	W/C
MC	1.350	0	0.450	0.50
MF1	1.350	0.045	0.405	0.55

MC: Control mortar without fiber ; MF1: Mortar formulated with 1% fiber .

3. Results and Discussion

The figures below (2, 3 and 4) shows the results of the mortars formulated

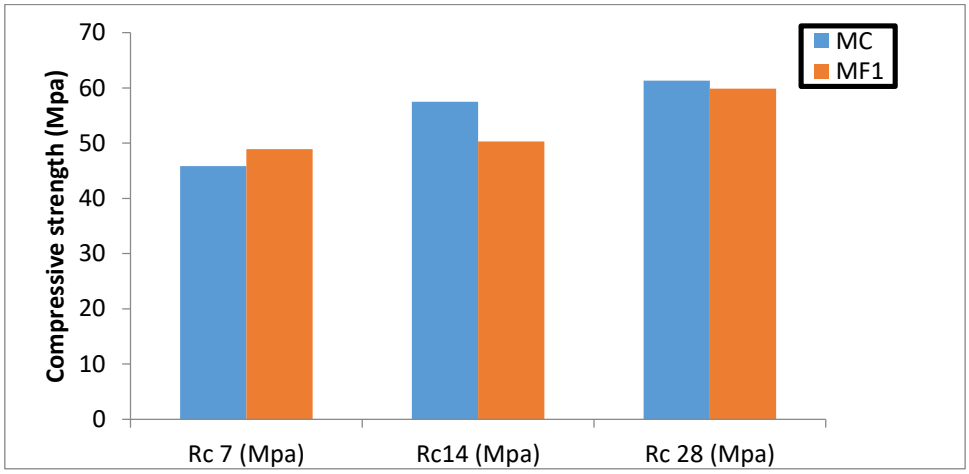


Figure 2: Compressive strength of mortars at 7, 14 and 28 days

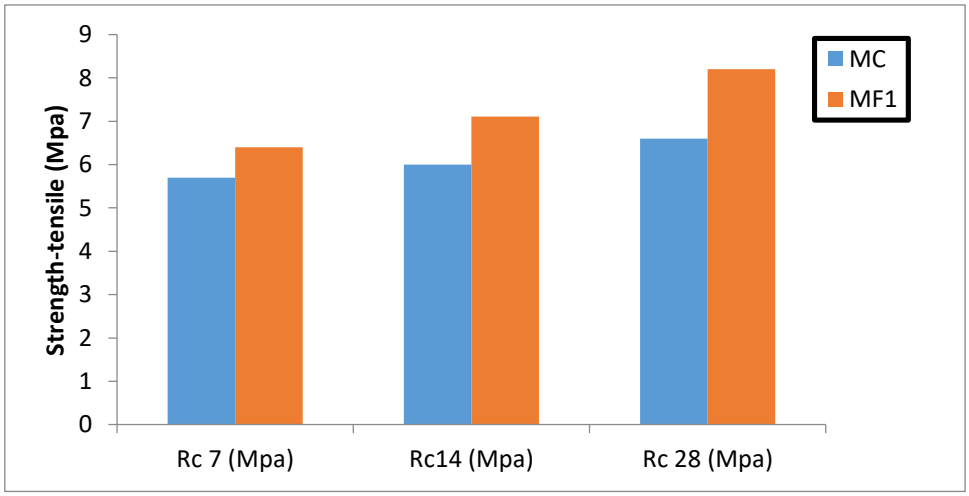


Figure 3: Tensile strength of mortars at 7, 14 and 28 days

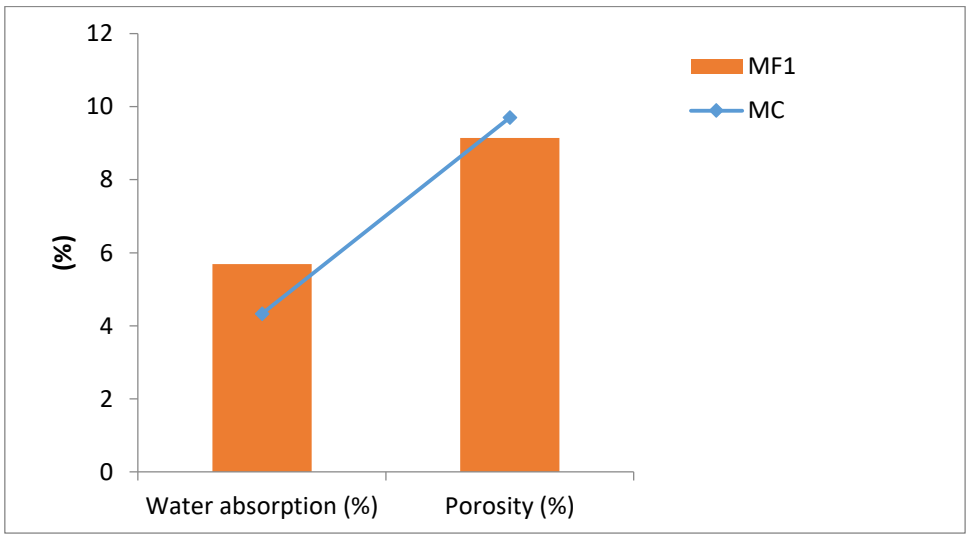


Figure 4: Water absorption and porosity of mortars 28 days

- A best performances at a young age;
- An increase in resistance between 7 and 28 days, for all concretes. This is due to the hydration of the binder paste and the formation of crystals which densify over time and thus contribute to the increase in resistance;
- The addition of metal fibers slightly increases the resistance at 7 and 28 days,
- At 28 days the MC mortar exceeds the MF1 even if the addition of slag gave better results without fibres, this is explained by a less good adhesion between the paste and the fibers compared to that with addition of slag;
- Fiber-free mortar exhibits brittle behavior; we can clearly distinguish the clean fracture characteristic of mortar. The addition of metal fibers increases the tensile strength by bending and the transmission of stresses via the matrix to the metal fibers gives the mortar a ductile behavior.
- The increase in the porosity of MF1 has a significant influence on the compression of the mortar tested, but such a reduction proved to be limited, mainly for the remains of the mortar. As well as its porosity have an effect on the resistance of the hardened mortar. From the incorporation of the sample with different % of cementitious addition, the replacement has a minor percentage of porosity of the mixtures compared to the reference mortar. This is due to the lower volume of voids inside the granular skeleton [13].

Conclusion

✓ Mortar with fibers has a higher mechanical resistance than that without fibers because of the presence of fibers which considerably influence the fluidity of the mortar, on the other hand this is due to the very fineness of the slag.

✓ An increase in resistance between 7 and 28 days, for all mortars. This is due to the hydration of the binder paste and the formation of crystals which densify over time and thus contribute to the increase in resistance.

✓ The addition of metal fibers increases the tensile strength by bending and the transmission of stresses via the matrix to the metal fibers gives the mortar a ductile behavior.

✓ As well as its porosity have an effect on the resistance of the hardened mortar. From the incorporation of the sample with different % of cementitious addition, the replacement has a minor percentage of porosity of the mixtures compared to the reference mortar. This is due to the lower volume of voids inside the granular skeleton.

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Study of the Effect of Steel Fiber Length on the Behavior of Mortar Combined with Inert and Active Filler

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Abstract

Since concrete is a mixture of cement, aggregates, and water, it can be used in a wide range of applications. It has excellent durability and availability which are its main advantages. Although concrete is strong in compression, it is relatively weak in tensile load. Over the years, various materials have been used to strengthen concrete to resist tensile stresses. Metal fiber is one such fiber that comes in different sizes and is used today to reinforce concrete. In this study, two different lengths of fibers (2.5cm, 5cm) has been used at 0.20% by weight of cement. The slag and the marble fillers are replaced at (10% by volume of cement replacement). Properties studied include compressive strength and tensile strength at 28 days.

Keywords: Mortar, granulated slag, marble, steel fiber, mechanical behavior.

1. Introduction

A concrete structure can be exposed to a variety of environmental conditions throughout its life. However, the tensile strength of concrete is very low in comparison to its compressive strength. The addition of steel fibers in concrete or mortar is a common method to improve its strength, toughness, energy absorption capacity and ductility after crack formation [1,2]. The introduction of more than 1% of fibers in a concrete, increases the resistance to cracking and slows down the cracking process [3]. Recent research has found that the quantity of fibers can be very large, varying from 5 to 20 % and is a function of several parameters, such as the shape, diameter, and aspect ratio of fibers; their orientation; the method used in packing; mold size; and the extent of vibration [4].

Hadjoudja *et al*. in his search, effect of mineral additions and metal fibers on the resistance

of cracking of the dune sand concretes, has shown that the age of cracking and the cracking stress of the selected specimens vary with the rate of mineral additions and fiber content. Indeed, the silica fume and the limestone filler significantly increase the age of the concrete cracking [5]. Shahad *et al*. confirmed that the compressive strength, static modulus of elasticity, splitting tensile strength and toughness are extremely affected by the geometry of fibers. It was also deduced from empiricism results that combining long and short fibers gives excellent results [6].

Wang et al. studied the Effect of silica fume, steel fiber and ITZ on the strength and fracture behavior of mortar. The result found that properties of the fresh mortar are greatly influence by water/binder ratio, the addition of silica fume and steel fiber. The compressive strength increased with silica fume and with the increased volume addition of steel fiber from 0.3 to 1.0 vol%, the compressive strength of the mortar is remarkably increased [7].

The main objective of the current work was to study the effect of of steel fiber length on the behavior of mortar combined with marble and granulated slag because the majority of studies were limited to the effect of the size or shape of the fibers on the mortar, but from the side of cement additives and their effect, the research on them is few if any.

2. Materials and Mix Proportions

2.1 Materials

Cement: CPJ 42.5 N cement from the Lafarge cement plant in Hammam Dalaa "M'sila"was used in this study.

The sand of siliceous origin coming from OUED MAITER of Boussaâda "M'sila" with particles ranging from 0.08 mm to 5 mm in size.

The adjuvant: high water-reducing super plasticizer (Medaplast SP 40) from the company Granitex – Oued Smar.

The marble powder used, is a waste of the manufacture of tiling type coating from an industry in Boussaâda (Algeria).

The granulated slag comes from the El-Hadjar Annaba plant. The physical properties of cement, granulated slag and marble powder are shown in Table 1 and 2.

Metal fibres: from the Algerian company "Granitex". These are mineral fibers in the form of corrugated rods. The fibers are standardized and marketed under the Medafac label. The characteristics and physico-mechanical properties of the fibers used indicated in the Table 2 [8,9].

Table. 1. The chemical and mineralogical composition of cement and marble powder used

The chemical composition of cement (%)									
Constituents	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Na_2O	K_2O	L.O.I
Clinker	18.51	5.98	2.96	58.37	1.85	2.89	0.12	0.58	8.74
Marble powder	1.47	0.35	0.14	55.3	0.01	0 .01	0.12	0.04	42.56
Slag	41.69	7.05	1.41	39.77	5.49	0.15	0.10	0.44	-
The mineralogical composition of cement (%)									
Constituents	C_3S		C_2S		C_3A			C_4AF	
(%)	58 - 64		12 - 18		6 - 8			10 - 12	
The mineralogical composition of marble powder and slag (%)									
Constituents (%)	Calcite	Dolomite	Quartz	Illite	Chlorite	Kaolinite	CO_2-XRD		
Marble	98.55	0.14	0.12	0.11	0.39	0.68	43.4		
Slag									
Characteristics of the chemical admixture									
Super plasticizer	Form	Color	PH	Density	Chlorine content	Dry extract			
Medaplast SP 40	Liquid	Brown	8.2	1.2±0.01	< 1g /l	40%			

The mortar mixture proportions of the mixes are given in Table 2.

Table 2. Mixture proportions

Mix design	Sand (kg)	Marble (kg)	Slag (kg)	Cement (kg)	Fibre (cm)	W/C
MC	1.350	-		0.450	-	0.50
MF M 2.5		0.045		0.405	0.2%.w de cement	
MF S 2.5		-	0.045			
MF M 5		0.045				
MF S 5		-	0.045			

MC: Control mortar without fiber; MF1:.
MFM 2.5: Mortar formulated with 2.5cm fiber length and marble; MFM 5: Mortar formulated with 5cm fiber length and marble; MFS2.5: Mortar formulated with 2.5cm fiber length and slag; MFS 5: Mortar formulated with 5cm fiber length and slag;

3. Results and Discussion

The figures below (1, 2 ,3 and 4) shows the results of the mortars formulated.

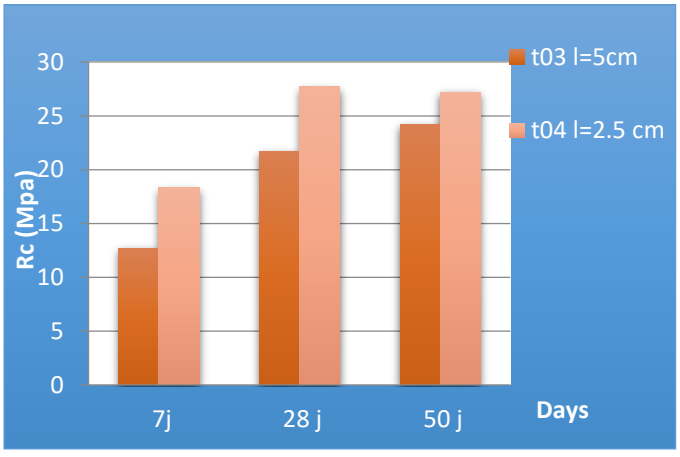


Figure 1. Compressive strength of mortars at 7, 28 and 50 days with slag

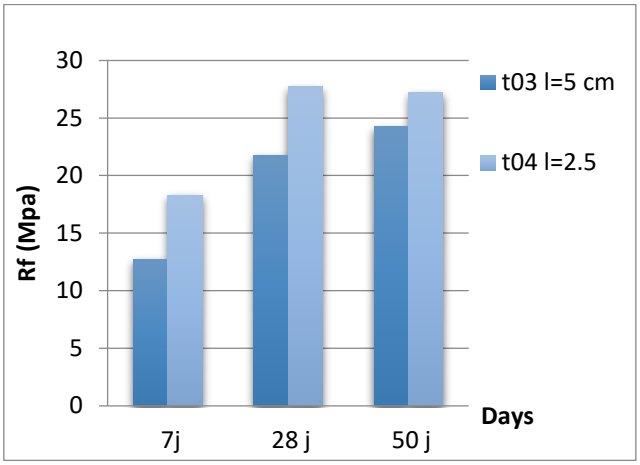


Figure 2. Tensile strength of mortars at 7, 28 and 50 days with slag

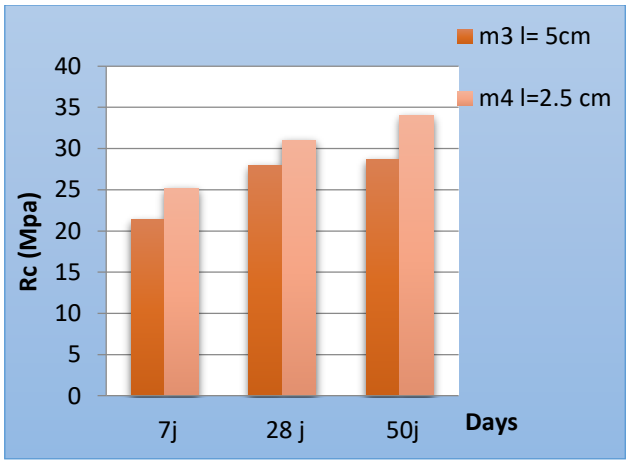


Figure 3. Compressive strength of mortars at 7, 28 and 50 days with marbe

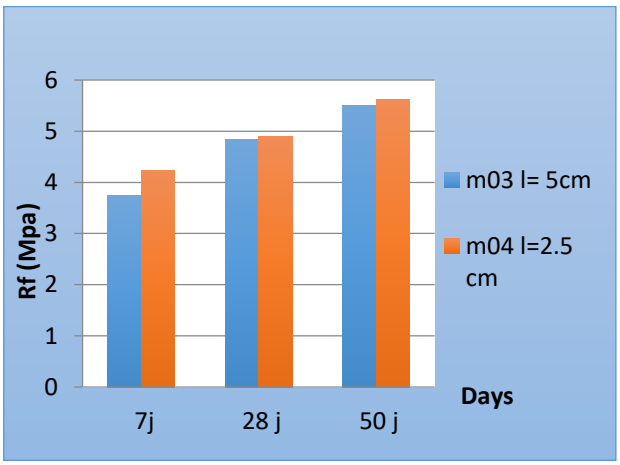


Figure 4. Tensile strength of mortars at 7, 28 and 50 days with marble

- The fiber length effect

The short fibers which, at the same dosage, are more numerous can be active by playing the role of stitching on microcracks which develop in the early stages of loading. Tensile strength may be increased. We noticed that the values of compression and flexion decrease for length of 5 cm against a significant increase in the value 2.5 cm of length. It can therefore be said

that the length of the fiber can also negatively affect the mechanical resistance and the bending of the mortars.

- *Mechanicals strengths*

1. *For mortar formulated by slag*

Figure 1 illustrates the evolution of the compressive strength as a function of the age of mortars containing slag. According to these figures, we notice that the compressive strengths of the mortars made with slag always remain higher than that of the control mortar and this for all ages. At a young age (7 days), the dosage of slag has a positive effect on the compressive strength, this increase tends as a function of time because it goes from 17MPa to T02.

• At the age of 28 days and the compressive strength between 26MPa and 28MPa.

• At the age of 50 days we notice the same trends of increased resistance

At a young age (7 days), the flexural strengths of mortars containing slag are low compared to that of the control mortar Rate of 10% according to (Figure 2). We observe a clear increase in the resistance to bending for a content of 10% slag in the long term (28 and 50 days).

2. *For mortar formulated by slag*

We can see that the compressive strength of the mortar with the addition of marble is higher than that of the control mortar. Note that the fineness favors the physical effect of the marble powder. Indeed, the presence of a large number of particles in the cementitious matrix around the cement grains multiplies the possibilities of germination of the hydrated Products and develops the microstructural complexity and the effectiveness of the bonds.

The addition of 10% marble powder significantly improves the mechanical resistance to bending. The best result was 4.6MPa for the m02 mortar.

Conclusion

The objective of our study is to analyze study of the effect of steel fiber length on the behavior of mortar combined with inert and active filler. objective was set following experimental analyses, and is based on several recent studies which have shown that cementitious additives and steel fibers modify and even improve the properties of cementitious materials:

• Pozzolanic mortars develop lower strengths than mortar control (witness).

• Although the compressive strength at a young age of mortars is reduced by the incorporation of slag, the latter improves over time and reaches its optimum in the long term. The strength of the mortar becomes comparable to that of the control mortar.

• Replacing part of the cement with slag leads to an increase resistance between 7 days and 28 days.

• Ternary mortars produced with the addition: slag have resistances comparable to that of the reference mortar in the short and long term.

. The addition of 10% marble filler improves the granularity of dune sand and reduces its porosity.

• The mechanical resistance in compression and in inflection of the mortars is notably improved it reaches very appreciable values.

- According to the increase in the compressive strength of short steel fiber mortars, it can be concluded that the presence of fibers in the matrix makes it possible to improve the ductility of the specimens.

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Investigation of Virtual Reality and Augmented Reality Studies in Cultural Heritage

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Abstract

We are going through a period of historical change that has built a different concept and model of social relations. Information technologies (ICT) have shaped the formation of a world in mutual communication from the local to the global. ICTs ushered in the era of digital interaction. The interaction of cultural heritage with technology provides innovations in the expression of heritage. Virtual reality (VR) and augmented reality (AR) technologies are the most revolting technologies of our time. In this study, virtual reality and augmented reality technologies are discussed. The latest developments in VR-AR technologies are examined from the perspective of cultural heritage. VR-AR technology provides an environment where a user can interact with heritage and heritage information in a virtual environment. VR-AR applications in the field of heritage are used for different purposes such as conservation, documentation and education. As a result of the literature review, VR-AR studies were categorized according to their intended use and supported with examples.

Keywords: Cultural heritage, virtual reality, augmented reality

Introduction

We are going through a period of historical change that has built a different concept and model of social relations. Changing times have created unforeseen challenges or conveniences in access, participation and sustainability, mainly in the protection of cultural heritage. The way we live, work and communicate with each other is changing rapidly. Internet and information communication technologies (ICT) have shaped the formation of a world in mutual communication from local to global. The rapid development of ICTs and the internet and its rise in our social life have transformed cities and world society into what Castells calls "network society" (Castells, 1996, p. 596). The opportunities provided by information technologies have led to a direct change in the habits of individuals by placing them in the living centers of individuals. ICTs ushered in the era of digital interaction. The new understanding in the world has affected the cultural heritage as well as other areas of life, and a period of change has begun in the works carried out for the protection of cultural heritage values.

The interaction of cultural heritage with technology is seen as a fundamental tool for the representation of architectural heritage. It is argued that information technologies play an important role in re-establishing links between cultural heritage and different social groups. These technologies contribute to the development of new tools for promoting the promotion of cultural heritage, digital access, storage, preservation and representation, and nurturing

relations between societies (Farazis et al., 2019). These tools reveal previously unseen connections by removing the barrier of time and space while examining and evaluating cultural heritage (Portalés et al., 2018). Virtual reality (VR) and augmented reality (AR) technologies are the most revolting technologies of our time.

This study focuses on virtual reality, augmented reality and the interaction of these technologies with cultural heritage. This work; For what purposes are reality technologies used in cultural heritage areas? seeks an answer to the question. In this study, virtual reality and augmented reality technologies are discussed. The latest developments in VR-AR technologies are examined from the perspective of cultural heritage. VR-AR technology provides an environment where a user can interact with heritage and heritage information in a virtual environment. VR-AR applications in the field of heritage are used for different purposes such as conservation, documentation and education. As a result of the literature review, VR-AR studies were categorized according to their intended use and supported with examples.

Findings and Discussion

Virtual Reality

Environments simulated by computers are called Virtual Reality (VR). It is used for things that do not exist but are accepted to exist. It is expressed in Webster's New Universal Unabridged Dictionary (1989) as "*in substance or effect but not in reality*". Virtual reality immerses users in a completely synthetic world without a real environment (Carmigniani et al., 2011). It provides a real environment experience with the contents it provides with the senses such as visual perception, hearing and touch (Zhao, 2009). Virtual reality is a new medium for experimentation to find practical applications and effective means of communication. Since it is a new environment, new definitions are constantly being created.

Augmented Reality

Augmented Reality, named for the first time by Roland Azuma, is an environment that offers a deeper experience as an alternative to virtual reality. VR is seen as a pioneer of augmented reality. It has similar and different points. VR gives the user an experience in a completely virtual environment. AR allows the user to see the real world enriched with virtual objects. In this respect, augmented reality makes virtual additions to reality instead of completely changing it. AR is an environment that combines virtual reality and the real world. Azuma

(1997) The main feature of AR is "*real and combining virtuality, real-time interaction, being registered in 3D*".

Mixed Reality

The concept of mixed reality put forward by Paul Milgram and Fumio Kishino offers a new perspective on the subject. The reality-virtual continuum defines the gap between real and virtual environments between augmented reality and augmented virtuality (Milgram & Kishino 1994). AR is close to the real world and AV is close to the virtual environment. As seen in Figure 1, the left side represents physical reality and the right side represents virtual reality. In the middle is augmented reality and augmented virtuality, which combines real and virtual images. In augmented reality, most of the images are real. In augmented virtuality, most images are computer generated. In this context, mixed reality encompasses the continuum from AR to AV, aiming to blend real and virtual environments in different ways.

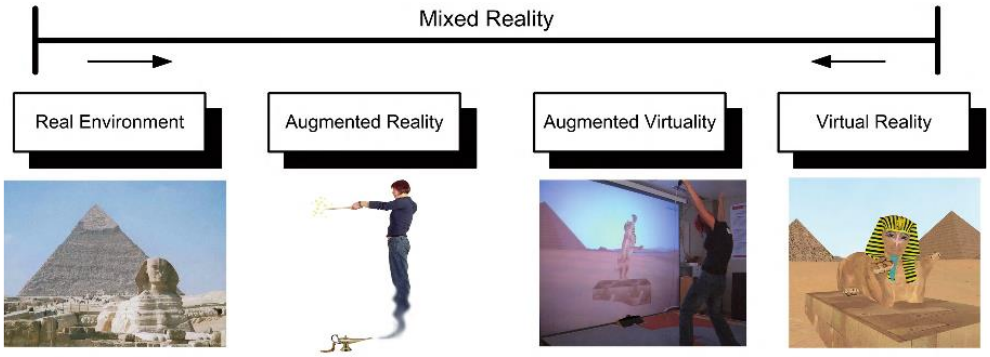


Figure 1. The reality-virtual continuum (Milgram & Kishino 1994)

AR studies in recent years have shaped our view of the real world (Rolland & Fuchs 2000). An AR system generally has the following features combines the real world with virtual objects, ıt works in real time, allows interaction between users and virtual objects (Liarokapis, 2007). When looking at augmented reality, augmented virtuality, virtual reality and mixed reality purposes in general;

- Augmented reality: aims to improve our perception and understanding of the real world by overlaying virtual information on our view of the real world.
- Augmented virtuality: aims to reinforce the virtual world with scenes from the real world.
- Virtual reality: aims to enhance our presence and interaction with a computer-generated environment without the means of interacting with or seeing the real world.
- Mixed reality: aims to combine real and virtual environments.

VR-AR Works in Cultural Heritage

Reality studies in the field of cultural heritage have accelerated considerably. Different digital technologies have been designed to express cultural heritage contents (Caggianese et al., 2018; Carrozzino & Bergamasco, 2010; Styliani et al., 2009). VR-AR-MR applications, which are three-dimensional technologies, have become a new method in the representation of heritage (Ioannides et al., 2017). A great deal of digital cultural heritage content has been developed. These digital contents enable interested visitors to visit cultural heritage sites digitally (Caggianese et al., 2018; Pletinckx et al., 2000). Looking at the literature studies, a number of studies have examined the application of augmented and virtual reality in different application areas of cultural heritage (Pietroni et al., 2013; Kang, 2013; Barsanti et al., 2015). Some researchers have stated that there are three main areas of application of AR in the field of cultural heritage: improving the visitor experience, heritage management and discovery (Kim et al., 2009; Colizzi et al., 2010). A perfect VR affects all our senses and allows us to interact naturally with the virtual environment. VR applications are used for various purposes such as virtual museum, virtual reconstruction, virtual exploration and cultural heritage education (Zhou & Deng, 2009).

Today, museums that do not offer new technologies are considered less attractive (Gerval & Le Ru, 2015). Explanatory learning experience in museums is informative but not interactive. The creation of an intelligent environment that dynamically adapts and supports information technologies has opened new avenues in the field of cultural heritage (Manovich, 2006). Augmented and virtual reality technologies have proven to be a viable solution in this regard. These reality systems interact in different environments. Looking closely at these purposes;

1. Informative Studies

Considering the reality applications, where education is the primary goal, we come across studies in more than one scientific field (Bacca et al., 2014). AR-VR technologies aim to enable users to learn the aspects they are curious about about cultural heritage. There are studies that argue that learning through virtual visits can be more productive by experiencing cultural heritage interactively. It shows that participants can increase their motivation to learn against the place they visit virtually (museum, heritage site, science center, etc.). (Gargalakos et al., 2011).

2. Studies to Improve the Heritage Experience

These applications are made to improve a visitor's experience. A virtual element such as a description, map, virtual-human character is superimposed on users' existing views of the real world. There is a lot of work in this area as AR applications help museums realize their role and goals (Choi, 2014). These technologies added to real spaces attract visitor attention. As an example, revealing the Appian way and superimposing immersive reality on real space is an important work (Lestøl, 2014) (Figure 2).



Figure 2**.** Tomb of Cecelia Metella, built around 30 BC in real background, Simulated on-screen in March 49 BC mod (Lestøl, 2014).

This work is a project developed at the University of Trieste. It was aimed to render the canvas in three dimensions in the Gallerie dell'Accademia Museum in Venice (Sdegno et al., 2015). Thus, it is aimed to improve the visitors' experience of the canvas. (Figure 3).



Figure 3. Virtual model of the scene and AR work presented at the university (Sdegno et al., 2015).

The CHESS Project was created to design interactive experiences for the exhibitions of the Archaic Gallery of the Athens Acropolis Museum using the AR system. The AR system is part of the whole procedure and does not support users to interact directly with the objects shown (Keil et al., 2013) (Figure 4).



Figure 4. AR at the Archaic Gallery of the Acropolis Museum. (Keil et al., 2013).

In general, VR-AR applications are used to enhance the visitor experience of cultural heritage sites. However, the glasses, gloves and other virtual items used should not distract visitors from the real world view. Because the aim is to enhance a visiting experience in physical museums or cultural heritage sites with their virtual view. In this respect, the created reality environment should be lively and realistic.

3. Studies Creating Virtual Museums

Virtual museums created with AR-VR technologies aim to present cultural heritage sites by simulating them. In some works, the assets displayed in museums are inaccessible. Therefore, it should be very realistic and detailed so that users cannot easily distinguish the difference between the original and the copy. Such simulations increase users' presence in virtual museums. It aims to make users feel as if they are physically present in a real museum or heritage site. The simulation created should take into account the behavioral and physical characteristics of the users. The system created should be completely immersive.

The British Museum developed a traveling exhibit depicting how Viking life was altered in Britain in collaboration with four different significant UK museums. Viking VR is a Virtual Reality exhibit through which viewers can experience the sights and sounds of a 9th Century Viking encampment (Schofield et al., 2018). This study was developed by an interdisciplinary team (Figure 5).



Figure 5. A still from the VR experience Viking VR (Schofield et al., 2018).

The project, called ARCO, or Augmented Representation of Cultural Objects, was created with the aim of developing technologies to help museums display digitized displays in virtual reality, both inside and outside museums. This project provides an exploration into the collection of ethnic artifacts. The user can experience selected artworks in augmented and virtual reality scenes by examining the web interface (Wojciechowski et al., 2004). This enables the user to analyze what is displayed in the environment created by digital structures (Figure 6).

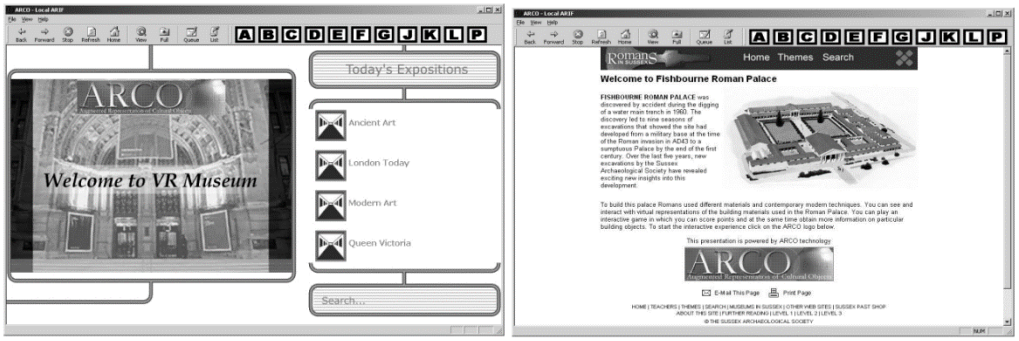


Figure 6. The AR application displaying standard web contents (Wojciechowski et al., 2004).

4. Virtual Restoration And Reconstruction Applications

Technological developments and tools of our time offer new experience opportunities for the restoration of a structure. Today, the creation of cultural heritage sites or works in the digital environment and their restoration and reconstruction in the virtual environment are in rematch. Virtual restoration is defined as the process of using a virtual model to visually recreate something that existed in the past and rearrange existing remains. In reality, virtual restoration consists of the application of digital techniques. It is limited in the digital realm and does not imply any physical interference.

Virtual reconstructions or restorations aim to enable users to visualize and interact with cultural heritage. Such applications allow users to make virtual visualizations of heritage assets that only existed or partially existed in the past. In 1994, professor Gianfranco Fiaccadori coined the term virtual restoration as a methodology combining technique and purpose to intervene in a virtual way on damaged heritage (Saggio & Borra 2011) (Figure 7).

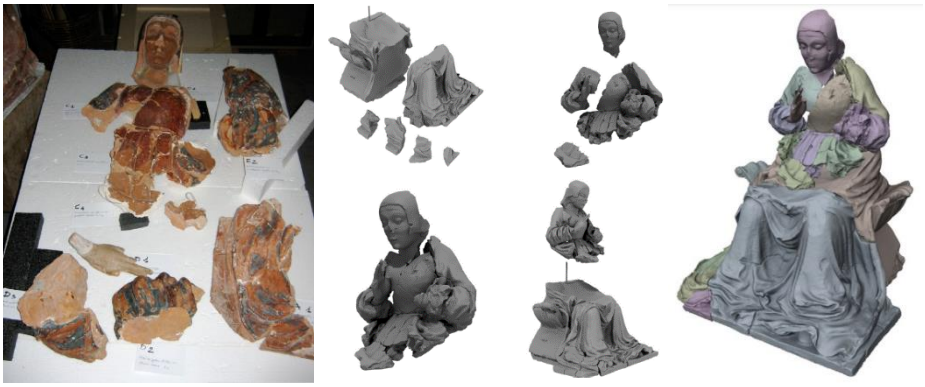


Figure 7. Virtual restoration of the Madonna statue (Arbace et al., 2013; 332)

Another example is Scrovegni Chapel: Virtual reality application. It is intended to make the virtual reconstruction part of a virtual ecosystem. The study should not be limited to just visualization and should not be detached from its informative context. This study was conducted using the stated precision (Pietroni & Ferdani, 2021).

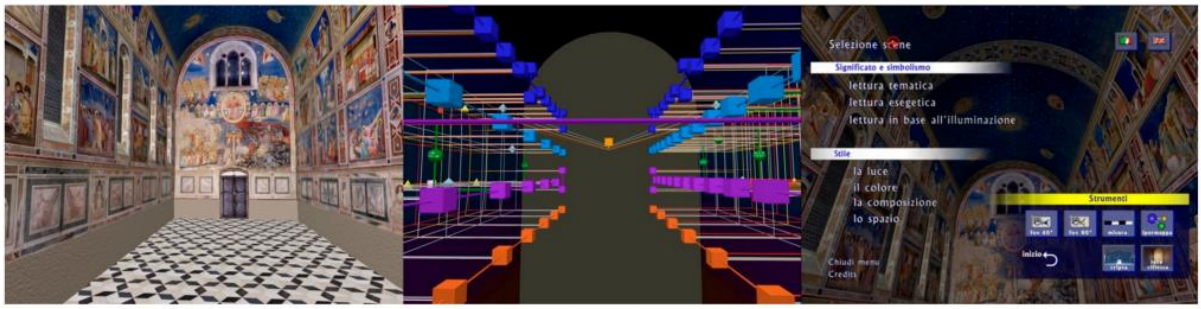


Figure 8. Scrovegni Chapel (Pietroni & Ferdani, 2021).

A study was carried out on the virtual reconstruction of the Roman period building. In a multimedia application, a comparison was made between the current state of archaeological remains and their 3D reconstruction in the past. Red was used for elements that existed archaeologically and are currently visible. Pink has been used for elements that exist archaeologically but are not currently visible. Blue represents hypothetical items based on structural data and archaeological record (Figure 9). Light blue is used for hypothetical items based on comparison with similar structures (Pietroni & Ferdani, 2021).

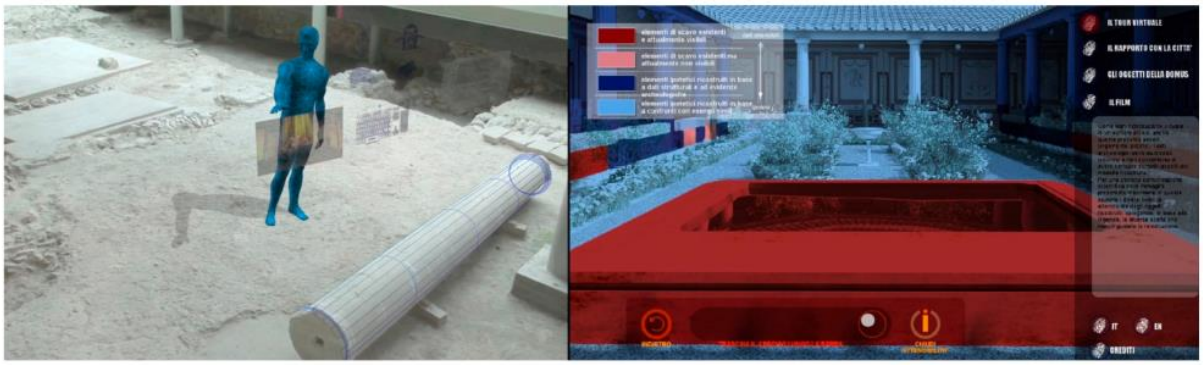


Figure 9. Teramo virtual city Project (Pietroni & Ferdani, 2021).

Conclusion and Recommendations

In this article, augmented and virtual reality is investigated from the perspective of cultural heritage. Augmented and virtual reality applications; It is used to provide information, to improve the heritage experience, to create virtual museums and to carry out virtual restoration and reconstruction applications in the conservation area. Augmented, virtual and mixed reality are all used to achieve the above-mentioned purposes. Considering the work intensity, it is seen that augmented reality applications are highly preferred in museums. Similarly, VR applications have been preferred more in the creation of virtual museums. In cultural heritage areas, it is seen that cultural artifacts can be experienced in an immersive way through the application of AR and VR technology.

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The People Houses as a Cultural/Archıtectural Heritage of Turkey; The Case of Zonguldak and Sivas the People Houses

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Abstract

In 1930s, new building types emerged in the field of architecture as concrete signs of the modernization efforts in Turkey. Being one of the first representatives of modernization products in Turkey, People Houses are important in terms of the modernist frameworks of their buildings, their location in the city and their contribution to the urban identity, as well as the various branches and rich social content they have in their education programs. With its asymmetrical planning and mass understanding, terrace roof, reinforced concrete construction system, People Houses buildings constitute a new turning point in the effort of local architects who are trying to produce a new architectural understanding unique to Turkey, as well as the pioneers of the modern architectural forms of the 30s. In this study, it is aimed to deliver the functional and formal values of the People Houses as the public component of the city, as the unique identity of the People Houses buildings in Turkish modern architecture is located next to the public buildings in the city, and to reveal its leading role in the architectural products of the early republican period. In the study, twoPeople houses; Zonguldak (1933) and Sivas (1938) People Houses were selected and their processes from project production to functional and spatial and design concepts were examined.

Keywords: People Houses, Modern architecture, Modernization, Early Republican Period.

Introduction

The period between 1930-1950 marked two world wars in history thorough worldwide. It also points a turning point in Turkey. Because it is important in Turkish architectural literature as it includes the period when the discourse of modernization was active and new building types belonging to the modern architectural period produced in this way were put into practice. The aim of this study includes the production and design processes of the People House buildings, which are among the building types in question, established in Anatolia and where various social and cultural studies take place. By choosing two of these buildings, the design styles of Zonguldak (1933) and Sivas (1938) buildings, from their location in the city at the time they were founded, to their project production, were tried to be understood.

1930's is the years when the country was restructured both politically, socially and culturally in line with the desire of the new Turkish Republic to rise to the level of contemporary civilization (Durukan Kopuz, 2018). These innovations made in the trend of modernization appeal to planners, engineers, architects and scientists who want to use state power to create radically different changes in the lifestyle, working habits, lifestyles, moral behaviors and participation of the people in social life (Bozdoğan, 2001).

Materials and Methods

As a material, Zonguldak (1933) and Sivas (1938) people house buildings were examined from their location in the city at the time they were founded, to their design production, especially their floor plans and facades. These were obtained from "Arkitekt" magazine that was only architectural magazine began to be published in 1931. Also some old photos about buildings were obtained through collectors in the mentioned cities.

People Houses as a Architectural Heritage

It would not be an exaggeration to put forward the People House buildings as one of the most symbolic representative spaces of the Modern Movement within the modernization efforts in Turkey. The implemented modernity project has been associated with a nation-building process in the light of modernization and has allowed the emergence of new building types, especially in cities. In this sense, it is thought that "People's Houses" established in many settlements of the country are the most concrete examples of new building types and the desire of this project to spread throughout the country (Durukan, 2006).

The methods of obtaining the projects of the People House buildings were carried out in various ways. In the People's Houses Instruction of the Republican People's Party, it is stated that the People's House buildings will be provided and furnished by the administrative committees of the party (C.H.F. People's Houses Regulations, 1932). One of the methods of constructing the buildings is People Houses C.H.P. To appoint someone by the Consultancy Office. Another method is to have the architects of the period prepare projects by order. Another method of obtaining Community Center buildings is to organize architectural project competitions. It was obtained through architectural competitions held in Zonguldak (1933) and Sivas (1938) Community Centers (Durukan, 2008). These two buildings, chosen as examples in this study, will be discussed in terms of architectural form and spatial arrangement.

Zonguldak People House, 1933

Zonguldak People House was opened on June 24, 1932 and became operational, but as in many community centers in those years, its first works started in the old Zonguldak Turkish Hearth Building (Namal, 2014). However, when this building was not sufficient, an architectural project competition was held to build a People House in Zonguldak in 1932. The jury of this competition organized; It consists of Zonguldak People's Party and People House President, Zonguldak Governor, five engineers and two architects working in Istanbul

Community Center. The persons in question; Halit Bey as the Governor of Zonguldak, Mithat Akif Bey, the head of the People's Party and People House, Samih Saim and Ö. Faruk Galip, engineer Tevfik Bey, chief engineer of mines Nuri Bey, one of mines administration engineers Cemal Bey, municipal engineer Fahri Bey, Nafia chief engineer Atıf Bey. 8 groups participated in the competition, which consisted of a 9-person jury, with 12 projects, and as a result of the evaluations, the project of Architects Abidin and Zeki Selâh was chosen, and it was decided to be implemented. Architect O. Faruk Galip writes in his article titled "On the occasion of the Zonguldak People House Project Competition" published in Arkitekt: "When the Zonguldak People's Party thinks to construct a new building for the People House, which is in great need of the country, it is the best idea and the straightest move to obtain the project of this building by competition method. He has made his decision." (Galip, 1933).

Zonguldak People Center features the architecture of the period. The fact that it is located on Gazi Paşa Caddesi, which is the busiest street of the city, and on the republic square with an Atatürk statue in the middle, ensures that the building is in a central location and reinforces its symbolic meanings (Figure 1). The People House, located close to the government building and İşbank buildings, defines the republic square. The republic squares and People Houses established as the representation of the nation-state are considered as a symbol of political power (Durukan and Uraz, 2008). In addition, the statue or bust of Atatürk, located in the middle of the republic square where the buildings are located, can also be seen as a result of this situation.

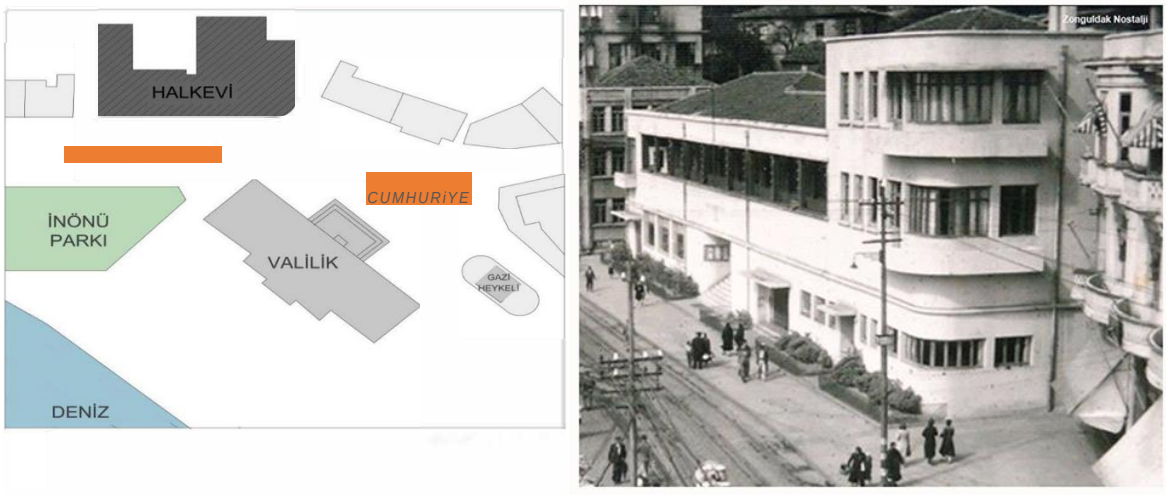


Figure 1. Zonguldak People House site plan and the building in 1940's (Anonym, 2016)

The building consists of 4 main parts. These are house, theatre/cinema hall, music hall and private residence on the top floor. There are 3 separate entrances on the lower floor. The first is reserved for commercial units, the second entrance is for accessing the upper floor classrooms, the third entrance is for the cinema/conference hall, and the fourth entrance is for the library section and the top floor accommodation. As in other People Houses, the Theater or the movie theater can be considered as one of the most important units of the People House as the places where the society meets for the first time (Figure 2).



Figure 2. Zonguldak People House floor plans

The private accommodation unit located in the People House buildings is another important place for the Zonguldak People House. Although not mentioned in the project report and on the plans, it is thought that this unit was planned for Mustafa Kemal Atatürk and other statesmen or artists to stay when they arrive. This place, which meets the need for a small residence, may have been built with the thought that the People's House, which is the house of the people, was also the house of Atatürk and other statesmen or artists. It has been investigated that this type of accommodation was also used in other people's houses for Atatürk to stay when he came. The photograph that Sabahattin Ali took from his own lens in

this accommodation unit during his visit to Zonguldak in 1939 proves that the room was furnished in a very plain and simple manner (Figure 3).

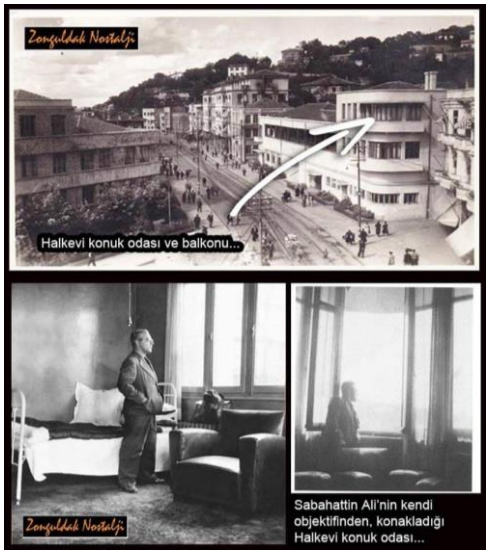


Figure 3. Zonguldak People House accommodation in 1939, from Sabahattin Ali's own lens (Anonymous, 2020)

When the Zonguldak People House is examined in terms of architecture, it is possible to see all the features of modern architecture both in the plan schemes and in the facade arrangements. Functional planning is seen in different entrance doors and interiors.

Sivas Peoples House (1938)

Sivas People's House was established on February 24, 1933, then it was decided by the Presidency of the Sivas Republican People's Party to build a People House on the land determined in Sivas Cumhuriyet Square for the construction of a new building of its own. In the journal Arkitekt (1939), it is stated that the opening of the project competition for the Sivas People House Building made Turkish architects extremely happy and excited. The reason for this is that many public and civil buildings were given to foreign architects in those years and this situation disturbed Turkish architects. However, this behavior of Sivas People House will lead Turkish architects and is appreciated for the future of architecture.

In that period, the city of Sivas has a geopolitical importance as it hosted the congress. 13 Turkish architects participated in the contest opened in 1938, and the joint project with the pseudonym "sovereign" won the first place by Architect Nazif Asal and Emin Necip. The project with the pseudonym "chaldan", which came in second in the competition, belongs to Sabri Oran and Emin Onat. It is designed with stone arch walls unique to Sivas, formed by the combination of two rectangular masses with angular lines (Oran and Onat, 1939). However, in the program of the competition project, It is stated that the two sides of the building are intended to be positioned to face the street and the other to the garden (Anonymous, 1939). It

is seen that this situation is achieved in the project of Nazif Asal and Emin Necip. Sivas People House is located on Cumhuriyet Street and Cumhuriyet Square, as is frequently seen in the examples of Zonguldak and other People Houses (Figure 4,5).

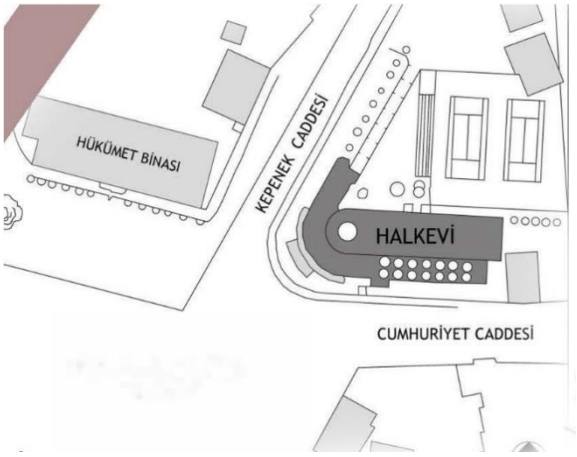


Figure 4. Sivas People House site plan

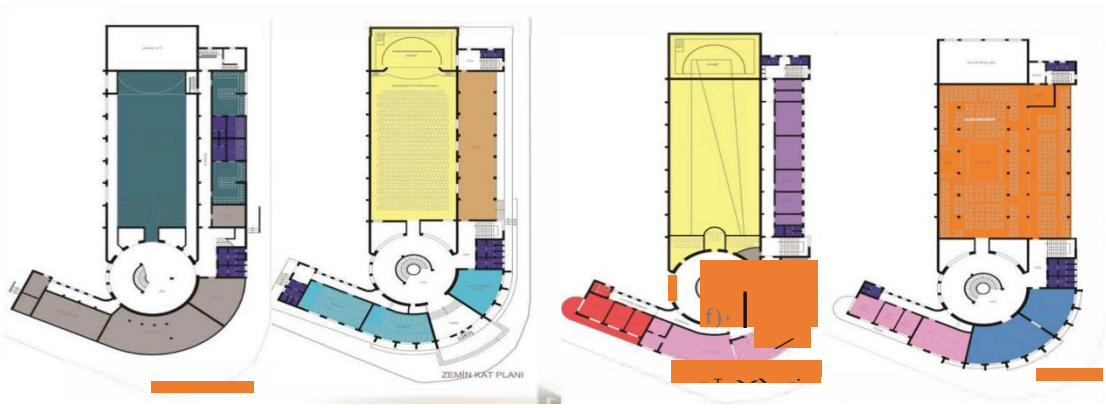


Figure 5. Sivas People House floor plans

Conclusion and Recommendations

As a result, it is extremely meaningful to evaluate the institutional and spatial identity of the People Housse in the relationship between the young Republic of Turkey, which has just emerged from the struggle for independence, and the modernization process on this path. People House buildings were shaped in the modern architectural style in accordance with a common trend in the architectural education and practices of the period. People's Houses, built in line with this style, were primarily shaped according to their function, freed from decoration, and had a plain and simple appearance. These buildings, which were tried to be built in the face of the negative economic conditions of the period, appear as the architectural representatives of the modern architectural style.

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Exploring a Heritage Building's Influence on the Surrounding Streetscape: A Case Study

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Abstract

The materials, equipment, and components that constitute the walls, roof, foundation, stairs, and other external parts and features of buildings concern the streetscape. Formed mainly by the built environment, streetscape includes landscape, street and pedestrian lighting, roads and pavements, street furniture, and signage that fill the streets with light, color, and texture. Historic buildings are considered one of the remarkable parts of the streetscape, even as singular structures. However, there is not enough data in the literature on the qualitative and quantitative features regarding single heritage buildings to allow an explanation for their effect on their surroundings. Listed heritage buildings usually retain their façade characteristics owing to the building regulations. In this research, we hypothesized that they also influence the surrounding streetscape. We aimed to reveal the elements affecting the streetscape within the context of a single heritage building by employing qualitative and quantitative research methods. A case study area was selected in the first stage, followed by a literature review to identify the building regulations that apply to the heritage buildings within that area. Data were collected by documenting the elements that make up the streetscape in the study area. In conclusion, this paper specifies how singular heritage affects the surrounding streetscape.

Keywords: *streetscape, conservation, urban identity, heritage, façade.*

Miras Yapılarının Cephe Özelliklerinin Sokak Manzarası Algısı Üzerine Etkisine Yönelik Bir Araştırma

Öz

Binaların duvarlarını, çatılarını ve dışarıdan görünen tüm diğer ögelerini oluşturan malzeme, ekipman ve bileşenler sokak manzarasına doğrudan etki eder. Yapılı çevre, yeşil alanlar, aydınlatma elemanları, zemin döşemeleri, kent mobilyaları ve tabelalar; sokakları ışık, renk ve doku ile doldurarak sokak manzarasını meydana getirirler. Miras yapıları tekil yapı olarak dahi sokak cephesini etkileyen unsurlar olabilirler, ancak bunu ne şekilde ve ne düzeyde yaptıklarına dair yeterli çalışma bulunmamaktadır. Tescilli miras yapıları yönetmelik ve tüzükler sayesinde cephe karakterlerini muhafaza edebilirler; bununla birlikte çevrelerindeki sokak manzaralarına da etki ettikleri düşünülmektedir. Bu çalışmada, kentsel mekânda sokak manzarasını etkileyen unsurların neler olduğunu, miras yapılarının, onları çevreleyen yapıların cephelerini ve sokak manzarasını (streetscape) nasıl etkilediğini hem nitel hem nicel veri toplama metotlarına başvurularak ortaya koymak hedeflenmiştir. Bu kapsamda öncelikle bir çalışma alanı belirlenmiş ve buna göre seçilen alanın tarihsel arka planını oluşturmak için bir literatür araştırması yapılmıştır. Aynı zamanda korumaya ilişkin yasalar ile ilgili yönetmeliklerin içeriği sistematik olarak sınıflandırılmış, seçilen çalışma alanında sokak manzarasını oluşturan unsurlara dair veri toplanmıştır. Elde edilen veriler doğrultusunda çalışma alanındaki miras yapısının sokak manzarasını ne doğrultuda ve düzeyde etkilediği belirlenmiştir.

Anahtar Kelimeler: *sokak manzarası, koruma, kent kimliği, miras, cephe.*

Giriş

Binalar, yapılı çevrenin en önemli unsuru olarak sokak manzarasının kritik bileşenleridir. Yeşil alanlar, aydınlatma elemanları, zemin döşemeleri, kent mobilyaları gibi pek çok başka unsurla birlikte sokak manzarasını oluştururlar.

Tarihi yapılar, tekil yapılar olarak dahi sokak manzarasının dikkat çekici parçalarından biri olarak kabul edilirler. Şayet tescilli yapılar ise, bina yönetmelikleri ve kanunlar sayesinde cephe özelliklerini zamana ve koşullara rağmen koruyabilmeleri beklenir.

Boğaziçi bölgesinde 70'li yıllardan bu yana doğal ve kültürel değerlerin korunması amacıyla yerleşime yönelik planlamaya ilişkin türlü çalışmalar yürütülmüştür. Bu çalışmalara rağmen, 50'li yıllardan beri görülen hızlı nüfus artışı ve şehirleşme, planlı ve plansız gelişmeler, yeşil alanların yapılaşma nedeniyle azalması gibi olgular, uygulamada korumaya yönelik hedeflenen başarının elde edilemeyişine zemin hazırlamıştır (Selçuk & Gülersoy, 2004).

İstanbul kentinin hızlı şehirleşmenin en yoğun yaşandığı ve değişimden en çok etkilenen bölgesi, Asya ve Avrupa arasındaki geçiş konumunda olan Boğaziçi bölgesidir. Ancak Boğaziçi bölgesi, tarihi değeri, yeşil alanları, hareketli kıyı kesimi, topografik özellikleri, mimari karakteristiği ve kentsel dokusuyla koruma uygulamalarında kritik öneme sahip bir bölgedir (Selçuk & Gülersoy, 2004). Bu nedenle örnek çalışma alanımız Boğaziçi bölgesinden seçilmiş olup, bu bölgede yer alan tekil bir tarihi yapının yakın çevresiyle kurduğu ilişki, alanın tabi olduğu kanun ve yönetmelikler kapsamında incelenmiştir. Zira bu çalışmayı tetikleyen sorular şöyledir: Tekil miras yapıları, yakın çevrelerine, özellikle de onları çevreleyen sokakların manzarasına nasıl ve ne ölçüde etki etmektedirler? İlgili kanun ve yönetmeliklerin bu etkideki payı nedir? Bu araştırmada, tescilli miras yapılarının, tekil yapı olsalar dahi çevrelerindeki sokak manzarasını doğrudan etkiledikleri varsayılmıştır. Bildiğimiz kadarıyla, literatürde tekil miras binalarının yakın çevreleri üzerindeki etkileriyle ilgili bilimsel tespitler yapılmasına izin verecek miktarda niteliksel ve niceliksel veri bulunmamaktadır. Bu sebeple, seçilen bir çalışma alanı üzerinden, belirli bir model aracılığıyla bu sorulara cevaplar üretmemizi sağlayabilecek veriler elde etmek amaçlanmıştır.

Materyal ve Metot

Seçilen çalışma alanındaki sokak manzarasına ilişkin verilerin analizi için Shimomura vd. (1993) tarafından geliştirilen "Tarihî Sokak Manzaralarını Bilişsel ve Öznel Değerlendirme" modelinden yararlanılmıştır. Buna göre öncelikle mevcut literatür yardımıyla sokak manzarasını oluşturan ögeler kategorize edilmiş, aynı zamanda korumaya ilişkin yasaların

amacı ile ilgili yönetmelik ve yönergelerin araştırma konusunu ilgilendiren içerikleri sistematik olarak sınıflandırılmıştır. Daha sonra sokak manzarasını ve ilgili yapıların cephelerini gösteren fotoğraflar çekilmiştir. Bu fotoğraflar esas alınarak, kanun ve yönetmeliklerde yer alan kural ve talimatların her birinin çalışma alanındaki tarihî sokak manzarasını muhafaza etmeye ve yönlendirmeye nasıl ve ne düzeyde katkıda bulunduğuna dair değerlendirmeler yapılmıştır.

Sokak Manzarasını Oluşturan Unsurlar

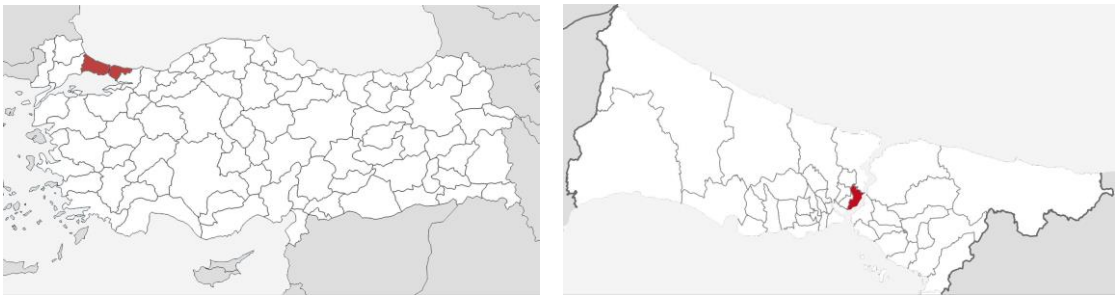
Bina cephelerine dair her unsur, sokak manzarasına doğrudan etki eder: Yapı nizamları (bitişik, ayrık, blok), çatı şekli, çatı saçakları, çatı eğimleri, giriş saçakları (markizler), açık ve kapalı çıkmalar, ön ve yan bahçeler, bahçe duvarları, portikler, kuranglezler, pergolalar, güneş kırıcılar, binalara ait trafolar, giriş rampaları, bunların renkleri ve kaplama malzemeleri…Bunlara ilaveten peyzaj düzenlemeleri (City of Cheyenne, n.d.), aydınlatma elemanları, kent mobilyaları, kaldırım ve diğer unsurlar; sokakları ışık, renk ve doku ile doldurarak sokak manzarasına katkıda bulunurlar (National Association of City Transportation Officials, n.d.). Bazı kentlerde belirli kent mobilyaları (Paris'te metro girişleri ve sokak lambaları, Britanya'da kırmızı telefon kulübeleri gibi) kent kimliğinin esas unsurlarından biri, hatta birer kültürel simge haline gelmişlerdir.

Sokak manzarasını oluşturan tüm unsurlar aşağıdaki gibi kategorize edilebilir:

A. Yapılı çevre: Bina cephelerine ve yakın çevrelerine dair yukarıda bahsedilen tüm ögeler.
B. Yeşil alanlar: Ağaçlar, her çeşit bitki, yağmur bahçeleri, kent parkları ve süs havuzları dahil tüm peyzaj düzenlemeleri.
C. Aydınlatma elemanları: Direkler, aplikler, yere gömme ve duvara gömme armatürler olmak üzere tüm park, bahçe, havuz ve kaldırım armatürleri; yol, refüj ve yaya aydınlatması ve bunların ışık kalitesi.
D. Zemin döşemeleri: Araç yolları, bisiklet yolları ve kaldırımlar.
E. Kent mobilyaları: Banklar, çardak ve kameriyeler, bisiklet park yerleri, park sayaçları, kamusal sanat eserleri, umumi tuvalet kabinleri, çeşmeler, kontrol ve bekçi kulübeleri, otobüs ve taksi durakları, trafik ve park işaretleri, geri dönüşüm ve çöp kutuları, yangın muslukları, otomatlar.
F. Tabelalar: Reklam panoları, levhalar vs.

Çalışma Alanı - Arnavutköy, Beşiktaş, İstanbul

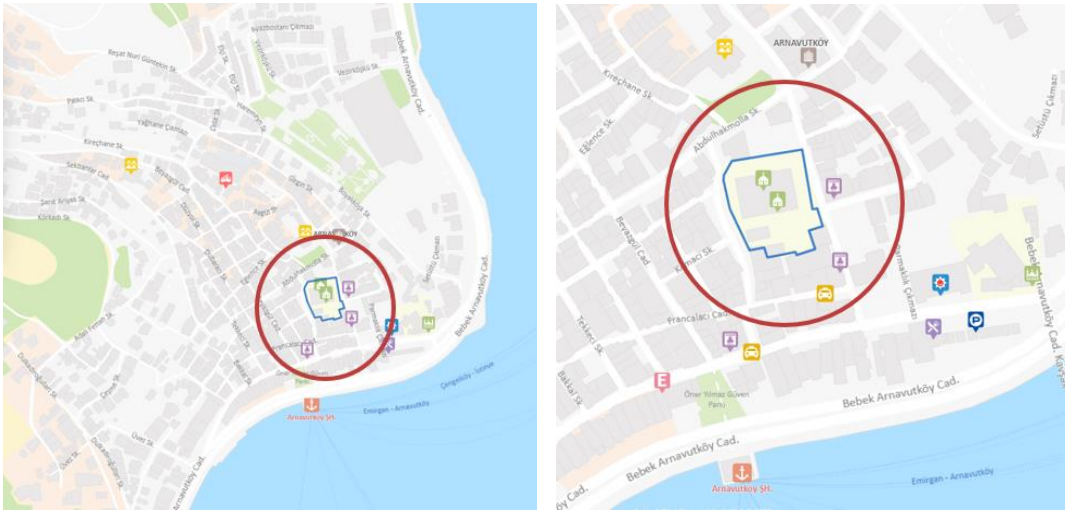
Arnavutköy, İstanbul Avrupa yakasında Beşiktaş ilçesinin sınırları içinde, Kuruçeşme ile Bebek arasında yer alan, miras yapılarının yoğun olarak bulunduğu tarihî bir mahalledir (Şekil 1.). 2022 yılı itibarıyla elli bir sokağı ve dört caddesi vardır. Satış Meydanı Sokak 22 Numara adresinde bulunan Taksiarhis Rum Ortodoks Kilisesi çevresi örnek çalışma alanı olarak seçilmiştir. Kilise çevresindeki Francalacı Caddesi, Arnavutköy Dere Sokak, Abdülhak Molla Sokak ve Satış Meydanı Sokak çalışmamızın odak noktalarıdır.



Şekil 1. Seçilen çalışma alanının Türkiye ve İstanbul içindeki konumu.

- **Taksiarhis Rum Ortodoks Kilisesi**

1600 yıllık bir geçmişi olduğu tahmin edilen, birçok kez tahrip olduğu ve tamir edildiği bilinen Taksiarhis Rum Ortodoks Kilisesi'nin günümüzdeki hali 1889'da inşa edilmiştir (Nayır, 1978) (Şekil 2 ve 3). Yapının kitabesinden Rum asıllı bir Osmanlı paşası olan Kostaki Musurus Paşa (1807-1891) tarafından yaptırıldığı okunmaktadır. Naosun güneyinde Musurus Paşa'ya ait bir aile kabristanı bulunur (Ayhan, 2013).



Şekil 2. Seçilen çalışma alanının Arnavutköy Mahallesi içindeki konumu. (URL-1)



Şekil 3. Taksiarhis Rum Ortodoks Kilisesi (URL-2)

- **Francalacı Caddesi**

Kilisenin sınırlarını güney yönünde belirleyen caddedir. Rakımı 11 metredir. Birçok işletmeye ev sahipliği yapmaktadır (Şekil 4).



Şekil 4. Francalacı Caddesi

- **Arnavutköy Dere Sokak**

Taksiarhis Rum Ortodoks Kilisesi'nin doğu sınırlarını belirleyen bu sokak tek yönlüdür. Trafik Arnavutköy Caddesi'nden Abdülhak Molla Sokak'a doğru akar (Şekil 5).



Şekil 5. Arnavutköy Dere Sokak

- **Abdülhak Molla Sokak**

Kuzey yöndeki bu sokak, kiliseyi çevreleyen sokaklar arasında en geniş olanıdır. Kilisenin karşısındaki cephede bir eğitim yapısı bulunur ve yapıya giriş bu sokaktan yapılır (Şekil 6).



Şekil 6. Abdülhak Molla Sokak

- **Satış Meydanı Sokak**

Kilisenin sınırlarını batı yönünde belirleyen sokaktır. Araç trafiği tek yönlü akmaktadır. Abdülhak Molla Sokak ile kesişim noktasında Kilise civarının yegâne kamusal sanat eseri olan bir heykel bulunur. Restoran, kafe ve dükkan yoğunluğu fazladır (Şekil 7).



Şekil 7. Satış Meydanı Sokak

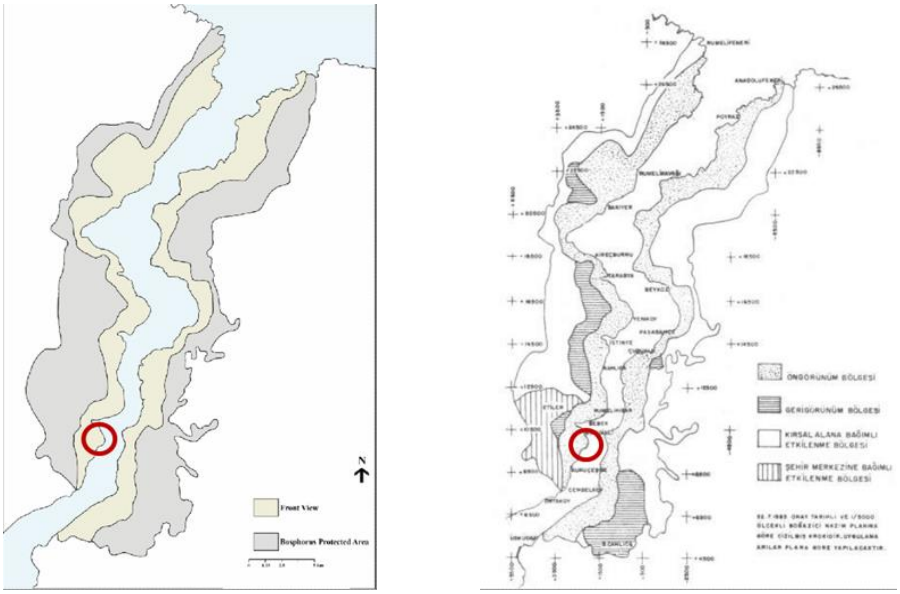
Beşiktaş-Arnavutköy Bölgesinin Tabi Olduğu Kanun ve Yönetmelikler

- **2863 Sayılı Kültür ve Tabiat Varlıklarını Koruma Kanunu (23.07.1983)**

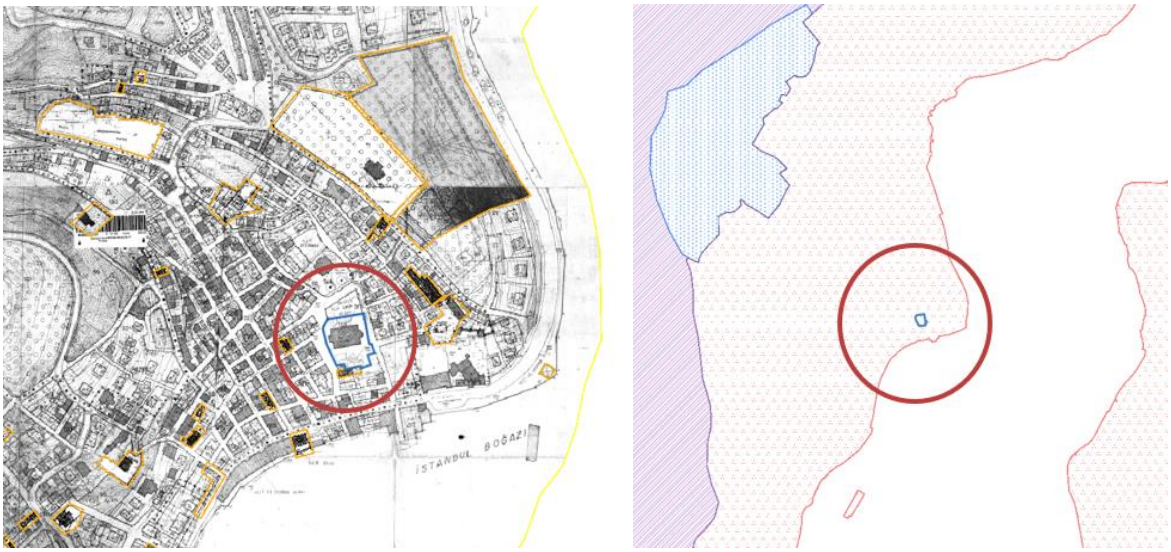
Bu Kanun, taşınır ve taşınmaz kültür ve tabiat varlıklarını, koruma alanlarını ve arkeolojik alanları belirlemeyi öngörür. Bunların yönetimi, korunması ve korunmasına ilişkin usul ve esasları ortaya koyar. Kanun ayrıca, gerçek ve tüzel kişilerin bu varlıklara ilişkin kamulaştırma kurallarının yanı sıra yükümlülük ve sorumluluklarını da ortaya koymaktadır. Kanun ayrıca araştırma, sondaj ve kazıları düzenleyen ilke ve prosedürleri de kapsamaktadır.

- **2960 sayılı Boğaziçi Kanun (18.11.1983)**

Bu yasa, kültürel mirasın ve doğal güzelliklerin kamu yararı açısından korunmasını ve Boğaz'daki inşaatın sınırlandırılmasını amaçlamaktadır. Bu kanun, orman arazileri, yeşil alanlar, şehir planlamasına ilişkin hükümlerin ortaya koymakla birlikte kültürel miras alanlarındaki yapılaşmaya yönelik kuralları belirlemektedir. Kanun kapsamında Boğaziçi bölgesi ön görünüm, geri görünüm ve etkilenme bölgelerine ayrılmıştır. Bu bölgelerin her biri için çeşitli ölçeklerde Koruma Amaçlı İmar planları hazırlanmıştır. Çalışma alanı Beşiktaş-Arnavutköy ön görünüm bölgesi olan tarihi ve doğal sit alanında kalmaktadır (Şekil 8). Ayrıca çevresinde çeşitli kademelerde tescilli yapılar bulunmaktadır (Şekil 9).



Şekil 8. Çalışma Alanının Boğaziçi Kanununa Göre Konumu. (2960 Sayılı Boğaziçi Kanunu, 1983)



Şekil 9. Çalışma Alanının Yer Aldığı 1/1000 Koruma Amaçlı İmar Planı (URL-3)

Ön görünüm bölgesindeki yapılaşma koşullarını belirleyen 1/1000 ölçekli Koruma amaçlı imar planında göre çalışma alanını kapsayan 106 nolu yapı adasında yeni yapılacak yapılara ilişkin kat yüksekliği plan kapsamında değerlendirilmek üzere, eski eser yapıların cephe mimarisi ve malzemesi ile uyum sağlayacak şekilde cephe şartı arandığı ve tüm projelerin bu kanunla belirlenen Anıtlar Bölge Kurulları onayından geçeceği belirtilmektedir. 2013 yılında onaylanan 1/1000 sahil şeridi ve öngörünüm bölgesi uygulama imar planı ve plan notlarında yeni yapılacak yapılara ilişkin bazı koşullar belirlenmiştir.

- **1/1000 Ölçekli Koruma Amaçlı İmar Planı (22.07.1983)**

1/1000 Ölçekli koruma amaçlı imar planı Ortaköy-Kuruçeşme-Arnavutköy bölgesi plan notlarında çalışma alanı olan kilise ve çevresindeki Francalacı Caddesi, Arnavutköy Dere Sokak, Abdülhak Molla Sokak ve Satış Meydanı Sokağının yer aldığı 106 nolu adaya ilişkin yapılaşma koşulları "*.....106-... adalarda yapılacak yeni inşaatlarda, planda verilen yükseklik sabit kalmak şartı ile çevresindeki tescilli eski eser ve öneri eski eser binaların cephe mimarisi ve malzemesi ile uyum sağlayacak şekilde cephe şartı aranacaktır. Projeleri Anıtlar Yüksek Kurulunun onayından geçecektir."* şeklinde belirtilmektedir.

- **1/1000 Boğaziçi Sahil Şeridi ve Öngörünüm Bölgesi Uygulama İmar Planı (04.06.2013)**

2013 yılında onaylanan 1/1000 sahil şeridi ve öngörünüm bölgesi uygulama imar planı ve plan notlarında da yeni yapılacak yapılara ilişkin bazı koşullar belirlenmiştir (Şekil 10). Bunlar, binalarda yapılabilecek çıkmalar, ayrık nizam yapılaşma, çatılar, bahçe duvarları ve yeşil doku ile ilgilidir.



Şekil 10. Çalışma Alanının Yer Aldığı 1/1000 Uygulama İmar Planı ve 1930 Anadolu ve Rumeli Ciheti Haritası (URL-3)

Plan notlarına göre, bitişik nizam yapılarda, (I) parsel dışına taşan hafriyat yapılmaması, (II) binaların açık ve kapalı çıkmalarının emsale dahil edilmesi, (III) kapalı çıkmaların 3.00 m., açık çıkmaların 2.00 metreden fazla komşu parsele yaklaşmaması, (IV) köy içlerinde geleneksel yapı düzeninin korunması amacı ile 6.00 m. genişliğine kadar olan yollarda 0.50

m. eninde, daha geniş olan yollarda 0.75 m. eninde açık ve kapalı çıkma yapılabileceği belirtilmektedir.

Korunması gerekli kültür varlıklarına bitişik tüm yapılanmalarda kapalı ve açık çıkmaların komşu mesafelerini korumak, imar hakkını geçmemek kaydıyla, eski eserin cephe özelliği dikkate alınarak ilgili Tabiat Varlıklarını Koruma Bölge Komisyonu ve ilgili Kültür Varlıklarını Koruma Kurulunca belirleneceği de belirtilmektedir.

Ayrık nizam yapılarda ise planda verilen imar haklarını geçmemek, komşu mesafeleri ihlal etmemek kaydıyla tek ve iki katlı ayrık nizam yapılaşmalarda, I) zemin katta ve buna bağlı normal katta yapılmasına müsaade edilen cephe hattı hareketi komşu parsele köy içlerinde 3.00 m.'den, diğer bölgelerde 6.00 m.'den daha fazla yaklaşamayacağı, II) bu hareketten doğan taban alanı, planla verilen taban alanından fazla olamayacağı, III) ön bahçe mesafesi 5.00 m.'den fazla olan bloklarda bu hareketle ön bahçe mesafesi 5.00 m.'nin altına düşürülemeyeceği belirtilmiştir.

Çatılara ilişkin, çatı meylinin saçak ucundan başlamak üzere en fazla %33 olacağı, teras çatı ve çekme katın yapılamayacağı, saçak genişliğinin en çok 1.00 m. yapılabileceği ve parapetli çatı yapılamayacağı, korunması gerekli kültür varlığına bitişik yapılaşmalarda çatı şekli, malzemesi ile çatı aralarıyla ilgili hususların Koruma Kurulu kararı ve eki proje ile belirleneceği belirtilmektedir.

Bahçe duvarları Boğaziçi dokusunun doğal parçası olduğundan, yüksekliği yol cephesinde 1.00 m., komşu parselde 1.50 m.'den fazla olmayan bahçe duvarı üzerine yapılan korkulukların perde dahil hiçbir örtü ile kapatılamayacağı ve tescilli yapılarla ilgili Tabiat Varlıklarını Koruma Bölge Komisyonu ve ilgili Kültür Varlıklarını Koruma Bölge Kurulu görüşü alındığı belirtilmektedir.

Mevcut yapılanmanın yeşil örtü ile kapatılmasının temini (görsel etkinin zenginleştirilmesi) amacıyla, parselin açık alanının her 25 m²'sinde ve kamuya açılan sosyal donatı alanları ve yol kenarındaki tretuvarlarda Orman Fakültesinden temin edilecek listeye göre ağaçlandırma yapılması gerektiği ve bu ağaçlar yerinde görülmedikçe iskan müsaadesi verilmeyeceği belirtilmektedir.

Belirtilen maddeler dışında yapılı çevre ve sokak bütünlüğüne etki edecek tüm müdahalelerin (zemin döşemeleri, kent mobilyaları, tabelalar vb.), Kültür Varlıklarını Koruma Bölge Kurullarının çalışmaları sonrasında tespit edilip onaylanacağı belirtilmektedir.

Bulgular

Alan çalışmamızda sokak manzarasını oluşturan unsurların ilgili kanun, yönetmelik ve plan notlarıyla belirlendiği görülmektedir.

Bahsedilen tüm kanun, yönetmelik ve plan notlarıyla korunan çalışma alanında, kilisenin etrafındaki unsurların sokak manzarasını nasıl etkilediği belirlenen parametreler kapsamında değerlendirilmiştir. Yapılı çevredeki yapı hizalarının, yapıların balkon ve veranda görünümlerinin tüm sokaklarda korunduğu; yapı yükseklikleri, yapıların mimari uyumu ve çatı görünümlerinin bazı sokaklarda korunduğu, bazı sokaklarda korunmadığı tespit edilmiştir (Tablo 1).

Tablo 1. Yapılı Çevreye Dair Tespitler

		Arnavutköy Dere Sokak	Abdülhak Molla Sokak	Satış Meydanı Sokak	Francalacı Caddesi
Yapılı Çevre	Yapı hizalarının korunumu	+	+	+	+
	Yapı yüksekliklerinin konumu	-	+	-	-
	Yapıların mimari uyumunun korunumu	-	+	-	-
	Yapıların çatı görünümlerinin korunumu	-	+	-	-
	Yapıların balkon ve veranda görünümlerinin korunması	-	+	-	-
	Bahçeler	-	+	-	-
	Yapıların bahçe duvarları ve korkuluklarının görünüm uyumunun korunumu	+	+	+	+
	Yapıların cephelerinin genel renk uyumunun korunması	-	+	+	-
	Yapılara eklenen güneş kontrol sistemleri (tente, pergola vb.)	-	-	+	+
	Trafolar	+	+	+	+
	Merdiven, rampalar ve araç park edilen alanlar	+	+	+	+

Plan notlarında belirtilmiş olan, tretuvarlarda ağaç dikme zorunluluğunu yerine getirmek adına, sokaklarda ağaçlar ve saksı bitkilerine yer verildiği görülmüştür (Tablo 2).

Tablo 2. Yeşil Alanlara Dair Tespitler

		Arnavutköy Dere Sk.	Abdülhak Molla Sk.	Satış Meydanı Sk.	Francalacı Cad.
Yeşil Alanlar	Ağaçlar	+	+	+	+
	Taşınabilir bitkiler (Saksı bitkileri)	+	+	+	+
	Yağmur bahçeleri	-	-	-	-

Aydınlatma elemanlarının tüm sokaklarda tarihi bölgeye uyumlu elemanlardan seçildiği gözlemlenmiştir (Tablo 3).

Tablo 3. Aydınlatma Elemanlarına Dair Tespitler

		Arnavutköy Dere Sk.	Abdülhak Molla Sk.	Satış Meydanı Sk.	Francalacı Cad.
Aydınlatma Elemanları	Araç yolları	+	+	+	+
	Bisiklet yolları	+	+	+	+
	Yaya kaldırımları	+	+	+	+

Benzer şekilde, zemin döşemelerinin tüm sokaklarda tarihi bölgeye uyumlu malzemelerden seçildiği tespit edilmiştir (Tablo 4).

Tablo 4. Zemin Döşemelerine Dair Tespitler

		Arnavutköy Dere Sk.	Abdülhak Molla Sk.	Satış Meydanı Sk.	Francalacı Cad.
Zemin Döşemeleri	Araç yolları	+	+	+	+
	Bisiklet yolları	-	-	-	-
	Yaya kaldırımları	+	+	+	+

Belirlenen kent mobilyalarından çöp kutularının tüm sokaklarda bulunmalarına rağmen tarihi dokuya uyumlu olmadıkları görülmektedir. Trafik güvenlik ekipmanları için de aynı durum geçerlidir. Yalnızca Abdülhak Molla Sokakta bir kamusal sanat eseri bulunduğu tespit edilmiş olup, bu eserin çevreyle uyumlu olduğu kanısına varılmıştır (Tablo 5).

Tablo 5. Kent Mobilyalarına Dair Tespitler

		Arnavutköy Dere Sk.	Abdülhak Molla Sk.	Satış Meydanı Sk.	Francalacı Cad.
Kent Mobilyaları	Banklar	-	-	-	-
	Çardak ve kamelyalar	-	-	-	-
	Bisiklet park yerleri	-	-	-	-
	Umumi tuvalet kabinleri	-	-	-	-
	Çeşmeler	-	-	-	-
	Güvenlik ve bekçi kulübeleri	-	-	-	-
	Otobüs ve taksi durakları	-	-	-	-
	Park sayaçları	-	-	-	-
	Trafik güvenlik ekipmanları (delinatörler/trafik dubaları)	+	-	+	-
	Çöp ve geri dönüşüm kutuları	+	+	+	+
	Kamusal sanat eserleri	-	+	-	-
	Yangın muslukları	-	+	-	-
	Otomatlar	-	-	-	-

Tüm sokaklarda işletme tabelalarının bulunduğu seçilmekte ancak tabelaların genellikle tarihi alanla uyumlu olmadığı görülmektedir (Tablo 6).

Tablo 6. Tabelalara Dair Tespitler

		Arnavutköy Dere Sk.	Abdülhak Molla Sk.	Satış Meydanı Sk.	Francalacı Cad.
Tabelalar	İşletme tabelaları	+	+	+	+
	Reklam panoları	-	-	-	-
	Trafik işareti ve levhaları	-	-	-	-

Tartışma

Elde edilen veriler ışığında, seçilen çalışma alanında sokak manzarasını oluşturan unsurların ilgili kanun yönetmelik ve plan notlarıyla büyük ölçüde korunduğu anlaşılmaktadır.

İlk olarak, yapılı çevreyi oluşturan unsurlardan bahçe duvarları ve korkuluklarının plan notlarında belirtilen kurallara uygun olacak şekilde yapıldığı görülmektedir. Bahçelerin bulunduğu sokaklarda bahçe mesafelerinin de plan notlarına ve eski yapı adası planlarına uygun olduğu görülmüştür. Ancak yapı cephelerinin genel renk uyumunun korunması ve yapılara eklenen güneş kontrol sistemlerinin (tente, pergola vb.) de çevreye uyumlu olması hususlarına bazı sokaklarda dikkat edilmediği tespit edilmiştir.

Plan notlarında belirtilmiş olan tretuvarlarda ağaç dikme zorunluluğuna uyulduğundan sokaklarda ağaçlar ve çeşitli boyutlarda taşınabilir saksı bitkilerinin olduğu görülmektedir.

Bahçe bulunan sokaklarda, bahçe aydınlatma elemanlarının genellikle tarihi bölgeye uyumlu elemanlardan seçildiği tespit edilmiştir.

Çöp ve geri dönüşüm kutuları gibi kent mobilyalarının tüm sokaklarda bulunmalarına rağmen tarihi dokuyla uyum içinde olmadıkları görülmektedir. Aynı durum trafik güvenlik ekipmanları için de geçerlidir. Sadece Abdülhak Molla Sokak'ta bir kamusal sanat eseri bulunduğu görülmüş olup, bu eser çevreyle uyumsuz bulunmamıştır. Araştırma konusu olan tüm sokaklarda çeşitli tabelalar bulunmakta olup, bunların çoğunun tarihi alana uygun olmadığı görülmektedir.

Tüm bu tespitler üzerine, sokak manzarasıyla ilgili belirlenen altı unsurdan altısını da ilgilendiren kanun ve yönetmelikler bulunduğu ve bunlarla uyum içinde kalındığı ölçüde sokak manzarasının tarihi yapıyla uyumlu olarak şekillendiği sonucuna varılmıştır. Araştırma hipotezi, tescilli miras yapılarının bağlı bulundukları kanun ve yönetmelikler sayesinde cephe karakterlerini muhafaza edebiliyor olmalarından ötürü çevrelerindeki sokak manzaralarını da doğrudan etkiliyor olduklarıydı. Elde edilen bulgular ışığında, bu hipotez doğrulanmıştır.

Sonuç ve Öneriler

Çalışma kapsamında sokak manzarasını oluşturan altı temel unsur belirlenmiş ve örnek çalışma alanında bu unsurlar ve alt unsurlarından hangilerinin mevcut olduğu tespit edilmiştir. Sonrasında ilgili kanun ve yönetmelikler sokak manzarasını oluşturan unsurlara göre taranmıştır. Sonuç olarak, belirlenen altı unsurdan altısını da ilgilendiren kanun ve yönetmelikler bulunduğu saptanmıştır. Bu kanun ve yönetmelikler sayesinde tekil bir miras

yapısının cephe karakterini muhafaza ettiği ve çevresindeki sokak manzaralarını da doğrudan etkilediği anlaşılmıştır.

Bu araştırma modeli, türlü örnek çalışma alanlarında yeniden denenebilir. Aynı çalışma alanının, şayet ilgili kanunlar yürürlüğe girmeden önceki haline erişilebilirse, geçmiş ve güncel durumu kıyaslanabilir; bu doğrultuda ilgili kanunların sokak manzarasını ne ölçüde değiştirdiğine dair yorumda bulunabilir.

Ek olarak, alanın, onu deneyimleyen kullanıcılar üzerinde bıraktığı etkilerin anlaşılabilmesi ve bu bulguların bu çalışmada elde edilen verilerle beraber okunabilmesi için yeni çalışmalar yapılabilir.

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The Effect of Demographic Traits on the Indoor and Outdoor Plant Tendencies of the People in the City of Çankırı-Türkiye

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Abstract

Increasing urbanization and construction in recent times has greatly increased the longing of urban people for nature. This increase has caused the urban people to demand more indoor and outdoor ornamental plants. It is important to know their plant preferences in order to meet the ornamental plant demand of the urban people. In this study, it was aimed to determine the indoor and outdoor ornamental plant preferences of the people in Çankırı and the effects of demographic traits on their plant tendencies. For this purpose, a face-to-face questionnaire was applied to 180 people in total. The majority of the participants was householder (78%) but did not have a house with a garden (81%). 55% of participants were aware of the public or private nurseries in Çankırı city. In the study, it was found out that 56% and 72% of participants had indoor plants in their house and did not have any plants in their balcony, respectively. If they had a house with garden, 61% of the participants stated that they would grow outdoor plants, 38% of them would prefer more fruit-bearing plants, and 19% of them plants with the function of noise reduction. If there was a hobby garden close to the city, 68% of participants reported that they would deal with the garden. Age, education and occupation had effects on having indoor plants in their house, having plants in their balcony, growing outdoor plants and the purpose of usage for outdoor plants. No demographic traits were effective on the question of whether you would like to deal with a garden if there was a hobby garden close to the city. When the results were considered as a whole, it was revealed that urban people did not have much knowledge about indoor and outdoor plants. For this reason, it would be beneficial to inform urban people about indoor and outdoor plants and also their crucial contributions to people and earth by the relevant institutions.

Keywords: Çankırı, indoor, outdoor, ornamental plant, demography.

Introduction

In recent years, the increasing construction in cities has increased the need of urban people for green spaces. In this sense, both indoor and outdoor ornamental plants are important functional materials for urban people. Thanks to these plants, people satisfy their longing for green texture to some extent.

Indoor and outdoor plants provide food, fiber, building material, fuel, and pharmaceuticals and also result in imperceptible benefits for human being, such as improving our health. Indoor plants physically present healthier air for us to breathe. They decrease stress, and increase pain tolerance and productivity in people (Lohr, 2010). Indoor and outdoor plants also provide aesthetic environments to people (Akça, 2021).

Indoor and outdoor ornamental plants should be used in landscape designs by considering the design criteria, ecological demands, aesthetic and functional traits of the plants (Sezen et al., 2017). As considered these principles, it clearly reveals to be extremely important to determine the trends of people towards indoor and outdoor plants and the effects of demographic effects on these trends. Recently, in addition to researches exploring people's plant preferences in their home gardens (Surat & Yaman, 2017; Kaya et al., 2018; Yücedağ et al., 2018; Yücedağ et al., 2019;) and their indoor and outdoor plant preferences (Aslan et al., 2013; Taşçıoğlu & Kuzucu, 2019; Yazıcı, 2020; Akça, 2021), there are studies evaluating only the plant preferences of elders (Tarakci Eren, 2020), an office (Selim et al., 2020), a parking lot (Selim, 2021a) or a hotel (Selim, 2021b). The purposes of this study are (1) to determine the indoor and outdoor ornamental plant preferences of the people in Çankırı and (2) to reveal the effects of demographic traits on their plant preferences.

Materials and Methods

The study was carried out in Çankırı, located in the north of Central Anatolia, in the transition zone of Central Anatolia and Western Black Sea Regions. The city is adjacent to Çorum in the east, Bolu in the west, Kastamonu and Karabük in the north, Ankara and Kırıkkale in the south (URL-1, 2022; Figure 1). It has a population of 196515 as from 2021.



Figure 1. Location of the study area

Data are provided from 180 participants in 2018 via a face-to-face questionnaire. The questionnaire includes the questions regarding demography (gender, age, marital status, education, occupation and income) of participants, their ownership for home with garden and their indoor and outdoor plant tendencies.

Firstly, data were run frequency analysis. In addition, as the data did not show a normal distribution, non-parametric Kruskal Wallis H test was used to determine whether the averages of some variables were equal in terms of demographic traits. All statistical analyses were performed by SPSS program.

Findings and Discussion

The numbers of female and married participants were 109 and 103, respectively. Most participants (96) were 15 to 35 years old. 72 participants had high school degree. Participants were distributed among other occupations at similar rate apart from farmer, unemployed and retired. The majority of participants (101) had a house income between 1001 and 3000 Turkish Liras (Table 1).

Table 1. Demographic traits of participants

Gender	**f**	**Marital Status**	**f**
Female	109	Married	103
Male	71	Single	77
Income (TL)		**Age**	
1000 and below	33	15-25	58
1001 - 3000	101	26-35	38
3001 - 5000	42	36-45	27
5001 and over	4	46-55	44
Occupation		56 and over	13
Officer	26	**Education**	
Self-employment	29	Illiterate	3
Unemployed	11	Literate	3
Farmer	2	Primary School	22
Retired	13	High School	72
Worker	34	Associate Degree	41
Student	32	Bachelor Degree	38
House wife	30	Graduate	1

The majority of the participants was householder (78%) but did not have a house with a garden (81%). 16% out of participants having house with a garden (19%) has detached house (Figure 2).

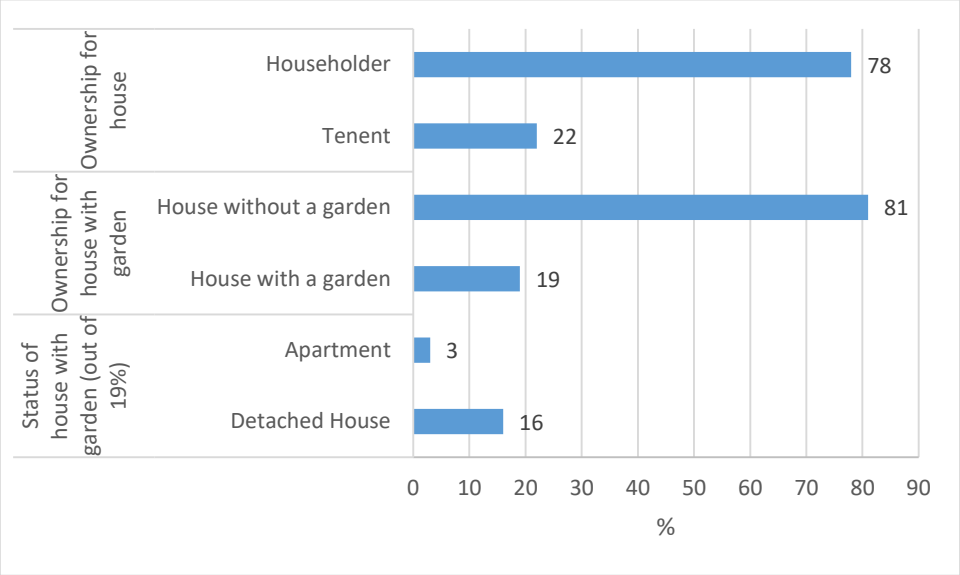


Figure 2. Ownership for home with garden of participants

55% of participants were aware of the public or private nurseries in Çankırı city. According to Figure 3, 56% and 72% of participants had plant in their balcony and indoor plant in their house, respectively. If they had a house with a garden, 61% of the participants stated that they would use outdoor plant.

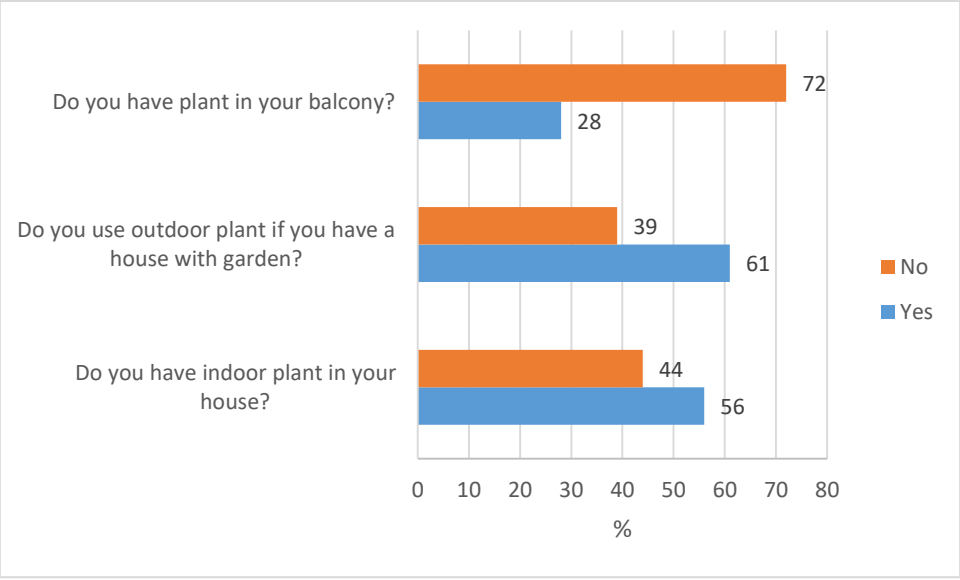


Figure 3. Plant tendencies of participants

38% of them would prefer more fruit-bearing plants and 19% of them would prefer plants with the purpose of noise reduction (Figure 4). In contrast to the results of the present study, studies conducted in Antalya (Kaya et al., 2018) and in Burdur (Yücedağ et al., 2019) reported that participants mostly preferred the shade purpose of trees. It was stressed that in

addition to other traits the fruit-bearing trait of the plants is also prominent in terms of usage preferences in the landscape (Acar & Sarı, 2010).

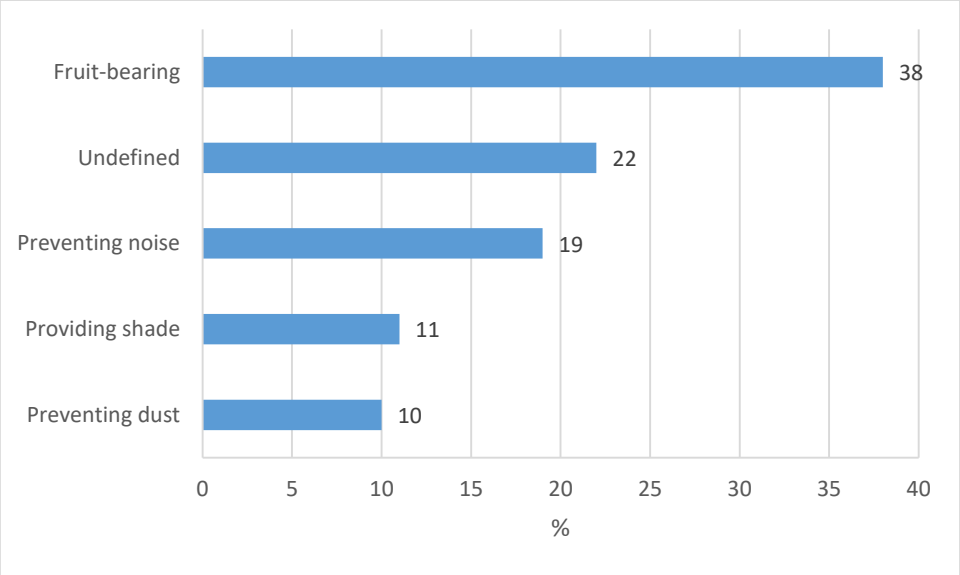


Figure 4. The purpose of usage for outdoor plant

In addition, if there was a hobby garden close to the city, 68% of participants reported that they would deal with the garden (Table 2). Similarly, Yücedağ et al. (2018), exploring the outdoor plant preferences of the city residents in Alanya, found that participants wanted to deal with garden in case of an opportunity in and near city.

Age, education and occupation had effects on having indoor plant in your house, having plant in your balcony, using outdoor plant and the purpose of usage for outdoor plants ($p<0.05$, Table 2). Accordingly, officer and self-employment participants graduated from high and vocational schools between the ages of 15-35 and 46-55 stated that they had indoor plants in their homes. In a study (Akça, 2021), investigating the consumption trends and purchasing behaviors of indoor ornamental plants in Zonguldak, reported that largely participants with the aged 31-45 preferred indoor plants. Different results of these two studies was related to the accumulation in the age profile of the studies. In another study (Sezen et al., 2017), 72% of participants in Erzurum stated that the use of indoor plants was necessary.

Workers mostly had plants in their balcony. Officer, self-employment and worker participants graduated from education levels between primary school and graduate between the ages of 15-35 and 46-55 indicated that we would like to use outdoor plants if we had a house with garden (Table 2). However, Yazıcı (2020) reported that the occupational groups preferring indoor ornamental plants the most and the least in Tokat were students and workers, respectively.

Officer, student and house wife graduated from education levels between high school and bachelor between the ages of 36-45 mainly preferred fruit-bearing as a purpose of usage for outdoor plants (Table 2). Selim et al. (2020) found that the income status, gender, the units (vocational training) of the participants significantly affected the keeping indoor plants in the offices in Akdeniz University.

Table 2. The effects of age, education and occupation on some plant tendencies of participants

Variable		Having indoor plant in your house	Having plant in your balcony	Using outdoor plant if you have a house with garden.	Purpose of usage for outdoor plants
Age	X^2	26.379	21.448	19.707	44.619
	sd	8	8	8	8
	p	**0.001****	**0.006****	**0.012***	**0.001****
Education	X^2	27.493	31.869	25.727	52.419
	sd	6	6	6	6
	p	**0.007****	**0.001****	**0.012***	**0.007****
Occupation	X^2	36.683	48.363	51.129	73.729
	sd	7	7	7	7
	p	**0.002****	**0.000*****	**0.000*****	**0.001****

*: 0.05, **: 0.01, ***: 0.001

Conclusion and Recommendations

About half of the participants had no knowledge about the public or private nurseries in Çankırı city. For this reason, it would be beneficial to inform urban people about nurseries providing indoor and outdoor plants by the relevant institutions. In addition, how important plants are for humans and the earth through their invaluable functions should be explained. Thus, urban people will be encouraged to grow or own indoor and outdoor plants.

Most of the participants did not have a house with a garden. But a satisfactory result from the present study is that more than half of the participants would like to deal with a garden and also grow outdoor plants if they have a hobby garden close to the city or a house with garden. If people are informed about the significant contribution of plants to human health, the number of people who want to grow plants will increase even more. Recently, scientific studies on the effects of plants or green tissue on human health have undoubtedly presented crucial contributions to this issue.

Age, education and occupation had effects on having indoor plant in your house, having plant in your balcony, using outdoor plant and the purpose of usage for outdoor plants. It was stated by some occupational groups that if they have a house with a garden, they will grow outdoor plants, and by some occupational groups that they prefer fruit-bearing plants. Considering this result, the information activity and content should be arranged according to the type of occupation, age and education level.

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Evaluation of Tree Species Diversity of Kılavuzlu Park (Kahramanmaraş, Turkey)

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Abstract

Since Turkey is situated at the intersection of three phytogeographical regions -Euro-Siberia, the Mediterranean, and Irano-Turanian- and serves as a bridge between two continents, it has experienced rapid changes in climate and geographic features, turning it into a small continent in terms of biodiversity. There are 12,000 plant species in Turkey alone, compared to 15,500 gymnosperm and angiosperm species across the entirety of Europe. About one-third of 12,000 plant species are endemic to Turkey. Turkey is home to 5 micro gene centers, which are the origin or diversity centers of most plant species. These gene centers offer very crucial genetic resources for the sustainability of many plant species. The world pays close attention to the growing negative effects of biodiversity loss, and efforts are made to find solutions to lessen these effects. Conservation techniques like in-situ and ex-situ are utilized to shield biodiversity from these harmful factors. One of these techniques is the usage of native plant species in man-made urban open-green spaces. The characteristics of plants that will be chosen for planting are great adaptability, low cost, minimal maintenance, and high disease and pest resistance. These characteristics increase the possibilities for using native plants to create more sustainable landscapes. Despite Turkey's rich plant diversity, it is clear that imported exotic plant species are used more frequently than native plant species, particularly in urban open-green spaces. Although exotic species have high requirements for maintenance, these costs can be ignored mostly due to aesthetic concerns in urban areas. However, due to factors like high cost, invasiveness, vulnerability to diseases and pests, and distorting the urban identity, the usage of exotic plants should be restricted. In this study, the tree species in Kılavuzlu Park (Kahramanmaraş) were evaluated. It was established which plant species were used in the park and if they were considered native or exotic. With this study, the advantages of native plant species were revealed, and it was emphasized that native plant species should be used as an alternative to plants that are frequently preferred for aesthetic and functional use in landscape studies.

Keywords: Exotic plants, native plants, sustainability, conservation, landscape

Introduction

Biodiversity is the legacy of millions of years of evolution. Human beings have many negative effects on this ecological heritage. As a matter of fact, the number of species that have disappeared in the last 200 years has been much higher than 65 million years ago (Uslu & Shakouri, 2013).

Turkey is in an important position in terms of biological diversity as a result of rapid changes in climate and geographical characteristics, as it is located at the intersection of three phytogeographic regions, Euro-Siberia, the Mediterranean, and Irano-Turanian, and is a bridge between two continents. Turkey's plant richness is revealed by the fact that one-third of more than 12,000 plant where in turkey that species are endemic. Although endemic species are spread throughout the country, they are concentrated in some areas throughout the

country, being dominant in the mountainous parts of Southern and Southeastern Anatolia. The highest endemic species are seen in Iran-Turanian Region and Mediterranean Region. (Tan, 2010). In addition, in its historical development, Turkey's being on the migration routes and hosting many civilizations played an important role in the increase of plant diversity and richness and in the enrichment of gene resources. However, in parallel with the rapid population growth and industrialization, as in the whole world, biodiversity and natural resources have been significantly destroyed as a result of unsustainable uses (Demir, 2013.) All these problems have also increased the pressure on plants, and many species have become endangered. As a result of the development of agriculture and the increase in industrialization, new conditions have emerged. The habitats of plants are fragmented, creating new barriers and more isolated units that limit the natural spread of plants (Öztürk et all., 2002; Avcı, 2012) According to IUCN, the factors affecting biodiversity are habitat loss and fragmentation, invasive-exotic species, pollution, climate change, excessive use, rapid population growth (Selim et al., 2015).

The preservation of biodiversity has come to the fore-front of conservation policy world-wide, following the adoption of the Biodiversity Convention at Rio in June 1992 (Hanley et all., 1995) In order to minimize the increasing negative effects of biodiversity loss, solutions are tried to be produced with conservation methods such as in-situ and ex-situ. The human factor plays a role directly or indirectly at the beginning of the reasons that reduce biological diversity in the world and affect it negatively. Regardless of the origin of the causes that reduce biological wealth, it is the common responsibility of all humanity to protect, effectively manage and sustainably use it (Çelik, 2017).

The cultural areas that people need and the open and green areas that allow wildlife form the natural and cultural structures of cities. Urban areas are not yet devoid of biological richness (Araújo, 2003). However, the fact that anthropogenic pressures progress faster than the rate of renewal of the natural environment puts intense pressure on this biological wealth and reduces the number of species. Therefore, biodiversity is at risk on a global scale due to changes in land use status as a result of human activities (Hilty et al., 2006). This situation poses a greater risk especially in urban areas where habitat fragmentation is intense. In addition, the expansion of urban areas endangers the biodiversity in the urban periphery (Gordon et al., 2009; Selim et. al., 2015)

Urban areas have a very complex structure (Pickett et al., 2001) Open-green areas play a role in protecting and sustaining biodiversity in urban areas. Despite Turkey's rich plant diversity, it is seen that exotic species brought from foreign countries are used more widely than native plant species, especially in urban open-green areas. Exotic plant species used in open green areas with aesthetic concerns should be limited due to reasons such as high cost, invasiveness, susceptibility to diseases and pests, and disrupting the urban identity. It is expected that the adaptation abilities of the species used in planting studies will be high. Plants that achieve these conditions are native species. Expanding the use of local species will create sustainable landscapes.

The aim of this study is to determine the usage percentages of native and exotic tree species in urban parks, which constitute a large part of urban open green spaces. It is to reveal the disadvantages of exotic species used for aesthetic purposes in urban parks and to highlight the advantages of native species in order to become an aesthetic and functional alternative to use in landscape applications.

Material and Method

Kılavuzlu City Park in Kahramanmaraş Onikişubat district and the tree species in this park were chosen as the study material (Figure 1). The reason for choosing this area is that it is a heavily used area, known for its proximity to the city center, and it also contains tree species in quantity and quality that can set an example in terms of plant uses.

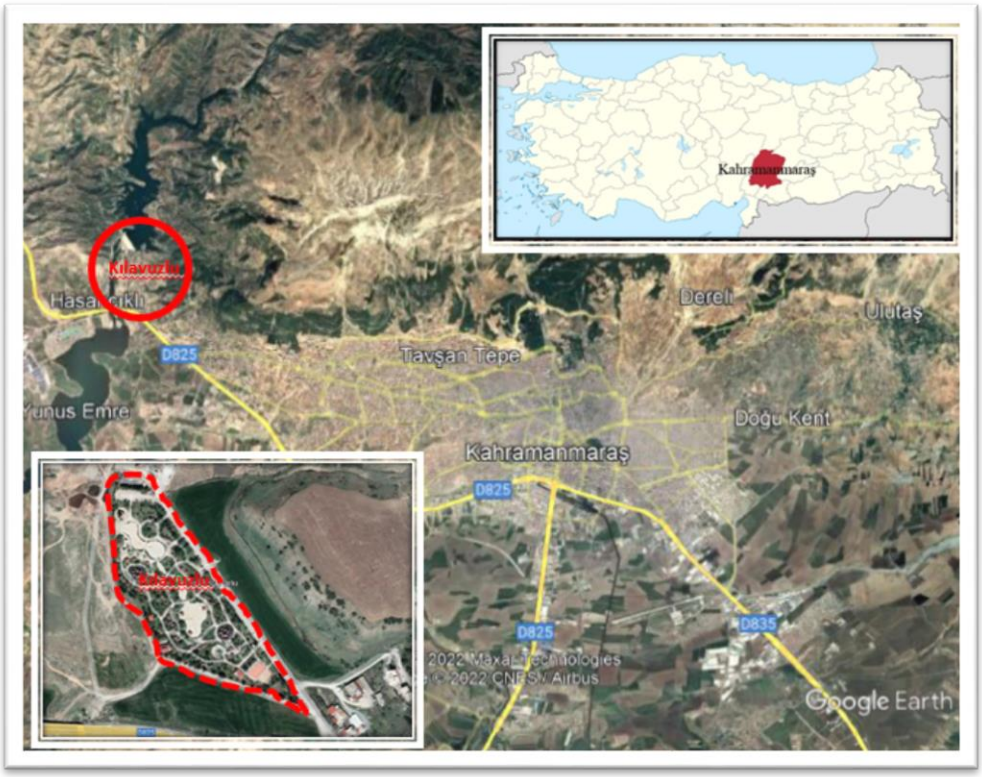


Figure 1. The Location of Kılavuzlu City Park

The method was carried out in 3 stages. These are;

1- Literature review and data collection

2- Species identification with land inventory study

3- Evaluation and synthesis of data

In the first stage of the study, literature information about the study was collected and a land inventory form was prepared for the inventory of trees in the study area (Table 1). Then, the species identification and percentage ratios of the trees in the area were determined. The native and exotic species status of the trees whose species were determined were marked in the form.

Table 1. Tree inventory information form

Tree Specie	Number of Trees	Percentage of Trees	Native/Exotic
Xxxx xxxx	X	%x	Native
Yyyy yyy	Y	%y	Exotic
…….	…	…	….

Findings

It has been determined that approximately 50% of the species used in the study area are exotic species, and 362 species are native and 136 species are exotic species in terms of the number of trees. When the study area is examined, it has been determined that although the native

species are generally used around the area and in the borders, mostly exotic species are used in groups or solitary in plant compositions.

The most used plants among exotic species; 31 *Sophora japonica* L. and 14 *Ligustrum japonica* Thund, usually on the side of the pedestrian roads.It has been determined that there are 17 *Lagerstroemia indica* L. which are generally used solitarily. Among the local species, the most used plants are; 95 *Cupressus sempervirens* var. *horizontalis*, mostly on the side of pedestrian roads, and 61 *Fraxinus excelcior* L. It has been determined that there are 38 *Platanus orientalis* L., which are generally used for shade providing or on the side of the pedestrian road (Table 2.)

Table 2. Study area tree species distributions

No	Plant Species	Number of Tree	%	Native/Exotic
1	*Acer platanoides* L.	3	0,61	Native
2	*Acer negundo* L.	35	7,09	Native
3	*Acer negundo* var. *flamingo*	2	0,40	Exotic
4	*Aesculus hippocastanum L.*	11	2,23	Exotic
5	*Albizia julibrissin* Durazz.	7	1,42	Exotic
6	*Cedrus libani* L.	6	1,21	Native
7	*Cercis siliquastrum* L.	6	1,21	Native
8	*Cupressocyparis leylandii*	3	0,61	Exotic
9	*Cupressus arizonica* Greene var. *glauca*	10	2,02	Exotic
10	*Cupressus macrocarpa* 'Goldcrest'	5	1,01	Exotic
11	*Cupressus sempervirens* var. *horizontalis*	95	19,23	Native
12	*Elaeagnus angustifolia* L.	1	0,20	Native
13	*Fraxinus excelcior* L.	61	12,35	Native
14	*Catalpa bignoniodies* Scop.	5	1,01	Exotic
15	*Lagerstroemia indica* L.	17	3,44	Exotic
16	*Ligustrum japonica* Thund.	14	2,83	Exotic
17	*Magnolia grandiflora* L.	2	0,40	Exotic
18	*Malus x purpurea* Rehd.	9	1,82	Exotic
19	*Melia azederach* L.	4	0,81	Exotic
20	*Morus nigra* L.	2	0,40	Native
21	*Picea abies* (L.) Karst.	3	0,61	Exotic
22	*Pinus brutia* Ten.	13	2,63	Native
23	*Pinus nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe	4	0,81	Native
24	*Pinus pinea* L.	3	0,61	Native
25	*Platanus orientalis* L.	38	7,69	Native
26	*Prunus cerasifera* Ehrh. var. *atropurpurea*	10	2,02	Native
27	*Prunus serrulata* var. *kanzan*	6	1,21	Native
28	*Robinia pseudoacacia* L.	44	8,91	Native*
29	*Robinia pseudoacacia* var. *umbraculifera*	12	2,43	Exotic
30	*Sophora japonica* L.	31	6,28	Exotic
31	*Sophora japonica* var. *pendula*	1	0,20	Exotic
32	*Tilia tomentosa* Moench.	8	1,62	Native
33	*Ulmus glabra* Huds.	23	4,66	Native
	TOTAL	494	100,00	

*Naturalized exotic species

Conclusion and Recommendations

As a result of this study, the tree species in the Kılavuzlu Park in Kahramanmaraş Onikişubat district were evaluated. Although the number of exotic species is less in plantations, it has been observed that they are used equally with native species on the basis of species. The economically less costly native species were often used in large numbers at the less aesthetically effective points of the site. In regions with plant compositions for aesthetic purposes, exotic species are generally planted.

Existing plant species are in danger of extinction at an alarming rate. Today, many plant species are disappearing only as a result of human activities. On the other hand, the use of cultivated and exotic species has also become widespread. This puts a strong pressure on local species.

Plant diversity forms the basis of nature. Plants can convert solar energy into energy through photosynthesis. In addition to the use of many plant species in nature as a resource to meet the basic life needs of people, thousands of plant species are used for functional or aesthetic purposes in many urban and non-urban areas.

However, the human factor negatively affects the life of all kinds of plants, especially native species. Among the factors that threaten human-made plants, there are many factors such as industrialization and urbanization, expansion of agricultural areas and overgrazing, tourism, collection from nature for export and domestic use, agricultural struggle and pollution, unconscious afforestation and fire.

In addition to all these problems, planting applications alone are not sufficient for the protection and sustainability of plant species. An understanding of in-situ and ex-situ conservation should be adopted in order to maintain the existence of existing plants and to prevent the danger of extinction. Priority should be given to the use of the right species in the right place. It is necessary not to think of plants as only oxygen producing and aesthetically effective creatures, but to adopt the understanding that plants are carbon sinks in preventing climate change.

The importance of native species should be emphasized and supported in planting studies. As a matter of fact, local species have many features such as more resistant to diseases and pests than exotic species, adaptation is high and adaptation processes are faster, low maintenance costs, easily available and economical, water usage requirements are lower, effective in creating and preserving local identity, higher rates of biomass and carbon storage due to

higher adaptability, faster development and longer lifespan, less requirements for fertilizer and biocide use, preventing erosion due to more efficient root development, supporting natural habitat and protecting and enhancing biodiversity.

Exotic species have had many negative effects such as; suppressing native species and creating an invasive species effect, consuming more water, more costly, facilitating the transportation of new diseases and pests, damage to the ecosystem cycle, cause local identity corruption, not sustainable, high maintenance costs.

Plants, which are the most important natural resources, are of vital importance for the survival of the world's life and existence. It should not be forgotten that protecting the existing vegetation, planting the right plant in the right place, giving importance to native species, making the right planning and management of the planting process and ensuring ecological sustainability are very important factors.

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Trees in Ritual Landscape and Their Roles

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Abstract

The existence of the tree in the universe is older than man. Since ancient times, people have believed that the tree is a living being. In the belief system in which the sanctity attributed to different elements of nature belonging to the cultural structure gains value, the tree is an important basic element that shapes life. In ancient civilizations, the sanctity attributed to various elements of nature and the tree in them was generally in the form of worshiping it and considering it sacred. It can be seen with the difference that each ethnic group considers a tree sacred. At that time, the mystical-religious attachment to various elements of nature created "rituals". Ritual defines a social phenomenon that is transmitted from the past to the present, continuing with social participation, expressed practically, verbally, in a symbolic language and with standard rhythmic movements. The necessity of making vital elements meaningful and sanctifying, understanding and representing the world and its phenomena, and ensuring cultural and identity stability are among the reasons for the formation of rituals and ritual landscapes. Many different roles have been given to the tree over the centuries in world cultures. In this study, he focused on the tree species, their meanings and uses in the ritual landscape, which is a part of the cultural landscape. It is thought that the identification of trees, which are the most effective elements of the elements of nature in the ritual landscape, and the transfer of this information to future generations are important in terms of keeping the cultural values alive.

Keywords: Ritual landscape, cult trees, cultural landscape.

Introduction

Cultural landscape formed by the interaction of culture and nature; trees, mountains, rivers, forests, valleys, plains, etc. are areas shaped by agricultural activities. Local architectural productions, rituals, structures, daily life traditions, languages, etc. tangible and intangible elements are considered as sub-expansions of this identity.

Since ancient times, people have believed that the tree is a living being. In the belief system in which the sanctity attributed to different elements of nature belonging to the cultural structure gains value, the tree is a valuable basic element that shapes life. In ancient civilizations, the sanctity attributed to various elements of nature and the tree in them was generally in the form of worshiping it. At that time, religious-mystical attachment to various nature elements formed “cults”. It can be seen with the difference that each ethnic group considers a tree sacred.

It is known that the ritual is closely related to faith, religion and culture. However, it is also said that the ritual is related to the place where the society lives and the characteristics of the place. A ritual landscape is a combination of place, event, and spectacle where its visual aspect is stronger than any other type of landscape. In the ritual context, "watching" and

"participating" are essential, while the actors in the ritual scene are people (Abarghouei Fard, 2021). Everyday landscapes and the rituals involved in this context are a valuable part of the daily space; reflects the past and the labor of the individuals who created that landscape. It provides important contributions to the creation of spatial identity by feeding from the narratives about the space. (Erbaş Gürler & Özer, 2012).

Ritual Landscape

Emerging in British archaeology in the early 1980s, the concept of 'ritual landscape' has been separated from the more traditional study of monuments and sites related to classification, dating and political districts. It relates to extensive 'sacred' places that seem to have been dedicated to ceremonial purposes by an ascendant ritual authority in the Neolithic and early Bronze Age (ca. 3500-1800 BC) (James, 1986). Physical manifestation is man's attempts to protect them. The landscapes formed as a result of this event are called "ritual landscapes" (Khorramrouei and Mahan, 2021).

According to Khorramrouei et al. (2019), the ritual landscape is initially shaped in the context of nature; because nature is the basis and creator of the elements that make up religion. Mokhles et al. (2013) stated in their study that ritual landscapes in most religions are determined in close relationship with geographical features, natural features of the environment and nature. According to this; Mountains, water and trees, visiting places established next to these three elements are among the three sacred elements of nature and thus reveal the positive qualities of the environment.

The ritual landscapes that can be seen in different regions are the sacred tree, its buildings and sacred mountains, as well as some churches, mosques, tombs and shrines located next to rivers and fountains in the heart of nature, are examples of rituals and cultural naturalism (Abarghouei Fard, 2021). Various practices in tree-related beliefs and tree-based rituals are embedded in folk culture in ritual landscapes.

According to Karakaş (2014); In fact, the tree, which is an ordinary element of nature, has turned into an extraordinary existence in the minds of primitive people with its hollow protecting it from the cold, its shadow preventing the heat, and its nourishing fruit. The myths about the tree in the mythologies of the world are verbal expressions that emerged from the search for meaning of the nature. As a matter of fact, trees such as olive, laurel, juniper, oak and beech were considered sacred in mythology.

The evergreen cypress symbolizes the tree of life, which is the image of the immortal paradise. In pre-Islamic Iranian mythology, one of the most sacred trees was the cypress tree. Zarathustra planted two cypresses with his hands in Kashmar and Tous. According to the famous historian Xenophon, the Achaemenid kings who planted the cedar plant were proud of their hands. For this reason, the cypress tree, which is a ritual tree, is found in the relief figures in Taht-ı Cemşid. Buddha means to associate the evergreen cypress tree with the concept of heaven, which has the same characteristics that symbolize eternal life and immortal soul (Hikmeti, 1987; Purmand & Koshtgarghallati, 2009; Mirzaei, 2012).

For example, a tree such as a date palm is sacred to the people of Egypt, Mesopotamia, and the Arabian Peninsula, or a tree such as an olive tree is sacred to the people of the Mediterranean. Iranians have a special respect for the tree for millennia, and in their culture and beliefs, the tree has been the symbol of paradise. For this reason, it is possible to see many tree names, symbols and examples in the poems of Iranian poets.

Rituals and Holy Trees

The sacred tree derives its sanctity from a recent miraculous event or an important figure associated with it—real or mythological. Sacred trees are known in many cultures, including the ancient Near East, Africa, Europe and the Far East. In these distant civilizations, a cult of sacred trees with similar characteristics developed independently of each other. Essentially, this is the sanctification of large trees, which usually do not bear fruit, together with their places (Lissovsky, 2004).

Trees considered sacred, used in various outdoor rituals, have certain characteristics. For a tree to be considered sacred, it must have at least one of these characteristics (Bars, 2014). These features are as follows according to Ergun (2000):

1. It should be in a single tree state.
2. It should be a tree that never sheds or sheds its leaves in summer or winter.
3. It should be more majestic, taller and more ostentatious than the trees around it.
3. It must be fruitless.
4. It must be older than the trees around it.
5. It should be large and provide shade.

Various roles have been given to the tree in different cultures over the centuries: According to Bars (2014), "cosmic trees such as the world tree, the tree of life, as a means of communication with God, in rituals to expel evil spirits, in rituals of directing natural events,

in ceremonies to prevent or delay the sunset. Trees are frequently used in rituals related to preventing a lunar eclipse or rescuing the eclipse, rain-making ceremonies, wind blowing or stopping ceremonies, burial ceremonies, seasonal ceremonies within the scope of increasing fertility" (Ergun, 2004). However, the trees planted in the graves today are another sign of the importance attributed to the tree, that one or more of them have reached the present day in the course of time.

The monument to the martyred soldiers of the Egoz Commandos, located on a hill on the slope of Mount Hermon (on the Lebanese-Syrian border), can be found in the Galilee and Golan Heights, with sacred trees. It is possible to see the oak grove when visiting the tomb of Sheikh Othman al-Hazury, which is sacred to the Druze. The grove consists of 73 imposing, centuries-old oak trees. The largest is a canopy with a diameter of 4,40 m and a span of 10 m on the trunk and is about 400 years old. Due to the sanctity of the place, it is strictly forbidden to damage trees or even prune dead branches (Lissovsky, 2020), (Fig. 1).



Figure 1. Muslim tombs under Bashan oaks (Wilson, Picturesque Palestine, 1881).

In the old Turkish civilization, the tree and the love of trees were highly valued. These trees include juniper, pine, beech, plane tree, mulberry, mountain cypress, poplar, oak and willow (Ergun, 2004). The literature also supports that such lofty and lonely trees are considered sacred (Işık, 2004; Selçuk, 2004). Demanding a child by tying a cloth to the tree and praying on behalf of the parents in the tombs of awliya is a phenomenon left over from the shamanic periods. According to the belief that it is possible to get pregnant thanks to the ritual performed around the tree, it is also found in Turkish communities outside Anatolia (Bars, 2014).

Beliefs that some trees are sacred in Turkey are also common in Eastern Anatolia. Alevis living in Adıyaman, Elazığ, Siirt and Tunceli provinces bless juniper and oak trees. In certain

periods of the year, people wear their most beautiful clothes, women and men visit these trees in groups accompanied by hymns, make votive offerings, cut sacrifices and tie wish cloths to the trees (Bars, 2014).

Siirt is one of the most visited cities of the holy places in Turkey. The "tree", which has a meaningful place in mythologies with symbolic designs such as "tree of life" and "universe tree", constitutes the main theme of rituals specific to tombs in various levels of Siirt folk culture. The rituals that take place in the sanctuaries in the Siirt region, where women who cannot get pregnant apply, continue today. The life stories of those who became pregnant as a result of the tomb-tree duo are reproduced by telling them (Bars, 2014).

The tree, which is thought to belong to a great person named "Ser Zer" in Yukarıbalcılar village of "Pervari' district of Siirt and is called "Dara Ser Zer", is used for ailments that modern medicine cannot cure. Dara Ser Zer is a frequent destination for patients today. The patients go to the area where the tree is and pray and sacrifice. They then go around the tree and pluck the dried branches of the tree and put them in their pockets. Visitors must leave without turning their backs on the tree. Again, the ritual of sleeping under the tree is a practice for children. Babies who cry constantly are taken under the tree at the head of the "Sheikh Gırdi" cemetery in Yayabağlar town and they are tried to be put to sleep under the tree. Sleeping under the tree means that the child will not cry again (Karakaş, 2014).

Every year, on September 24, in order to meet wishes in Büyükada, Istanbul, many local and foreign people climb the 202-meter-high hill where the Hagia Yorgi Church is located. Those walking on this road continue on their way by connecting the ropes on the reel to the branches of the existing trees (Anonymous, 2022b).

Some Ritual Landscape with Trees

In the development of human history, tree cult as a belief and rituals in this context, although they contain diversity and differences in their own structure, the continuation and reflection of each other with their similar aspects to the present shows the strong presence of an integrative feature in the essence of these cultural values. In this direction, various rituals related to different trees in different regions of the world are given below:

- Palms are used in various ways in Africa that involve a ritual content or procedure. It is impossible to understand the meaning and use of palm trees in African healing without seeing these uses as part of general cultural systems where healing techniques cannot be restricted to bio-physical ailments or ideas of intervention (Gruca et al., 2014). Palm trees have played a

protective role in Zambia. Palm leaves were used in various ceremonies, rituals and religious festivals.

- In Kenya, skirts made of palm leaves were used at festive occasions by masked Poro dancers and Mwila women. Leaves of Hyphaene petersiana have been used to prepare bridal hats in Ovambo, Namibia (Rodin, 1985). Today, the leaves of Phoenix reclinata are used for ceremonial and religious purposes in Uganda (Katende et al., 1999).

- The Betsimisaraka people of Madagascar use Dypsis pinnatifrons leaves to decorate their churches. The leaves of Raphia farinifera are used to make crosses and are burned as incense in the church (Burkill, 1997). In Madagascar, Cocos nucifera and Dypsis canaliculata are still planted in sacred places by the Betsimisaraka people (Byg & Balslev, 2001).

-The traditional Nyialang honey-gathering ritual is performed by most Malay communities in Indonesia's Jambi Province. The Niyalang ritual is the process of extracting honey from wild beehives in sialang trees in the forest, led by a honey collector (Jaspan, 1967). They are performed at certain times and in a certain way, and they are all based on the myth of the origin of honey (Bascom, 1984: Malinowski, 1984: Gaster, 1984). Sialang, in the Malay Peninsula, "Tualang" or "Si Alang" is not the name of certain tree species, but the general name of all the trees on which bees build their hives and simply means "Bee Tree" (Skeat, 1900). Si Alang tree is a special tree belonging to the Caesalpiniaceae family, namely kempas or ghempas (*Koompassia malaccinsis*) and menggeris (*Koompassia excelsa*) (Sarwono, 2020). The process of collecting honey is not only the acquisition of honey and other associated products such as beeswax, it has also become an important cultural ritual and even a part of the Jambi Malay community's identity. Sialang tree is a plant protected by both state and customary law. A log can be 100 cm in diameter and 25-50 meters high. A single Sialang tree usually has 30-100 nest colonies. Each nest can contain 10 kilograms of genuine honey (Anonymous, 2022d).

- The holiness of the tree has been known since the Huns. Turkish tribes, who were hunter-gatherers, offered bloody sacrifices. Pieces of cloth tied to trees can be seen as bloodless sacrifices. The Huns offered sacrifices to trees and sprinkled the victim's blood on their leaves. Among the Huns, the acorn tree was considered the mother of trees. The dignitaries of the state respected this tree, which was seen as a savior (Bars, 2014).

-In the Nakhchivan Autonomous Republic, especially elm, juniper, mulberry, plane tree, oleaster, willow, nut, rosehip, apple, pear, etc. trees are believed to be sacred. Those who visit

these trees, which are located in different regions of Nakhchivan's districts such as Şerur, Babek, Culga, Ordubad, Şahbuz, tie cloths to their branches and believe that these sacred trees will bring happiness and put money, etc., on them items are left. It is believed that harming these trees is considered a sin, and the people who harm them see no good and a disaster is seen in their families (Amanoğlu, 1998).

- Beech trees are used in the funeral ceremonies of Tatar Turks. Nursery and Astrakhan Tatars make a pillow from beech branches by placing the dead in a coffin while burying them. Tatars usually plant beech trees on the grave. Tatar Turks believe that if the cradle prepared for the newborn child is made of beech wood, the child growing in this cradle will experience misfortune (Bars, 2014).

- In India, married Hindu women perform their annual rituals around a banyan tree (*Ficus benghalensis*) during the Vat Savitri Festival. During the festival, women pray for a long life with their husbands by wrapping the banyan tree with various ropes and decorating it with flowers. Since the banyan tree is a long-lived tree, it is known that Hindus pray around the tree in this traditional festival (Anonymous, 2022e).

-According to the Siberian Turks, the tree was seen as a symbol of life, raising and feeding the child. Yakut women, who had no children until recently, pray by laying the white horse skin under the black pine (Pinus nigra) tree. After the prayer, people who had children believed that it was given by tree spirits and God (Bayat, 2007). The tribes living in Upper Asia worship the beech tree and it is thought that this tree has a special place in shaman festivals, ceremonies and rituals. The trees depicted on the shaman's drum are the expression of the beech tree blessed by the Gods (Gökyay, 2000).

The "Dut Dede" festival held in Ankara is one of the rituals that reflects today. In these festivities, a mulberry tree grows at the place where a saint who lived in the 13th century, a relative of Hacı Bayram, struck the ground with his staff, and an army could not eat the fruits of this tree. This mulberry tree is considered sacred in the festivities, turning it into a votive tree, tying pieces of cloth, and showing the transition between belief systems. The healing and fertility of the fruit-bearing mulberry tree and the miracle of the saint with his staff, and the votive tree motifs take place in similar ways (Gürsoy, 2012).

- In the traditional structure of the Turks, priority was given to planting fruit trees around the house before laying the foundation. In this context, one of the trees attributed to holiness in the tree cult is the mulberry tree. The mulberry tree, which is called the soul of the house, is

considered the symbol of the future, peace and fertility of the house. In the Velayetname of Hacı Bektaş Veli, it is stated that making a wish by tying a cloth to the branches of the mulberry tree, which has a valuable place in the old Turkish religion, gives the tree a sacredness (Gürsoy, 2012).

-Visits to the Tomb Settlement, which is a neighborhood of Yaka Village of Fethiye District of Muğla Province, are rituals carried out with the aim of making wishes and healing from the great tree in this area. The most important ritual that increases the value of the settlement in the Türbe District among the people is the belief that the deposit here has a supernatural power. In this way, women who do not have children due to various health problems frequently visit this tomb. Women visiting the tomb first tie a ribbon to the wishing tree. Then, the women are tied into the hollow in the trunk of the sacred cypress tree just east of the tomb, and prayers are offered there. The maintenance and cleaning of the tree's hollow and its surroundings are carried out regularly (Kaynakçı Elinç et al., 2013).

Conclusion

Literature studies show that humanity has given great value to trees and their love for trees in the historical process. According to Eliade (2005), trees show themselves as the power of holiness in the order of life, with features such as indestructibility, continuity and regular reappearance. Throughout the centuries in world cultures, trees have been given many different roles. Trees, which are a mythological symbol and generally manifested in different beliefs and rituals in the cultures of different peoples in different parts of the world, formed one of the building blocks of these cultures.

For centuries, people have looked at the tree believing that it is a living being. In the belief system in which the sanctity attributed to different natural elements belonging to the cultural structure gains value, the tree is an important building element that shapes life. Trees are guardians of newborn children, facilitating birth, and protecting children's lives just as the earth does. According to different beliefs of Turks, Huns, Yakuts, Japanese and Africans, trees played a great role in some outdoor rituals. Old and great oak, beech, pine, mulberry, acorn, sycamore, cypress, juniper and palm trees that stood alone in the land made vows, offered sacrifices, and made wishes from them through a series of religious rituals.

In this study, the ritual, which is a part and product of the cultural landscape, focused on the tree species and their meanings. In this context, various rituals related to different trees in different regions of the world are included. The identification of trees, which are the most

effective elements of the elements of nature in the ritual landscape, and their transfer to future generations in different ways are important in terms of keeping the cultural values alive.

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The Effects of Horticultural Expositions (EXPO) on the Urban Landscape

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Abstract

Fairs are sizable markets that are established for a set amount of time in specific locations to advertise items and foster business relationships. Expo, commonly known as the World's Fair, is one of the notable events held since the middle of the 19th century. Expo is an Olympiad in the domains of culture, history, education, art, entertainment, and commerce. One of the most significant organizations recognized among the global Expos is horticultural Expo s. Horticultural Expo is a horticultural fair, which has an international scope, lasts for 3-6 months, hosts millions of visitors in areas of at least 50 ha, and incorporates and promotes a wide variety of landscape designs. Horticultural Expo has emerged to stimulate innovation in agriculture, horticulture, and landscaping. Today, horticultural Expo also undertakes important tasks such as improving life in cities, sharing experiences, and thus ensuring regional development through horticulture. The goals of horticultural Expos include gaining international recognition, supporting the open-green area system of cities, ecotourism, the horticulture, and landscape industry, and educating people about the environment and sustainability. This study aims to investigate the positive and negative impacts of the horticultural Expos, which have been implemented in Turkey and will be implemented in the coming years, on urban ecology, open-green area systems, sustainability, and urban identity. Additionally, suggestions have been made about how to make these Expos impact on the cities a success. As a result, it has been suggested that horticultural Expos are a recreational benefit that supports the open-green area system as well as their economic and cultural contributions to the cities, and recommendations have been made to address the shortcomings in areas like urban identity, post-Expo land use, and sustainability.

Keywords: Fair, landscape, expo, garden, urban.

Bahçecilik Expo'larının Kentsel Peyzaj Üzerindeki Etkileri

Öz

Fuarlar, ürün tanıtmak ve ticaret bağlantıları gerçekleştirmek amacı ile belli yerlerde kurulan ve belli dönemlerde belli süre açılan büyük pazarladır. Dünya Fuarı olarak da bilinen Expo, 19. yüzyılın ortalarından beri düzenlenen önemli, organizasyonlardan biridir. Expo, kültür, tarih, eğitim, sanat, eğlence ve ticaret alanlarında bir olimpiyat niteliğindedir. Dünya Expo'ları arasında bilinen en önemli organizasyonlardan biri de bahçecilik Expo'sudur. Bahçecilik Expo'su uluslararası kapsamı olan, 3-6 ay boyunca süren ve en az 50 ha'lık alanlarda milyonlarca ziyaretçiye ev sahipliği yapan, çok çeşitli peyzaj tasarımlarını bünyesinde barındıran ve tanıtan bahçecilik fuarıdır. Bahçecilik Expo'su tarım, bahçecilik ve peyzaj alanlarını canlandırmak ve bu alanlarda yenilikleri teşvik etmek için ortaya çıkmıştır. Bugün bahçecilik Expo'su aynı zamanda bahçecilik aracılığıyla kentlerdeki yaşamın iyileştirilmesi, deneyimlerin paylaşılması ve dolayısıyla bölgesel kalkınmanın sağlanması gibi önemli görevler üstlenmektedir. Bahçecilik Expo'ları, uluslararası tanınırlık kazanmak, kentlerin açık-yeşil alan sistemini, ekoturizmi ve bahçecilik ve peyzaj sektörünü destelemek, doğa ve sürdürülebilirlik konusunda farkındalık kazandırmak gibi misyonları amaç edinmektedir. Bu çalışmada özellikle Türkiye'de uygulanmış olan ve gelecek yıllarda uygulanacak olan Bahçecilik Expo'larının kentlerin ekolojisi, açık-yeşil alan sistemleri, sürdürülebilirliği ve kent kimliği üzerindeki olumlu ve olumsuz etkilerinin irdelenmesi amaçlanmıştır. Ayrıca bu Expo'ların kentler üzerinde amaçladığı misyona ulaşabilirliği konusunda fikirler ortaya koyulmuştur. Sonuç olarak bahçecilik Expo'larının kentlere ekonomik, kültürel katkılarının yanı sıra açık-yeşil alan sistemini destekleyen rekreasyonel bir kazanım olduğu belirtilmiş, bunun yanında kent kimliği, Expo sonrası alan kullanımı ve sürdürülebilirlik gibi konularda eksik yönlerin giderilmesine yönelik öneriler getirilmiştir.

Anahtar Kelimeler: Fuar, peyzaj, expo, bahçe, kent.

Giriş

Modern kentler günden güne büyüme ve gelişme eğilimindedir. Büyüme ve gelişimin devam etmesi var olan insan ihtiyaçlarının artması ve yeni ihtiyaçların ortaya çıkmasına neden olmaktadır. Bir kentteki insan ihtiyaçlarını karşılama düzeyindeki çeşitlilik o kenti daha ilgi çekici hale getirmektedir. İnsan için kentteki en dikkat çekici unsur o kentin peyzajıdır. Çünkü kenti yaşanılabilir kılan etken kentsel peyzajlarının güçlü ve nitelikli olmasıdır. Kentsel peyzajın birincil bileşeni açık- yeşil alanladır. Kentteki açık-yeşil miktarı ve çeşitliliği arttıkça yaşam kalitesi düzeyi de o ölçüde artmaktadır. Bu çeşitliliğin bir parçası da Dünya Fuarı olarak bilinen Expolardır.

Expo, "Exposition" kelimesinin kısaltılmışı; başlıca Dünya Fuarı olarak da bilinen ve 19. yüzyılın ortalarından beri düzenlenen organizasyondur. Tanım olarak; Expo, kültür, tarih, eğitim, sanat, eğlence ve ticaret alanlarında bir olimpiyattır. Expo resmi olarak Uluslararası Sergiler Bürosu (BIE) tarafından gerçekleştirilir. BIE 4 çeşit fuar düzenler. Bunlar; Dünya Expo'su, Özel Tematik Expolar, Bahçecilik Expo'su ve Triennale Milano'dur. Expo'lar genellikle 3-6 ay arası sürmektedir (BIE, 2022). Expo organizasyonları ile, ülkeler bir araya getirilerek daha iyi bir dünya için bilgi paylaşımında bulunulmakta ve ülkelerinin kültürel mirasları korunarak, modern yaşama dair beklentilerin karşılanabileceği imkânlar sunulmaktadır (Ökmen et al., 2012). Her bir Expo kendi alanında halkı bilinçlendirmeyi, değişimi paylaşmayı, ilerlemeyi teşvik etmeyi ve diyalog ile deneyimleri aktarmayı hedeflemektedir. Expolar, katılımcılar, uluslararası toplum, halk ve ev sahibi ülke için birçok fayda sağlamaktadır. Ev sahibi ve katılımcı ülkelere uluslararası işbirliği bağlarını güçlendirmeleri ve ülkelerini tanıtma fırsatını sunar (Çelik & Aslantaş, 2018).

Dünya Expoları, 5 yılda bir düzenlenen ve evrensel Expo olarak tanımlanan Expo'lardır ve süreleri 6 aydır. Bu tür Expo'lar son yıllarda 2000 Hannover, 2005 Aichi, 2010 Şanghay'da 2015 yılında Milano'da düzenlenmiş olup, 2020 yılında Dubai'de düzenlenmiştir. Dünya Expo'ları; bugüne kadar düzenledikleri tüm kentleri köklü bir şekilde değiştirdikleri gibi, bu kentlere görkemli anıtsal yapılar da kazandırmışlardır.

Bir diğer dikkat çekici Expo türü de Bahçecilik Expo'lardır. Bahçecilik Expo'ları diğer Expolardan ayıran en önemli özellik, Uluslararası Çiçek Üreticileri Birliği (AIHP) ile BIE'nin müştereken onaylamalarıyla hayata geçirilmeleridir. Başka bir deyişle, süreçte tek bir kurum değil, iki farklı kurum yetkilidir. Uygulamada, AIPH Konseyi projeyi benimsediği takdirde,

BIE Genel Kurulu'nda ev sahibi ülkeye ve şehre Bahçecilik Expo'su düzenlenmesi hakkı verilmektedir (BIE, 2022).

Modern büyük ölçekli Expolar, uluslararası alanda ekonomik, kültürel ve teknolojik işbirliğinde giderek daha önemli bir rol oynar hale gelmiştir. Uluslararası bahçecilik Exposu, bahçecilik kültürünü miras edinme, bilim ve eğitimi yaygınlaştırma, ekoloji ve çevreyi koruma gibi işlevleri üstlenmeyi amaçlar. Kentlerde doğal kaynakların korunmasında aktif bir rol üstlenme hedefinde olan bahçecilik Expoları, kentin makro düzeyinde yeşil alan sisteminin oluşumunu etkiler ve yer seçimi ve planlama yoluyla bölgesel koordineli gelişmeyi sağlar (Gao, 2020).

Bahçecilik Expo'su, bahçecilik ve peyzaj alanlarını canlandırmak ve bu alanlarda yenilikleri teşvik etmek için ortaya çıkmıştır. Bugün bahçecilik Expo'su aynı zamanda bahçecilik aracılığıyla şehirlerdeki yaşamın iyileştirilmesi, deneyimlerin paylaşılması ve dolayısıyla bölgesel kalkınmanın sağlanması gibi önemli görevler üstlenmektedir (Çelik, F. & Aslantaş, F., 2018).

Bahçecilik Expo'su ve Türkiye

Türkiye'de bugüne kadar 2016 ve 2022 yıllarında 2 adet bahçecilik Expo'su düzenlenmiş 2023 yılında da 3. kez bahçecilik Expo'suna ev sahipliği yapacaktır. Türkiye'de düzenlenen ve düzenlenecek olan Expolar; Expo 2016 Antalya, Expo 2021 Hatay (Covid 19 pandemisi nedeni ile 2022 yılına ertelenmiştir), Expo 2023 Kahramanmaraş'tır.

Expo 2016 Antalya: Resmi olarak 23 Nisan-30 Ekim 2016 tarihlerinde Antalya'da düzenlenmiş olan uluslararası sergi organizasyonudur. Uluslararası Sergiler Bürosu (BIE) ve Uluslararası Bahçe Bitkileri Üreticileri Derneği (AIPH) 17 Eylül 2009'da aldığı kararla Expo'yu düzenleme hakkını elde eden Antalya, Türkiye'de düzenlenen ilk Expo'nun ev sahibi olmuştur. "Geleceği Yeşertmek" sloganının kullanıldığı organizasyonda tarih, biyoçeşitlilik, sürdürülebilirlik ve yeşil şehirler organizasyonun alt temaları kullanılmıştır. Expo 2016 Antalya "Gelecek Nesiller için Yeşil Bir Dünya" felsefesi ve 'Çiçek ve Çocuk' teması ile düzenlenmiştir. Resmi olarak 52, resmi olmayarak 3 ülkenin katılımıyla gerçekleşen, Expo 2016 aktif olduğu 6 aylık süre boyunca çeşitli, organizasyon ve yerli yabancı konserlere ev sahipliği yapmıştır. Antalya'nın Aksu ilçesinde, 1121 dekarlık bir alanda, A1 kategorisindeki sergi resmi olarak 6 ay sürmüştür. 31 Ekim-31 Aralık 2016 arası 2 ay daha uzatılmıştır (T.C. Tarım ve Orman Bakanlığı, 2022).



Şekil 1. Expo 2016 Antalya alanından görüntüler (T.C. Tarım ve Orman Bakanlığı, 2022).

Expo 2021 Hatay: 2021 yılında yapılması planlanan fakat Covid-19 pandemisi nedeniyle ertelenen Expo 2021 Hatay 1 Nisan - 29 Ekim 2022 tarihleri arasında gerçekleştirilmektedir. Antakya ve İskenderun bölgelerinde 2 adet olmak üzere toplamda 30 ha arazi üzerinde kurulmaktadır. Antakya Expo alanı 20ha büyüklüğünde bir alana yayılmaktadır. İskenderun Expo alanı 10ha büyüklüğünde bir alana yayılmaktadır. Expo 2021 Hatay ana teması "Medeniyetler Bahçesi"dir bu tema Expo 2021 Hatay'ın küresel deneyim paylaşımına ve iş birliğine ilham vermek ve sürdürülebilir kalkınma yolunda yeni ortaklıklar geliştirmeyi teşvik etmek için Hatay'ın tarihten gelen tecrübesinden yararlanmayı hedeflenmektedir (URL 1).



Şekil 1. Expo 2021 Hatay alanından görüntüler (URL 1.)

Expo 2023 Kahramanmaraş: EXPO 2023 Kahramanmaraş, 23 Nisan - 31 Ekim 2023 tarihleri arasında Kahramanmaraş'ın Onikişubat ilçesinde düzenlenecek olan etkinliktir. Fuarın ana teması "Doğa Dostu Şehir ve Duyarlılık" olarak belirlenmiş olup kültürleri bir araya getirmesi amaçlanmıştır. 789.000 m² alanda inşa edilen fuar alanında yıl boyunca açık kalacak bir yaşam alanına dönüştürülmesi planlanmaktadır. Bahçecilik Expo'su üzerine organizasyon düzenleyecek olan Kahramanmaraş Uluslararası Bahçe Bitkileri Üreticileri Birliği'nin (AIPH) desteğiyle tarım ve bahçecilik alanında yenilikçiliği desteklemeyi, yaşam

kalitesini artırmayı bu alanlardaki sorunlara çözüm arayışına aracılık yapmayı hedeflemektedir (URL, 2.).



Şekil 1. Expo 2023 Kahramanmaraş Projesinden Görüntüler (URL, 2.)

Kentsel Peyzaj ve Bahçecilik Expo'su İlişkisi

Kentsel peyzajı oluşturan 2 önemli unsur yapısal alanlar ve açık-yeşil alanlardır. Kentin ekolojik olarak sürdürülebilirliğinin sağlanması için açık-yeşil alanların çok yönlü işlevleri bulunmaktadır. (Gül & Küçük, 2001).

Kentsel açık-yeşil alanların kente sağladığı hizmet ve katkılar şunlardır:

- Kent mekânına fiziksel ve estetik değer sağlar
- Mikroklimayı kontrol eder ve düzenler,
- Kent içi sirkülasyonda kolaylık sağlar,
- Bireyin ve toplumun aktif ve pasif rekreasyonel ihtiyaçlarının karşılanması için ortam oluşturur,
- İnsan psikolojisine olumlu katkı sağlar,
- İnsan ilişkilerini olumlu yönde etkileyerek bireylerin sosyalleşmesine ve toplumsal birliğe yardımcı olur,
- Doğa ve çevre kavramları konusunda bilgilenme ve bilinçlendirme de önemli rol oynar,
- Kent kimliği oluşturur (Gül & Küçük, 2001).

Nitekim bahçecilik Expoları da kentlerde açık-yeşil alanları oluşturan bir parça niteliğinde alanlardır. Bu nedenle, kente yeni yeşil alan kazandırması, ekosistemi desteklemesi, bitkisel çeşitliliği artırma olanakları, rekreasyonel faaliyetlere katkıda bulunması ve açık-yeşil alan miktarına katkısı gibi unsurlar bahçecilik Expolarının kent peyzajına sunduğu katkılardır. Ancak bahçecilik Expolarında, planlama bakım ve yönetim, yer seçim kriterleri, Expo sonrası kullanım durumu, kullanılan fonksiyonlar, sürdürülebilir ve ekolojik tasarımlar, enerji tüketimi, Expo uygulamalarında doğal kaynak kullanımı gibi unsurların eksikliği ya da yanlış

planlanması durumunda kentin ekolojik sürdürülebilirliği, sosyo-ekonomik durumu ve kent kimliği üzerinde oluşturabileceği olumsuz yönlerin de olabileceği unutulmaması gereken bir gerçektir.

Sonuç

Uluslararası organizasyonlar, bir kentin ve kültürünün tanıtımı, sosyo-kültürel anlamda gelişme ve ekonomiye döviz girdisi sağlaması açısından çok önemli etkinliklerdir. Bu sayede ev sahibi ülkeler normal koşullar altında elde edemeyeceği fırsatlar yakalamaktadırlar. Böyle zamanlarda, etkinlik sayesinde çok büyük turizm hareketleri ve buna bağlı olarak ülkeye döviz girmekte ve ekonomi canlanmaktadır. Expo, bu mega etkinliklerin en önemlileri arasında gösterilmektedir.

Ancak tüm bunların yanında bahçecilik Expolarının uygulanma aşamasında ve sonrasında ekolojik temelli planlamalar yapılması gerekmektedir. Aksi takdirde kent üzerinde olumsuz etkileri kaçınılmaz hale gelebilecektir. Bahçecilik Expoları genellikle çevre dostu ve ekolojik olarak planlansa da daha önceki örneklerde yer seçimi gibi planlamalarda yapılan hatalar ile bu alanlar atıl hale gelebilmektedir.

Bahçecilik Expo'su ev sahibi kente çok büyük turizm hareketi getirmektedir. Bu durumda kent kendi potansiyelini etkin bir şekilde kullanmalıdır. Çünkü bu durum aynı zamanda bölgenin turizm potansiyelinin ön plana çıkarılmasına ve bölgesel turizmin gelişimine katkıda bulunmaktadır.

Türkiye için bahçecilik Expo'su etkinlikleri ülke imajının yükselmesi adına en iyi fırsatlardan biridir. Etkinliklerin hem sosyal hem de ekonomik anlamda ülkeye olacak katkıları çok fazladır.

Tüm bu sebepler göz önünde bulundurulduğunda bahçecilik Expoları;

- Kente açık-yeşil alan kazandırır
- Turizme katkıda bulunur
- Tanınırlık ve farkındalık sağlar
- Kent ekosisteminde yer edinir
- Yerel halka sürekli bir rekreasyon imkanı sunar.

Bu nedenle bahçecilik Expoları planlama tasarım ve yönetim sürecinde; ekolojik temelli tasarımlar içermeli, sürdürülebilir olmalı, doğal kaynak kullanımı gözetilmeli, Expo sonrası bakım ve kullanım süreci planlanmalı, ekonomik getirisinin yanında giderlerin de iyi planlaması gerekmektedir.

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Determining the Effects of Potassium Silicate Application on Some Quality Parameters of Different Turfgrass Species

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Abstract

Silicon is the eighth most common element in nature and the second most common in the soil after oxygen. Despite silicon's abundance in nature, little is known about its biological effects. But many studies indicate that silicon has positive effects on the growth and development of many plant species. This study investigates the effects of potassium silicate applications on some quality parameters of Festuca arundinacea 'Starlett' and Lolium perenne 'Sun' cultivars. For this purpose, 3 different potassium silicate rates (0, 2440, and 4880 kg/ha) and 2 different turfgrass seed rates (20 and 30 g/m2) were applied. Turfgrass seeds were sown in pots containing peat+perlite+vermiculite (3:2:1, v:v:v) in a greenhouse setting. After sowing, granular potassium silicate was mixed with 0.5 l of water and the mixture was applied to the soil. The pots in the control group were not treated with potassium silicate. Every two weeks, measurements of the NDVI (Normalized Difference Vegetation Index) and chlorophyll content were taken from plants that were exhibiting adequate growth and development. The 3x3 factorial completely randomized block design with three replications was used to set up the experiment.

The NDVI and chlorophyll values of plants treated with potassium silicate were not found to be greater than those of control plants. Future studies are required to ascertain the impact of potassium silicate on turfgrass quality parameters like establishment rate, quality, color, and texture in green areas to be established in the Mediterranean region.

Keywords: Silicon, plant growth and development, quality parameters.

Introduction

Silicon (Si) is the eighth most frequent element in nature and the second most frequent element (after oxygen) in soil. Silicon refers to the element, and silica refers to a compound (SiO_2; silicon dioxide) where each silicon molecule is chemically bonded to two oxygen molecules (Ingri, 1978; Iler, 1978). Silicon is the only element that does not cause severe damage to plants when present in excess (Ma et al., 2001). Although silicon is abundant in nature, its biological functions have not been determined as well as those of other elements such as carbon, hydrogen, and oxygen (Wainwright, 1997). The essentiality of silicon for plant growth and the silicon content of plants has been one of the study topics of plant nutrition researchers. Silicon was recognized as one of the 15 essential elements for plant life in the early 1900s (Halligan, 1912). However, it is now known that silicon is an essential

element only for a group of algae known as diatoms (*Bacillariophyceae*; a subspecies of algae), some members of yellow-brown algae, and only members of the *Equisetacea* family in vascular plants (Ketchum, 1954; Chen and Lewin, 1969; Volcani, 1978; Round et al., 1990; Epstein, 1999; Kinrade et al., 2001; Kinrade et al., 2002). As a result of many studies, it was stated that silicon is not an essential element for plant growth. The AAPFCO (Association of American Plant Food Control Officials) defined silicon as a 'beneficial substance' for plants (Sebastian, 2012; Sebastian et al., 2013). Many authors describe silicon as a 'semi-essential' element for higher plants (Rafi and Epstein, 1997; Ma & Yamaji, 2008). That is, while plants devoid of silicon may exhibit physical abnormalities, plant growth can be promoted by the supply of silicon.

Although it is abundant in the soil, silicon is not found in its pure form in nature because it is very active (Richmond and Sussman, 2003). In soil solutions, silicon is mostly found as mono silicic acid (H_4SiO_4, Si $(OH)_4$) (Lindsay, 1979). Silicon is absorbed more or less by most plants (Weiss and Herzog, 1978; Epstein and Bloom, 2005). In particular, plants belonging to the *Gramineae (Poaceae)* family are known to absorb silicon in high amounts (Carpita, 1996; Rafi & Epstein, 1999). Silicon is actively absorbed by the roots in the form of mono silicic acid and then passively transported to the shoots through the plant's transpiration canal (Figure 2.6) (Bybordi, 2012). At the endpoints of the transpiration flow, silicic acid condenses due to water loss, and as soon as the solubility limit is exceeded, it polymerizes into colloidal silicic acid, resulting in amorphous silica ($SiO_2.nH_2O$; also called opal, silica gel, or phytolith in higher plants) (Haynes, 2014). As a result, significantly higher silicon concentrations occur around the stoma (Sommer et al., 2006). Silicon uptake varies according to species and plant groups (Jones & Handreck, 1967; Richmond and Sussman, 2003). In general, silicon uptake in grain plants is much higher than in other plant species.

Both research results and practical experience show that silicon has beneficial effects on the growth and development of many plant species, especially under stress conditions (Ma, 2004). Silicon increases the growth and yield of plants, provides erectness, prevents lodging, provides water use efficiency, increases tolerance to bacterial and fungal diseases (Voogt & Sonneveld, 2001), herbivores (Coors, 1987), extreme radiation and high temperatures, low temperatures, freezing, nutrient stress, ultraviolet rays (Tisdale et al., 1985), salinity (Hamayun et al., 2010; Lee et al., 2010), and heavy metal toxicity (Neumann & zur Nieden, 2001; Voogt & Sonneveld, 2001) and affects the composition of nitrogen, phosphorus and

other elements in plant tissue (Bollard & Butler, 1966; Epstein & Bloom, 2005; Ma, 2004; Liang et al., 2007; Guntzer et al., 2012; Zhu & Gong, 2014). These benefits have led to silicon being applied directly to plants or incorporated into applied fertilizers.

Although abundant, most sources of silicon are insoluble and not in a form usable by plants (Richmond & Sussman, 2003). Plants absorb silicon in the form of silicic acid or silicate. For this reason, there is a need for silicon supplementation, which is easily available to plants. The application of silicon-containing materials to crop plants started in Japan in the early 1950s and continues to be widely used in many parts of the world, such as Korea, Taiwan, Thailand, Sri Lanka, and the USA. Silicon, which has no toxic effects on humans and the environment, is probably the only element that can increase resistance to multiple stresses (Savvas & Ntatsi, 2015). In addition, silicon fertilization has the potential to reduce environmental stresses and the depletion of nutrients in the soil. As a result, silicon fertilization offers an alternative to the overuse of phytosanitary products and N-P-K fertilizers for sustainable agriculture (Guntzer et al., 2012). Silicon can be applied to plants by spraying, mixing with the soil, or with irrigation water. Foliar fertilization is carried out in order to quickly eliminate nutrient deficiencies or to supplement plants that take nutrients from the soil (Çetinsoy & Yıldız Daşgan, 2016). Foliar fertilization is the technique of feeding the plants by applying liquid fertilizer directly to the leaves of the plant by spraying. Many sources of silicon have been used to determine the effects of silicon on plants. The most widely used sources of silicon are potassium silicate (K_2SiO_3), calcium silicate ($CaSiO_3$), sodium silicate (Na_2SiO3), magnesium silicate (MgO_3Si), ammonium silicate ($(NH_4)_2SiO_3$), silica gel, wollastonite, and blast furnace residues (Guntzer et al., 2012). In addition, post-harvest crop residues of rice, wheat, and other small grain plants also contain high amounts of silicon and are used as a silicon source. Recognized as safe by the US Food and Drug Administration, potassium silicate is the most common soluble silicate used as a bioactive substance to reduce abiotic stress and contribute to disease control in plants (Li et al., 2009). Potassium silicate, which has a clear, thick consistency and liquid form, is easily soluble in water. Potassium silicate, which provides many benefits such as reducing environmental stress, heat stress, cold stress, water, and soil toxicity, can also increase root growth thanks to its contribution to beneficial bacteria in the soil. Potassium silicate, which also acts as a natural fungicide, can protect the plant from insect and fungal attacks by strengthening the cuticle layer with silicon when sprayed on the plant. At the same time, the color of the plants becomes more saturated thanks to the increase

in the rate of photosynthesis in parallel with the increase in the possibility of benefiting from the light of the plant leaves fertilized with potassium silicate.

In this study, it was aimed to determine the effects of potassium silicate applications on some quality parameters of *Festuca arundinacea* 'Starlett' and *Lolium perenne* 'Sun' cultivars.

Materials and Methods

Lolium perenne 'Sun' and *Festuca arundinacea* 'Starlett' were used as the plant material. Three different potassium silicate rates (0, 2440, and 4880 kg/ha) and two different turfgrass seed rates (20 and 30 g/m^2) were applied. Potassium silicate (K_2SiO_3; K_2O: 12.79% and SiO_2: 26.19%) was used as a silicon source. Table 1 shows the trial applications.

Table 1.Trial applications and application rates

Appl.	Code	Seed rate	Potassium silicate rate
1	**LPS_1 K**	0,658 gr/pot	**0 ml/pot (control)**
2	**LPS_1 D1**	0,658 gr/pot	**8 ml/pot**
3	**LPS_1 D2**	0,658 gr/pot	**16 ml/pot**
4	**LPS_2 K**	0,986 gr/pot	**0 ml/pot (control)**
5	**LPS_2 D1**	0,986 gr/pot	**8 ml/pot**
6	**LPS_2 D2**	0,986 gr/pot	**16 ml/pot**
7	**FAS_1 K**	0,658 gr/pot	**0 ml/pot (control)**
8	**FAS_1 D1**	0,658 gr/pot	**8 ml/pot**
9	**FAS_1 D2**	0,658 gr/pot	**16 ml/pot**
10	**FAS_2 K**	0,986 gr/pot	**0 ml/pot (control)**
11	**FAS_2 D1**	0,986 gr/pot	**8 ml/pot**
12	**FAS_2 D2**	0,986 gr/pot	**16 ml/pot**

Turfgrass seeds were sown in pots (r=10 cm) containing peat+perlite+vermiculite (3:2:1, v:v:v) in a greenhouse setting. After sowing seeds, granular potassium silicate was weighed with a precision balance for each pot and mixed with 0.5 l of water, and applied to the soil homogeneously. The pots in the control group were not treated with potassium silicate. Figure 1 represents the seed sowing and silicon application process. After the applications, the pots were irrigated with sprinklers. During the establishment period, plants were not fertilized with any fertilizers and irrigated daily to prevent visual wilt symptoms. Mowing processes were carried out regularly with scissors from a height of 50 mm, and clippings were removed. Since the frequency and duration of irrigation vary during the vegetation period according to the soil moisture, irrigation was done according to the need depending on the soil moisture. Mechanical weed removal was also done regularly in the trial plots. The 3x2x2 factorial completely randomized block design with 3 replications was used to set up the experiment.

The trial was carried out in Anka Botanical Plant Production Greenhouses in Kemer, Antalya/Turkey. The trial area is shown in Figure 2.



Figure 2. Seed sowing and silicon application



Figure 2. The trial area

Every two weeks, measurements of the NDVI (Normalized Difference Vegetation Index) and chlorophyll content were taken from plants that were exhibiting adequate growth and development. The TCM 500 NDVI Turf Color Meter (Figure 2) calculates the more objective NDVI values by using the light of 660 nm and 840 nm wavelengths in the measurement area and converts these values to grass index values. Grass index data takes values between 1.0 and 9.0. On this scale, 1.0 is the worst turf quality (dead/yellow grass cover), with a value of 9.0 being equivalent to the highest turf quality. Arithmetic averages were taken by making 10 measurements from each pot.



Figure 2. TCM 500 NDVI turf color meter

The chlorophyll content of plants was determined with a chlorophyll measuring device (FieldScout CM 1000 Chlorophyll Meter) (Figure 3). The specified chlorophyll meter measures the relative chlorophyll index by using the light of 700 nm and 840 nm wavelengths reflected from the grass canopy and gives a unitless chlorophyll content index on the 0-999 scale as an output. Arithmetic averages were taken by taking 10 measurements from each pot.



Figure 3. FieldScout CM 1000 chlorophyll meter

Evaluation of the measurements and analysis was made with the SPSS (Statistical Programs for Social Science) 13.0 package program. Statistical control of the data among themselves was done with one-way analysis of variance (ANOVA). When the difference was determined in the procedures, the Duncan test was used to determine the homogeneous groups formed by the existing difference.

Findings

Various measurements were made on three different dates during the experiment, which was conducted to determine the effects of potassium silicate applications on some grass quality parameters of *Festuca arundinacea* 'Starlett' and *Lolium perenne* 'Sun' cultivars. The analysis results of the measurements from each plot are presented in Table 2 and Table 3. Variations in grass index values were observed as a result of different applications. In order to determine the effects of the applications on the NDVI of the cultivars, the data of the observations and the analysis results are presented in Table 2. No statistically significant difference was observed in *Lolium perenne* 'Sun' between the applications in terms of NDVI at all dates.

Appl.	21/01/2021 NDVI	Appl.	21/01/2021 NDVI	Appl.	21/01/2021 NDVI
LPS2 D1	7,06	LPS1 D2	7,62	LPS2 K	7,53
LPS1 D2	7,17	LPS1 K	7,64	LPS1 D1	7,57
LPS1 D1	7,21	LPS1 D1	7,64	LPS2 D1	7,58
LPS2 D2	7,23	LPS2 D1	7,67	LPS1 D2	7,60
LPS2 K	7,24	LPS2 K	7,72	LPS1 K	7,62
LPS1 K	7,30	LPS2 D2	7,73	LPS2 D2	7,62
Sig.	0,387	Sig.	0,644	Sig.	0,821

Table 2. Effects of different applications on NDVI values of *Lolium perenne* 'Sun'

A statistically significant difference was observed in *Festuca arundinacea* 'Starlett' between applications in terms of NDVI only at one date. It was observed that the pots with a high seeding rate had higher NDVI values on the first date. No linear trend was observed in terms of potassium silicate rates. The differences were not found to be statistically significant among the applications on other dates Table 3.

Appl.	21/01/2021 NDVI
FAS1 D2	7,07a
FAS1 D1	7,11a
FAS1 K	7,24a
FAS2 D2	7,28ab
FAS2 K	7,35b
FAS2 D1	7,37b
Sig.	0,021

Appl.	21/01/2021 NDVI
FAS1 K	6,61
FAS1 D2	7,17
FAS1 D1	7,37
FAS2 D2	7,39
FAS2 D1	7,43
FAS2 K	7,46
Sig.	0,298

Appl.	21/01/2021 NDVI
FAS1 D2	7,44
FAS2 D2	7,46
FAS1 K	7,47
FAS1 D1	7,47
FAS2 D1	7,47
FAS2 K	7,53
Sig.	0,693

Table 3. Effects of different applications on NDVI values of *Festuca arundinacea* 'Starlett'

Relative chlorophyll content was measured from 10 different points by the FieldScout CM 1000 Chlorophyll Meter, and the averages were determined. The analysis results are presented in Table 4. The chlorophyll contents of the grasses with different applications showed significant variations. When the results were examined, statistically significant differences were observed in chlorophyll content only at one date in *Lolium perenne* 'Sun'. The increase in potassium silicate ratios did not increase the chlorophyll values.

Appl.	21/01/2021 Chlorophyll
LPS1 D2	108
LPS2 K	109
LPS2 D1	112
LPS2 D2	112
LPS1 K	114
LPS1 D1	118
Sig.	0,47

Appl.	21/01/2021 Chlorophyll
LPS1 D2	161a
LPS2 K	168ab
LPS2 D1	177ab
LPS1 D1	179ab
LPS2 D2	191b
LPS1 K	192b
Sig.	0,04

Appl.	21/01/2021 Chlorophyll
LPS1 D1	169
LPS2 D1	170
LPS1 K	172
LPS1 D2	173
LPS2 D2	174
LPS2 K	179
Sig.	0,821

Table 4. Effects of different applications on chlorophyll content of *Lolium perenne* 'Sun'

The chlorophyll contents and analysis results of the *Festuca arundinacea* 'Starlett' for different applications are presented in Table 5. Statistically significant differences were observed in chlorophyll content only at one date in *Festuca arundinacea* 'Starlett'. It is seen that chlorophyll content increases as the seeding rates increase. No correlation was observed between chlorophyll content and potassium silicate rates.

Appl.	21/01/2021 Chlorophyll
FAS1 D2	111a
FAS1 D1	111a
FAS1 K	117ab
FAS2 K	123ab
FAS2 D2	125ab
FAS2 D1	130b
Sig.	0,017

Appl.	21/01/2021 Chlorophyll
FAS1 D2	162
FAS1 D1	164
FAS2 D2	172
FAS1 K	174
FAS2 D1	177
FAS2 K	187
Sig.	0,423

Appl.	21/01/2021 Chlorophyll
FAS1 D1	191
FAS1 D2	198
FAS2 D1	200
FAS2 D2	200
FAS1 K	204
FAS2 K	205
Sig.	0,805

Table 4. Effects of different applications on chlorophyll content of *Festuca arundinacea* 'Starlett'

Discussion and Conclusion and Recommendations

According to the results of the experiment, although some positive results were observed in NDVI and chlorophyll values, it was generally seen that potassium silicate application was insufficient to increase the chlorophyll and NDVI values on these cultivars. Potassium silicate applications made within the scope of this study were found to be unsuccessful in increasing the NDVI values of the plants. On the contrary, Trenholm et al. (2001) stated that potassium silicate application increased the color and grass density significantly in two different *Paspalum vaginatum* ecotypes. These studies' findings do not coincide with those of Trenholm et al. (2001). Similarly, literature data shows that silicon increases the chlorophyll content of sorghum (Kaya et al., 2006), strawberries (Wang and Galetta, 1998), and soybeans (Lee et al., 2010). Similarly, Chen et al. (2010) stated that silicon application to rice increases the chlorophyll concentration and silicone application increases the chlorophyll content of *Agrostis palustris* (Schmidt et al., 1999).

As a result, it was determined that the applications did not create statistically significant differences in most of the observed parameters. As a result of the analysis, it was observed that different seeding rates and different potassium silicate rates created statistical differences in the parameters observed in some dates.

In addition, when the studies on silicon fertilization are evaluated, it seems that silicon applications are more effective when used to alleviate biotic stresses (diseases caused by fungi, insects, etc.). Also, Wang et al. (2015) stated that nano-silicon forms that have been introduced to the market in recent years allow plants to absorb higher silicon.

In light of the results obtained from this study, it is recommended to investigate different potassium silicate application rates, different application methods (nano-silicon, foliar application), and the use of different silicon sources in future studies.

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A Research on the Recreational Use of Visitors in the First National Park in Turkey

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Abstract

The aim of this study is to investigate the recreational use tendency of the visitors in Yozgat Çamlık National Park, the first national park in Turkey. For this purpose, a total of 80 people was surveyed. According to the survey results, the park is mostly visited for picnic, resting, nature and forest trips in summer. While they spend 3-5 hours in the park, the frequency of their visit to the park is several times a month. Visitors stated that it is difficult to access the park and so they mostly prefer private vehicles. While the visitors found the lighting system, security and municipal services insufficient in the park, they found the resting area and green texture sufficient. It was stated that the area is not used consciously and that there is a lack of cleanliness and inventory in the park. In general, it was found that the park was moderate proficiency. Demographic characteristics apart from gender were found to be effective on some usage characteristics. Accordingly, single and student visitors aged between 18-25 reached the area by public transport or on foot. On the other hand, the visitors aged between 26-40 stated that it is difficult to access the area. Except for the age group of 61 and above, and those residing in the center, visit the area several times a month. Those inhabiting in the city center visit the area for resting and picnic, while those inhabiting in the county and village visit the area for picnic. Completing the lacks, facilitating accessibility, deploying promotional activities and explaining conscious use will ensure more effective recreational use of the park.

Keywords: National park, recreation, Yozgat, visitor.

Introduction

Recently, the population and construction increase in cities has resulted in the orientation of urban people towards green areas in or around city. People are looking for recreational activity opportunities in these green areas. One of the important areas presenting recreational activities is national parks close to the city. Today national parks, one of protected areas, are of worldwide attractive for recreational activities with their flora and fauna characteristics. They have great scientific, scenic and cultural importance at national and international levels (Çağlayan et al., 2012). Their natural landscape, ecological services, and available activities and facilities have a positive effect on physical health, mental well-being, and social relationships of visitors (Li et al., 2021).

According to the National Parks Law No. 2873 (TC Resmi Gazete, 1983), national park is defined as nature parts including protection, recreation and tourism areas with national and international rare natural and cultural resource values scientifically and aesthetically. There are 48 national parks in Turkey and they cover a total area of 884.566 hectares. Yozgat Çamlığı National Park is the first national park of Turkey (DKMP, 2022). Anatolian black pine (*Pinus nigra* subsp. *pallasiana*) constitutes the main resource value of the national park. The national Park is a natural resource that integrates mountain and valley landscapes with its five centuries-old natural trees and snow wells that have been used by the local people for years. Moreover, it has cultural and recreational resource values to meet people's recreational demands (TC Yozgat Valiliği, 2022).

Up to date, there is a study (Ayten & Dede, 2007) carried out on the conservation and management problems of the Yozgat Çamlığı National Park. Akın (2019) has revealed the properties and mysteries of this national park. Another study (Kılıç & Kervankıran, 2019) explained elaborately the earlier periods and the development process of this national. As seen, about 15 years ago only one study included the visitor opinions in the Yozgat National Park. Today, as the recreational demand of urban people increase and diversify, the aims of the present study is (1) to investigate the recreational use tendency of the visitors of Yozgat Çamlığı National Park and (2) to determine the effects of demographic traits on their tendency.

Materials and Methods

The study was conducted in Yozgat Çamlığı National Park, located in two kilometers south of Yozgat in Central Anatolia Regions (Figure 1). The national park was declared in 1958 and covered 517 ha. Its altitude was 1350 m. In addition to forest trees such as Anatolian black pine, juniper, oak, aspen, scotch pine, the vegetation of the national park contains various wild fruit trees and herbaceous plants. In the national park, there are hotel, daily usage areas, country restaurant, cafeterias, nature education center, amphitheater, walking and bicycle paths, observation terraces, parking lots and mosques (TC Yozgat Valiliği, 2022; DKMP, 2022).

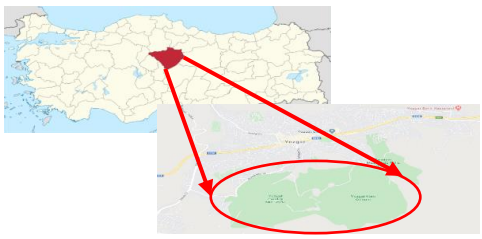


Figure 1. Location of the study area

Data were obtained from 80 visitors during the summer of 2020 via a face-to-face questionnaire. The questionnaire included the questions regarding demography (gender, age, marital status, residence, occupation and education) of visitors and recreational use of the park.

Data were run frequency analysis. In addition, as the data did not show a normal distribution, non-parametric Kruskal Wallis H and Mann-Whitney U tests were performed to determine whether the averages of some variables were equal in terms of demographic traits. All statistical analyses were done by SPSS program.

Findings and Discussion

The numbers of male and married visitors were 45 and 42, respectively. Visitors' ages are proportionally distributed in the range of 18-60 ages. The majority of visitors (40) had high school and bachelor degrees. Most visitors were student. The residence of visitors was mainly city center (Table 1).

Table 1. Demographic traits of visitors

Variables	f	Variables	f
Gender		Residence	
Female	35	Central	41
Male	45	County	21
Age		Village	13
18-25	26	Others	5
26-40	23	Marital Status	
41-60	21	Married	42
61 and over	10	Single	38
Occupation		Education	
Student	24	Primary school	11
Retired	14	Secondary school	15
House wife	19	High school	20
Others	23	Associate degree	14
		Bachelor	20
		Graduate	0

The majority of the visitors go to national park for picnic by car for 3-5 hours several times a month in summer. Visitors mostly indicated that accessibility to national park was difficult and parking lot was adequate. Favorite traits of national park were scene and ecosystem (Table 2). Accordingly, the findings regarding the favorite trait of the park overlap with those of visit reason. Because both trails from the favorite trait of the park and walking from visit reason had low frequencies. As stated by Akın (2019), the national park has mostly visited with the purpose of picnic. A study (Ayten & Dede, 2007) conducted in the same park reported that %73 of participants visited the park for picnic. Moreover, the parking lot needed in the study in 2007 is currently considered sufficient by visitors. On the other hand,

transportation by foot is still low despite being close (about 5 km). This may be because the park is mostly visited for picnic purposes rather than sports or walking.

Table 2. Traits regarding visit

Variables	f	Variables	f
Accessibility		Parking lot	
Easy	33	Yes	46
Difficult	47	No	34
Transportation		Visit frequency	
Car	38	Everyday	0
Bus	29	Several times a week	13
Foot	12	Several times a month	29
Bicycle	1	Several times a year	17
Visit duration (hour)		Rare	21
0 - 1	4	Visit season	
1 - 3	19	Spring	18
3 - 5	33	Summer	50
5 - 7	23	Autumn	12
7 and over	1	Winter	0
Favorite trait of park		Visit Reason	
Trails	0	Walking	6
Scene	24	Rest	18
Ecosystem	24	Nature and Forest	12
Lake	6	Health Issues	8
Silence	20	Picnic	32
Furnitures	6	Sport	4

Visitors stated that resting area, green texture and park security were sufficient but lighting system, municipal service and conscious use were insufficient (Figure 2). Earlier study Ayten & Dede (2007) in the same park, security was found insufficient. This means that the relevant institutions made improvement works about the security of the area. Again, we can understand from in the present study revealing the inadequate municipal services that the playgrounds, inadequate in 2007, are still not improved.

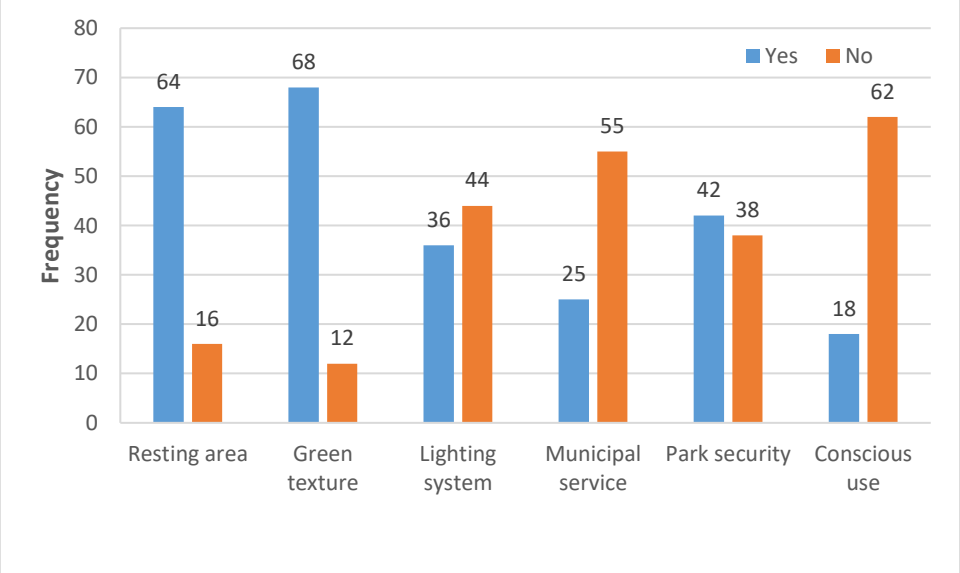


Figure 2. Adequacy of traits regarding national park

Visitors evaluated the general adequacy of national park as good and moderate (Figure 3). This result shows that there are improvements in the park considering the findings of the previous study (Ayten & Dede, 2007) revealing inadequacy of the park.

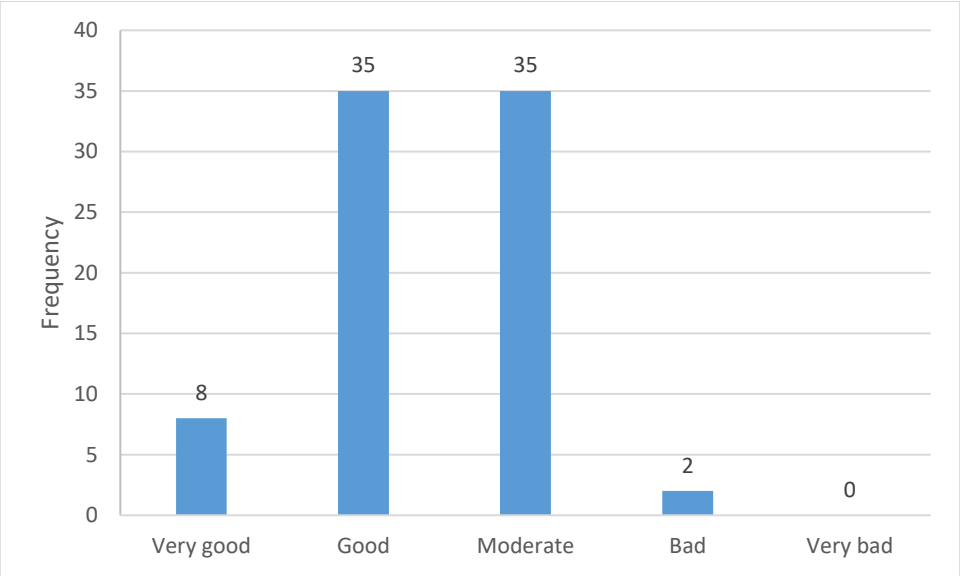


Figure 3. General assessment for Yozgat Çamlığı National Park

Visitors mainly indicated that deficiencies in the national park were cleaning and lack of inventory (Figure 4). This finding shows that the problems especially about cleaning around national park reported by Ayten & Dede (2007) still continue. Uzun et al. (2014) in Beydağları Sahil National Park found similar results for cleaning. Çetinkaya et al. (2016) stressed that there is only a limited literature concerning the constraints upon visiting national parks and most studies concentrate upon the structural constraints and ethnic minorities.

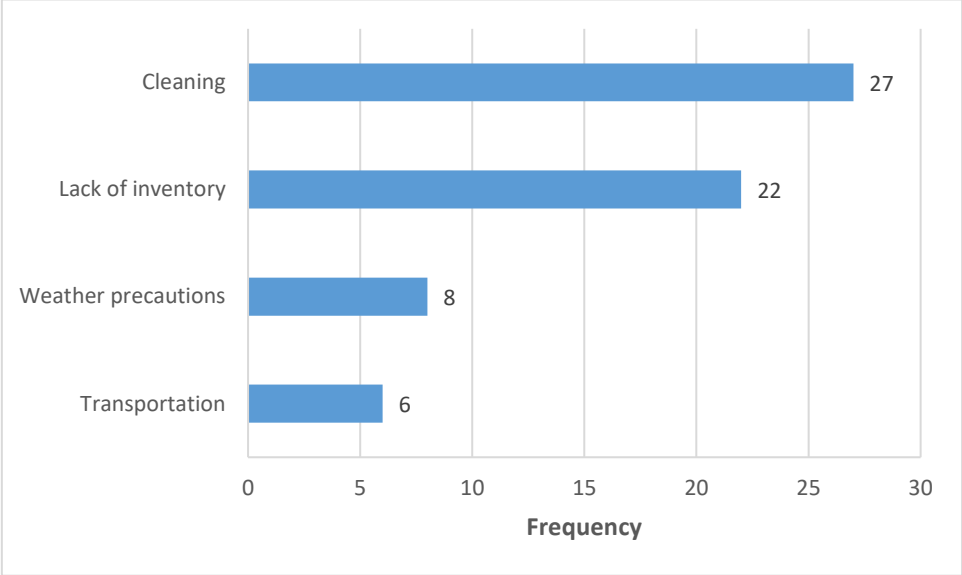


Figure 4. Deficiencies in Yozgat Çamlığı National Park

Demographic characteristics apart from gender were found to be effective on some usage characteristics of national park. Marital status, age and occupation had effects on transportation ($p<0.05$, Table 2). Accordingly, single and student visitors aged between 18-25 reached the area by public transport or on foot. Age and occupation affected accessibility ($p<0.05$, Table 2). The visitors aged between 26-40 stated that it is difficult to access the area. The means of age and residence were significantly different in terms of visit frequency ($p<0.05$, Table 2). Except for the age group of 61 and above, and those residing in the center, visit the area several times a month. Residence had effect on visit reason ($p<0.05$, Table 2). Visitors inhabiting in the city center visit the area for resting and picnic while those in the county and village visit the area for picnic.

Table 3. The effects of demography on accessibility, transportation, visit frequency and reason

Variable		Accessibility	Transportation	Visit frequency	Visit reason
Marital Status	MW-U	771	493	715	747
	Z	-0,305	-3,202	-0,833	-0,512
	p	0,760	**0,001****	0,405	0,608
Age	χ^2	8,473	14,042	10,500	3,488
	df	3	3	3	3
	p	**0,037***	**0,003****	**0,015***	0,322
Occupation	χ^2	11,249	9,159	4,020	5,164
	df	3	3	3	3
	p	**0,010***	**0,027***	0,465	0,160
Residence	χ^2	7,132	2,540	9,764	8,617
	df	3	3	3	3
	p	0,068	0,468	**0,021***	**0,035***

*: 0.05, **: 0.01

Conclusion and Recommendations

Visitors generally evaluated the park at a good level but stated that conscious use is insufficient. In this sense, it is necessary to raise awareness of the public especially through visual media as the society is informed and educated about the need to protect natural areas in developed countries.

Due to the proximity of the park to the city, it should be informed that people living in Yozgat city center can use the park not only for picnics but also for sports purposes. The improvement of municipal services and lighting systems will greatly contribute to this purpose.

It is extremely important to plan and implement trails in a park where the ecosystem and scenery are favorite traits of the park as well as its proximity to the city. This revision will increase the use of the park for health and sports.

Especially age had effects on accessibility, transportation and visit frequency. Considering this result, it is mandatory for the relevant institutions to take into account the age factor to increase the park usage of all age classes. For example, alternative transportation types can be planned for the elderly as well as the other visitors. Existing playgrounds can be also improved or new ones established. In conclusion, completing the lacks, facilitating accessibility, deploying promotional activities and explaining conscious use will ensure more effective recreational use of the Yozgat Çamlığı National Park. Considering the current global problems, conservation compatible with visitors' use and enjoyment of the natural values in the national park should be performed instead of just a strict protection of the park.

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Multi-Attribute Optimization of EDM Drilling Process Parameters on Nitinol Using GRA-Assisted PSO

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Abstract

Nitinol is an exotic material found its applications in various fields of engineering and medical applications. It is well known for its superior properties like biocompatibility, shape memory effect and superelasticity. On the contrary, it is a difficult-to-cut material due to higher flank wear. Hence, advanced machining processes are best suited for manufacturing Nitinol products. EDM is capable of processing Nitinol. The energy of the sparks leads to material removal through melting and evaporation. Furthermore, the shape-memory effect of Nitinol is temperature-dependent, which requires optimized processing. Therefore, the EDM drilling of Nitinol was carried out using copper electrodes (0.8 mm) and optimized for multiple responses using GRA-assisted PSO. The experimental work was carried out using distilled water as the dielectric fluid. The process parameters considered were the discharge current (I), servo gap voltage (V), discharge time (T_{ON}), charging time (T_{OFF}) and the dielectric flushing pressure (DP). The responses considered for the multi-attribute optimization were material removal rate (MRR), tool wear rate (TWR) and the degree of tapper (DoT). The GRA converted the three-objective problem into a single objective one. The GRG's model was optimized using PSO. The optimized EDM drilling process parameters were I = 22A, V=40 volts, T_{ON} = 6 µs, T_{OFF} = 5 µs and DP = 100 kg/cm^2. The confirmation test was conducted and compared the variations concerning to the predicted ones, and it was found that the MRR, TWR and the DoT varied by 20.9, 27 and 10.9 %, respectively.

Keywords: NiTi-alloy; Copper electrode; Distilled water; EDM; Optimization; GRA; PSO

1. Introduction

NiTi-alloy, Nitinol, is known for its superior superelasticity, shape memory [1], and biocompatibility [2]. Hence it found applications in the field of biomedical devices and actuators. However, on the contrary, it has a lower thermal conductivity and strain hardenability that makes it difficult to machine material and brings higher crater wear on the rake surface of the tool [3]. Hence, removing material through advanced machining methods without direct contact with the work material is becoming more relevant. Electric discharge machining (EDM), an advanced machining process, removes material with its sparks generated between the work-electrode gap [4]. Therefore, EDM is suitable for removing material from electrically conductive ones irrespective of their mechanical strength and behaviour. In contrast, the heat of the process could alter the properties like biocompatibility and shape memory effect [5]. Hence it is required to have the machining of the NiTi-alloy with thermal processing that alters the properties [6] as low as possible. That brings the requirement of optimized process control. Therefore various researchers attempted to optimize advanced machining processes on exotic materials like NiTi-alloy [7]–[12].

Sahoo and Mishra [13] optimized EDM drilling on Nitinol using GRA and Taguchi analysis for material removal rate, tool wear rate and hole taper simultaneously. Dong et al. [14] experimented with micro-welding using laser on Nitinol wires and reported the formation of intermetallics Ti_2Ni, $TiNi_3$ and Ti_3Ni_4 at the fusion zone. Vidyasagar et al. [15] optimized the laser parameters to enhance the corrosion behaviour of Nitinol by the formation of TiO_2 and Ti_2O_3. Guo et al. [16] studied the machinability of Nitinol for milling and EDM and found a thick white layer with micro-cracks formed while doing the primary cut of EDM. Adeleke and Yao [17] studied the impact of high temperature on Nitinol's shape memory (SM) effect and found that above the critical temperature, 700 K, the martensitic phase undergoes permanent deformation and the loss of the SM effect. Bhadeor and Umeda [18] welded Nitinol alloy using friction stir welding to study superelastic behavioural changes of the material and suggested that post-weld heat treatment is required to retain the property. Chekotu et al. [19] investigated part production using selective laser melting of Nitinol and mentioned that the transformation temperature of Nitinol altered due to oxygen, carbon and nitrogen presence during the processing of the material inside the chamber. Chaudhari et al. [20] investigated the WEDM process on Nitinol and stated that the irregularities on the surface at the optimized machining condition are better than at a higher energy level of cutting. Obeidi et al. [21] performed powder bed fusion of Nitinol on 316L stainless steel using laser and concluded that at 33 J/mm^3 of energy density, better properties like the uniform chemical composition with high compression strength and strain rate of the coating were produced. Li et al. [22] modified the Nitinol surface through a nanosecond laser to improve the material's biocompatibility and found the formation of TiO_2, Ni_2O_3-like oxides that help the cell growth.

Abhilash and Chakradhar [23] optimized WEDM on Inconel 718 using GRA-TOPSIS and concluded that the optimized method is faster with better surface and geometrical quality of the workpiece. Kumar and Mondal [24] optimized the EDM process on Al2050 alloy for various electrode materials using Taguchi-TOPSIS and GRA and stated that the rotary tool provides better depth, MRR and tool-wear. Bhaumik and Maity [25] performed multi-objective optimization of EDM on Ti-5Al-2.5Sn alloy using GRA and found an improvement of 44.23%. Bobbili et al. [26] investigated WEDM on ballistic grade Al-alloy and found improvement in the process due to the optimization of the process using GRA. Moayedi et al. [27] completed optimization of ANFIS by using GA and PSO for the estimation of α-ratio for the driven shaft. Dave [28] optimized the orbital EDM process on AISI304 and Inconel-718

using PSO and TLBO. Mistry et al. [29] implemented m-GA embedded PSO for facial emotion and concluded that the PSO outperformed other methods available. Ding et al. [30] estimated biomass pyrolysis kinetics using GA and PSO and confirmed that 30% of the best fit reaches using PSO compared with GA. Dey et al. [31] analyzed EDM on Al6061 alloy using Taguchi-PSO and confirmed the feasibility of the PSO as per the prediction within a wide range of process parameters. Babu et al. [32] experimented and optimized WEDM on Inconel-750 for MRR and surface roughness using ANN-PSO, where the ANN model was trained with the help of PSO. Naik and Sathisha [33] optimized the ECM on a silicon wafer with mixed electrolytes using GA-PSO and stated that PSO provided the best convergence.

Quarto et al. [34] optimized the EDM process through PSO and ANN and stated that this method makes the operator choose the best solution for the requirement.

Zahoor et al. [35] experimented with milling operation on Inconel 718 and completed mathematical modelling for surface roughness, and concluded that the surface roughness improved by 73.5 % while using Mecagreen 450 compared with the traditional flooding of the cutting fluid.

Jagadish et al. [36] reported the modelling and optimization process of SWJM on green composite and stated that TLBO provided a faster convergence, GWO required low computation time, and the HSMO provided an accurate solution.

Ram et al. [37] experimented with the prediction of surface roughness and kerf width for WEDMed Al6351-based MMC and found that the discharge time and the current were the most significant parameters for kerf width, whereas the wire feed rate was the major influencing parameter for the surface roughness.

Pandey et al. [38] optimized the vibration-assisted electric arc machining (VEAM)process of aluminium and boron carbide MMC and found that the MRR raised thirtyfold compared to EDM.

Rajaguru et al. [39] investigated the EDM process using Cu-CNT composite electrodes and found improvements in MRR and surface roughness compared to the conventional copper electrode.

Sisodiya et al. [40] completed the feasibility study of maglev EDM and stated that the MRR and specific energy were improved compared to the conventional EDM process.

Kiran et al. [41] experimented with the PMEDM process for surface modification with bio-dielectric fluid and confirmed that the microhardness of the coated layer was highest with sunflower oil and MoS_2 as the dielectric medium.

Roy and Mandal [42] experimented with the study of the inclination angle of the EDT wire on NiTi-60 SMA and concluded that the inclination angle influenced the MRR and surface finish.

Chaudhari et al. [43] investigated and optimized the PMWEDM process on Nitinol and stated that the enhancement in the graphene nanopowder in the dielectric fluid enhanced the MRR and surface finish.

Singh et al. [44] checked the surface integrity of the Nitinol surface while depositing TiN using an almost dry EDSC process.

Chaudhary et al. [45] optimized the WEDM process on the Nitinol SMA using RSM and HTS algorithms. Datta et al. [46] performed LBW on Nitinol sheets, optimized using desirability analysis and metaheuristic techniques, and stated that the BO had the fastest converging speed.

Kumar et al. [47] reviewed micro-EDM for manufacturing and emphasized that improvements in tool materials, dielectric fluid, power supply and flushing mechanism were required.

The NiTi-alloy has a wide range of applications, including biomedical devices and actuators, but is a hard-to-cut material. Therefore it is suitable to manufacture products using advanced machining methods like EDM. EDM can remove electrically conductive material due to the heat of the sparks generated between the tool-work gap. However, NiTi-alloy has one important shape-memory property induced by heat or temperature. Therefore an optimized process on the material for the shake of the required property rises. Hence, this article attempts EDM drilling of NiTi-alloy and optimization of the process using GRA and PSO

Experimentation

The experimentation work of EDM drilling has been completed using the Sparkonix EDM drilling machine, and its photograph is shown in *Figure 1*. The machine has five control parameters and different levels of each. The discharge current (I) can be varied between 1 to 25 A with 1 A step, whereas the gap servo voltage (V) varies between 10 to 100 volts with 10 volts step. The other parameters are the charging time (T_{OFF}) and discharge time (T_{ON}), and

each varies between 1 to 10 μs with a 1 μs step. The fifth control parameter is the dielectric flushing pressure, up to 100 kg/cm^2.



Figure 1: Photograph of Sparkonix EDM drilling machine

The NiTi-alloy used for this experimental work has 49.1 % Ni and 50.9 % Ti. Six specimens of size 35×35×6.156 mm^3 were used for the EDM drilling operation. Tubular copper electrodes with a diameter of 0.8 mm were used to drill the holes in the NiTi-alloy. The dielectric fluid used to flush the removed work material from the spark gap was distilled water.

Pilot experimentation was completed to decide the levels of each process control parameter. As a result, the levels of each control parameter used in the experimental work are shown in *Table 1*. Box-Behnken design (BBD) of the experiment was used with three levels of each parameter that reduce the number of experiments and take care of the responses' nonlinearity. The BBD resulted in forty-six experimental sets containing six replications of the centre point of the design and was found using Design-Expert 13 software. The experiments were conducted using the BBD design. During the experimental work, the weights of the workpieces and the electrodes before and after the EDM drilling were measured using a digital weighing machine having an accuracy of 0.001 grams. In addition, the drilling times of each experiment were measured using a Casio stopwatch with an accuracy of 0.001 seconds. After the drilling process, each hole's top and bottom diameters are measured at six different orientations to consider their average values using a travelling microscope with an accuracy of 0.01 mm. *Figure 2* shows the photographs of the workpieces, copper electrodes, travelling

microscope and digital weighing machine. The experiment numbers are also marked on the photographs of the workpieces.

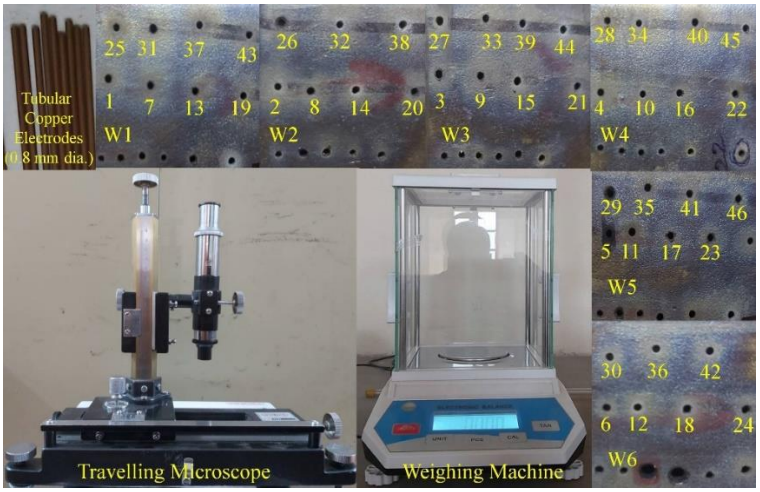


Figure 2**:** Photographs of workpieces with marked experiment numbers, electrodes, travelling microscope and weighing machine

Table 1: Process control parameters and their levels used for the experimentation

Control Factors	Unit	Notation	Level 1	Level 2	Level 3
Current	Ampere	I	12	17	22
Gap Voltage	Voltage	V	40	50	60
Pulse on time	µs	T_{ON}	2	4	6
Pulse off time	µs	T_{OFF}	5	7	9
Dielectric Pressure	Kg/cm^2	DP	50	75	100

$$MRR = \frac{(inital - final)\,weight\ of\ \ work\ \ material}{machining\ \ time \times density\ of\ \ work\ \ material} \quad (1)$$

$$TWR = \frac{(inital - final)\,weight\ of\ \ electrode}{machining\ \ time \times density\ of\ \ electrode} \quad (2)$$

$$DoT = \tan^{-1}\frac{(D_t - D_b)}{2H} \quad (3)$$

where D_t and D_b are the hole's average top and bottom diameters.

This experimental work considered three different responses to evaluate the EDM drilling process.

The responses were material removal rate (MRR), tool wear rate (TWR) and hole taper (DoT) and were calculated using Equations 1, 2 & 3 and tabulated in Table 2.

Table 2. Designed experimental set using BBD and corresponding responses

Sl	Process parameters					Responses		
	I	V	T_{ON}	T_{OFF}	DP	MRR	TWR	DoT
	amp.	volts	µs	µs	kg/cm^2	g/min	g/min	rad.
1	12	50	4	7	100	0.011	0.007	0.017
2	17	50	2	5	75	0.013	0.005	0.028
3	22	50	4	7	100	0.020	0.009	0.013
4	17	50	4	7	75	0.015	0.007	0.015
5	17	50	6	5	75	0.020	0.007	0.015
6	12	50	4	7	50	0.008	0.004	0.015
7	12	50	4	9	75	0.008	0.004	0.021
8	17	50	2	7	100	0.007	0.005	0.028
9	22	50	4	5	75	0.024	0.008	0.030
10	17	40	2	7	75	0.009	0.004	0.025
11	17	40	4	7	50	0.011	0.005	0.014
12	17	60	4	5	75	0.028	0.013	0.027
13	17	50	6	7	50	0.015	0.004	0.027
14	17	60	4	7	50	0.018	0.015	0.030
15	12	50	6	7	75	0.011	0.006	0.011
16	17	50	4	9	50	0.009	0.006	0.023
17	12	60	4	7	75	0.017	0.017	0.019
18	12	50	2	7	75	0.010	0.004	0.027
19	22	50	4	7	50	0.018	0.006	0.028
20	17	60	2	7	75	0.013	0.013	0.027
21	17	40	4	9	75	0.007	0.004	0.019
22	17	50	2	7	50	0.011	0.005	0.027
23	22	50	6	7	75	0.016	0.006	0.010
24	17	40	4	7	100	0.014	0.005	0.012
25	17	40	4	5	75	0.014	0.005	0.015
26	22	60	4	7	75	0.022	0.017	0.017
27	17	50	4	7	75	0.016	0.007	0.024
28	22	50	2	7	75	0.017	0.004	0.032
29	17	50	4	5	50	0.017	0.004	0.026
30	17	50	4	7	75	0.020	0.007	0.012
31	17	50	4	7	75	0.016	0.005	0.032
32	17	50	4	7	75	0.012	0.006	0.030
33	12	50	4	5	75	0.011	0.005	0.028
34	22	40	4	7	75	0.021	0.005	0.032
35	17	50	2	9	75	0.007	0.005	0.032
36	17	50	4	7	75	0.008	0.005	0.014
37	17	60	4	9	75	0.019	0.018	0.030
38	12	40	4	7	75	0.007	0.003	0.021
39	17	50	6	9	75	0.015	0.005	0.015
40	17	50	4	5	100	0.019	0.005	0.015
41	17	60	4	7	100	0.021	0.015	0.015
42	17	50	4	9	100	0.014	0.007	0.012
43	22	50	4	9	75	0.015	0.008	0.013
44	17	40	6	7	75	0.015	0.004	0.015
45	17	50	6	7	100	0.022	0.005	0.026
46	17	60	6	7	75	0.020	0.016	0.024

2. Mathematical Modelling of The Responses Using GRA

This work is one hybrid multi-response optimization approach simultaneously dealing with MRR, TWR and DoT. The MRR requires maximization and the TWR and DoT require minimization to have higher accuracy of the holes and efficiency of the EDM drilling. Therefore the responses were normalized before the gray relational analysis (GRA) using Equation 4 or 5 [48].

For the larger, the better performance characteristic (MRR):

$$x_i = \frac{y_i - \min(y_i)}{\max(y_i) - \min(y_i)} \quad (4)$$

For the smaller, the better performance characteristic (TWR & DoT):

$$x_i = \frac{\max(y_i) - y_i}{\max(y_i) - \min(y_i)} \quad (5)$$

where y_i is the i^{th} response.

After the normalization of responses, the deviation sequences were calculated using Equation 6. Then the gray relational coefficients (GRCs) were calculated using Equation 7, and then the gray relational grades of each experiment using Equation 8.

$$\Delta x_i = \max(x_i) - x_i \quad (6)$$

$$\xi_i = \frac{\min(\Delta x_i) + \zeta \max(\Delta x_i)}{\Delta x_i + \zeta \max(\Delta x_i)} \quad (7)$$

$$\gamma_i = \frac{1}{n}\sum_{1}^{n} \xi_i \quad (8)$$

where ξ_i & γ_i are the i^{th} GRCs for each response and GRG of i^{th} experiments. ζ is equalled to 0.5, which means equal weights were given to each response. The calculated normalized values of each response, along with their GRCs and GRGs, are tabulated in *Table 3*.

Table 3. Normalized responses along with their gray relational coefficients and grades

Sl	Normalized responses			Gray relational coefficients of responses			GRG
	MRR	TWR	DoT	MRR	TWR	DoT	
1	0.179	0.767	0.678	0.379	0.682	0.609	0.556
2	0.266	0.902	0.178	0.405	0.836	0.378	0.540
3	0.597	0.597	0.857	0.553	0.554	0.778	0.628
4	0.369	0.765	0.786	0.442	0.680	0.700	0.607
5	0.599	0.778	0.786	0.555	0.693	0.700	0.649
6	0.014	0.927	0.750	0.336	0.873	0.667	0.625
7	0.053	0.947	0.500	0.345	0.905	0.500	0.583
8	0.006	0.859	0.178	0.335	0.781	0.378	0.498
9	0.830	0.651	0.107	0.747	0.589	0.359	0.565

10	0.100	0.951	0.321	0.357	0.910	0.424	0.564
11	0.197	0.914	0.821	0.384	0.854	0.737	0.658
12	1.000	0.345	0.250	1.000	0.433	0.400	0.611
13	0.361	0.984	0.250	0.439	0.968	0.400	0.602
14	0.514	0.182	0.107	0.507	0.379	0.359	0.415
15	0.196	0.837	0.964	0.384	0.754	0.933	0.690
16	0.088	0.797	0.428	0.354	0.711	0.467	0.510
17	0.478	0.047	0.607	0.489	0.344	0.560	0.465
18	0.119	0.939	0.250	0.362	0.891	0.400	0.551
19	0.529	0.797	0.214	0.515	0.711	0.389	0.538
20	0.258	0.324	0.250	0.402	0.425	0.400	0.409
21	0.004	0.921	0.607	0.334	0.863	0.560	0.586
22	0.163	0.897	0.250	0.374	0.829	0.400	0.534
23	0.444	0.784	1.000	0.474	0.698	1.000	0.724
24	0.341	0.870	0.893	0.431	0.793	0.823	0.683
25	0.344	0.910	0.750	0.432	0.848	0.667	0.649
26	0.727	0.026	0.678	0.647	0.339	0.609	0.532
27	0.404	0.758	0.393	0.456	0.674	0.452	0.527
28	0.498	0.920	0.000	0.499	0.862	0.333	0.565
29	0.492	0.919	0.286	0.496	0.861	0.412	0.590
30	0.637	0.722	0.893	0.580	0.642	0.823	0.682
31	0.410	0.892	0.036	0.459	0.823	0.341	0.541
32	0.246	0.801	0.107	0.399	0.716	0.359	0.491
33	0.189	0.860	0.178	0.381	0.781	0.378	0.514
34	0.658	0.914	0.000	0.594	0.853	0.333	0.594
35	0.005	0.892	0.036	0.334	0.822	0.341	0.499
36	0.047	0.906	0.821	0.344	0.841	0.737	0.641
37	0.552	0.000	0.107	0.527	0.333	0.359	0.407
38	0.000	1.000	0.500	0.333	1.000	0.500	0.611
39	0.361	0.880	0.786	0.439	0.806	0.700	0.648
40	0.579	0.868	0.750	0.543	0.791	0.667	0.667
41	0.675	0.164	0.786	0.606	0.374	0.700	0.560
42	0.349	0.748	0.893	0.434	0.665	0.823	0.641
43	0.392	0.648	0.857	0.451	0.587	0.778	0.605
44	0.384	0.947	0.750	0.448	0.904	0.667	0.673
45	0.709	0.862	0.286	0.632	0.783	0.412	0.609
46	0.637	0.137	0.357	0.579	0.367	0.437	0.461

The GRGs of each experiment were further analyzed through regression modelling using Design-Expert 13 statistical software. The mathematical linear, the best fit, model developed through the multi-regression analysis is given in Equation 9. The analysis of variance (ANOVA) of the GRGs is provided in *Table 4*, showing that the model is significant. The servo gap voltage (V) and the discharge time (T_{ON}) are the two most significant process control parameters for the GRG as the single response.

$$GRG = 0.790269 + 0.001932I - 0.007234V + 0.028028T_{ON} - 0.009512T_{OFF} + 0.000921DP \quad (9)$$

Table 4. Analysis of variance of GRGs

Source	Sum of Squares	df	Mean Square	F-value	p-value
Model	0.1498	5	0.0300	10.38	< 0.0001
A-I	0.0015	1	0.0015	0.5176	0.4761

B-V	0.0837	1	0.0837	29.03	< 0.0001
C-T_{ON}	0.0503	1	0.0503	17.43	0.0002
D-T_{OFF}	0.0058	1	0.0058	2.01	0.1643
E-DP	0.0085	1	0.0085	2.94	0.0940
Residual	0.1154	40	0.0029		
Lack of Fit	0.0884	35	0.0025	0.4674	0.9164
Pure Error	0.0270	5	0.0054		
Cor Total	0.2651	45			

Optimization using particle swarm technique (PSO)

The particle swarm technique is one nature-inspired stochastic technique of optimization which considers the behaviour of the flock of birds or school of fishes. The PSO is a population-based technique that considers a specific size of the population randomly distributed in the solution space. Each member of the population has its position and velocity of searching for the optimum value of the response. Each member always takes the best data of their own and the group. Each member searches the local optima and the global optima; hence care should be taken while deciding the local (c_1) and global (c_2) acceleration coefficients along with the inertial weight (w) of the velocity. The initial positions and velocities were calculated using random numbers inside the solution space for the full population size. Each population member's local best (P_{lbp}) and the global (P_{gbp}) best positions are recorded to find the next velocity and position using Equations 10 and 11.

$$V_{i+1} = w \times V_i + c_1 \times r_1 \left(P_{lbp} - P_i \right) + c_2 \times r_2 \left(P_{gbp} - P_i \right) \qquad (10)$$

$$P_{i+1} = P_i + V_{i+1} \qquad (11)$$

where r_1 & r_2 are two random numbers.

One update to the positions and velocities of each member of the population with respect to their local and global best positions completes one iteration. The iterations should have to proceed until the solutions are converged. Convergence means the local and global best for each solution are the same.

3. Results and Discussion

Figure 3 shows the grey relational grade's (GRG) surface and contour plots. In addition, it shows the GRG variation concerning the most significant process control parameters, i.e. the servo gap voltage (V) and the discharging time (T_{ON}). The other parameters are kept constant as the optimized process control parameters found using PSO: discharge current (I) = 22 amperes, charging time (T_{OFF}) = 5 μs and the dielectric flushing pressure (DP) = 100 kg/cm^2.

The maximum value of GRG was 0.7547 at V= 40 volts and T_{ON} = 6 µs. The minimum value of GRG was 0.5023 at V = 60 volts and T_{ON} = 2 µs.

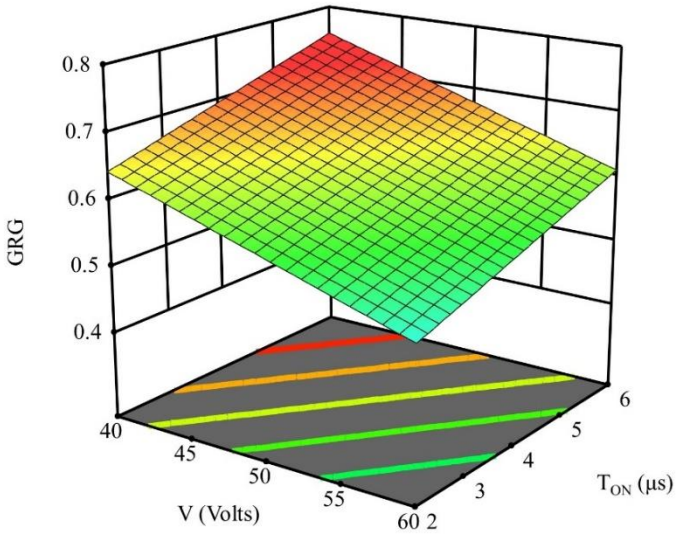


Figure 3. Surface and contour plots for GGR

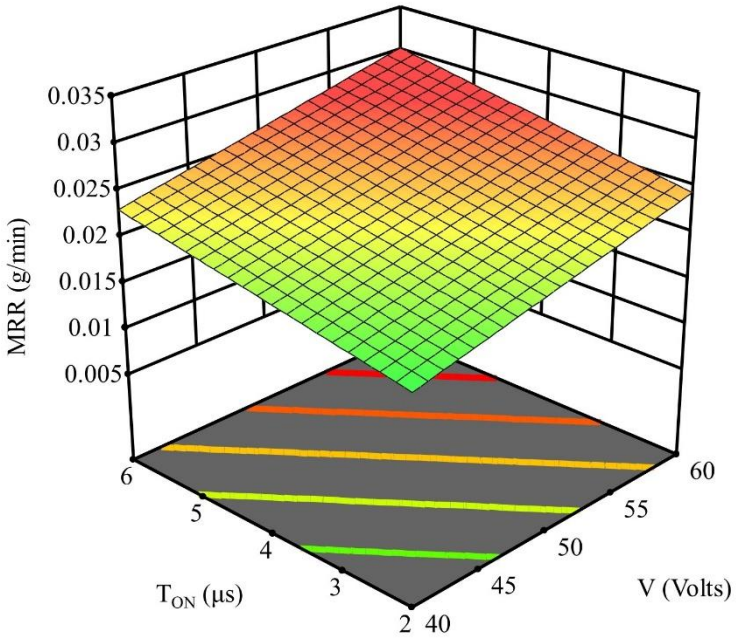


Figure 4. Surface and contour plots for MRR

Figure 4 shows the surface and contour plots for the MRR. In addition, the variations of MRR are shown concerning the V and T_{ON} and the other process control parameters at their optimum values found through the PSO. The maximum value of MRR found around .03 g/min at higher values of V and T_{ON}. At the higher value of V, the spark's energy is higher as more energy is required to ionize the dielectric fluid in the tool-work gap. Hence the temperature rises and more amount of material get removed. Furthermore, by raising the T_{ON},

the work material is exposed to the spark for a longer duration leading to a higher volume of material being removed.

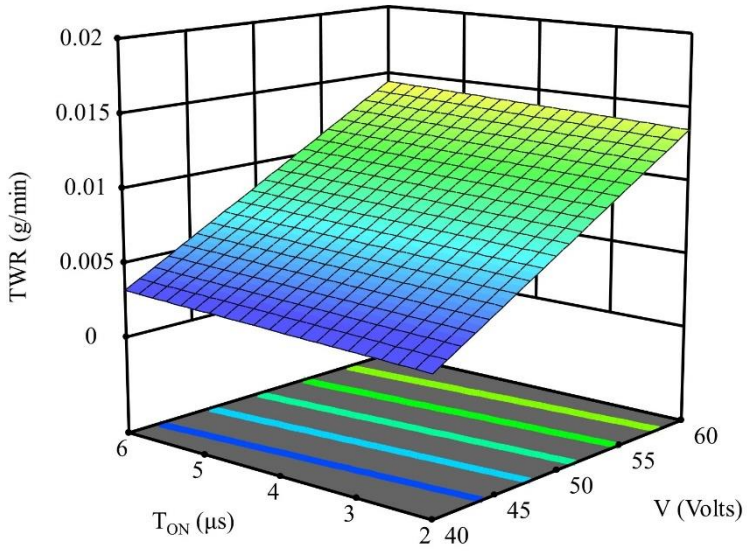


Figure 5. Surface and contour plots for TWR

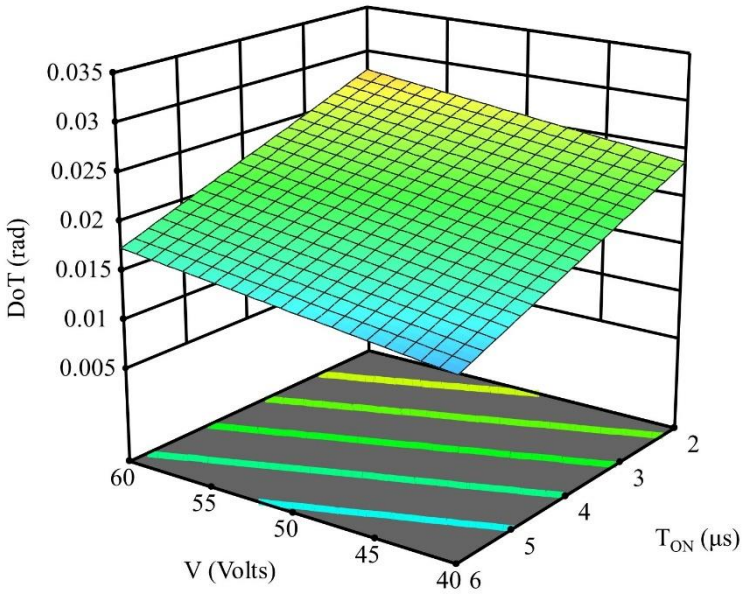


Figure 6. Surface and contour plots for DoT

Figure 5 shows the variation of TWR as the surface and contour plots. The process control parameters are taken according to the ANOVA of GRG and the optimized process control parameters found using PSO. The figure shows that the TWR is more at a higher value of servo gap voltage V and almost independent of T_{ON}. By raising the V, the energy per spark rises, which raises the amount of heat the electrode receives, hence a higher TWR detection.

Hence, for a desired lower TWR, the gap voltage V should be at a lower value, as seen in the figure.

Figure 6 shows the variation of hole taper (DoT) with respect to the process control parameters, as shown in the case of the other surface and contour plots. The maximum undesired value of DoT was 0.0277 radians at higher V and lower T_{ON}. The DoT arises due to the sparks generated at the cylindrical interface tool, which takes longer at the top of the drilled hole. Therefore, at a higher value of V, the chances of discharge at the cylindrical interface rise, leading to a higher value of DoT. Likewise, at lower discharge time T_{ON}, the probability of spark formation at the cylindrical interface rises. Therefore, the lower DoT can be seen at a lower value of V and a higher value of T_{ON}.

The linear multi-regression equation of the GRG was taken to optimize the process control parameters using PSO, a hybrid technique. In this PSO algorithm, the population size was taken as 10. Because of the rise in population size leading to the local optima, it is desired to have global optima. Therefore, the inertial weight for the velocity, local and global acceleration coefficients were taken as w = 0.2, c_1 = 0.4 and c_2 = 1.7. These conditions were checked through the PSO algorithm to get the optimum PSO parameters. The PSO provides the optimum parametric setting as I = 22 A, V = 40 volts, T_{ON} = 6 µs, T_{OFF} = 5 µs, and DP = 100 kg/cm^2. The optimum value of the GRG found through the PSO algorithm was 0.756121.

The confirmation experiment was completed at the optimized parametric setting found using PSO. The predicted and experimental values of MRR, TWR and DoT are shown in *Table 5* as per the confirmation experiment. The percentage of deviations are also shown in it.

Table 5. Variation of predicted and experimental values of the responses

Responses	**MRR**	**TWR**	**DoT**
Unit of responses	g/min	g/min	radians
Predicted	0.023165	0.003238	0.013229
Measured	0.0293	0.004439	0.014862
% of deviation	-20.9395	-27.063	-10.9905

4. Conclusion

The experimental investigation and optimization of the EDM drilling process on the NiTi-alloy were completed along with the validation experiment. The following conclusions were drawn from this work:

1. The gap servo voltage and the discharging time are the most significant process control parameters found through the analysis of variance of GRG.

2. The PSO provides the optimum parametric setting for the EDM drilling on the NiTi-alloy as: I = 22 A, V = 40 volts, T_{ON} = 6 µs, T_{OFF} = 5 µs, and DP = 100 kg/cm^2.

3. A confirmation experiment was conducted to validate the predicted optimized values, and the deviations recorded were approximately 20.94, 27.06 and 10.99 % lower for MRR, TWR and DoT, respectively.

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Comparisons and Evaluations of Historical and Traditional Housing Architecture in Muş Kale Neighborhood on Visual Materials from 2011 and 2021

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Abstract

The Muş region is a deep-rooted geography that can be traced back to prehistoric times. In this geography, there are many settlements that can provide housing sustainability. One of the most important of these settlements is the city center of Muş, which constitutes the administrative, cultural, and social focus of the region. The region, which is called Eski Muş (Old Muş) and is located in the southwestern part of the city center, is home to many monuments that stand out with their historical and cultural characteristics. The mosques, hammams, churches, and cemeteries in this region are concrete examples of the region's settlement continuity from the past without interruption. Previous studies conducted in the region have investigated the historical characteristics, cultural qualities, and architectural forms of these religious and cultural monuments in many aspects. Until the recent time, the surroundings of these monuments were also home to historic and traditional residential buildings, which constitute the spatial counterparts of the settlement culture developed in the region over thousands of years. Considering that there are many answers formed over thousands of years according to topography, geographical references, climatic characteristics, cultural codes, manners, and accessible building materials in traditional architecture, the importance of examining the examples of traditional architecture emerges. The disappearance of these examples without sufficient investigation also causes the answers that have been formed to disappear suddenly. The examples of historic and traditional residential architecture in the Eski Muş region faced such a situation and disappeared suddenly and largely due to the urban transformation and urgent expropriation practices that started in 2012. Therefore, the present study focused on Muş Houses with historical and traditional characteristics. The residential buildings with historical and traditional characteristics, which have largely disappeared due to urban transformation and urgent expropriation practices within the boundaries of the Kale Neighborhood, which constitutes the historic settlement core of Muş, and changes in the texture caused by these buildings were investigated within the scope of the study. The photography method was used in the study. As a result of the study, facade features and facade details of the historic and traditional residential architecture of Muş were recorded and evaluated together with their formations. Furthermore, the historic and traditional residential buildings, which still exist in the Kale Neighborhood after the urban transformation and urgent expropriation practices, and the new condition of the neighborhood were also investigated and discussed. It is thought that the study will make a modest contribution to the knowledge of the historic and traditional residential architecture of Muş, especially in terms of visual materials.

Keywords: Turkey, Muş, Kale Neighborhood, traditional residential architecture, process-based urban photography.

Introduction

The Muş region is a deep-rooted geography that can be traced back to prehistoric times. In this geography, there are many settlements that can provide housing sustainability. One of the most important of these settlements is the city center of Muş, which also constitutes the administrative, cultural, and social focus of the region. The region, which is called Eski Muş (Old Muş) and is located in the southwestern part of the city center, is home to many monuments that stand out with their historical and cultural characteristics (Fig. 1). The

mosques, hammams, churches, and cemeteries in this region are concrete examples of the region's settlement continuity from the past without interruption (Fig. 2).

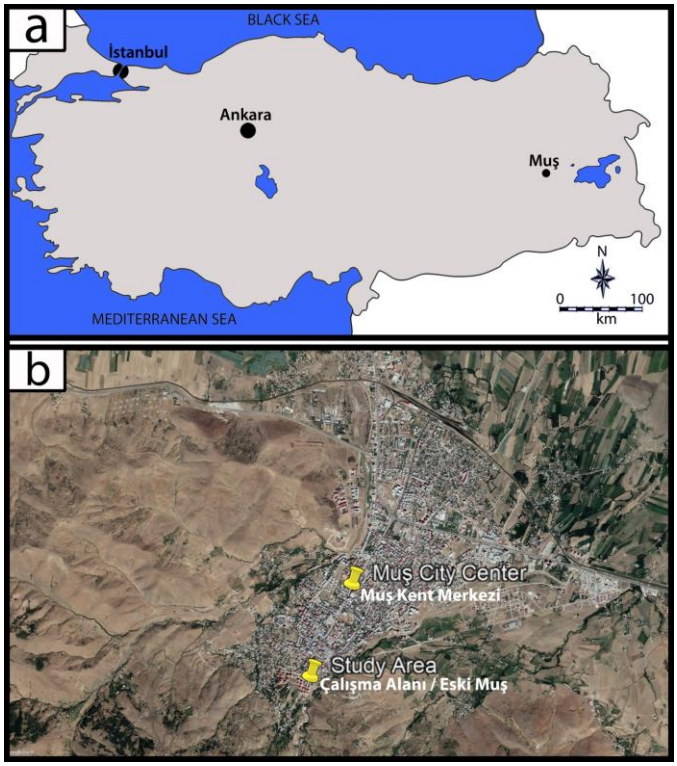


Figure 1. Study area; a) location of Muş province, b) location of the city center and study area.



Figure 2. Important monuments in the region; a) Ulu Mosque, b) Virgin Mary Church, c) Migren (Dere) Hammam, d) Armenian Cemetery.

Previous studies conducted in the region have investigated the historical characteristics, cultural qualities, and architectural forms of these religious and cultural monuments in many aspects (Kulağuz, 1997; Kılavuz, 2009; Öztürk, 2022). Until the recent time, the surroundings of these monuments were also home to historic and traditional residential buildings, which constitute the spatial counterparts of the settlement culture developed in the region over thousands of years.

Considering that there are many answers formed over thousands of years according to topography, geographical references, climatic characteristics, cultural codes, manners, and accessible building materials in traditional architecture, the importance of examining the examples of traditional architecture emerges. The disappearance of these examples without sufficient investigation also causes the answers that have been formed to disappear suddenly.

The examples of historic and traditional residential architecture in the Eski Muş region faced such a situation and disappeared suddenly and largely due to the urban transformation and urgent expropriation practices that started in 2012 (Resmî Gazete, 2012; 2013). Nevertheless, the studies by Kılavuz (2013a), Kılavuz (2013b), Büte (2014), and Işık (2017) on the historic and traditional residential architecture in the region stand out as important sources. The surveys, interior and exterior photographs, and various spatial analyses of the historic and traditional residential buildings, most of which have not reached the present day, were included in these studies.

However, studies on the historic and traditional residential architecture of Muş were stopped after the interventions in the region, and no new studies were found in the literature after 2017. Therefore, the present study focused on Muş Houses with historical and traditional characteristics. The residential buildings with historical and traditional characteristics, which have largely disappeared due to urban transformation and urgent expropriation practices within the boundaries of the Kale Neighborhood, which constitutes the historic settlement core of Muş, and changes in the texture caused by these buildings were investigated within the scope of the study.

The photography method was used in the study. Photography studies were conducted in two stages; the first stage covers the year 2011 before the urban transformation and urgent expropriation practices, and the second stage covers the year 2021 after the urban transformation and urgent expropriation practices.

As a result of the study, facade features and facade details of the historic and traditional residential architecture of Muş were recorded and evaluated together with their formations. Furthermore, the historic and traditional residential buildings, which still exist in the Kale Neighborhood after the urban transformation and urgent expropriation practices, and the new condition of the neighborhood were also investigated and discussed. It is thought that the study will make a modest contribution to the knowledge of the historic and traditional residential architecture of Muş in terms of visual materials.

Materials and Methods

With regard to the scope, the study was conducted within the boundaries of the Kale Neighborhood, which constitutes the historic settlement core of Muş.

The photography method was used in the study. Photography studies were conducted in two stages; the first stage covers the year 2011 before the urban transformation and urgent expropriation practices, and the second stage covers the year 2021 after the urban transformation and urgent expropriation practices.

In the photography studies conducted in 2011, the street facades of residential buildings with historical and traditional characteristics and details such as windows, entrances, and grates within these facades were recorded and evaluated together with their formations.

In the photography studies, the details and construction systems visible to the naked eye due to the deterioration and destruction in the residential buildings with historical and traditional characteristics were also documented.

In the photography studies conducted in 2021, the residential buildings with historical and traditional characteristics, which still exist in the Kale Neighborhood after the urban transformation and urgent expropriation practices, and the new condition of the neighborhood were also investigated and discussed.

Findings and Discussion

In the research conducted in the study area in 2021, it was observed that the historic and traditional residential texture formed within the boundaries of the settlement, called Kale Neighborhood, and circulation elements such as pathways, roads, road junctions, streets, and squares, which formed the defining axes of this texture, were largely removed in line with the results of the urban transformation and urgent expropriation practices that were initiated in 2012 (Fig. 3).

It was determined that the relevant interventions completely removed communal areas such as the silhouette, landscape, garden, border walls, courtyards, barns and fountains, and tandoori (tandır) houses, which were formed together with the traditional life in the region (Fig. 3).

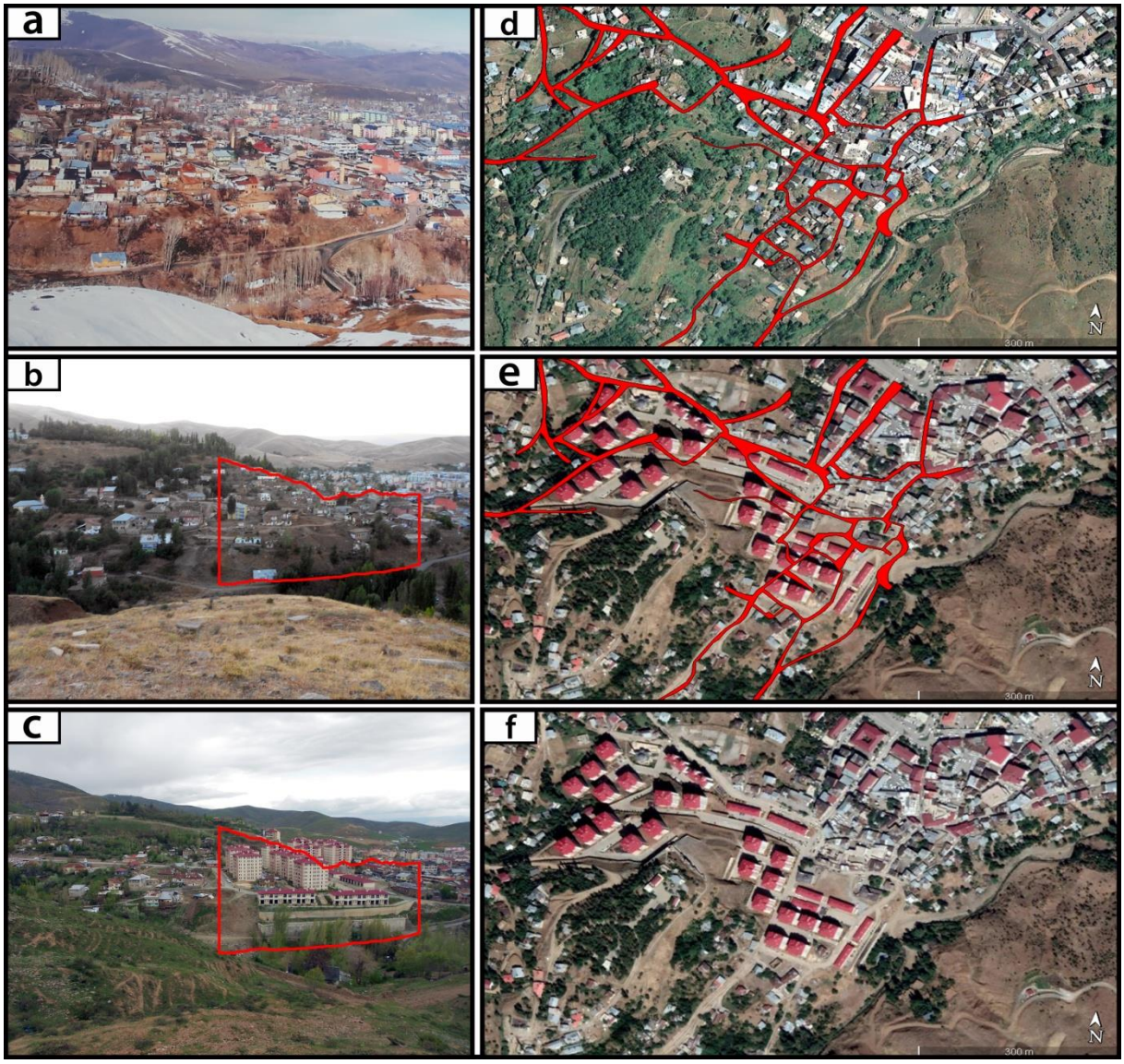


Figure 3. Changes in the silhouette and settlement texture in the study area; a) the view of the Kale Neighborhood in the 1980s (Yıldırım, 2022), b) the view of the Kale Neighborhood in 2011, c) the view of the Kale Neighborhood in 2021, d) satellite image of the Kale Neighborhood in 2011, e) largely destroyed circulation network superimposed on the satellite image of the Kale Neighborhood in 2021, f) satellite image of the Kale Neighborhood in 2021.

It is seen that quite a limited number of residential buildings with historical and traditional characteristics still exist in the region. These residential buildings are mainly lined to the south of the Virgin Mary Church (Fig. 4). In addition to the relevant examples, a residential building located on plot 710 and parcel 6 adjacent to the urban transformation application area also seems to be able to continue its existence since it is registered (Fig. 4).



Figure 4. Residential buildings with historical and traditional characteristics (2021).

It is considered that the plot systems and block orders formed as a result of the urban transformation practices in the region create a language incompatible with topography. It can be observed that especially the settlement plans that do not take into account the sloping land elevations have formed high retaining walls and, accordingly, deaf surfaces (Fig. 5).

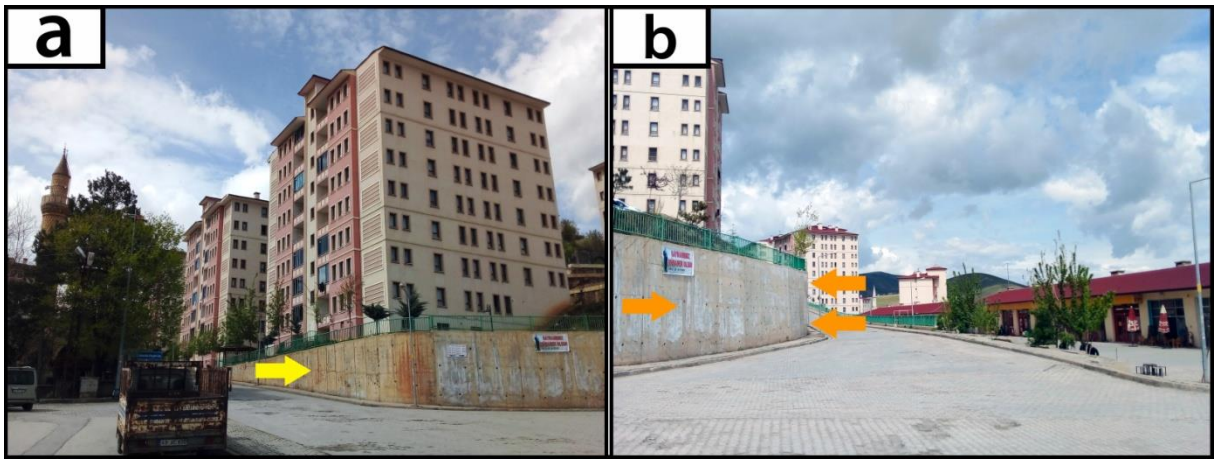


Figure 5. High retaining walls and deaf surfaces (2021).

Moreover, it is perceived that the block dimensions and gauges have caused an overwhelming effect compared to religious monuments and traditional houses (Fig. 6a, b). It is observed that the block gauges, which are quite high compared to the religious buildings, have obscured these monuments within the new texture (Fig. 6c, d).

It is worth examining in detail the residential building, which is located on plot 710 and parcel 6 adjacent to the urban transformation application area and registered due to its historical and

traditional characteristics (Fig. 6e, f), in that it presents a unique case of what kinds of results the conservation of a historical monument on a singular scale can produce.

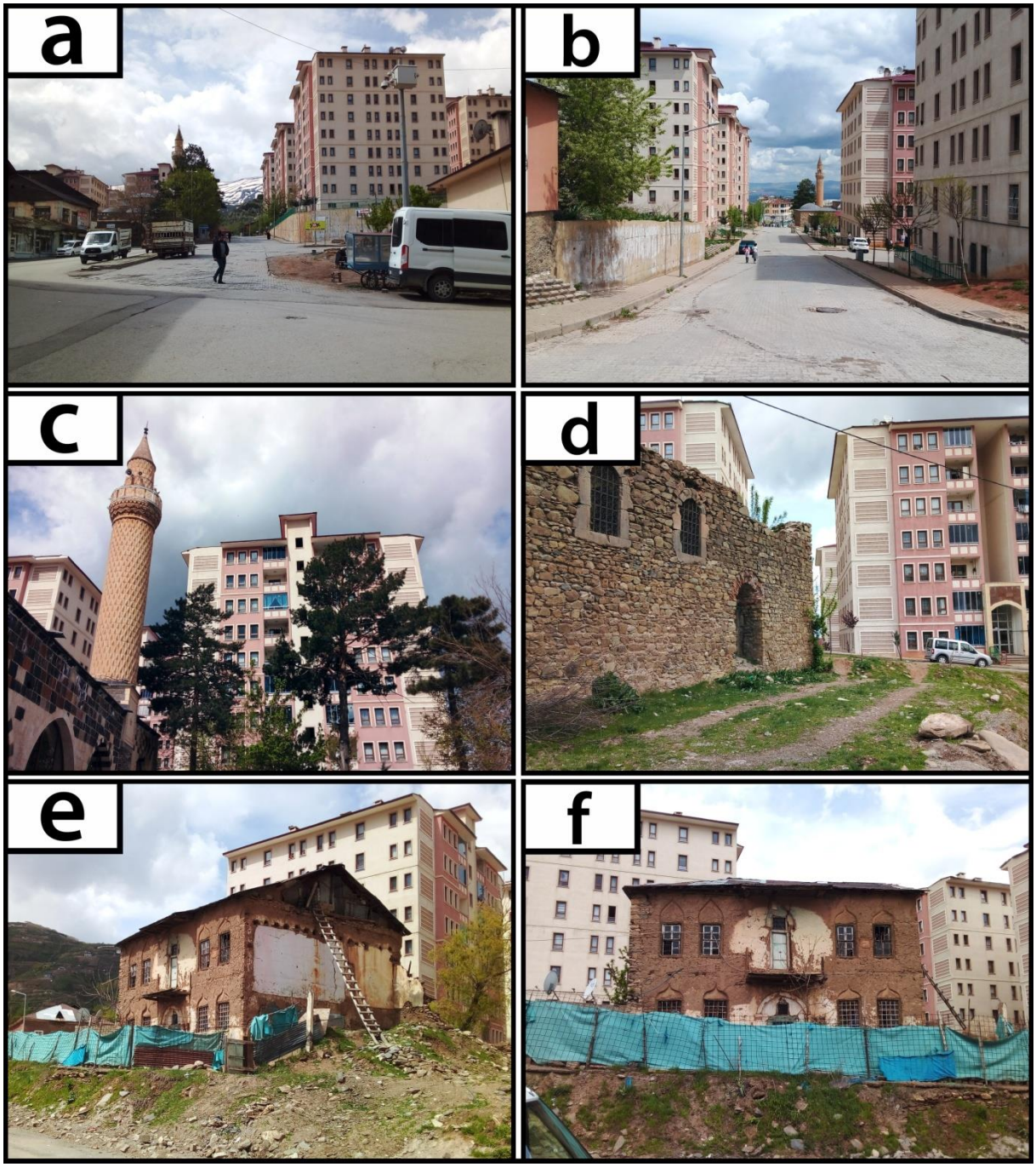


Figure 6. The relations of the new arrangements created as a result of the urban transformation practice with the religious monuments and traditional houses; a, b) perception of the Ulu Mosque over Fabrika Street, c) high-rise residential blocks built right across the Ulu Mosque, d) high-rise residential blocks built in the northeast of the Virgin Mary Church, e, f) residential building located on plot 710 and parcel 6.

The previous studies on architectural and urban conservation have frequently emphasized that traditional settlements and buildings within these settlements form a meaningful sequence. To clarify this issue, all buildings in a historic and traditional settlement are defined as the

elements that gain meaning according to their location, just like words in a sentence, but become meaningless when left alone. According to the aforementioned sequence approach, each unit building within traditional settlements is a part of a flow that is referenced by buildings before it and gives references to buildings after it (Fig. 7a). The buildings, whose sequence has been removed and which are left alone with preservation on a singular scale, will largely become meaningless along with eliminating the elements that give meaning to them (topography, street, the order of the neighboring buildings, the characteristics of the opposite buildings, etc.) (Fig. 7b). When the residential building located on plot 710 and parcel 6 with a different topography around it, a disappeared street route, deaf side facades due to the demolition of its neighboring buildings, and a removed pattern formed by the opposing buildings is evaluated with its current condition, it is seen that it was left in a situation far from the meaning of the period when it was in the historical sequence, despite the conservation decision. Considering the new construction situation around this residential building, it is considered that it has turned into a museum exhibition object waiting for its conservation time rather than a traditional residence (Fig. 7a, b).

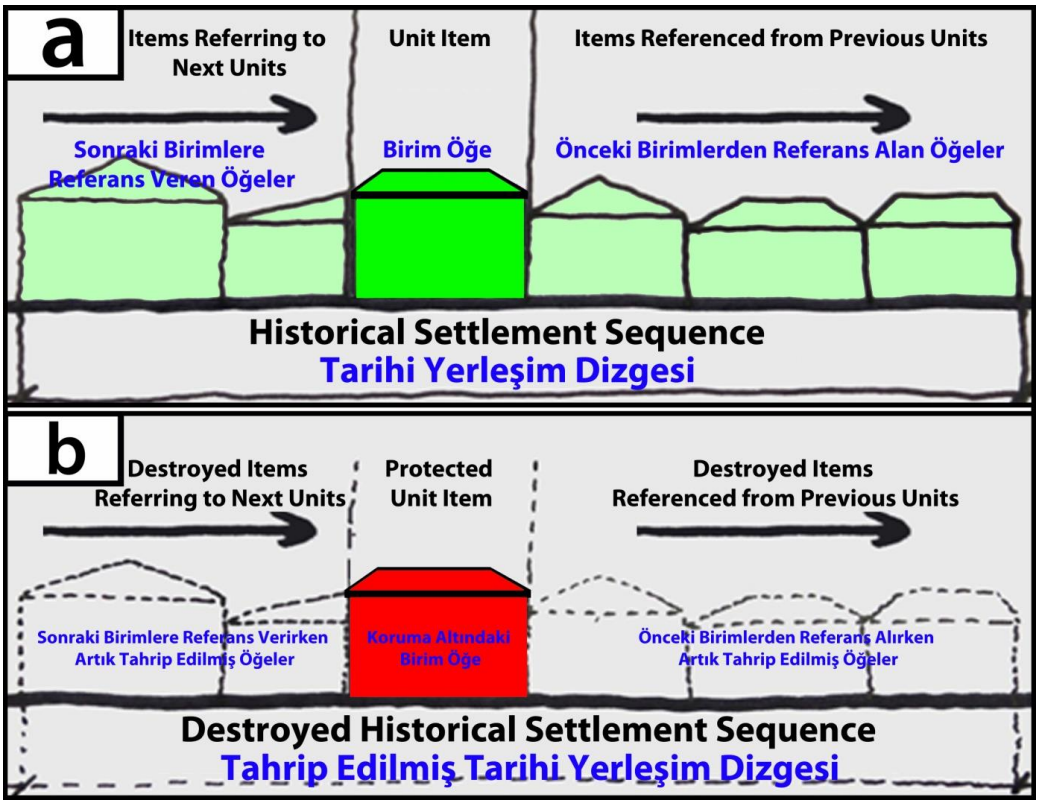


Figure 7. Consequences to be caused by the preservation of a historical monument on a singular scale; a) the meaning of the residential building located on plot 710 and parcel 6 in the period when it was in the historical sequence, b) the meaning of the residential building located on plot 710 and parcel 6 in the period after the historical sequence was removed.

When the historic and traditional residential buildings were examined based on the photography studies conducted in 2011, it was observed that both floors of the two-storey residential buildings were used for residence purposes (Fig. 8). On the facades of the houses, which can be opened to both the street and the courtyard, window and entrance forms appear as remarkable facade elements (Fig. 8-10).



Figure 8. Facade forms of traditional Muş Houses; a, b) rectangular windows and arched entrances, c-f) rectangular windows observed on both floors reserved for residence.

Rectangular and ogee-shaped arch types are mainly observed in the window formations of traditional Muş Houses (Fig. 8-9). The residents of the Kale Neighborhood frequently mentioned that the ogee-shaped arched window forms were created with the inspiration from "Muş Tulip / Tulipa Sintenisii Baker" (Sayılan, 2008) or "Inverted Tulip / Fritillaria Imperialis" (Erbil et al., 2015) grown in the Muş Region (Fig. 9).

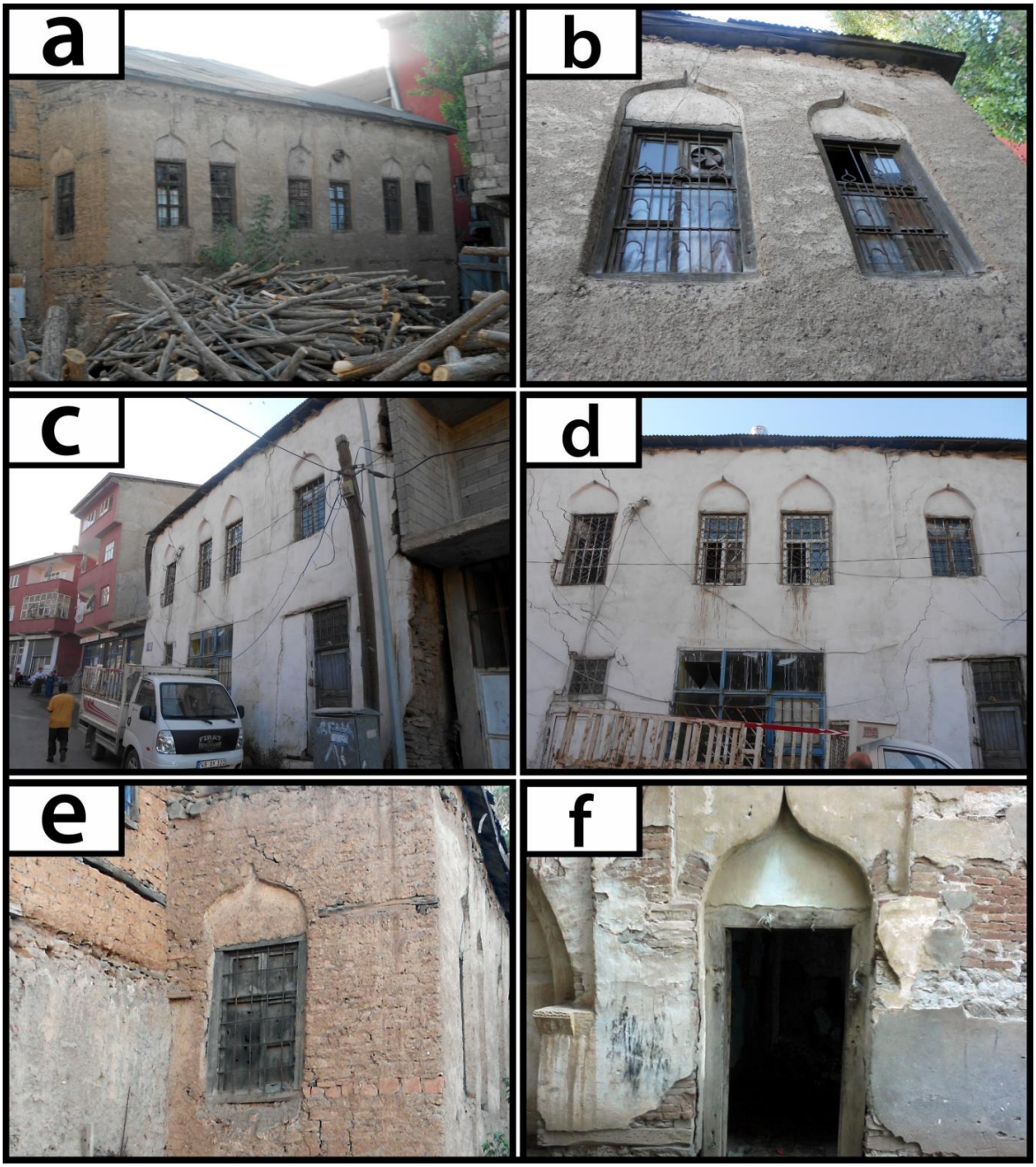


Figure 9. Ogee-shaped arched windows observed in traditional Muş Houses.

On the facades of traditional residential buildings, entrances are also the elements that stand out with their characteristic forms (Fig. 10). The entrances marked by a pointed arch define

the door section by being drawn in two or three levels from the outer wall of the building (Fig. 10). Geometric decorations and stylized plant figures are occasionally encountered on the pillow stones of these arches (Fig. 10).

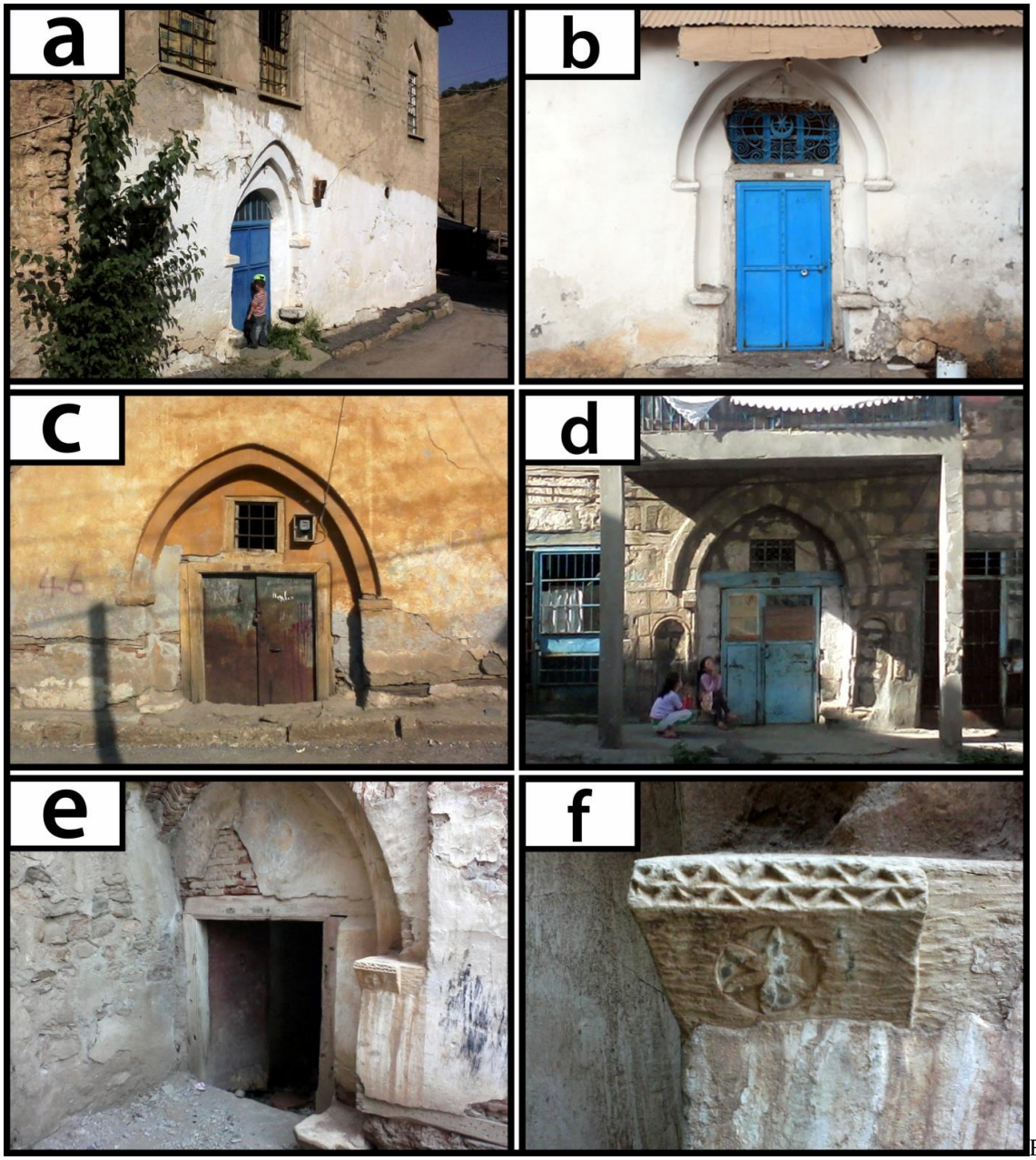


Figure 10. Arched entrances and details in Traditional Muş Houses.

The grates created with detailed metalworking and in which stylized figures are used extensively are encountered both on the windows and doors of traditional residential buildings (Fig. 11). These grates, in which the units that are cast in the mold or shaped singly by heating and forging cold iron are attached to each other by passing them through or riveting to each other, form different compositions (Fig. 11).

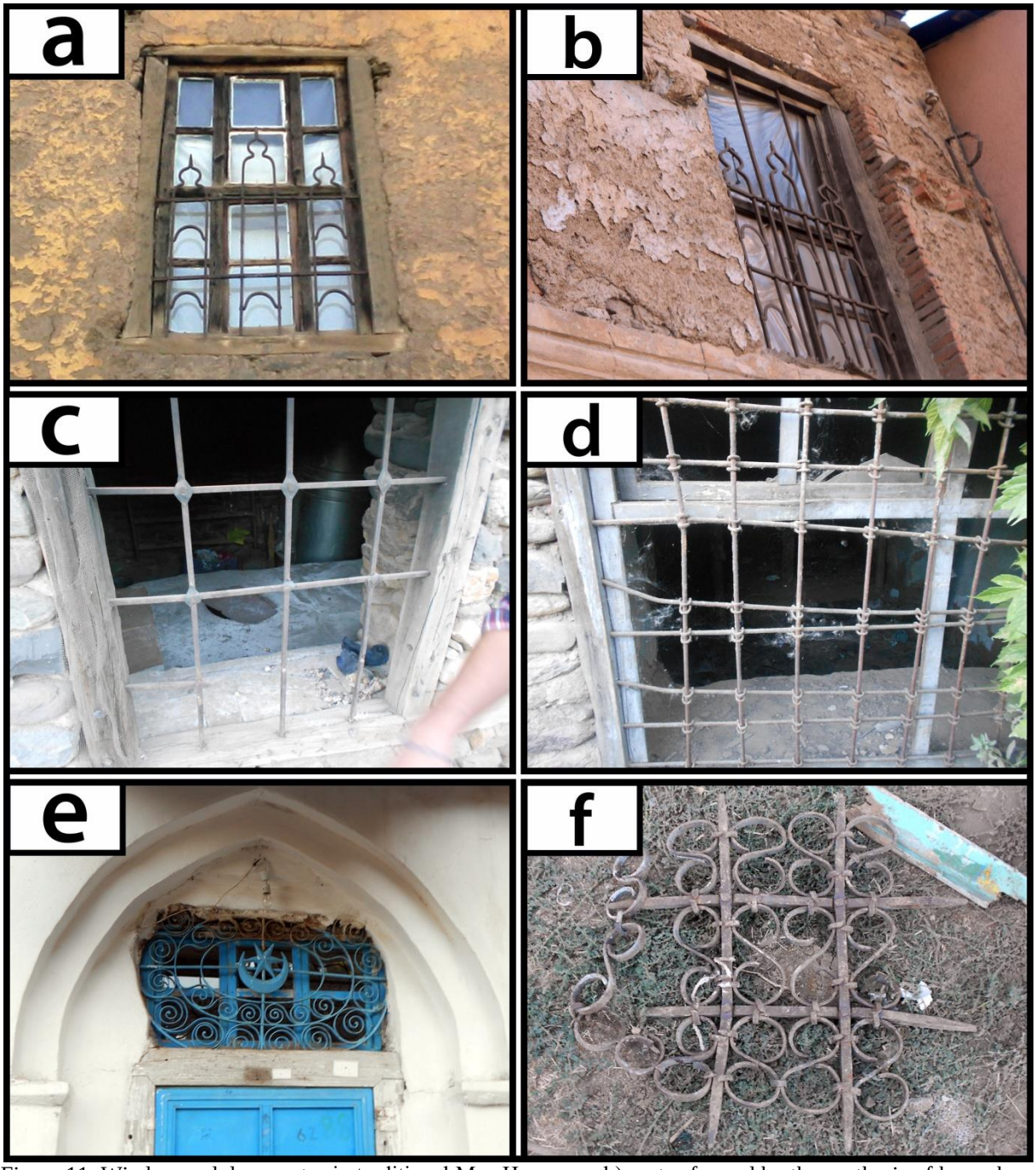


Figure 11. Window and door grates in traditional Muş Houses; a, b) grates formed by the synthesis of horseshoe arch and ogee-shaped arch forms, c, d) riveted and plug-in window grates, e) Crescent and Star-shaped over-door window grates, f) iron grates considered to belong to a round window.

Traditional Muş Houses, which were described as whitewashed (Çağlayan, 2016: 258) and plastered in the past, remained neglected for many years due to the changing economic, social, and cultural structure of the region (Yıldırım, 2014: 30-31). The deterioration and destruction as a result of neglect and human effects in the residential buildings with historical and traditional characteristics examined in the Kale Neighborhood made information about the construction systems and structural details of the buildings visible (Fig. 12). In the

examples examined, it is seen that the main walls were created using stone and mud mortar on the lower floors of the residential buildings (Fig. 12a). The directions of the wooden beams on these walls are attached by overlapping each other at the corner points (Fig. 12b). The mud bricks were mainly used on the upper floors of the buildings, and these bricks were laid with mud mortar and supported by beams (Fig. 12c, d). Earthen roofs were commonly used in traditional Muş Houses. These roofs are supported by round wooden beams in the lower sections, and a wooden covering or mat layer is observed on these beams. On top of this layer, there is a layer of soil with a thickness of 25-40 cm (Fig. 12e, f).

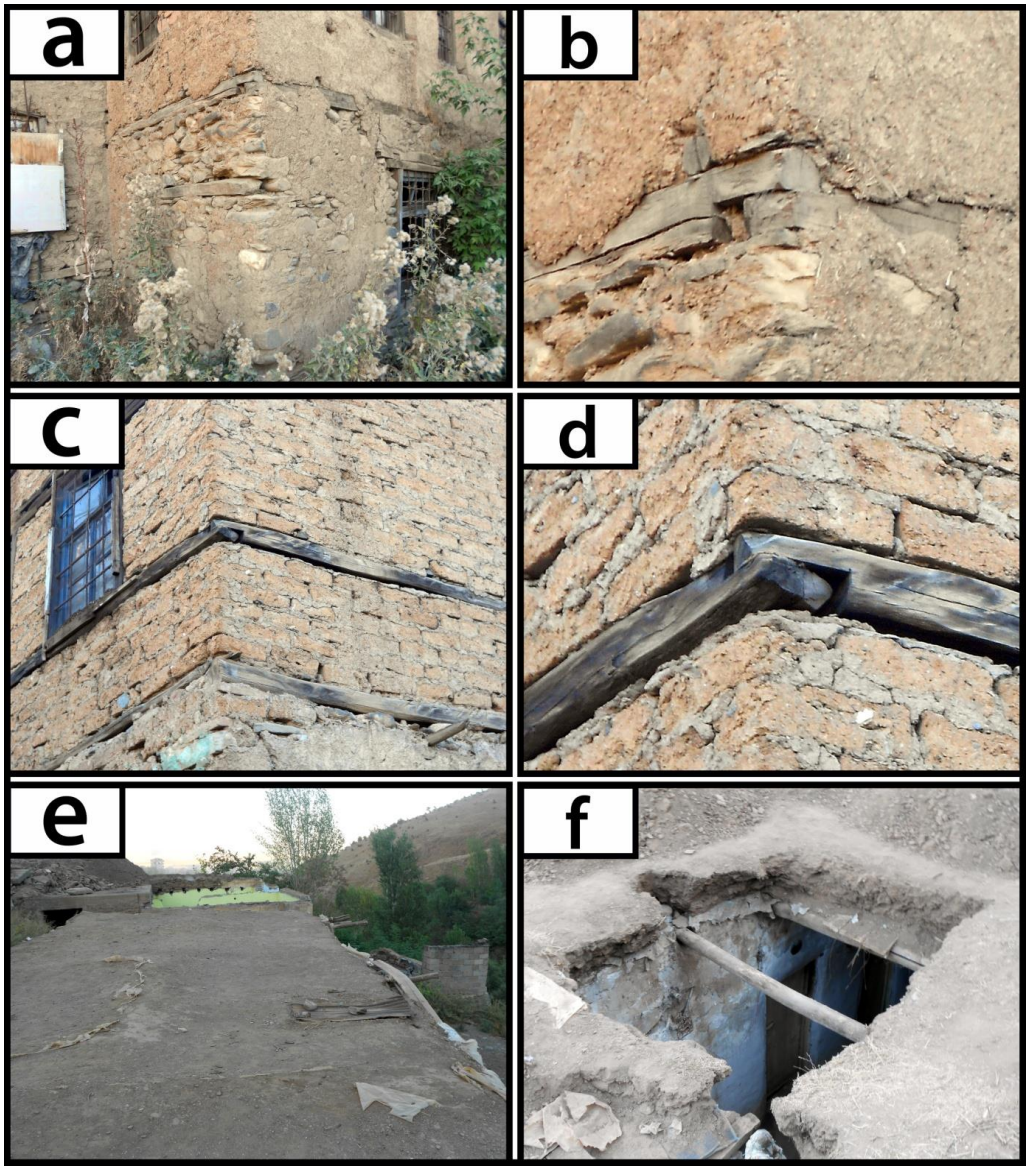


Figure 12. Construction systems and structural details of traditional houses; a) ground floor main walls, b) corner joints of wooden beams, c, d) corner joints of adobe bricks and wooden beams observed in upper floor walls, e) earthen roofs of residential buildings, f) section of a collapsed earthen roof and ceiling beams.

Conclusion and Recommendations

The Kale Neighborhood, where residential buildings with historical and traditional characteristics of Muş are densely located, has lost this texture largely and irreversibly due to urban transformation and urgent expropriation practices. Nevertheless, a small number of residential buildings with historical and traditional characteristics still exist in the region.

It is considered that the preservation of the existing residential buildings by accepting that they constitute a historical sequence can save these last examples of the traditional housing inventory of Muş from being transformed into museum exhibition objects waiting for their conservation time.

This study, which used the fragments of a time when the historic and traditional residential architecture of Muş was still alive as a base, also attempted to reveal the importance of process-based urban photography in terms of the lost cultural heritage values.

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