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Year**

3RD

**INTERNATIONAL
SYMPOSIUM OF
DESIGN FOR LIVING WITH WATER**

**THE
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3rd International Symposium of DESIGN for LIVING with WATER

"from hunting society to society 5.0"

* The event will be held on Zoom

Meeting ID: 953 0658 2499

Deadline for Abstract:

September 3, 2021

Deadline for Full Text:

September 24, 2021

A two-day interdisciplinary symposium within the framework of Beykent University and the contributors from six different countries, which aims to discuss and exchange experiences about the past, present and the future roles of water as a design element for living spaces.

THEMES

- Yacht design
- Sustainability
- Naval engineering
- Industrial structures
- Culture and heritage
- Floating architecture
- Futuristic approaches
- Urban transformations

Online Symposium
18-19 November 2021

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BEYKENT UNIVERSITY

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**BEYKENT 3RD INTERNATIONAL SYMPOSIUM OF
DESIGN FOR LIVING WITH WATER**

18-19 NOVEMBER 2021 ISTANBUL/TURKEY

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2022

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18-19 November 2021 Istanbul/Turkey

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**BEYKENT 3RD INTERNATIONAL SYMPOSIUM OF DESIGN
FOR LIVING WITH WATER SCIENTIFIC PROGRAMME**

18 NOVEMBER 2021

Time	Theme
09:30 - 10:00	Registration and Welcome
10:00 - 10:15	Beykent University Vice Rector Opening Speech Prof. Dr. Şeyma Aydınoğlu
10:15-10:30	Chair of ISDWL Welcoming Speech Assoc. Prof. Dr. İnanç Işıl Yıldırım
10:30-11:15	(Netherlands Local Time 8:30 am – 9:15 am) Prof. Masi Mohammadi (Eindhoven University of Technology, Netherlands) - Invited Speaker “Towards an Understanding Architecture: Evolution of Architecture Through the Embedding of Emerging Technologies”
11:15-12:15	Nagehan Yağmur ŞİMŞEK “Istanbul Anatolian Side: Bosphorus Mansions and Their Relation with Water”
	Tuğba KARADENİZ, Pınar ÖKTEM ERKARTAL “Regenerating the Waterfront: From Industrial Use Back to Urban Life”
	Melek DEMİR, Esin Özlem AKTUĞLU AKTAN “Water Sensitive Urban Design Applications”
	Canan Eda ÖZGENER SEMERCİ “In Search for the Public Affordances of Different Physicalities: Comparative Cases of Istanbul and Lecurne Shores”
12.15 – 14.00	Lunch Break
14:00 – 15:00	İstem Seçkin PARLAKYILDIZ KÖSE, İnanç Işıl YILDIRIM “A Review About User-Centered Design (UCD) Researches and Considerations About How to Apply UCD Researches in Cruise Ship Design for Post Pandemic World”

14:00 – 15:00	Suchandra BARDHAN, Aneesh NANDI “Decentralised RWH Integrated Prototype System (DRIPS): A Design Imperative for High-Rises in Water-Stressed Cities”
	Ketham Santosh KUMAR “Re-Building Flood Affected Communities in India with Adaptive Action Building”
	Başak ERİK “A Study on the Reduction of Water Consumption due to Selection of Fixtures in Interior Design”
15:00 – 16:00	Lana KUDUMOVIC and Leile KRIVOSIC DIZDAREVIC “Rivers as an Urban Element of Change”
	Mohammad Arif KAMAL “A Study of Off-Land Structures: Paradigm Shift and Design Considerations”
	Zeynep ATMACA “İstanbul Kıyıları Dolgu Alanlarında Yer Alan Kentsel Kamusal Mekânların Mekân Kalitesi Yönüyle İncelenmesi”
	Soner ŞAHİN “Tarihi Çeşmelerde Suyun bir Tasarım Ögesi Olarak Kullanımı: Taksim Suyolu Çeşmeleri”

19 NOVEMBER 2020

Time	Theme
9:30 – 10:00	Welcome
10:00 – 10:15	Beykent University Rector Opening Speech Prof. Dr. A. Murat Ferman
10:15 – 10:20	Chair of ISDWL Welcoming Speech Assoc. Prof. Dr. İnanç Işıl Yıldırım
10:20 – 11:00	(Australia Local Time 5:20 pm – 6:00 pm) Prof. Joerg BAUMEISTER (Griffith University, Australia) – Invited Speaker “SeaCities' Aquatecture”
11:00 – 11:45	(Qatar Local Time 11:00 am - 11:45 am) Assoc. Prof. Mohd Faris KHAMIDI (Qatar University, Qatar) – Invited Speaker “Cultural and Heritage of the Malay Architecture”
11:45 – 12:30	(South Korea Local Time 5:45 pm - 6:30 pm) Prof. Changho MOON (Kunsan National University, South Korea) – Invited Speaker “Design Proposals of Modular Floating Parking Building for Archipelago”
12:30 – 14:00	Lunch Break
14:00 – 14:45	(Finland Local Time 1:00 pm - 1:45 pm) Dr. Markus AHOLA (Aalto University School of Arts, Design and Architecture, Finland) – Invited Speaker “Experience Design for Living with Water”
14:45 – 15:30	Prof. Gökdeniz NEŞER (Dokuz Eylül University Institute of Marine Sciences and Technology, Turkey) – Invited Speaker "Effects of Marine Environment on the Performance of Structural Elements: Sailcloth as a Case"

15:30 – 16:15	(Italy Local Time 1:30 pm - 2:15 pm) Prof. Arch. Claudio GAMBARDELLA (Campania University "Luigi Vanvitelli", Italy) – Invited Speaker “This is not a... Floating Building, but a Yacht. Reflections and Symbols About Dwelling on Water”
16:15 – 17:00	(Illinois Local Time 7:15 am - 8:00 am) Prof. Francisco Javier RODRIGUEZ (University of Illinois School of Architecture, USA) – Invited Speaker "Water, Global Warming and Resiliency: Another Hurricane Season in the Caribbean"
17:00 – 17:15	Last Words

Beykent 3rd International Symposium Of Design For Living With Water

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Ricardo Balbo, IED Istituto Europeo di Design Spa

WELCOME TO ISDLW III 2021

Dear Researchers;

Water is the main life source for human being starting from birth. Throughout the history this vital element effected every field of life as well as the discipline of architecture and design, which have the mission to create comfortable and livable spaces for human. It is observed that apart from alternative living spaces to terrestrial architecture in traditional forms, during the recent years, the studies which include the analysis as to space hotels, floating spaces and effects of spatial characteristics of pole stations on the users have increased. One of the reasons for this, is that people's need for alternative living spaces and resources has come up. The association of the concept of human-space-water is being considered together more frequent day by day.

In Recent years there is a growing focus on living with water due to the extreme climate changes, rising density, economical trends and sustainability problems. Scientist and futurists from all over the world are indicating the solutions for living with water and predict that the relationship between human and water will increase. Not only the countries which have the risk of flood, or rising sea levels, but also the other countries which has the probability of effecting by the climate changes are taking into consideration water based solutions. Also the flow of the capital and changing human life style requirements show us the water as an alternative living space.

Although the concept of living with water seems revolutionary the human relation with water is not a new trend. In the scope of this symposium, different integration types of water to spaces from the vernacular models to floating homes will be discussed. As a respond to the world's sustainability problems, from both economical, socio - cultural and also the ecological, we need to understand the importance of living with water. As the designers and engineers of the "climate change generation" we have the responsility to look at the past, present and the future and ask the opportunities of water that we could apply, inform and transform to our designs.

We invite designers, architects, engineers, sociologists, students and everyone who feel the need creating solutions sensitive to climate change and for sustainable future of the world on particulary design with water.

Kind Regards...

Assoc. Prof. Dr. İnanç Işıl Yıldırım,
Symposium Chair
Beykent University Faculty of Engineering and Architecture,
Head of Interior Architecture (EN) Department

For more information please visit: www.isdlw.org

*“A drop of water,
if it could write out its own history,
would explain the universe to us.”*

Lucy Larcom

Ladies and gentlemen,

Sudden climate changes, rising sea levels, increasing population density, decreasing habitats... have caused us to turn our gaze from land to sea.

But we forgot one thing, that the seas have a different character from the land and that with the passive lands (in fact, the last reactions of nature showed us that it is not passive), the seas that are determined to set their own rules will not be approached with the same attitude... Especially in recent years, nature has told us.

Heyy, my next answers will be much harsher.. Now, projects are produced in the seas with great enthusiasm, some utopian and some applicable.. designers are designing houses, floating structures, living spaces and even cities in vast waters. So what do we have about the character, rules and variables of water?

Unfortunately, there are fewer scientific studies than there should be. We are meeting with you here for the 3rd time today, in order to prevent the seas from becoming new consumption areas, to make designs for water according to the character of the water, to establish sustainable, environmentally friendly, energy efficient worlds on water. Knowing that water is life, to write down what we know and what we need to know in order to have life for future generations.

The Covid 19 pandemic has shown us that the only reality of the globalizing world is not production based on capitalism and how difficult it is to fix something after it is broken. Now, before it's time to come to the seas, before the problems start, we are meeting at the isdlw 3 symposium in order to prepare our solutions. In order to say our best when the new generations ask us what you have done...

Assoc Prof Dr İnanç Işıl Yıldırım,

ISDLW General Coordinator

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KEYNOTE SPEAKERS

Prof. Dr. Joerg BAUMEISTER



Joerg Baumeister is leading the SeaCities Lab (SeaCities.org) at the Cities Research Institute, Griffith University in Australia which develops and implements water-adapted cities (aquacities) and floating structures (aquitecture). Its holistic research approach - that spans and includes the disciplines of engineering, architecture and environmental sciences - enables researches in the group to develop new approaches to building with and for nature, to create ecosystem-based developments that respond to the current challenges in an adaptive and compatible fashion.

Joerg has been a practitioner, educator, and researcher for Architecture and Urban Design for more than 20 years throughout Europe, Africa, the Arabian Peninsula, Asia, and

Australia. He is an award-winning architect and consults governmental institutions on the federal, state and regional level as well as NGOs and private industry leaders to apply his current research interests which comprise Ecological Cities, Affordable Housing in serial building technology, and Marine Design Innovation.

Prof. Dr. Masi MOHAMMADI



Masi Mohammadi is the Leading Professor at the academy of Built Environment, HAN University of applied sciences, where she heads the research group Architecture in Health and a Full Professor of Smart Architectural Technologies at the Eindhoven University of Technology.

As the principal investigator and leader of the research program 'Empathic Living Environment', an interdisciplinary study into the socio-spatial context of smart living, Mohammadi aims to develop a people-led framework for embedding emerging technologies in architecture. To arrive at this

framework, she, in collaboration with industry and Dutch housing and care organizations, set up a nationwide platform, 'Dutch Empathic Living Labs', to empirically evaluate smart homes and neighbourhoods and their impact on the well-being of users. She currently supervises 17 PhD dissertations on this subject. Masi has served as chair or board member of various (inter)national committees and research networks, i.a. a board member of a European committee on 'Active Ageing & Design', member of the Board Science, Technology and Society of The Royal Institution of Engineers, and as visiting Professor at University of Technology Sydney (2017).

Prof. Dr. Changho MOON



Changho Moon, born in 1955, has been a professor since 1989 and is going to retire at the end of August 2022 from the department of architecture and building engineering, Kunsan National University, Korea. Also he was a principal investigator of Floating Architecture Research Group, funded by the ministry of land, infrastructure and transport, Korean Government. Research period was about 5 years from December 2010.

Building” in 2021. He has consulted several floating building projects for local waterside developments, continued to research floating structures with industries, and taught floating architectures such as public floating information center, floating parking building for islands, floating guest house as term projects in the University.

Around 15 professors from 3 Universities and 12 industries participated in the research. He wrote books “Floating Architecture as a New Building Paradigm” in 2015, and “Floating Architecture as a Sustainable

Prof. Dr. Francisco Javier RODRIGUEZ



Francisco Javier Rodríguez-Suárez is the director of the School of Architecture at the University of Illinois at Urbana-Champaign. He studied architecture at Georgia Tech, the Université de Paris-Tolbiac and Harvard GSD, where he earned a Master of Architecture with Distinction winning the AIA Medal and the Portfolio Award. After working for Machado-Silvetti in Boston, Rodríguez-Suárez returned to his hometown to work on a renovation of its historic district. For two decades, he taught at the Universidad de Puerto Rico, where he served as Dean for nine years.

At UPR, Francisco directed (in)forma, an award-winning academic journal and edited five books including Alma Mater, Aula Magna, Chronologies of an Architectural Pedagogy and Contemporary Architecture in Puerto Rico 1992-2010, a joint effort with the AIA. During his academic career, Rodríguez-Suárez has taught and lectured at prestigious

universities in Europe, Asia, Latin America, Africa, the US, Canada, the Middle East and the Caribbean, including a sojourn as Visiting Scholar at the American Academy in Rome and a Fulbright Fellowship in Spain. His comprehensive practice has earned over 10 AIA-PR Awards and Citations, several Bienal awards in seven different categories and has been widely published and exhibited around the world. Mr. Rodríguez-Suárez was selected by El Nuevo Día newspaper as one of the ten most influential pioneers in Puerto Rico for the year 2008, when he collaborated with artist Ai Wei Wei on the Ordos 100 project in China. In 2017 he was elected President of the Association of Collegiate Schools of Architecture (ACSA), an organization that had previously recognized him as Distinguished Professor. As ACSA president he lobbied for architecture to be included as a STEM discipline, condemned the construction

of a border wall between the US and Mexico and organized an international congress in Madrid to discuss the future of architectural pedagogy. In 2020 he was elected Chairman of the ACSA College of Distinguished Professors. A committed urbanist, Francisco enjoys writing poetry, experimenting in the kitchen and is currently working on a historical novel.

Prof. Dr. Claudio GAMBARDILLA



Claudio Gambardella, architect and designer, is professor of Industrial Design at the Department of Architecture and Industrial Design (DADI) of the Campania University "Luigi Vanvitelli" (SUN) and he passed a public competition for recruitment as FULL professor (February 2021). He is delegate of the Director for the Internationalization Policies of the Department.

He is currently working on two main research branches: the first one concerns a new concept of company museums, that he has been studying for years, to create a distinctive identity that differentiates them from other types of museums. On this topic he directed a series of publications for publishing company

Alinea, being the author of the first publication entitled "IL SISTEMA MUSEALE REGIONALE DEL DESIGN E DELLE ARTI APPLICATE" (2005, English version: "OFFICIAMUSEUM. THE REGIONAL MUSEUM SYSTEM OF DESIGN AND APPLIED ARTS", 2008). From 2016 he has been directing the series "THE 3RD INDUSTRIAL REVOLUTION. Futuro e memoria del Design", for publishing company Altralinea. He is scientific advisor and artistic director for the project "Temporary Museum of Enterprise" product of excellence in Campania, under construction in Pompeii, under an agreement between the city of Pompeii and SUN. Moreover, he has been project coordinator of "Summer School in designing of company museum systems in Euro-Mediterranean area" of SUN in collaboration with OKAN ÜNİVERSİTESİ of Istanbul and FACHHOCHSCHULE KÖLN approved in 2013 from INDIRE/MIUR (Ministry of Education, University and Research).

The second research branch he is focusing on is about the preservation and enhancement of those forms of design that are capable of connecting with local craftsmanship, thus developing what Gambardella calls "Handmade in Italy", i.e. a kind of design that is strongly linked to local diversity over the country, competing with the more globalized "Made in Italy". In this regard, he is national Coordinator of the Thematic ADI Commission called HANDMADE IN ITALY from 2017. He is part of the Academic Board of the PhD programme in "Architectural and Urban Design and Architectural Restoration" of SUN as well as the Academic Board of the International Doctorate in "Philosophy of Interior Architecture" of the University of Naples "Federico II". Moreover, he is one of the members of MUSA Scientific Committee (University's Museum of Sciences and Arts) of SUN. He curated the Materials Library project for SUN, first ever in Southern Italy, in collaboration with Material Connexion Italia. He was also curator of the 2013 and 2016 editions of the DADI/SUN booth at SALONE SATELLITE, a section of the SALONE DEL MOBILE dedicated to young talents and universities, both Italian and foreign, in Rho-Fiera, Milan. He has been the Chairman of Board Master's Degree (Aggregated Study Course in IT/EN) in Architecture: Interior Design and for Autonomy from October 2013 to 2016; currently scientific director, managing relationships with Okan University (Istanbul), East China Normal University (Shanghai), and Epoka University (Tirana). He is also the responsible for ERASMUS relations with Ozyegin University of Istanbul, Çankaya of Ankara, École nationale supérieure d'architecture of Saint-Étienne, Cologne University of Applied Sciences, and Aristotle University of

Thessaloniki. He has been one of the three congress chairs of BEYOND ALL LIMITS, a congress on sustainability held at Cankaya University, in Ankara (TR) in October 2018. He is member of the Scientific Committee of IEREK - International Experts for Research Enrichment and Knowledge Exchange, based in Egypt, and member of Collegium "Scriptorium Fontis Avellanae". He is President of I LOVE POMPEI, a non-profit association to promote Architecture, Design and Conserving Cultural Objects; a successful exhibition he curated in 2002 at Villa Pignatelli Museum in Naples was named after the association. He was the president of ADI - Association for Industrial Design Campania Delegation from 2004 to 2011. He also designs, creates and curates design exhibitions. From 2008 to 2010, he was artistic director of the Trends/Design section of the Ravello Festival. Within this section, he conceived and curated the exhibitions "Shoes on exhibit: the treasures of the Ferragamo Museum", "The Richard Ginori Museum: a new lease on life" and "ZERODISEGNO: madness is freedom" set up respectively in 2008, in 2009 and 2010. In 2011, he curated the exhibition "more craft, more design. Annibale Oste|Studio Azzurro". His design objects and architectural projects have been exhibited and published in Italy and abroad. He also worked for several years as an editor for specialized magazines such as DOMUS, INTERNI, MODO, SPAZIO& SOCIETA'.

Prof. Dr. Gökdeniz NEŞER



Gökdeniz Neşer, from Dokuz Eylül University Institute of Marine Sciences and Technology's Marine Technology Department, is a naval architect graduated from İstanbul Technical University. He has carried on several research studies in the field of advanced polymer composites in marine use including their degradation and recycling, and Life Cycle Assessment. Neşer has published researches on the marine pollution issues, e.g. environmental and occupational impacts of global ship recycling industry, environmental management of dredging, shipyards and ship repair facilities' effects on the environment, oil pollution prevention funded by EU, UN, and national agencies. He has been in Japan, USA, United Kingdom, and Poland as visiting professor and research fellow. Neşer also served as a board member of Water Supply and Treatment Directorate in local level and the director of DEU's Boatbuilding Research Centre. In his speech, Neşer will talk about marine environmental degradation on the materials with a case of sailcloth.

According to Neşer, "Structural elements of built environments located in, along, close to marine environment are often compromised in their usage by

the uncertainty of material behavior under cyclic and impact loading and various environmental factors, e.g. exposure to seawater, water vapor, UV, change in extreme temperature and long-term physical and chemical stability mainly due to the climate change, attacks of marine organism. Since reliable theory and experimental data are practically nonexistent, properties of materials of these structural elements are severely penalized by the use of unusually large margins of safety in actual design, if the designers have an awareness on their degradations. Until the degradation of these structural elements by various environmental factors is better understood so that corrective measures can be taken, the true potential of such materials cannot be realized. In the study, attention has been primarily focused only on these environmental factors and failure mechanism that caused by these factors which influence the end use of the related structural elements in a range of marine structures, from boats to wind turbines, cars and elements of buildings." Effects of Marine Environment on the Performance of Structural Elements

Assoc. Prof. Mohd Faris KHAMIDI



Mohd Faris Khamidi is currently an Associate Professor in Architecture at Qatar University. He holds a PhD from Kyushu University, Japan in the field of Architectural Engineering (2005) and completed a graduate certificate in Tertiary Education Management from LH Martin Institute, University of Melbourne (2016). He has more than 20 years experiences in applying sustainability concept and principles to optimize building performance based on climatic condition as well as enhancing building lifecycle in particular reducing carbon footprint.

Since 2012, Faris has started developed his capability and competencies in Building Information Modelling (BIM) and Virtual and Digital Construction (VDC) with the emphasis on SMART Technologies. He is a Revit (BIM) certified professional by Autodesk in 2013. Faris was also the founding member and Deputy Director of Taiwan-Malaysia Construction Project Management and Digital Technologies International Centre [DiTIC] with

Tamkang University from January 2018 – August 2019. Based on his expertise, he has been invited in various conferences and event as keynote and plenary speaker and Visiting Professor in Singapore, Indonesia, Brunei, Taiwan, China, UK, Norway and of course Malaysia.

On the research front, Faris has concluded a dozen of research projects amounting USD 1.1 million, notably the USD 750,000 MyRA Top Down Incentive Grant (Malaysia Ministry of Higher Education), titled 'Smart Integrated Low Carbon Infrastructure Model' (SMART i-LOCI MODEL) from August 2013 to July 2015 as Co – Lead Principal Investigator.

Dr. Markus AHOLA



Markus Ahola, from Aalto University School of Arts, Design and Architecture, has an interest area of user-centred design and designing for experiences. He has been applying these approaches to multiple applications such as magnetic resonance imaging, safety and ship design.

He is an expert in multidisciplinary research project building and had a key role in the establishment of the Experience Research Society, Aalto Experience Platform and Aalto Cruise & Ferry Experience Program. He is an executive committee member and secretary of Experience Research Society and board member of SIGCHI Finland. Currently, he works in improving the accessibility and experience design of Magnetic Resonance Imaging technology.

**EFFECTS OF MARINE ENVIRONMENT
ON THE PERFORMANCE OF STRUCTURAL ELEMENTS:
SAILCLOTH AS A CASE**

Gökdeniz NEŞER

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ABSTRACT

Structural elements of built environments located in, along, close to marine environment are often compromised in their usage by the uncertainty of material behavior under cyclic and impact loading and various environmental factors, e.g. exposure to seawater, water vapor, UV, change in extreme temperature and long-term physical and chemical stability mainly due to the climate change, attacks of marine organism. Since reliable theory and experimental data are practically nonexistent, properties of materials of these structural elements are severely penalized by the use of unusually large margins of safety in actual design, if the designers have an awareness on their degradations. Until the degradation of these structural elements by various environmental factors is better understood so that corrective measures can be taken, the true potential of such materials cannot be realized. In the study, attention has been primarily focused only on these environmental factors and failure mechanism that caused by these factors which influence the end use of the related structural elements in a range of marine structures, from boats to wind turbines, cars and elements of buildings. Accounting for environmental degradation is an essential element in the multi-scale modelling of marine structures but it requires reliable test data input. The traditional approach to account for ageing effects, based on testing samples after immersion for different periods, is evolving towards coupled studies involving strong interactions environmental agents and mechanical loading. These can provide a more realistic estimation of long-term behaviour but still require some form of acceleration if useful data, for 20 year lifetimes or more, are to be obtained in a reasonable time. A study carried by the author on the most commonly used synthetic sailcloth due to its cost-effectiveness, is aliphatic woven PET which is known as Dacron will be given as a case on these severe effects. In this experimental study, the combined effect of seawater exposure, temperature, UV, and wet-dry cycle on the Dacron's mechanical performance which influence the end use of this sailcloth in marine environment have been investigated experimentally by accelerated aging method. Tensile tests were performed for the Dacron specimens with nine different areal weights and in two different fiber alignments (warp and weft) and dynamical mechanical analysis for a Dacron sailcloth was made. Discussion and suggestions to designers of marine structures will be given in detail on the basis of data gathered.

Key Words : Marine environmental degradation; Marine structural elements; Accelerated aging; Sailcloth

INTRODUCTION

It is a reality that water, as the source of live and wellbeing for the mankind, is not so nice to the materials and structures contacted and close to it. Water helps to initiate and progress natural phenomenon at the base of degradations which cause the weakening of mechanical properties determined at the design stage and shortening the expecting lifetime of the related materials and structures. Material degradation, in general, is a worldwide phenomenon that causes costly repairs. The major form of material degradation is corrosion of metallic materials which costs in China in 2014 was approximately 310 billion USD (3.34 % of the gross domestic product) (Xia et al., 2020).

In a water environment, the water itself is not only element to cause these irreversible effects on the materials and structures and the other degradation agents can be listed as (Maxwell et al., 2005) (Figure 1):

- Thermal aging, high or sub-zero (low) temperature exposure and thermal cycling
- Humidity
- Immersion in water
- Freeze/thaw and dry/wet cycling condition
- Continuous or intermittent saltwater immersion or spray
- Weathering (including rain and sand erosion)
- Loads (i.e. creep, fatigue, impact) and combined loads
- Chemical (including water, fuel, acids, alkalis, solvent and oxygen)
- Ultraviolet and high-energy radiation
- Electrical stress (e.g. Lighting stress and galvanic reactions)
- Micro-organism (e.g. fouling-boring organisms, fungi)

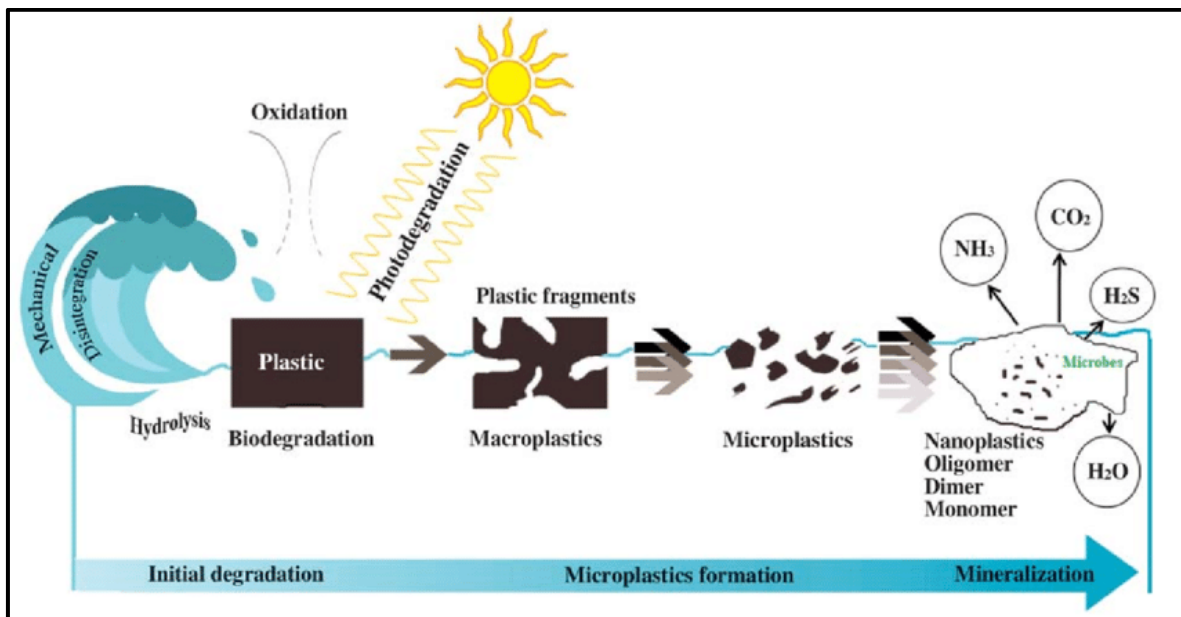


Figure 1. Degradation agents in marine environment (Sarkar et al., 2020).

In the other hand, degradability is considered as an environmental friendly capability or property of the polymer-based materials accumulated in the oceans in the form of debris. Today, serious environmental concerns have raised because of plastic marine debris which continues to increase and has reached worldwide proportion (Min, Cuiffi & Mathers, 2020). In 2018, the world production of plastic reached 359 million tonnes, an increase of 15.43 % from 2014. China and Japan are the two leading plastic producer with 30% and 4% of the global plastic production, respectively. However, in 2014 it was estimated that the per-capita plastic consumption in China was 45Kg/person while those of India was 9.7 Kg/person). It is quite lower than the USA (109 Kg/person) and Europe (65 Kg/person) (Samanta & Das, 2020).

Fiber-reinforced polymers (FRPs) are used in a vast number of marine industrial applications including civil engineering structures mainly due to their high specific strength and stiffness (Davies & Rajapakse, 2014). FRPs also present high corrosion resistance, good impact strength and fatigue durability, which are attractive characteristics for their use in marine applications such as propellers, boats, ships, turbines (wind and tidal) blades, sails.

FRPs are also used to strengthen the coastal structures such as port and piers either through rods “replacing” reinforcing steel bars, or strips bonded to concrete as external strengthening of structural members, or confining columns. The beneficial effects of their use in rehabilitation, based on ease of installation, high chemical resistance, and reduced

architectural impact and/or increase of the mechanical or fatigue resistance are known and have been reported in the technical literature. However, FRPs under aggressive environmental conditions are not a solution free of problems i.e. the action of moisture in glass fibers may induce damage and the effect of moisture and temperature may reduce their expected durability (Figure 2). Under the influence of humidity or water the glass fibers form a water skin in which the alkali ions (e.g. NaOH) are leached, replaced by protons (H^+), and such leaching of alkali oxides (sodium and potassium oxide) from the surfaces of the fibers leads into formation of microcracks. The water around the glass fibers becomes an alkali solution as the alkali ions dissolve out of the glass, and the glass fibers gradually decompose (Silva, Da Fonseca & Biscaia, 2018).



Figure 2. Environmental degradation on a coastal structure.

With the agents mentioned above, vicinity of water can be considered as hostile environment. Designing a product such as marine craft, pipelines, wind turbines, a built environment requires a far better understanding of the failure mechanisms to enable a reliable lifetime predictions to be made. In this review, degradation mechanisms of agents except the ones related with loads will be given and a case study on a polymer-based sailcloth life prediction will be presented.

2. SOME of SIGNIFICANT DEGRADATION MECHANISMS

2.1 Influence of water

In case of exposition to humid air or water environments, materials absorb moisture by instantaneous surface absorption and diffusion. Usually, the moisture concentration initially increases with time and finally approaches the saturation point (equilibrium) after several days of exposure. The time to reach the saturation point depends on the materials properties and the ambient temperature and drying can reverse the process but may not result in complete attainment of original properties (Garcia-Espinel et al., 2015). This degradation can commonly cause damage in FRPs such as matrix microcracking, fiber/matrix interfacial debonding and delamination, plasticization and swelling of matrix materials which may cause the polymer to become more ductile reducing its glass transition temperature and hydrolysis leading to the final failure of structures (Trujillo, Gonzales & Gonzales, 2019).

In one of the pioneer studies on this area by Gellert and Turley (1998), it is shown that glass reinforced plastics materials (GRP) in marine use consisting of different resins such as polyester, phenolic, and two types of vinylester lost their mechanical properties ranged from 15 to 25% during ageing. In the test, specimens immersed in seawater and unloaded and loaded at a high service temperatures of 30 and 50 °C. Greater losses in mechanical properties from the 50 °C immersion were accompanied by indication of abnormal degradation (Figure 3).

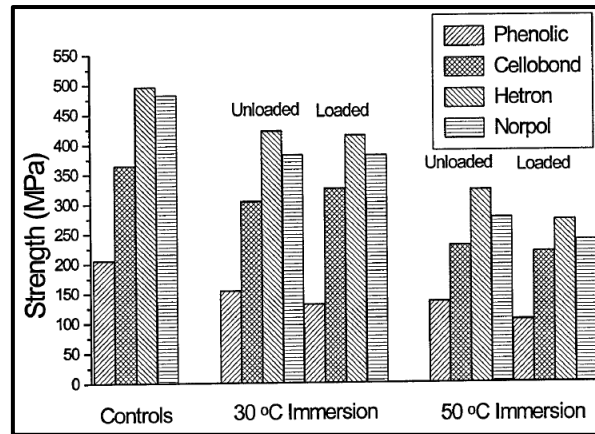


Figure 3. Flexural strength for control specimens, 30 °C specimens immersed for 800 days and 50 °C specimens immersed for 490 days (Gellert & Turley, 1998).

The uptake of water by polymer composites follows the generalized Fick's law of diffusion. However, the exact rate of moisture uptake depends on several factors including void content, fiber type, resin type, fiber orientation/architecture, temperature, applied stress level, presence of microcracks, and thermal spikes. Equation 1 gives a nearly linear relationship between weight uptake (%) and time which then asymptotes to a constant saturation level:

$$\frac{M_t}{M_\infty} = \frac{4}{\sqrt{\pi}} \cdot \left(\frac{D \cdot t}{d^2} \right)^{\frac{1}{2}}$$

Equation 1.

where,

- M_t : weight uptake at time = t ,
- M_∞ : weight uptake at time = ∞ ,
- D : the measured diffusion coefficient,
- d : the specimen thickness.

In Figure 4, the hydrophobicity of plastics was quantified. Based on LogP which determines the solubility of drug-like molecules (computational octanol-water partition coefficient). Negative values of LogP indicate water solubility while positive values predict insolubility in water.

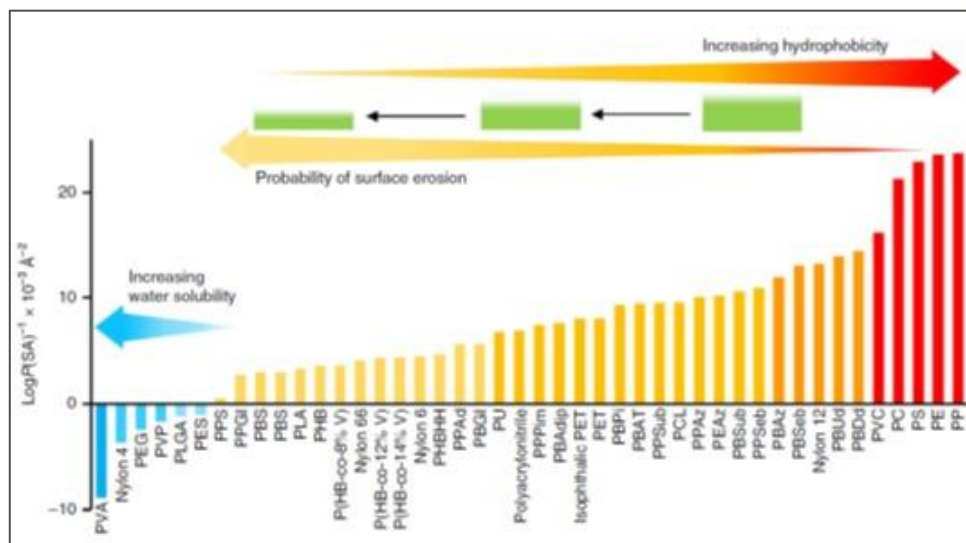


Figure 4. Common plastics and their hydrophobicity (Min, Cuiffi & Mathers, 2020).

2.2 Influence of UV

UV radiation is the one of the most important sources of radiation found in the environment. It can affect many properties of the materials by degradating supermolecular structure of the fibers and causes photo-oxidative degradation which results in breaking of the polymer chains, produces free radical, and reduces the molecular weight (. Changes in the internal structure of the fibers lead to variation of the color absorption behavior. As it is known dyes absorb UV light, which helps in reducing exposure. Darker colors tend to absorb more UV light than lighter colors, including whites and pastels, but vivid colors such as red can also substantially absorb UV rays. But even a pale fabric can offer good protection if the weave, material, weight, etc. are effective at keeping out UV light. Some of white fabrics have “optical whitening agents” which are the chemical compounds that strongly absorb UV radiation, UV-A in particular (Mengüç, Temel & Bozdoğan, 2018).

Damage by UV radiation is commonly the main reason for the discoloration of dyes and pigments, weathering, yellowing of plastics, loss of gloss and mechanical properties (cracking), sun burnt skin, skin cancer, and other problems associated with UV light (Mengüç, Temel & Bozdoğan, 2018).

The manufacturers of paints, plastics, contact lenses, and cosmetics have a great interest in offering products that remain unaltered for long periods under conditions of light exposure (Mengüç, Temel & Bozdoğan, 2018).

2.3 Biodegradation

Biological degradation is not a common form of degradation as most commonly used thermoplastics are resistant to microbiological attack. The only cases where biological attack has influenced life expectancy has been with certain polyurethanes and some low molecular weight additives in PVC. No predictive techniques for the life expectancy of conventional polymers due to biological degradation have been developed although there are standards for testing resistance. There is, however, growing interest in the development of deliberately short-lived polymers both for medical applications and for use as disposable packaging (Maxwell et al., 2005).

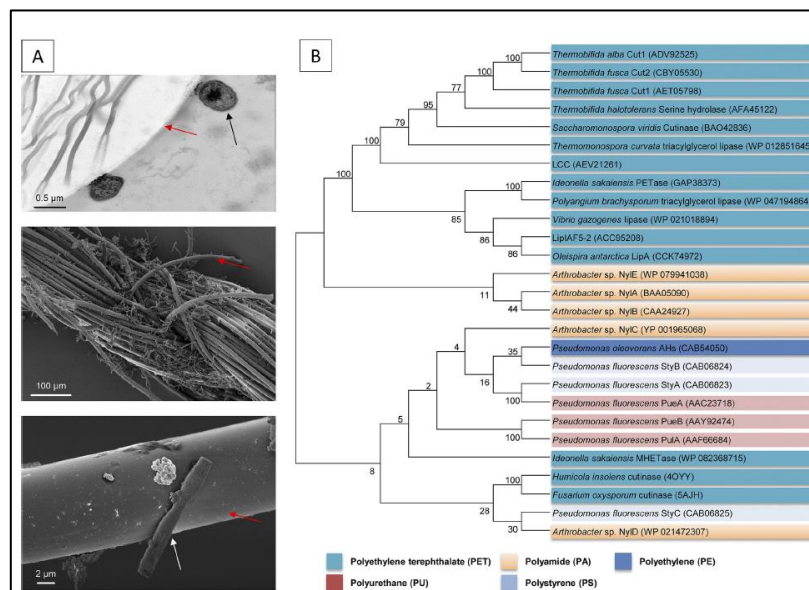


Figure 5. (A) Bacteria located in the polymers, (B) Some polymers degrading bacteria.

3 DEGRADATIONS ON THE SAILS

From the plate found in Kuwait with a drawing that depicts a man in a boat using sail to today, sails in the human history has been dated back to seven thousand years ago (Carter, 2006). The materials used to make sail have evolved from the natural materials such as animal leathers, papyrus, cotton and flax to today's synthetic fibers such as Nylon, Polyester (PET), Pen fiber (Pentex), Kevlar, Technora, Twaron, Spectra, Dyneema, Centran, Zylon (PBO), Vectran, Carbon Fiber. The most commonly use synthetic fabric due to its cost-effectiveness is aliphatic wovnen PET which is know as Dacron, its commercial name. Dacrons, which are relatively cheap, easy to form, very slow to breakdowm, but problematic to keep original shape while subjected to load (Tesei, 2005) have been produced since 50's by several producer.



Figure 6. Degraded sailcloth.

In one of our study carried on with the collaboration of our department and Ege University's Textile Engineering Department, the combined effect of seawater exposure, temperature, UV, and wet-dry cycle on the Dacron's mechanical performance which influence the end use of this sailcloth in marine environment were investigated experimentally. Tensile tests were performed for the Dacron specimens with nine different areal weights and in two different directions (warp and fill) and dynamical mechanical analysis for a Dacron sailcloth is made. The comparative results were given with the conclusions.

From this study which considers the combine effects of seawater and UV exposures, wetting-drying cycles and finishing, it is clearly seen that:

- The marine environment has a significant effects on the mechanical performance of sailcloth.
- Water repellent treatment is not so strong solution to prevent sailcloth from adverse effects of environment

Choosing a right sailcloth with a proper fiber alignment is crucial for the design stage of a sailing boat. Taking into account of such degradation effect through the lifetime of these fabrics needs much more extensive researches.

CONCLUSION

Degradation of materials are generally expected, but their severity is always unknown. To consider the environmental effects during the design stage of a material extensive data is needed. To get these kind of knowledge is not easy without performing reliable tests. However in the open literature, on can find the info might be close to his/her needs.

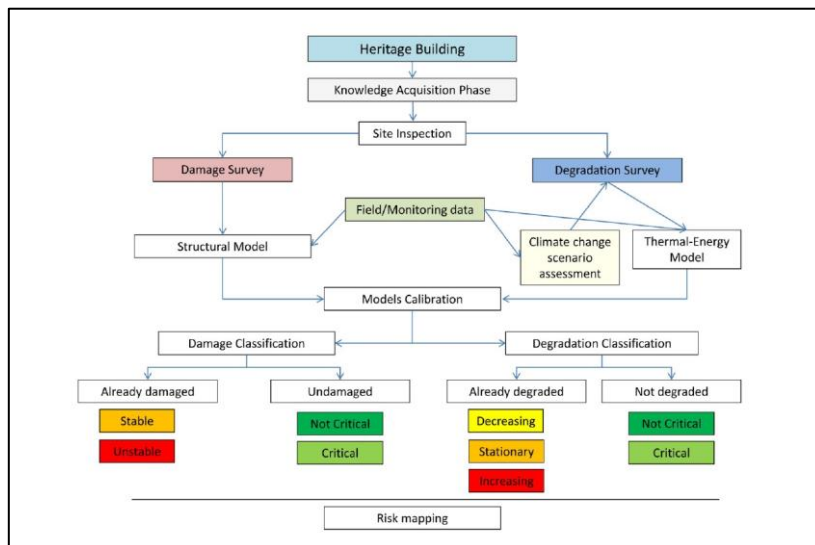


Figure 7. A material degradation risk assessment method for heritage building (Cavalagli et al., 2019).

Not only during the design stage, but also in renovation or repair and maintenance works, risk assessment should be performed to evaluate the actual condition of the structure. A method given in Figure 7 for a historical building is highly recommended in this sense.

It is clear that not only experimental studies but also some analytical or numerical approaches are needed for to overcome this very sneaky problem that many designers and builders faces with in their professional life.

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**İSTANBUL ANATOLIAN SIDE: BOSPORUS MANSIONS
AND THEIR RELATION WITH WATER**

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ABSTRACT

The first known roots of İstanbul are based on the city-state of Byzantium. It served as the capital of the Eastern Roman Empire, the Ottoman Empire, and then separated from the capital status with the foundation of Republic of Turkey. Apart from its previous status, İstanbul continues to be the most important city of Turkey. When this city, which has great past, is examined in terms of architecture, it can be seen that the mansions that adorn the Bosphorus are one of the most important values of İstanbul. Most of them were luxury residences, so they were carefully built for high-level government officials during the Ottoman Period. Their architectural movement, changes that they were influenced by in the process can also be read from their plan, façade, ornaments or structure. In this research, the formation process of the Bosphorus mansions, their architectural movement developments, the factors affecting the plan schemes in general and the relationship they have with water have been tried to be explained. Afterwards, these factors, which are considered in plenary context, are explained with examples of mansions located on the Anatolian side and examined through plan schemes, façade and detail photographs. Within the scope of this research, it has been targeted to obtain detailed information about the mansions, which are one of the most valuable building groups in the housing class of İstanbul architecture, and to determine the components in this relationship with the Bosphorus.

Key Words: Bosphorus Mansion, Anatolian Side, İstanbul, Water

INTRODUCTION

Mansions are buildings of various sizes, located on the Bosphorus shore, usually built for Ottoman upper-level officials and pashas.

There are two different alternatives about how the name of the mansion came out. First is, yali, wash; lip to lip with the sea second is, yali comes from the Byzantine/Greek word, yalos. After the conquest of Istanbul, in the 15th century, the Bosphorus Mansions became one of the densely populated areas outside the Beşiktaş city walls. The main reason why Beşiktaş is a dense settlement is due to its relationship with the navy. Because the navy is stationed in Beşiktaş, sailors reside in the area and important captain pasha mansions have been built (Abdulla, 2014).

Tophane, on the other hand, has become an area where workers and soldiers reside due to the military function of this region. Being close to the city, the summerhouses and mansions belonging to the notables of the state have been an important factor in the increase of the population in the region.

There are vineyards and gardens in the 16th century in the area between Tophane and Fındıklı (Gülersoy, 1984). The zoning activities that took place in this century led to the formation of many settlements. Baltalimanı, Emirgan, Tarabya, Rumeli Kavağı, Anadolu Kavağı and Vaniköy settlements are at the forefront of these districts on the Bosphorus.

The reason behind, why Bosphorus shores were opened to settlement was the need for a summer residence. While the residential areas gained population, the Bosphorus became the place preferred by the sultans and the notables of the state due to its calmness (Abdulla, 2014).

The mansion architecture developed in parallel with the Turkish House planimetry. While the classical style was dominant from the 17th century to the middle of the 18th century, when the construction density of the mansions became more than before, the western influence on their style began to be felt in the 18th century.

EVOLUTION PROCESS OF MANSIONS ACCORDING TO PLAN SCHEME

Foreign and Levantine architects living in Istanbul, who were brought to Istanbul for the first time in the 17th century, led the design of the mansions and the course of architectural activities. Towards the 18th century, with this new architectural understanding and with the effect of the westernization process of the Ottoman Empire, palaces and mansions developed with the influence of European architectural styles. The mansions along the Bosphorus, built with the Ottoman Classical Style, continued to be built in Eclectic, Rococo, Baroque, Gothic, Art Nouveau, and Art Deco styles, with the architectural influence of the reform movements during the reign of Mahmut II.

In the 18th century, while the middle sofas were going round and oval, these effects started to show themselves on the facades, and the *harem* and *selamlık* sections were gathered under one roof. However, it came until the 18th century and the settled plan scheme started to be simplified gradually. Towards the end of the 19th century, the influence of the West increased, and examples of the old mansion plan types began to be seen less and less.

The First World War and the War of Independence, caused the old, unique atmosphere of the Bosphorus to disappear. Some of the mansions, which could not be maintained due to various reasons, especially financial problems, were left to rot and thus the continuity of the spatial texture of the Bosphorus began to be damaged. Some of the mansions started to be used as warehouses because they were empty. Between 1923 and 1950, the Bosphorus had a stagnant period. Due to the loss of population during the war, residential areas were not developed, yet industrial facilities were built by the government to revive the economy. In this period, the Bosphorus became the area where the industrial function took place. Until the 1950s, the Bosphorus lacked an urban structure. However, it is not possible to describe the Bosphorus as an area where rural life continues, together with its industrial function. Along with, cultural buildings, universities, public buildings, the decreasing use of housing has been tried to be developed in the area.

FACTORS AFFECTING THE PLAN SCHEME OF THE MANSIONS

The distance between men and women stemming from the conditions and lifestyle of the period appears as an important factor in the planning scheme of the mansions. The separation of the mansion plan scheme into two as; *harem* and *selamlık*,

the positioning of the stairs, and the elements that are placed in pairs on each floor, such as the kitchen, are the obvious results of this privacy concern (Abdulla, 2014).

First of all, the opening of the rooms to the sofa was limited by various factors due to heating concerns and privacy. Therefore, either the rooms were opened into units, the doors opening to the sofa were given from the side, or a part of the entrance was closed with a bench or a cage so that the mouth of the entrance was placed sideways. Later, these units were transformed into secret passages or connection joints between rooms (Ünsal, 1987).

These elements, shaped by the concern of privacy in the plan scheme, display themselves differently on the façade. Curtaining by closing the windows on the ground floor with lattice stemming from the sense of privacy seen in Turkish house plan types, the fact that the main façade starts after the first floor, has emerged as a result of the conservative and outwardly closed attitude.

These solutions applied in the Turkish house have been solved by the positioning of the facade elements and the use of natural restraints. Privacy is provided in the mansions by using the sea as the front façade limiting element, and by the use of high protective walls for the other three façades. The garden on the road side that surrounded by high walls was used as a harem garden, and the garden/pier facing the sea was generally used as a *selamlık* (Eldem, 1954).

CONDITIONS OF BOSPHORUS MANSIONS

Bosphorus mansions has also been raised from the floor as in the Turkish house architecture, the balconies were taken on the pylons as it carried out as the continuation of the room, not in the form of the bay window. So, the *selamlık* part was created here.

The reason for this is that, according to the urban planning rules applied in the 19th century, the mansions were prevented from extending towards the sea. However, if neighbors do not have complaints and if it's not detrimental to the conditions, it was determined that the middle rooms can carry out as 96 cm to 100 cm (Figure 1) (ELDEM, 1954).



Figure 1. Extension of the Rooms Towards the Bosphorus (Erdenen, 1993).

The rooms are the main members of the mansions. A certain number of rooms are needed to form the mansion. For instance, plan scheme with the middle hall -*sofa*- and *eyvan* there needs to be at least four rooms on each floor.

Extended families with the gaining of the socio-cultural structure of the period are mostly known to live together. However, together with daily life in the rooms, the activities of resting and entertainment are nested. The rooms would have acquired their importance to the person, decor and the view they have. Therefore, the location of the rooms was very important to connect with each other and with sofa (Erdenen, 1993).

As in the Turkish house, the sofas are important in the mansions, in fact, the Turkish house draws apart from the European houses, with the plan scheme that shaped by the *sofa*.

As the evolution of the plan schemes, the *sofas* are also changed as a square or rectangular, and the trapezoidal corners, and after the oval round types, it gets longer and narrower and finally turns into corridor that can be typically seen in nowadays houses.

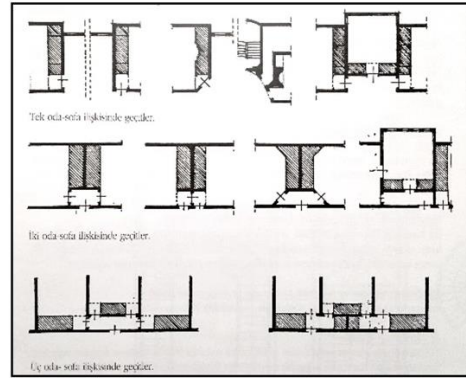


Figure 2. Formation of Passages in Bosphorus Mansions (Erdenen, 1993).

It is more likely to see internal and central plans in Bosphorus mansions. The plan schemes are common with each other because they are made for people with similar socio-cultural structures in the same ecological environment. The plan scheme could vary according to the owner's economic situation. Sometimes it contains some comprehensive changes and various adaptations were made in the plan scheme. For example, if the mansion belongs to the grand vizier -*sadrâzam*- or captain pasha, the size of the *selamlık* was held wide because there will be more visitors than usual. However, the plan would be the same as the general rules (Hacıhasanoğlu, 1981).

Although the mansions built in the early times were mostly single-storey, the use of stairs in the mansions gained great importance with the increase in the number of floors towards the 18th and 19th centuries. Since the main used areas are the upper floors, the position and shape (Figure 3) of the stairs connecting the ground floor and the upper floors have become more important (Yazıcıoğlu, 1980). Mansions can be divided into two types according to the use of stairs: Single-stair and double-stairs.

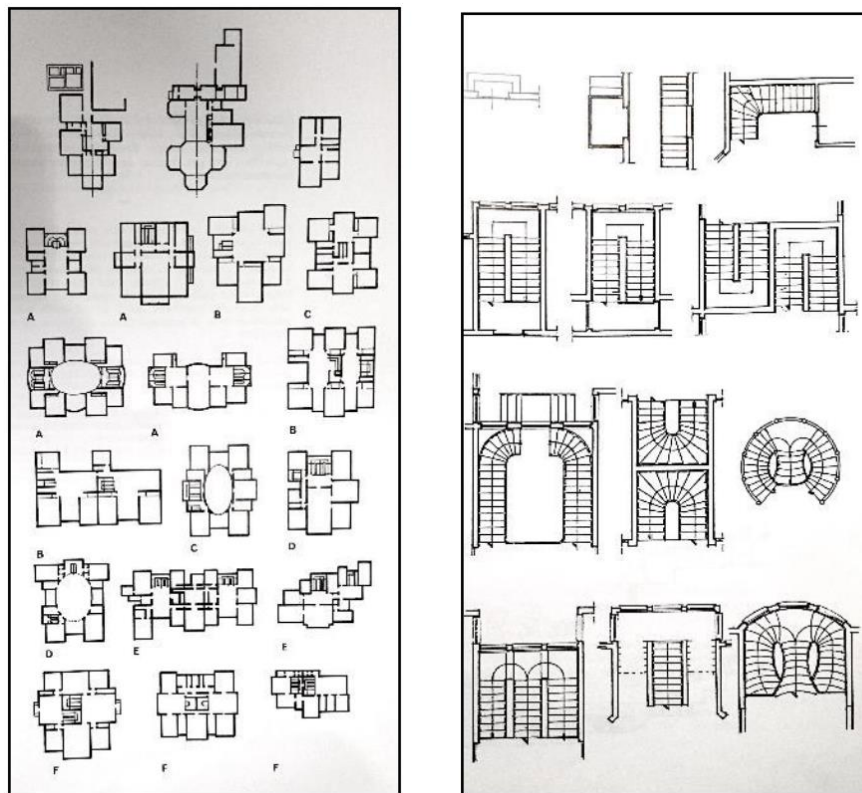


Figure 3. Positions and Staircases of Bosphorus Mansions (Erdenen, 1993).

FAÇADE

Since people with a high level of economic income lived in the mansions since the first years, a single storey one was started to be built, relatedly with the construction traditions of the period. After that, multi-storey, complex structures and flamboyant facades have begun to be seen on the Bosphorus coastline. Thus, apart from the plan scheme, the façade decorations and the gigantcity of the building became a significative feature of the owner's prestige.

The structure, covered by the Turkish style roofiles, very sloping low roof, opens towards the landscape with wooden frame, horizontal or vertical openings. Window shutters or blinds protect from the sun, cold and heat.

Wood veneer, eaves and plasters at floor levels emphasize the horizontality of the structures and harmonize with the horizontal form of the Bosphorus. The vertical position of the windows and the mutules create a balance by connecting the horizontal lines vertically (Şehsuvaroğlu, 1986).

WINDOWS

Windows are important elements for the mansions in terms of illuminating the interior and affecting facade view. Since the mansions are intertwined with the landscape and nature, and also because they are built with high ceilings due to their wooden architecture, the windows are positioned vertically. Most of the time windows are more or less at the same size and quality. When analyzed the history of the mansions, it is seen that guillotine windows created at a ratio of 1:2 were used for a remarkable period. However, as a result of the renovation process, the original windows were not preserved. For the mansions, which started to be used in winter as well as in summer, the windows were changed due to heating concerns. Until today, the majority of the mansions are late 18th and 19th century structures, and the most rapidly changing elements are window frames, however, information about old mansion windows is obtained based on comments and sources (Yazıcıoğlu, 1980).

STYLE

In traditional Ottoman architecture, were affected by the westernization process as well as the state, and movements that origins from Europe began to come to the forefront.

Until the middle of the 18th century, classical Turkish architecture and classical Turkish motifs take the Turkish-Baroque form. Empiric elements begin to be outlander. In the 19th century, Baroque and Empiric elements began to be seen. During the Tanzimat period, architecture also passed into the hands of the Europeans, but the plan and form of the body remains Turkish. The change stays limited to the expositions in the decoration and some details of the architectural elements (Abdulla, 2014).

RELATIONSHIP OF MANSIONS WITH ENVIRONMENTAL ELEMENTS

In the original formation, the mansions showed some differences between regions. It has been determined that these differences are the effects of sea, road, local topographic condition and physical structure. Bosphorus mansions were structures where large families lived with crowded populations. The primary physical components that form up the mansion are, the *harem* and the *selamlık*, then they are followed by the kitchen, the bath and the curtilage.

Servants did not stay inside the mansion, so the curtilage and kitchen were located outside. The bath was built separately from the mansion since the fire burned in it, but its relationship with the harem was also established. (Terzioğlu, 1995). The mansion garden was as important and valuable as the mansion. The mansion, with its inner garden -patio-, flower fields, groves, conservatories, and a gazebo at the top, was in a uniquely introverted state with moonlights and pavilions (Yazıcıoğlu, 1980).

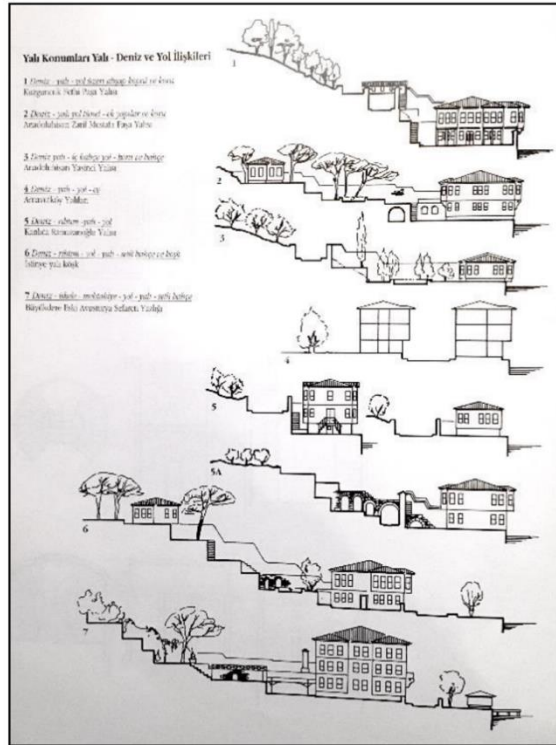


Figure 4. Mansion, Sea and Road Relation (Erdenen, 1993).

ANALYZING ANATOLIAN SIDE MANSIONS

SAFFET PASHA MANSION

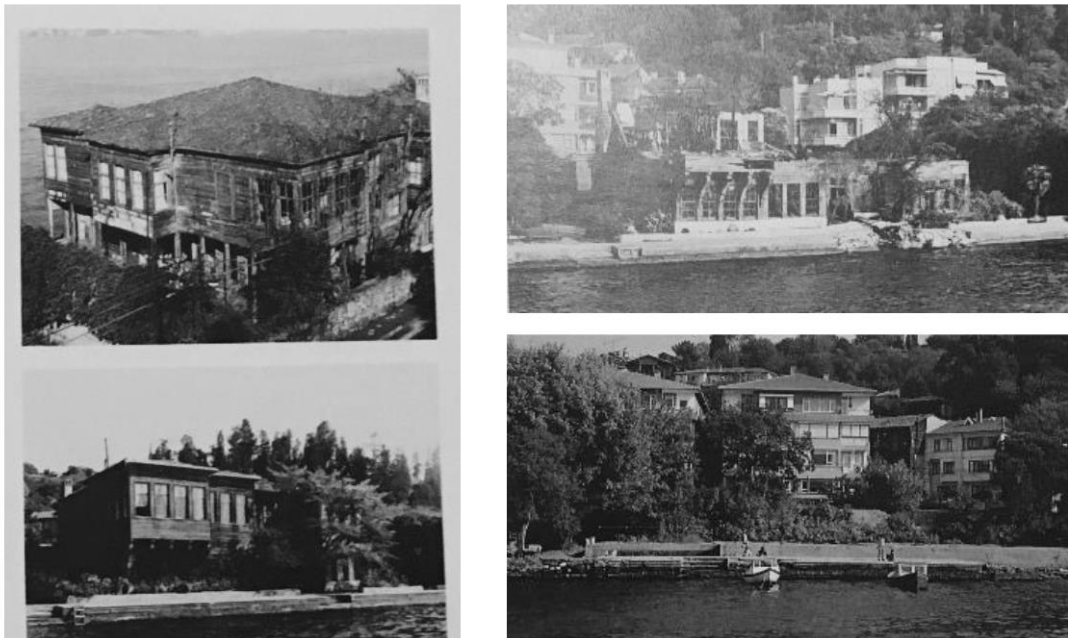


Figure 5. Saffet Pasha Mansion on the left; 1965 above and 1975 below; On the right; After fire 1976 above and 1992 below (Erdenen, 1993).

The mansion was ordered to build in 1760 by Ethem Efendi, although the architect of the mansion is unknown, it is derived from the traditions the architect used that he was a Turkish educated in Venice. It is one of the oldest of the Bosphorus mansions with a history of more than two hundred years. Saffet Pasha, after whom the mansion is named, is the second owner of the mansion and He is an important statesman who served as the Minister of Foreign Affairs six times and as the grand vizier for a while during the reign of Abdülhamit II. When it was transferred from the first owner to Saffet Pasha, the second owner of the mansion in 1865, it underwent repairs and changes in plan. It was destroyed in 1976 after the *selamlık* part was burned (Erdenen, 1993).

The classical simplicity of the plan that consists two storey, has taken on a very dynamic and asymmetrical form. The plan scheme can be likened to the ones that used in 19th century because of the skylight added for the bathroom and corridor which was used as a connector between the harem and *selamlık* apartments. There are thirteen rooms in total, two sofas, two stairwells, service rooms and toilets on both floors (Erdenen, 1993).

The sofas are in the middle of the two sections. The plan has two important features, first, the corridors connecting the sofas to each other extend in good order and are not curved.

The second is; at the beginning of the middle room row between the two departments, a large and protruding room, overlooking the sea, was created. This central hall is connected to both sections (Ekimoğlu, 1970).

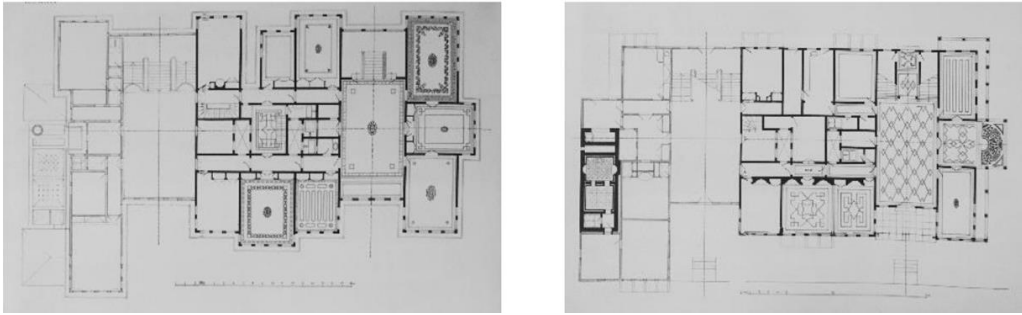


Figure 6. Saffet Pasha Mansion First Floor Plan; Ground Floor Plan (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

European effects on the style can be observed in interior decoration. Niches and wall panels were also applied in the rooms along with the traditional domestic cabinets. Turkish ceiling coverings and decorations replaced by European motifs, ceiling roses and floral ornaments. The rooms are furnished with French style furniture (Erdenen, 1993).

One of the most striking room of the mansion is room two, which was prepared with reliefs during the 18th century. Decorations made in 1957 still retain their original colors (Figure 7).

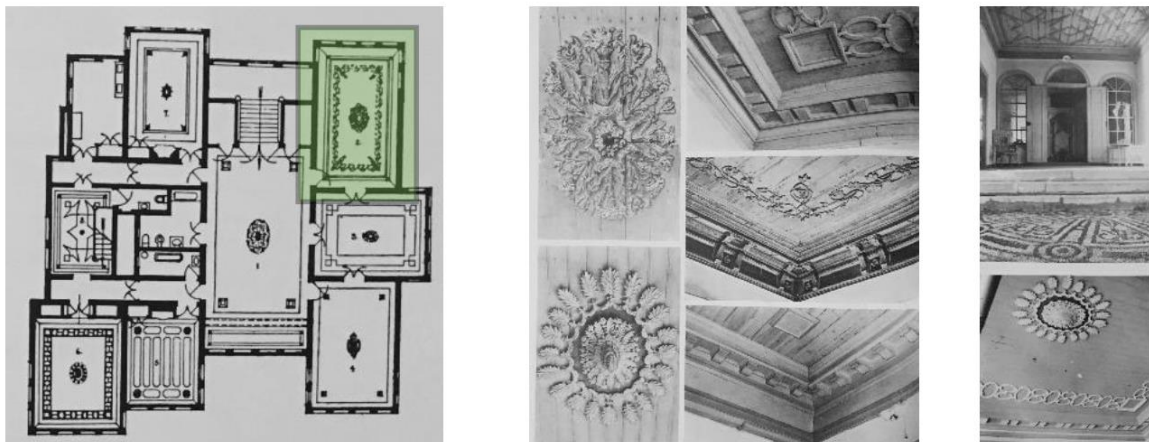


Figure 7. Room number two on the plan; ceiling ornaments of room number two (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

The facade of the mansion can be count as dynamic. The parts with windows are more than the deaf parts in terms of quantity (Figure 8). It can be seen from the figure 9, that Baroque-influenced buttresses were used. The mansion is separated from the Bosphorus by a lone flower bed and a stone pier, this stone staircase on pier is the main passage on the Bosphorus side.



Figure 8. Front View of Saffet Pasha Mansion (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

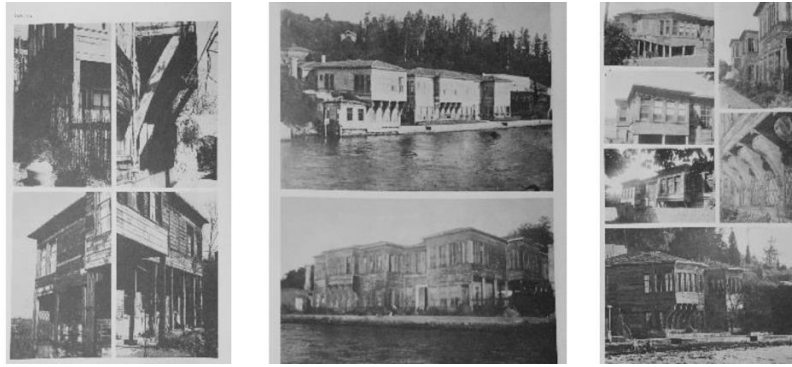


Figure 9. Façade Views from Saffet Pasha Mansion (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

SADULLAH PASHA MANSION



Figure 10. View of Sadullah Pasha Mansion from the Bosphorus Side.

Sadullah Pasha mansion is the best preserved on the Bosphorus, and is the oldest mansion after Köprülü mansion. It was built in 1783. Ninety years after its construction, it passed to Sadullah Pasha and took his name (Terzioğlu, 1995).

It was built in the traditional Turkish building style on a Baroque interior plan. It means that, it is a central plan type. There is a great hall in the middle that staircases and the rooms be opened.

The first-floor plan is the same as the ground floor. It is the central plan type that distinguishes it from the other mansions, which can be seen more clearly on the ground floor stony *-taşlık-*. The sofa is opened to the Bosphorus and the garden side with iwans *-eyvan-*.

The three-armed double staircase leads to the floor hall with an oval plan drawn on the transverse axis. The iwans on the axis heads, which develop longitudinal, thus turned into voluminous spaces (Eldem, Boğaziçi Mansions II Anatolian Side, 1994).

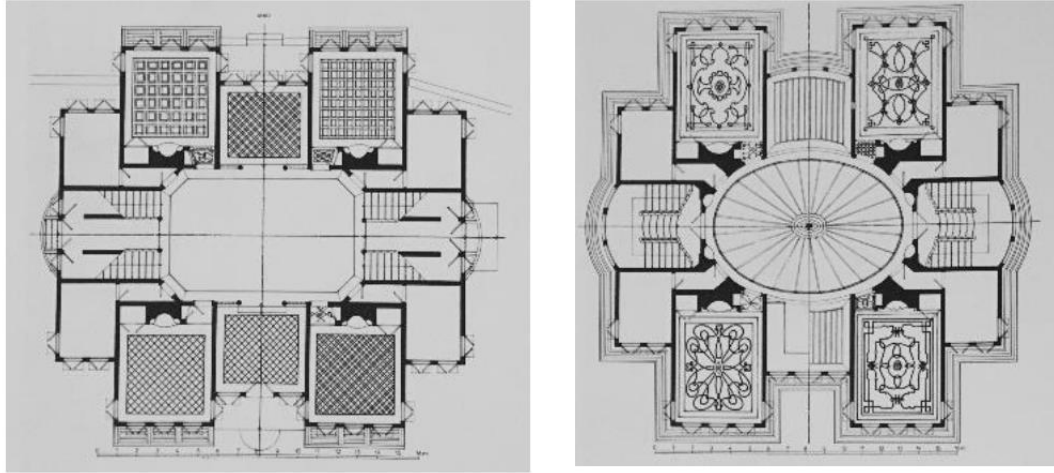


Figure 11. Sadullah Pasha Mansion Ground Floor and First Floor (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

Each room has different decoration. The ceilings on the ground floor are all thin-bar divisions called 'bottles'. In the entrance area that is the part of the sofa, the ceilings are decorated with double and crossed bottles. The ones on the Bosphorus side are more modern and cassette-shaped and different from the traditional. The four pairs of columns surrounding the sofa have Tuscan-Doric column headings. There are hand drawn motifs on the walls. The existing colors that emerged were left in pale tones and fine tonalities were created.

In the ceiling roses, combinations of sunburst and berry bundle ornaments can be seen. Umbrella-style tent cover was applied in the middle *sofa*, and it is noteworthy that this *sofa* is similar to the large *sofa* in the Şevkiye Pavilion in Topkapı Beach Palace (Eldem, Boğaziçi Mansions II Anatolian Side, 1994).

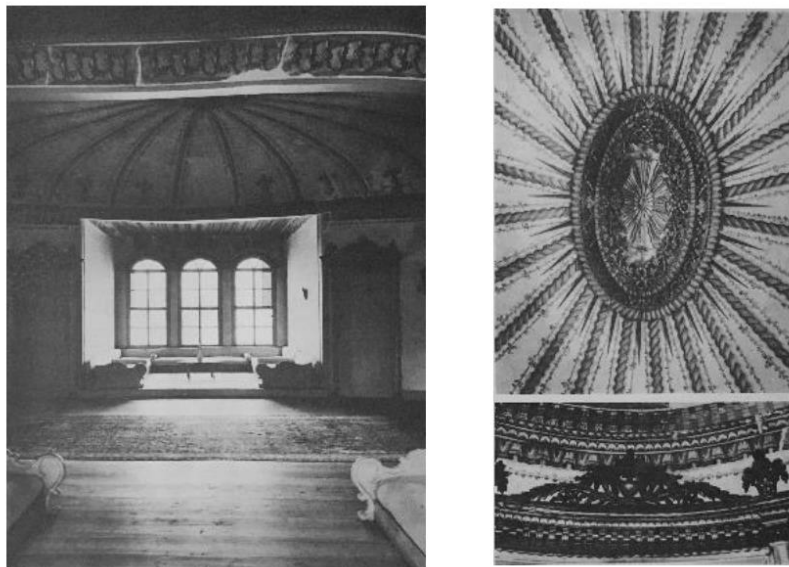


Figure 12. Middle *Sofa* and Details from the Ceiling Ornaments (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

The main façade at the Bosphorus side with mutule bay windows, Turkish style tiled roof eaves, window system, that are classical, keeps the local architecture sustain.

The upper parts of the windows are adorned with rich festoon and folio bunched caps. The *Selamlık*, bath and kitchen, which were spread out on the pier from the front, were removed because they were very dilapidated, and after that, the mansion owned a symmetrical shape and plan. As a result, it became more compact (Eldem, Bosphorus Mansions II Anatolian Side, 1994).

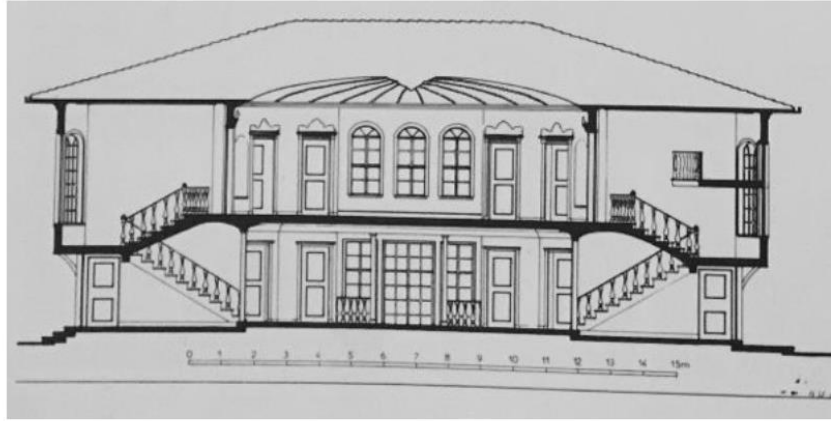


Figure 13. Sadullah Pasha Mansion Section.

ZARIF MUSTAFA PASHA MANSION

According to Zarif Ogun and Sedat Hakkı Eldem, it was built in the late 17th or early 18th century, and according to Behçet Ünsal in 1792. In his memoirs, Zarif Mustafa Pasha stated that he bought the mansion in 1848. Pasha is not the first owner of the mansion; but it is not recorded from whom it was bought. It took its present form at the beginning of the 19th century. The durable part of mansion is *Selamlık* it is today's Esad Bey Mansion.



Figure 14. Gazebo and Harem (Erdenen, 1993).



Figure 15. Selamlık (Erdenen, 1993).

The Neoclassical and the traditional Turkish construction style are harmonized, but it can be said that the dominant is the traditional. The middle motif of the sea front, mutule cantilever profile, supports that go down to the ground floor, roof shield and with window and other floor moldings it resembles an Empiric style (Erdenen, 1993).

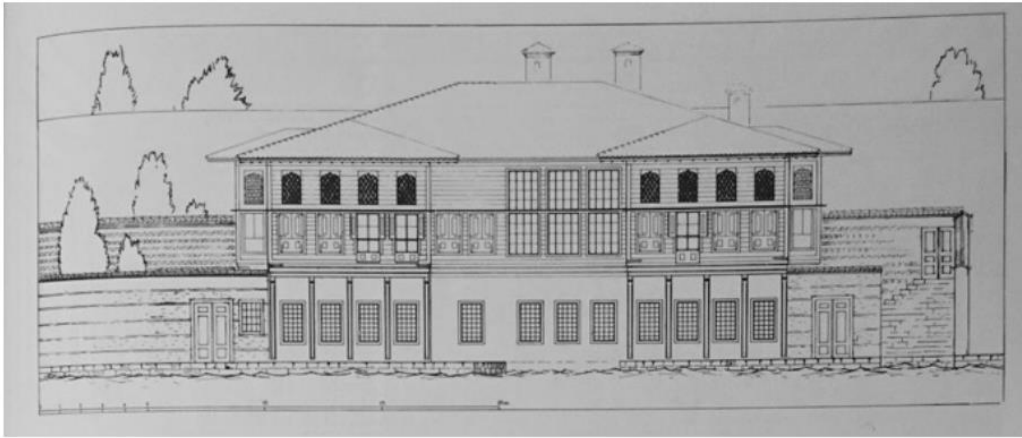


Figure 16. Facade View of Zarif Mustafa Pasha Mansion (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

The Turkish bath -*hamam*- structure of the mansion complex has the classical Turkish bath plan type. The plan of this mansion is like an anonymous seaside house with a middle sofa. The bath section, unlike the public baths, consists of two separate sections, one for the cold room and the other for the bathing area. It also has a lavatory (cleaning room before praying). There are two marble sets facing each other in the cold room (Erdenen, 1993).

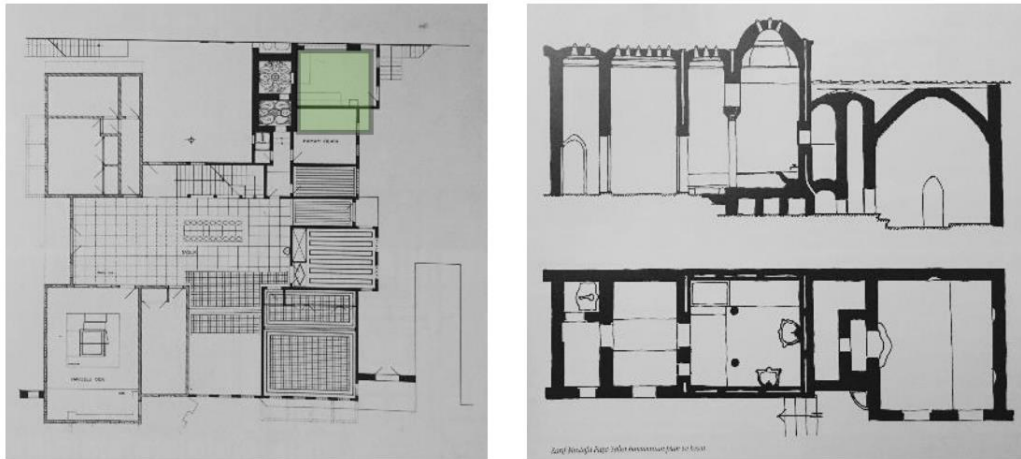


Figure 17. Turkish Bath on Plan That Marked in Green and section (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

The *harem* of the mansion draw attention from the outside by its ochre-painted coatings and white window sills, and the *selamlık* is painted in a yellowish color (Ünsal, 1987).

Unique balusters of the stairs, hand carved solid wood doors, mutules that supports bay window shaped as parenthesis can be seen from the picture. Those are the valuable elements of Turkish house construction tradition.

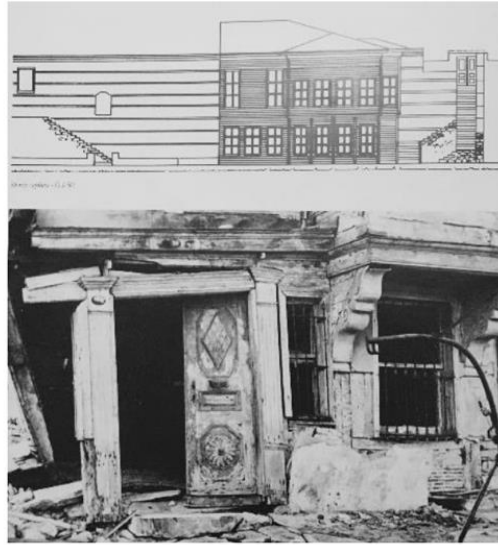


Figure 18. Harem, Before It Was Destroyed, the Entrance Door, Staircase Handrails and Baluster (Erdenen, 1993).

After many repairs on the exterior of the mansion, its cladding and windows can be seen in the Empiric Style. However, inside, there are wooden and painted ceilings and wainscots in the style of the period, from the first construction. The grandchildren of the Zarif Pasha named the rooms of the mansion according to their characteristic features.

The 'Room with Furnace' and the decorated part were called the 'Gilded Room'. In the gilded room, there is an extraordinary panel with a size of 6.60m. x 2.20 m consists of six parts.

There is another wooden decoration on the two side walls of the room, separate from this panel, and on which there are inscriptions for verses or other writings. The simplicity of the flower groups and the harmony on the border are of rare beauty. Ceiling, with the sun in the middle completes the elegance of the room with its double border decorated with octagonal stars and *halkar* -ornament that made with gold- (Erdenen, 1993).

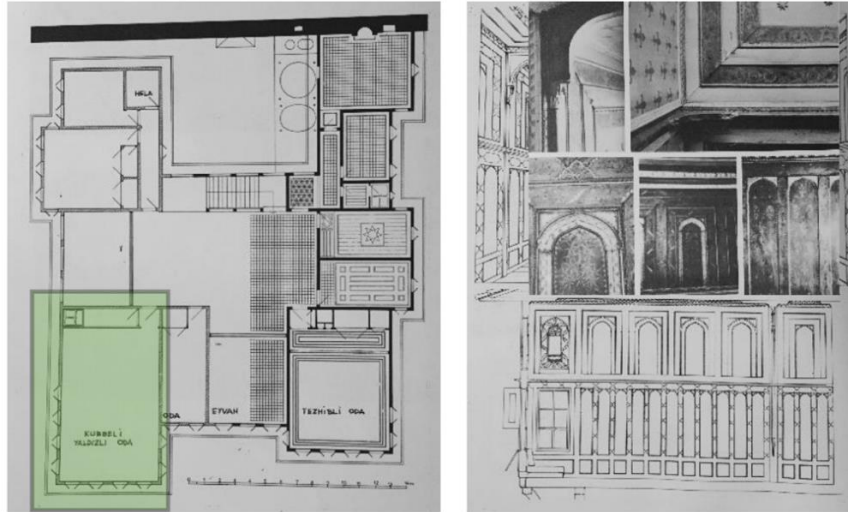


Figure 19. 'Gilded Room' on plan marked with green, ceiling and wall ornaments (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).



Figure 20. Details from ceiling and wall ornaments (Eldem, Boğaziçi Yalıları II Anadolu Yakası, 1994).

CONCLUSION

When the plan typologies of the Bosphorus mansions are examined, it is seen that they are similar to the traditional Turkish house. Its location by the Bosphorus is worth studying in terms of its close relationship with the water. The Bosphorus as Istanbul, when evaluated from historical and physical perspectives, increases the value of the structures located around it, due to its unique characteristics.

For this reason, the region, which has been reserved for the notables of the state since the Ottoman period, maintains its importance today. The Bosphorus mansion planimetry, which is based on the traditional Turkish house, has developed in connection with the living tradition of men and women. It is possible to encounter examples where the sections separated as *harem* and *selamlık* were enlarged in relation to their functions.

The plan development, shaped by the need for privacy, has also been improved in connection with the exterior of the mansion.

In the mansions, environmental elements such as the Bosphorus, the grove used as the mansion garden and the road, as the limiter between the interior and exterior, have an important place. As a result, the Bosphorus mansions, which are planned based on the traditional Turkish house, are the continuation of the Turkish lifestyle and traditions with their usage, planimetry, construction method. The functional construction of the connection of the mansions with the Bosphorus has been shaped according to the traditions that have developed over the centuries and it still maintains its importance today.

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REGENERATING THE WATERFRONT: FROM INDUSTRIAL USE BACK TO URBAN LIFE

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ABSTRACT

From past to present, society and the waterfront have been in constant interaction. With industrialization, the relationship of cities with water has changed compared to the agricultural society and port cities have emerged. With the location of industrial buildings on the coast, city centers have begun to stay away from water and access to the waterfront has become difficult. This difficulty of access has caused the urban waterfront to lose their former vitality and lose their recreational identities. In order to save the waterfront from the silence of industrial buildings that are no longer used, to strengthen the coastal-city relationship, to give cities a new image and to provide economic development, renewal projects have begun to be implemented, in which new functions such as tourism, recreation and housing are provided to coastal areas. The main purposes of these projects are to reopen these valuable areas, which have been idle due to abandoned industrial facilities, to public use, to revitalize the coast and to increase the brand value of the city. These regeneration projects, of which we have seen examples abroad and in Turkey, are worth a guide to many cities, especially in terms of coastal use.

The aim of this study is to examine the coastal regeneration projects that have been successfully concluded on a national and international scale and to understand the design criteria of these projects. Five sample projects, four of which were chosen from abroad and one from Turkey, were examined and compared in terms of the variety of activities they offer, interaction with nature, preserving the historic identity, accessibility and continuity. It is aimed that this study will guide designers and authorities in the process of regulations to be made on other coasts on an urban scale.

Key Words: Urban waterfront; regeneration projects; reuse of old industrial areas.

INTRODUCTION

The urban waterfront defines the areas where the city interacts with water. Waterfronts are public spaces that increase the quality of life in cities, increase city's attractiveness, have cultural and historical values, affect the economy and provide social communication. At the same time, they are one of the areas that make up the silhouette and identity of cities. In the past, people settled on the waterside in order to meet their physical needs, to trade and to carry out agricultural activities. For these reasons, societies and the waterfront always have been in constant interaction. With industrialization, the relationship of cities with water has evolved and changed; port cities emerged. In the rapidly developing port cities, social and cultural values have started to diverse (Duru, 2003).

As a result of the increasing world population and the intense pressure of the activities that emerged in the face of this population increase, the coasts in the cities have always been the focus of people and they have undergone a rapid change with human interventions (Çölkesen & Sesli, 2007). The density of the settlement in the coastal region has drawn the attention of industrial investors to these regions. Industrial structures are located on the waterfront for many reasons, such as easy access to the raw materials required for the industry, rapid delivery of the products to the market and easy recovery from post-production wastes. This situation created an insurmountable border by breaking the connection between the waterfront and the city-center. Later, due to the damage to the natural resources, the loss of the unique character of the city and the inability of people to use the waterfront, industrial structures started to be transferred to the new industrial zones determined over time (Tokyay, 2006).

The waterfronts, which have lost their function with idle industrial structures and cannot be used for public benefit, needed sustainable regeneration that will reveal their tourism and recreation potentials. Today, many coastal cities in the world aim to increase the use of green areas by rehabilitating the damaged coastline after the industrial use and to enable the people to use these areas again. In order to save the waterfronts from the silence of abandoned industrial buildings, to re-establish the water-city interaction, to give cities a better image, and to revive the economy, new structures with various functions such as recreation, accommodation and trading have been started to be designed for waterfronts. The targets of these regeneration projects are: to authenticate the waterfronts that started to become unidentified and homogeneous, to organize the waterfront in a planned manner and to use it efficiently, to preserve the natural character of the waterfront and to prevent ecological degradation, to regulate the distorted coastal texture with population growth and rapid construction, to strengthen social interaction and economy with new functions, to increase employment opportunities, to ensure that the waterfront can be sustainable and protected areas for future generations with new functions, to increase the brand value by giving a new image to the city, to improve the quality of urban life, to increase the attractiveness of the city with recreational activities, to create public spaces that reduce the urban waterfront-city center division by providing the community with access to the shore (Uzun Sönmez, 2017).

Today, it is a great advantage and a necessity for the re-generated waterfronts to have sustainable designs that are open to public access and that have the least damage to the environment. In the context of the initiatives for the Global Conference on the Urban Future held in Berlin in July 2000 and in the course of the Expo 2000 World Exhibition ten principles for a sustainable development of urban waterfront areas were approved. These are, securing the quality of water and the environment, considering the waterfronts as a part of the city, preserving the historic character, encouraging the mixed use, providing the public access, planning in partnership of public and private actors, planning with public participation, considering the regeneration as a long process, making flexible plans and making profit from international networking (Bradbury, 2010). In short, waterfront planning with transparency and community participation are essential for successful waterfront regeneration, the design should environment-friendly and should firstly establish a good relationship with nature and water, preserve the historical character as much as possible, offer a variety of activities and be accessible. In addition to these, it is an important criterion that the continuity of the urban coast is not interrupted by restrictions such as private property.

Seeing how these criteria are applied in waterfront regeneration projects in different locations is an important guide for future projects. For this purpose, five sample projects, four of which were chosen from abroad and one from Turkey, were examined and compared in terms of the variety of activities they offer, interaction with nature, preserving the historic identity, accessibility and continuity.

HUNTER POINT SOUTH PARK, NEW YORK, USA

Hunter Point South Park, an abandoned post-industrial area in Long Island City until recently, has been converted into an active green space and affordable housing by Thomas Balsley Associates and Weiss Manfredi with Arup (Figure 1).



Figure 1. Hunter's Point South Masterplan (URL-1).

Hunter's Point South creates a new model of urban ecology and works as a laboratory for innovative sustainable design. Transforming a post-industrial coastal area into both a new cultural and ecological space, the Hunter's Point South project combines infrastructure, landscape and architecture with new ecological corridors that anticipate inevitable flooding and rising water levels along the East River (URL-1). The park has a multi-purpose lawn, a beach terrace, playgrounds, sports equipment for adults, jogging areas for dogs, a rail yard, beach, bike paths, waterside promenades, picnic areas, basketball court, nine meters high viewing platform named "Overlook" (Figure 2), a large exhibition area and many more units.



Figure 2. Hunter's Point South Viewing Platform (Bill Tatham, URL-2).

A sloping rock wall constructed instead of concrete flood barriers to protect from storms preserves the natural texture of the shoreline and softens it with an aesthetic transition without ending it harshly (Figure 3). In addition to all this, perhaps the most important part of the park is a tidal marsh designed to gently absorb and release rainwater. Described by its designers as "a place of discovery, ecological resilience and extraordinary drama", the project is cited as an ideal example for waterside projects worldwide due to its commitment to adaptability as well as aesthetics (Sinopoli, 2019).

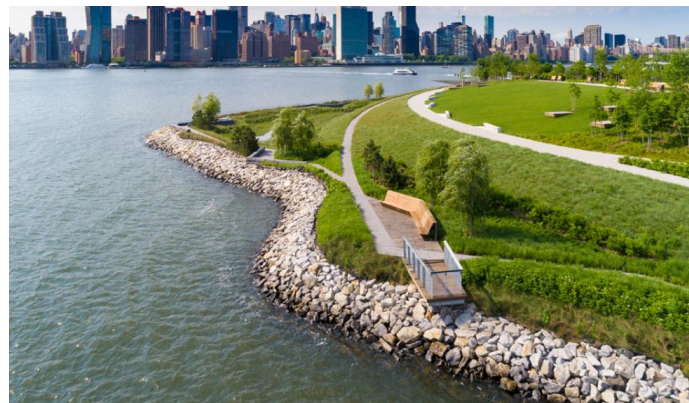


Figure 3. Hunter's Point South Sloping Rock (Bill Tatham, URL-2).

NAVY PIER, CHICAGO, USA

At the turn of the 20th century, as many passengers and many tons of cargo entered Chicago each year by water, architect Daniel Burnham devised the Chicago Plan in 1909. Believing that the piers could serve both for transportation purposes and as entertainment centers, Burnham's ideas were appreciated and the first pier, known as Navy Pier, was built by architect Charles Sumner Frost and opened in 1916 (Figure 4). It consists of two-story freight and passenger sheds, bookended by a head house and a ballroom. For quite some time this place has become a mix of business and leisure, with many cargo and cruise ships arriving daily. With picnic areas, children's playground and tram access, the pier has turned into a pleasant relaxation area used by the public (URL-3).



Figure 4. Navy Pier in 1916 (URL-4).

With the Great Depression, first maritime transport and then the mobility at the pier slowed down considerably. When the World Wars began, buildings were added to the pier so that it could serve as a military training center. During the First World War, there was a military barracks and a prison for deserters on the pier, while during the Second World War the pier became a Naval Base. In 1941 the pier was converted into a training facility, and after the war it was used as the University of Illinois campus. When the campus was moved from the scaffolding, the massive structure became unusable. With the celebration of the Biennale of America in 1976, the Great Ballroom was rebuilt and the pier was given Chicago Landmark status. Although the launch of Chicago Fest, an annual music festival, made the quay a little more popular, it remained dysfunctional for another decade when the festival ended (URL-3).

Navy Pier was redeveloped in 1994 with extensive improvements designed by VOA and Benjamin Thompson Associates and reopened to the public in July 1995. Since then, Navy Pier has provided guests with a diverse and eclectic experience. In July 2011, Navy Pier Inc., a nonprofit organization, was formed to operate and redevelop Navy Pier. The main purpose of this establishment is to expand Pier's audience and enrich the guest experience. Pier celebrated its 100th anniversary with the opening of the iconic Centennial Wheel, Polk Bros Park, Fifth Third Bank Family Pavilion and Peoples Energy Welcome Pavilion. Ongoing pier-wide redevelopment began in 2019, including the 220-room Hilton hotel and the Offshore Rooftop & Bar. Today, Navy Pier offers free arts and culture programs throughout the year designed to inspire, educate, and bring communities together (URL-4).

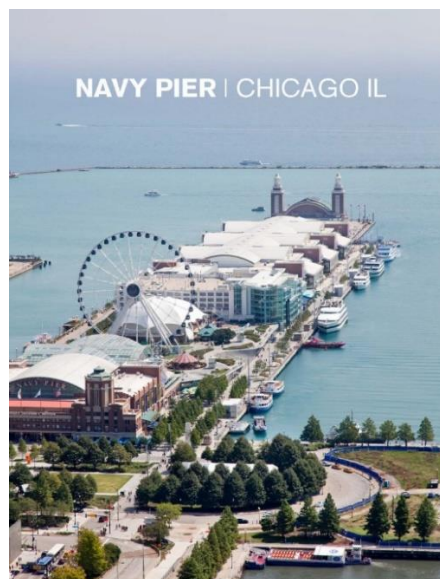


Figure 5. Navy Pier South Dock and Polk Bros (URL-5).

BARANGAROO, SIDNEY, AUSTRALIA

A 22-hectare disused container port west of Sydney Harbor, the site has been closed to public use for over a century. In 2009, within the framework of the vision of making Sydney the leading financial service center in the Asia and Pacific region, plans were made for this area, and since 2010, it has begun to be transformed into public space, commercial and residential areas (URL-6). For the first time in over a hundred years, this area has been opened to the public thanks to this regeneration project (URL-7).



Figure 6. Barangaroo, Sidney (URL-8).

The project consists of three zones: Headland Park, Barangaroo South and Barangaroo Central (Figure 7).

The headland has been transformed into a large green space that houses an underground cultural center and a public garage accessed by a discreet lift at the highest point of the cape. Continuous walking trails and bike paths follow the original coastline in 1836 (Figure 8). In order to protect the waterfront from the tides, this line is framed by sandstone blocks that refer to Sydney's history and are a unique material to that region. This aligned the tidal gradient towards the water at the harbor side, allowing people to experience a wide variety of natural formations, including tide pools and rocky beaches. The landscape planted in the region is also unique to Sydney and creates an ecology suitable for the region with bushes consisting of three separate layers (URL-6). During construction of Barangaroo Reserve historic features, including Munn's sandstone Slipway, Cuthbert sandstone seawall, a sewer pumping station and a sandstone seawall were uncovered and protected. The old pumping station which was moved and restored, serves today as the amenities block (URL-7).



Figure 7. Barangaroo Site Plan (URL-6).



Figure 8. Barangaroo, Headland Park (URL-6).

In the Barangaroo South, there are skyscrapers called “International Towers Sydney” (Figure 9), which are used for commercial purposes, and the “Crown Sydney Hotel Resort”, a luxury international hotel, whose construction started on 2019. Office areas, residences and sales units are located in three skyscrapers in the region. These structures were awarded a 6-star rating by the Australian Green Building Council in 2016. While designing energy efficient structures, the carbon content of the many materials used in construction has been reduced, and net zero carbon emissions have been achieved with the use of renewable energy and sustainable materials. In this way, the region was declared Australia's first carbon neutral zone in 2019 (URL-7).



Figure 9. Barangaroo South in 2019 (URL-8).

Central Barangaroo is located between Headland Park and Barangaroo South and is the last part of Barangaroo to be completed. In addition to commercial buildings, the area contains large turfed areas that provide opportunities for arts, culture and education as well as festivals and entertainment. Thanks to the Sydney Metro station, which is expected to be completed in this region by 2024, it is aimed to connect the public spaces and the commercial area. With the opening of the walking track Wulugul Walk in 2024, a 14 km Sydney Harbor gateway will be created (URL-6; URL-7).

BROOKLYN BRIDGE PARK, NEW YORK, USA

Continuing along the banks of the East River from Jay Street to Atlantic Boulevard, most of the site is a bulk shipping and storage complex that was built in the 1950s by the Port Authority of New York and New Jersey, but later became dormant with the popularization of container shipping. The Brooklyn Bridge Park Project transforms this dysfunctional post-industrial waterfront into a vital urban threshold that mediates a connecting system between the city and the river, providing space for a wide variety of events and programs, all with stunning views of the Manhattan skyline. The attention paid to the rich history, existing pattern and natural features of the site is the strongest feature of this radical transformation (Van Valkenburgh, 2003).

The Project consists of Pier 1-2-3 and Greenway Terrace, Pier 4-5-6, Main Street City Park and Empire-Fulton Ferry Park (Figure 10). The “Greenway” (including bike and walking paths) connects the Park's piers 1 to 6 and different facilities. In this way, visitors can experience the park uninterruptedly along the river (URL-9).

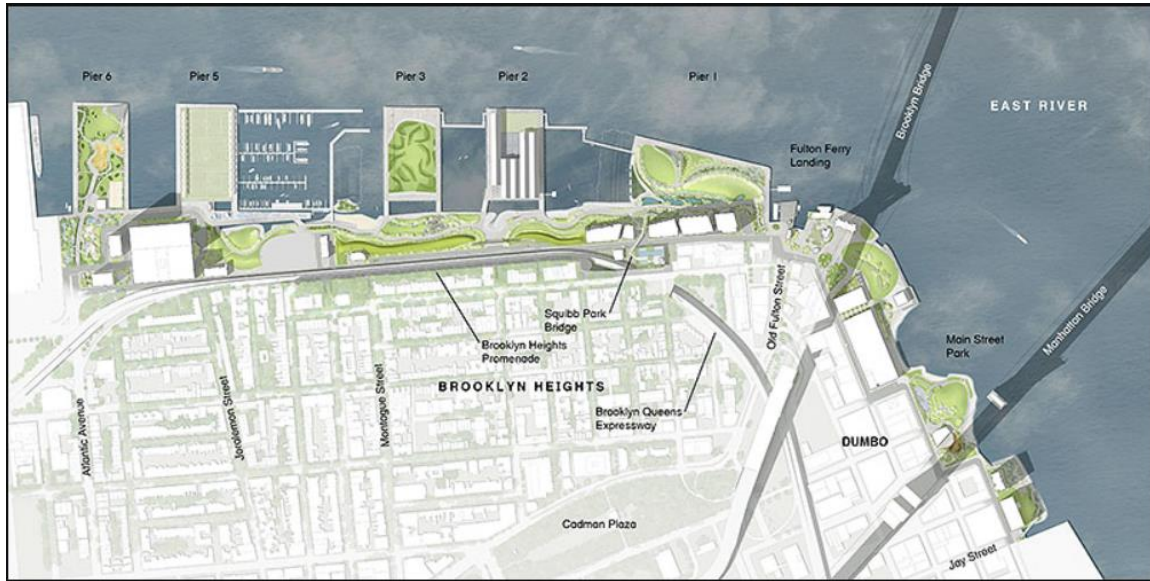


Figure 10. Brooklyn Bridge Park, Site Plan (Van Valkenburgh, 2003).

Pier 1 is the largest pier in Brooklyn Bridge Park and unlike the others, it was built on filled land, not on piles (Figure 11). The pier, which was opened in 2010, has landscape areas, a salt marsh, a playground, coastal walking paths and gastronomy venues (URL-10).



Figure 11. Brooklyn Bridge Park, Pier 1 (URL-11).

Pier 2 was formed by reusing an old warehouse pier for recreational activities. A full-length walkway surrounds the pier and includes handball, basketball, bocce and shuffleboard courts. The area also includes an artificial turf area, swings, a fitness room, picnic tables, Brooklyn Bridge Park Boathouse, and a skating rink. The pier has been partially covered with an existing warehouse roof and has become sheltered (URL-10).

While Pier 3 was a former industrial area, it has been transformed into a large green area with more than 500 trees and bushes (Figure 12). The area also includes one of the largest open lawns in the area. An exploratory labyrinth garden at the northern end of the pier contains interactive elements such as mirrored games, walk-in kaleidoscope, conference tube, and unique stone seating designed by German industrial designer Gunter Beltzig. With its curved walkways, wide lawns and Manhattan view, unlike other piers, it is not designed for entertainment but for relaxation (Franklin, 2018).



Figure 12. Brooklyn Bridge Park, Pier 3 (Franklin, 2018).

Pier 4, completed in 2014, was achieved by rebuilding a sunken and decaying railway bridge east of the river. It is aimed to protect the natural vegetation and wildlife on the pier. This section, called “Bird Island”, is covered with shrubs and trees off the coastline and is home to three of the seven tidal pools. Here, the “Osprey” platform aims to protect the natural vegetation and wildlife to attract herons to this area (URL-10).

While the shore of Pier 5 consists of sports fields used for lacrosse, frisbee, cricket and rugby, the inner part is home to a green area consisting of picnic tables, a tetherball court and a telescope. Activities such as canoeing, fishing and sailing can be done in the marina next to the pier. Pier 6 (Figure 13) has a volleyball court, several plantations and a dog park, and four playgrounds themed Swing Valley, Slide Mountain, Sandbox Village and Water Lab (URL-10).

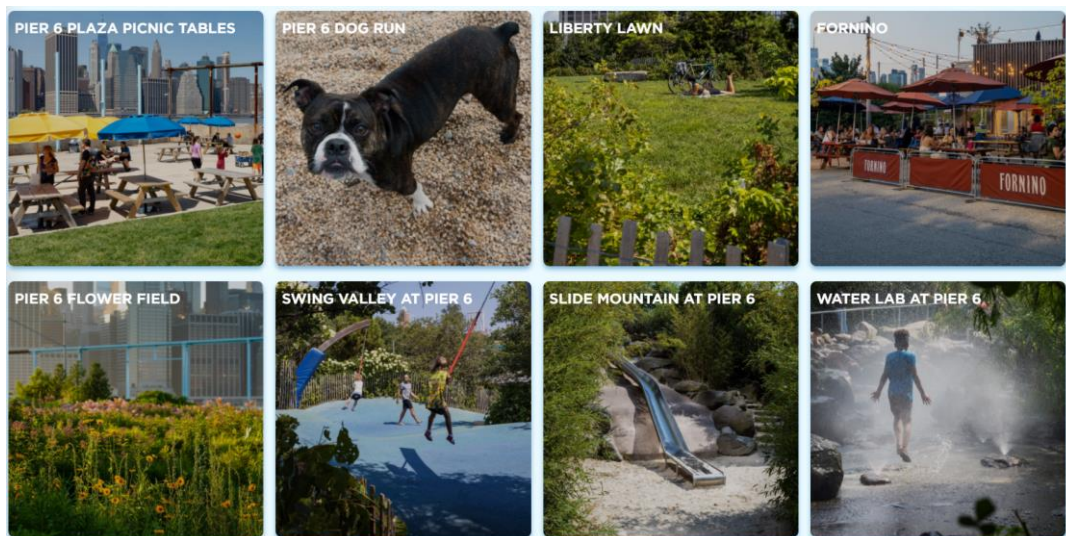


Figure 13. Brooklyn Bridge Park, Pier 6 (URL-9).

Main Street City Park (Figure 14) is a 1.9 hectare parkland under the Manhattan Bridge. In addition to the Pebble Beach and nautical-themed playground, the park includes an extended and elevated lawn, an elevated dog run area, Main Street Terrace, and an entrance plaza on Washington Street. “The Ed Center”, a learning center located here, hosts interactive exhibits that showcase the plants, animals, and ecology of the Park and Brooklyn waterfront. “The Cliffs”, which also includes one of the largest outdoor rock climbing facilities in North America, is an important structure within the park that offers a different climbing experience (URL-9).

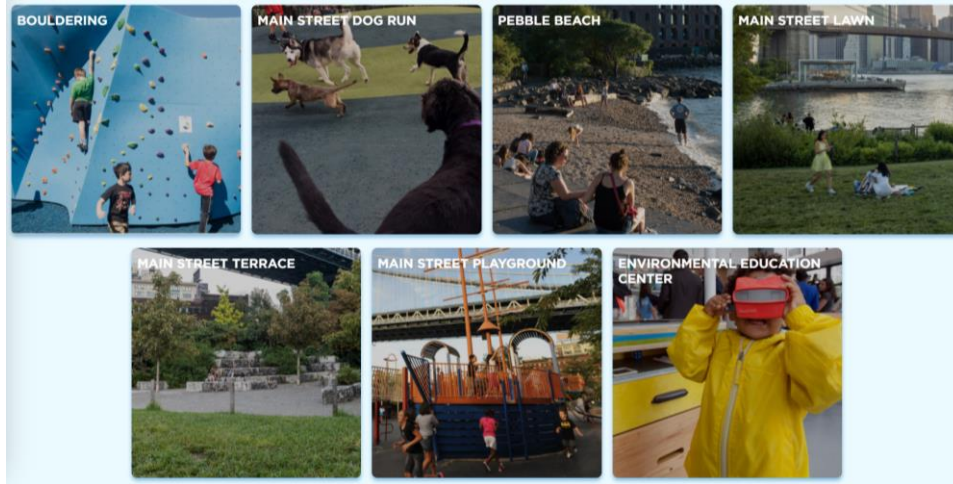


Figure 14. Brooklyn Bridge Park, Main Street (URL-9).

Finally, the Empire-Fulton Ferry section is a waterfront park located west of Main Street City Park. In this park, where picnic and recreation areas are located, there are a historical tobacco warehouse “St. Ann's Warehouse” built during the civil war and a historic brick warehouse called “Empire Store”, which transformed into a multi-purpose space including a dining hall, market and an art gallery (URL-9).

SEKA PARK, İZMİT, TURKEY

Seka Park is located in the city center of İzmit, on a waterfront area, on the land of the former Seka Paper Factory (Figure 15). It is one of the largest industrial transformation projects in Turkey and one of the largest city parks in the world. Established in 1934, the Seka Paper Factory continued to operate until the 1980s, and after this date, it was closed in 2004 as the private sector came to the fore and the business suffered a loss. The closed factory was completely transferred to Kocaeli Metropolitan Municipality. The municipality started the regeneration project in 2005 that will improve the coastal identity of the city and create a socially and physically sustainable living space (Uzun, 2014).

The main idea of the project is to transform the area where the Seka Paper Factory is located by reconfiguring it with public functions, to establish strong ties with the city and its inhabitants, and to ensure the continuity of green throughout the bay. The design consists of three stages in total. In 2007, the implementation of the first phase project was completed and opened to the public (Oğuz, Saygi & Akpınar, 2010).

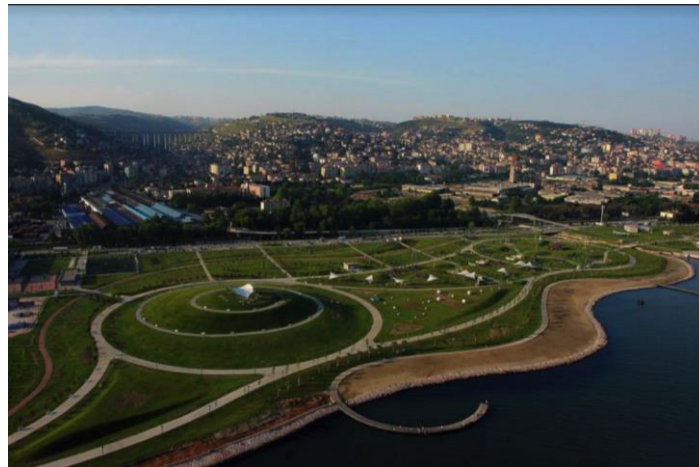


Figure 15. Seka Park 2009 (URL-12).

The first stage is in the area between the coast and the railway and consists of areas such as multi-purpose grass fields, wooden piers, playground, eating and drinking areas, kite hill, sports fields, uninterrupted pedestrian and bicycle paths, fitness fields, sea stage. In the second stage, industrial buildings that can be re-functionalized for cultural and educational purposes were determined and it was proposed to turn them into an attraction center in organic relation with the SEKA park area. The transformation is based on the architectural structure of the factory, taking into account the architectural restoration principles and landscape features (Muşkara & Tunçelli, 2019). So, visitors also have the opportunity to visit old industrial buildings like the Seka Paper Factory, which is one of the important industrial heritages of the Republican era, as it is the first paper mill in Turkey. The factory has been restored and continues to exist today as Seka Paper Museum (Figure 16) and Kocaeli Science Center (Yeşildal, 2017).



Figure 16. Seka Park 2009 (URL-12).

Other cultural centers located in the area are: Film Plateau, Gazi Akçakoca Memorial House, Seka Documentation Center, Thököly İmre Memorial House, Traditional Turkish Decorative Arts Education Center, Arts, Literature and Culture Academy, Kocaeli Uni. Rectorate of Culture House, Balkan Culture House, Mevlevi House, Azerbaijan Haydar Aliyev Culture House, North Caucasus Friendship and Culture House, Seismology Monitoring and Earthquake Education Center, Veterans Culture House, Leader Education and Youth Center (Yeşildal, 2017).

With the Sekapark transformation project, the biggest change in the use of coastal area has occurred in the green areas, rest and recreation areas built in accordance with the Turkish coastal law. In all stages of the transformation project, parks and green areas cover a total of 27.42 hectares, recreation and playgrounds cover 7.29 hectares. Large and small hills were formed in the area 50 meters from the coastline towards the land and all of them were evaluated as green areas. This change is an example of topographical changes at the waterfront (Figure 17). These measures will ensure the conservation and revitalization of the terrestrial and marine ecosystems in the coastal area (Uzun, 2014).



Figure 17. Seka Park, The Kite Hill (URL-13).

ANALYSIS OF PROJECTS

In all of the projects summarized above, it is seen that the waterfronts that have lost their industrial function and remained idle have been regenerated by considering the public interest. These areas, which have been out of public use for a very long time, have been reopened as areas that can be used with functions such as entertainment, commerce and housing for the whole society with regeneration projects. How the sustainable coastal development criteria are applied in these projects is an important element in terms of setting an example for other projects.

The first of the criteria to be sought in sample projects is the interaction with nature. This shows how the community finds the opportunity to communicate with water and landscape. The waterfront, where water and green areas are used effectively, always get more attention of visitors. The second criterion is the preservation of historical character. It is important to hold the traces

that will keep the social memory alive in the process of renewing the defunct area with new structures and equipment. In this way, the historical continuity can be ensured. The variety of activities that will attract the visitors, relax or entertain them is one of the factors that directly affect the success of the project. The accessibility and publicity criterion is related to the degree of publicity of the area, transportation facilities and being barrier-free. Continuity, on the other hand, is an indication that the waterfront use continues uninterrupted within defined limits. Success is negatively affected in projects where public use or pedestrian transportation is interrupted by restrictions such as private property or for other reasons.

Table 1 provides the opportunity to show, how these above mentioned criteria are applied in each project.

Hunter Point South Park	
Interaction with nature	The park has an active green space with many functions. Thanks to the density of the green texture, it creates a relaxation area for its users. This design, which was made by paying attention to the deterioration of the coastal texture, is an important example in terms of urban ecology.
Preserving Historic Character	A sloping rock wall, constructed instead of concrete flood barriers to protect from storms, preserves the natural texture of the shoreline.
Variety of Activities	Visitors can enjoy a multi-purpose lawn, a beach terrace, playgrounds, sports equipment for adults, jogging areas for dogs, a rail yard, beach, bike paths, waterside promenades, picnic areas, basketball court, nine meters high viewing platform, a large exhibition area and many more units.
Accessibility and Publicity	Apart from the social housing area, the park is completely public. It is possible to reach the park both by sea and by land (train, bus, bicycle and car). The abundance of activities in the park allows people to choose this place to spend their free time and to find both relaxation and socialization in a crowded and complex city like New York.
Continuity	The walkway which spreads linearly and parallel to the shore, works like a network connecting the landscape, green areas and facilities in the park.
Navy Pier	
Interaction with nature	The green areas designed for various activities in the park provide people with peaceful and spacious areas.
Preserving Historic Character	The Regeneration project envisaged the renovation of existing buildings and the construction of new buildings together. The Shelter Building and Recreation Building, providing additional space for events, and the magnificent structure on Navy Pier, the beautifully restored Great Ballroom, are part of the original pier. In addition to all of these, the completely renovated brick head house is the new headquarters of the administration and the new Ferris wheel is designed based on the original, the world's first Ferris wheel.
Variety of Activities	The visitors can enjoy different places like picnic areas, walking paths, parks, Ferris wheel, public stairs, festival hall, children's museum, Crystal Garden and Grand Ballroom.

Accessibility and Publicity	The Pier is easy to reach by public transport (bus, subway) or private vehicle by road. All areas within the park are open to the public. This publicity is one of the important parameters of the design, as it is desired that the pier be used by everyone, regardless of their socio-economic status, as in the original Burnham plan.
Continuity	The Family Pavilion, Chicago Children's Museum, Crystal Gardens, Centennial Wheel, Shakespeare Theater, Funhouse, Beer Garden and Navy Pier Auditorium can all be visited on a single walking route.

Barangaroo	
Interaction with nature	With its sustainability vision, Barangaroo aims to be carbon neutral and water positive, creating zero waste emissions. There is a green area of approximately 6 hectares in the region where more than 75,000 saplings have been planted. The skyscrapers built within the scope of the project received a six-star rating from the Australian Green Building Council.
Preserving Historic Character	During construction of Barangaroo Reserve historic features, including Munn's sandstone Slipway, Cuthbert sandstone seawall, a sewer pumping station and a sandstone seawall were uncovered and protected. The old pumping station which was moved and restored, serves today as the amenities block.
Variety of Activities	The visitors can enjoy various spaces for events, festivals, arts, culture and entertainment, walking and cycling paths. Apart from these, there are mixed-use skyscrapers and a hotel in the project.
Accessibility and Publicity	The regeneration project has opened up this waterfront area to the public for the first time in more than hundred years. It is possible to access the port by land and sea transportation. Transportation can be provided by public transport such as bus, train or private vehicle. There are two parking lots in the area. Thanks to the metro station to be built, it is aimed to connect the public areas with the commercial area and to facilitate access to the region.
Continuity	When the Wulugul Walk walking track opens in 2024, it will be possible to experience an uninterrupted harbor experience with the 14 km Sydney Harbor gateway.

Brooklyn Bridge Park	
Interaction with nature	There are green areas rich in trees and shrubs in the park. The Osprey platform was established at the 4 th pier to protect the natural vegetation and wildlife and to attract herons to this area. Thanks to salt marshes, boat ramps, beaches, and waterfront promenades, the park allows its residents to interact with water in different ways.
Preserving Historic Character	In the Empire-Fulton Ferry section the historical tobacco warehouse "St. Ann's Warehouse" built during the civil war and a historic brick

	warehouse called “Empire Store” are transformed into multi-purpose spaces.
Variety of Activities	The visitors can enjoy large green areas, playgrounds, walking paths, various sports fields, artificial grass field, skating rink, labyrinth – garden, picnic and recreation areas and dog park.
Accessibility and Publicity	The park, which is completely open to the public, offers opportunities to socialize and discover natural beauties thanks to its large areas and variety of activities. The park is accessible by public transportation (bus, subway and ferry) and by biking or walking.
Continuity	The “Greenway” (including bike and walking paths) connects the Park's piers 1 to 6 and different facilities. In this way, visitors can experience the park uninterruptedly along the river.

Seka Park	
Interaction with nature	Parks and green areas cover a total of 27.42 hectares. In the coastal area, large and small hills were formed and all of them were evaluated as green areas.
Preserving Historic Character	Old industrial buildings like the Seka Paper Factory are transformed to cultural buildings. Visitors have the opportunity to experience the industrial heritage and feel the historic character.
Variety of Activities	Visitors can enjoy multi-purpose grass fields, wooden piers, children's playgrounds, eating and drinking areas, kite hill, sports fields, uninterrupted pedestrian and bicycle paths, fitness fields, sea stage.
Accessibility and Publicity	As a result of the regeneration project, the area, which used to be an abandoned industrial area, has become a public waterfront that can be fully benefited by the citizens. The park can be reached by car or on foot from the city center. It is also possible for those coming from other provinces to reach Seka Park easily by the D-100 highway.
Continuity	Thanks to the bicycle and pedestrian paths that continue uninterrupted in the area, continuity has been ensured along the coast, and the cultural centers obtained by re-functioning the old industrial structures have been connected to these transportation networks and contextual integrity has been achieved.

Table 1. Examination of projects in terms of sustainable coastal development criteria.

CONCLUSION

Waterfronts are favorite places that people have used for various purposes throughout history. Especially urban waterfronts are among the places where the citizens want to go most to relax, have fun, meet nature and do recreational activities, and it is best to use them as public spaces. For this reason, the regeneration of the urban waterfronts, which have been idle and lost their vitality especially after the industrial use, increases the attractiveness of the city, makes the city more livable and puts it ahead of the global competition by improving its image.

While planning coastal areas, it is very important to make sustainable designs that take care to protect nature and historical heritage, are suitable for the use of all segments of the society, meet the needs of the users and use the potential of the coast in the most efficient way. Considering the public interest instead of rent profit and taking into account the sustainable development criteria in the planning are essential for a correct regeneration project. It is possible to say that the criteria determined for sustainable coastal development have been applied to a certain extent in all successful examples. It is seen that all the projects

examined interact with nature as much as possible, preserve and maintain the historical character, if any, enable different and rich activities, are easily accessible and completely open to the public, and their continuity is not interrupted.

As a result, it is a necessity for coastal cities to physically protect, revitalize and legally secure their coasts, which have great potential to stand out in terms of livability, tourism and creativity. The correct use of this potential is directly related to the sustainable development of the waterfront by considering the public interest and natural life. It is possible that the examples discussed in this study will constitute a guide for future coastal regeneration projects. When a regeneration process based on transparency and public participation is combined with an accessible and barrier-free design that offers plenty of activities based on respect for history, nature and socio-cultural texture, the coastal areas will find the value they deserve.

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WATER SENSITIVE URBAN DESIGN APPLICATIONS

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ABSTRACT

The water cycle is an indispensable system for the continuity of the ecosystem in case of continuous withdrawal. With the increase in population, biological, chemical and radioactive wastes originating from industry, agriculture and urban activities put pressure on natural water resources. Because of these conditions and changing climatic conditions cause excessive precipitation. With the increasing impermeable surface, it creates an obstacle for underground water resources to renew themselves, and therefore floods and overflows occur in cities. On the other hand, changing climatic conditions cause drought in some regions due to the lack of precipitation. Excessive consumption and pollution caused by human activities has become a global problem that threatens the existence of water in our world, in this progress, the ecosystem and the life of all living things. The water crisis, which has become an important problem recently, of many countries in the world and alternative solutions are sought for the crisis.

The aim of the study is to examine the effective use of water in urban design, the principles and benefits of water-sensitive design. Within the scope of the study, the reason for the emergence of the concept of Water Responsive Urban Design (WSUD), its principles and aims are explained in this case. Stormwater management plans that will recycle water and Water Responsive Urban Design tools such as green roof, green wall, rain gardens, rain ditches, waste water recycling, gray water and storm water harvesting are also included. Thesis, articles and papers were examined in detail within the scope of the literature study covering the last twenty years. Along with this, national and international examples are also included with Water Sensitive Urban Design. Water Responsive Urban Design integrates the water cycle (rainwater, drinking water and wastewater) in the city into urban design. It strives to strengthen ecological, aesthetic and recreational activities and to minimize environmental degradation. Therefore, it is important to use water-sensitive designs for aesthetic and functional uses of water resources in order to prevent future water crises.

As a result, when water-sensitive design approaches are adopted, water-sensitive cities will be created, minimizing the risks of water crisis and drought that may occur in the future. Therefore, groundwater will be fed without the surface flow of rain water and its loss. With this solution, floods and overflows will also be prevented. Targeted with rain water; With its storage by rain gardens and green roofs, savings on building basis will be achieved with the use of gray water. Also the main point; By reintroducing water elements such as rivers and streams to cities, new recreation areas and microclimate balance will be preserved and cities will gain identity and water memory.

Keywords: Water Responsive Urban Design, Water Cycle, Water Scarcity, Stormwater Management

SUYA DUYARLI KENTSEL TASARIM UYGULAMALARI

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ÖZET

Su döngüsü, sürekli devam eden çekim halinde ekosistemin devamlılığı için vazgeçilmez bir unsurdur. Nüfus artışı, sanayi, tarım ve kentsel faaliyetlerden kaynaklanan biyolojik, kimyasal, radyoaktif atıklar doğal su kaynakları üzerinde baskı oluşturmaktadır. Bu sorunlar nedeniyle değişen iklim koşulları aşırı yağışlara neden olmaktadır. Artan geçirimsiz yüzeyle yer altı su kaynaklarının kendini yenilemesine engel oluşturmakta ve dolayısıyla şehirlerde sel ve taşkınlar meydana gelmektedir. Diğer tarafta değişen iklim koşulları bazı bölgelerde yağış azlığı nedeniyle kuraklığa neden olmaktadır. İnsan faaliyetlerinden kaynaklanan aşırı tüketim ve kirlilik, dünyamızdaki su varlığını, kısacası ekosistem ve tüm canlıların yaşamını tehdit eden küresel boyutlu bir sorun haline almıştır. Son dönemlerde önemli bir sorun haline gelen su krizi dünyadaki birçok ülkenin gündeminde yer almakta ve krize yönelik alternatif çözüm yolları aranmaktadır.

Çalışmanın amacı kentsel tasarımda suyun etkin kullanımı, suya duyarlı tasarım ilke ve faydalarının neler olduğunun incelenmesidir. Çalışma kapsamında Suya Duyarlı Kentsel Tasarım (WSUD) kavramının ortaya çıkış nedeni, ilke ve amaçlarının neler olduğu açıklanmaktadır. Ayrıca suyun geri dönüşümünü sağlayacak yağmursuyu yönetim planları ile yeşil çatı, yeşil duvar, yağmur bahçeleri, yağmur hendekleri, atık suların geri dönüşümü, gri su ve yağmursuyu hasadı gibi Suya Duyarlı Kentsel Tasarım araçlarına da yer verilmektedir. Son yirmi yılı kapsayan literatür çalışması kapsamında tez, makale ve bildiriler incelenmiştir. Böylece Suya Duyarlı Kentsel Tasarım ile ulusal ve uluslararası örneklerle de yer verilmektedir. Suya Duyarlı Kentsel Tasarım kentteki su döngüsünü (yağmursuyu, içme suyu ve atıksu) kentsel tasarıma entegre etmektedir. Ekolojik, estetik ve rekreatif faaliyetleri güçlendiren ve çevresel bozulmaları en aza indirmeye çalışmaktadır. Dolayısıyla su kaynaklarını ileride yaşanan su krizlerinin engellenmesi için estetik ve işlevsel kullanımlarda suya duyarlı tasarımların kullanılması önemlidir.

Sonuç olarak suya duyarlı tasarım yaklaşımları benimsendiğinde gelecekte oluşabilecek su krizi ve kuraklık risklerini en aza indirmiş ve suya duyarlı kentler yaratılmış olacaktır. Dolayısıyla yağmur sularının yüzeysel akışa geçmesi ve kaybedilmesi yerine yeraltı suları beslenmiş olacak. Böylece sel ve taşkınlar da önlenmiş olacaktır. Yağmur sularının; yağmur bahçeleri ve yeşil çatılar tarafından depolanmasıyla, gri su kullanımıyla beraber yapı bazında tasarruflar elde edilecektir. Ayrıca nehir, dere gibi su ögelerinin kentlere yeniden kazandırılmasıyla yeni rekreasyon alanları ile mikroklima dengesi korunacak ve kentlere kimlik ve su belleği kazandırılacaktır.

Anahtar Kelimeler: Suya Duyarlı Kentsel Tasarım, Su Döngüsü, Su Kıtlığı, Yağmursuyu Yönetimi

GİRİŞ

Tarih boyunca insanoğlu için barınma, yerleşme ve beslenme ihtiyaçlarını elde etmek için suya yakın alanlar tercih edilmiştir. İbadet, manzara, spor, sanayi, tarım, kişisel ihtiyaçlar gibi çok çeşitli alanlarda sudan farklı şekillerde yararlanılmaktadır. Su ilk yerleşmelerden günümüze önemini koruyarak devam etmektedir. Su döngüsünün sağlanması ekosistemin ve dolayısıyla insanoğlunun yaşamının devamı için vazgeçilmez bir unsurdur. Ancak nüfus artışı, sanayi, tarım ve kentsel faaliyetlerden kaynaklanan biyolojik, kimyasal, radyoaktif atıklar ile dünyamızın kirlenmesine, su döngüsünü de tehlikeye sokmuştur. İnsan faaliyetlerinden kaynaklanan aşırı tüketim ve kirlilik, dünyamızdaki su varlığını, kısacası ekosistem ve tüm canlıların yaşamını tehdit eden, küresel boyutlu bir sorun haline almıştır. Suyun hayatımızdaki yeri bu kadar önemli iken her geçen gün nüfus artmakta ve buna bağlı olarak su kaynaklarının bilinçsiz şekilde tüketimi devam etmektedir. Doğaya verdiğimiz bu zararlardan biri olan su kıtlığı gelecek dünya için çok önemli sorunların başında yer almaktadır.

Su krizi dünyadaki birçok ülkenin gündeminde yer almakta ve krize yönelik alternatif çözüm yolları aranmaktadır. Buna bağlı olarak ekolojik tasarımlar ve özellikle son yıllarda suya duyarlı kent kavramı doğrudan kentleri biçimlendiren politikaların içinde yer almaya başlamıştır. Başta Avustralya olmak üzere İngiltere ve Amerika Birleşik Devletleri gibi ülkelerde “Sürdürülebilir Kentsel Drenaj Sistemleri” (SKDS) kavramı önem kazanmış ve tasarım kriterleri ortaya konmuştur (Karpuzcu, USEPA,2012).

Suya Duyarlı Kentsel Tasarım (Water Sensitive Urban Design, WSUD) yeni gelişen bir alan olup geleneksel su taşıma yaklaşımına ve gri altyapıya alternatifler sunar. Geçirimsiz yüzeyleri en aza indirmeyi, suyu yerinde yeniden kullanmayı, kentsel ortamlardan alıcı ortamlara akan suyun kalitesini iyileştirmeyi ve doğal çevreye kirli su deşarjlarını en aza indirmeyi hedeflemektedir. Böylece peyzaj ve entegre su yoluyla kentsel alanlarda görsel, sosyal, kültürel ve ekolojik değerleri geliştirmek için çok amaçlı yeşil alanlar tasarlanmaktadır.

Her devirde su insanlar için vazgeçilmez bir unsur olmuştur. Günümüzde su bir ihtiyaç olduğu kadar estetik ve işlevsel kullanımları da bulunmaktadır. İnsan becerisine teknoloji eklenmesiyle bu tasarımlar çeşitlenerek artmaya devam etmektedir. Bu bağlamda kolay erişilebilen su kaynaklarını ileride yaşanan su krizlerini engellemek için estetik ve işlevsel kullanımlarda suya duyarlı tasarımların kullanılması önemlidir. Dolayısıyla su kaynakları yönetimi konusunda çevreyle ilgili ve sürdürülebilir yönetim ilkelerinin uygulamaya geçirilmesi oldukça önemli olup bu alanda yapılan uygulamaların artırılması, doğal ekosistemi koruyan ve sürdürülebilirliğini sağlayabilen daha yenilikçi, iklim değişikliklerine duyarlı altyapı sistemlerinin geliştirilmesi ve uygulanması ve bunun kentsel tasarım süreçlerine entegre edilebilmesi gerekli ve önemlidir.

DÜNYADA SUYA DAİR YAKLAŞIMLAR

Kentlerdeki nüfus artışı, kentsel gelişme dinamikleri, sanayi faaliyetlerin kirlетici etkileri, artan enerji ihtiyacı, altyapı ihtiyacının bakım ve inşaa maliyetleri, geçirimsiz yüzeylerin artmasıyla sel ve taşkın olayların artması, doğal yaşam alanların tahribatı ve bunların sonucunda ortaya çıkan iklim değişimi gibi sorunlar günümüz kentlerinin genel bazı sorunları oluşturmaktadır. Kentlerde bu sorunlar su yönetimi bağlamında da ele alınıp çeşitli politikalar geliştirilmektedir.

Azalan su kaynaklarına rağmen değişen tüketim alışkanlıkları, nüfus baskısı ve kentleşme faaliyetlerinin artışı su tüketim oranını artırmaktadır. Bu sorunlar beraberinde bizi su kıtlığı sorunuyla karşı karşıya getirmektedir. Yaşanan bu değişimler su sorununu politikayla çözülemeyecek bir hale getirmiştir. Dolayısıyla mevcut ve gelecekte bizleri bekleyen su sorununa karşı kentlerin suya duyarlı bir şekilde planlanmasını ve kentlerde daha sürdürülebilir yaklaşımları gerekli kılmaktadır. Bu bağlamda bazı kentler iklim değişikliği ve su kıtlığı konusunda önlem almaya, sürdürülebilir kentsel su yönetimi, arazi kullanımı ve kentsel tasarımı bütünleştirecek programlar geliştirmiş ve uygulamaya başlamıştır (Tablo 1).

ÜLKE	YAKLAŞIMLAR
Amerika	<i>Yeşil Altyapı(Green Infrastructure)</i>
Birleşik Krallık	Sürdürülebilir Kentsel Drenaj Sistemleri (Sustainable Urban Drainage Systems / SUDS) Düşük Etkili Gelişme (Low Impact Development / LID)

Avustralya	Suya Duyarlı Kentsel Tasarım (Water Sensitive Urban Design / WSUD)
Kanada	Doğal Miras Sistemleri (Natural Heritage Systems)
Çin	Sünger Şehir (Sponge City)

Tablo 1. Ülkelerin Su Yönetim Yaklaşımları (Karpuzcu, 2019; USEPA, 2012).

Suya duyarlı yaklaşım benimseyen Avustralya'nın Melbourne kenti, suya duyarlı tasarımlar ve yağmursuyu yönetimini ulusal ve yerel ölçekte kent olma yaklaşımından yola çıkarak çeşitli planlar ve kılavuzlar oluşturmuştur. Kentler su konusunda bilinçli bir toplum yaratmayı ve yaşanabilir kentler oluşturmayı hedeflemektedir. Ayrıca sağlıklı, suya duyarlı kamusal mekânlar oluşturmaktadır. Bu bağlamda su kalitesini iyileştirmek, suyun tekrar geri dönüşümünü sağlayacak yağmursuyu hasadı, yağmur bahçeleri, sulak alanlar ve yağmur olukları gibi tasarımlar kentlerde uyarlanmaktadır. Bu tasarımlar su kalitesini iyileştirme ve suyun etkin kullanımı da sağlamaktadır. Suya duyarlı yaklaşım benimseyen bir diğer kent olan Singapur kenti ise yaşanabilir kent ve suyun duyarlı kullanımı yaklaşımından yola çıkılarak suya duyarlı kentsel tasarım araçlarını kullanan "ABC Waters" programını geliştirmiştir (Tablo 2). Bu program Aktif-Güzel-Temiz (Active- Beautiful-Clean) kriterleri benimseyerek kentte yağmur bahçeleri, sulak alanlar, yağmur olukları inşa etmekte ve taşkınların etkisini azaltmaya çalışmaktadır. İnsanları suya yaklaştırıp toplum öncelikli rekreasyon alanları oluşturma hedefinden yola çıkılarak da havzaları, nehirleri, dereleri toplumun vakit geçirebileceği kamusal alanlara dönüştürmektedir. Ayrıca geliştirilen Smart PUB programı ile suyun takibi yapılmakta ve kentsel su yönetiminde yaşanan sorunları daha kolay bir şekilde çözülmesini sağlamaktadır.

Aktif (Active)	Güzel (Beatiful)	Temiz (Clean)
İnsanları suya yaklaştırıp toplum öncelikli rekreasyon alanları oluşturan.	Beton su yollarını, kentsel çevre ile entegre edilmiş estetik su manzaralarına dönüştüren.	Temiz su kaynaklarının ve halk eğitiminin bütünsel yönetimi sayesinde su kalitesini iyileştiren.

Tablo 2. ABC (Aktif-Güzel-Temiz (Active-Beautiful-Clean)) Sular Programı'nın Açılımı (Centre for Liveable Cities, 2017).

Singapur'da Aktif-Güzel-Temiz (Active-Beautiful-Clean) Sular programı, Singapur'un sürdürülebilir şehir planlaması ile yağmur suyu yönetimi entegre çalışması yapılmıştır. Singapur, kentsel arazi kullanım kararları doğrultusunda su yollarının konut, ticari ve rekreasyon alanlarıyla entegre edilmesini ve tüm şehri bir yağmursuyu toplama havzası olarak görmüş bu doğrultuda kanallar, nehirler aracılığıyla toplanan yağmursuları ham işlem görmek üzere barajlarda toplamaktadır (Kaplan, 2020). Bu bağlamda ABC Sular Programı ile yenilenerek Bishan-Ang Mo Kio Parkı tekrar açılmış ve park; Waterfront Center Ödülleri'nde Çevre Ödülü'ne layık görülmüştür.



Şekil 1. ABC Sular Programı ile iyileştirilen Bishan-Ang Mo Kio Parkı (Atelier dreiseitl, 2012).

SUYA DUYARLI KENTSEL TASARIM GELİŞİMİ VE FAYDALARI

Kentlerdeki ekolojik ve iklimsel krizin derinleşmesi ve kuraklık tehlikesi de dikkate alındığında bu sorunların çözümü için Avustralya'da "Suya Duyarlı Kentsel Tasarım" (Water Sensitive Urban Design, WSUD) kavramı ortaya çıkmış ve bu alanda tasarım kriterleri ortaya konmuştur (Karpuzcu, 2019; USEPA, 2012). Suya Duyarlı Kentsel Tasarım, sürdürülebilir kentsel su yönetimi ve suya duyarlı şehirler inşa etmek için daha geniş bir çerçeve sağlamak için yağmur suyu yönetimi ile olan erken ilişkisinden sonra gelişmiş ve Avustralya yönetiminde kentsel yağmur suyu böylece WSUD'ye geçiş yapmıştır (Wong ve

Brown, 2011). Avustralya’da ortaya çıkan bu yaklaşım Suya Duyarlı Kentsel Tasarım (WSUD), Ekolojik Olarak Sürdürülebilir Kalkınma (ESD) ve Entegre Su Döngüsü Yönetimi (IWCM) ilkeleri ile bağlantılıdır. Bunlardan Sürdürülebilir Kalkınma (ESD) geniş bir yelpazeye sahip sosyal ve ekonomik faaliyetleri, ulaşım, enerji tasarımı, konut alanları ve atık yönetimi gibi konularını da kapsamaktadır. Entegre Su Döngüsü Yönetimi ise arazi kullanımı ve kentsel su yönetimini yerel koşullar göz önünde tutularak incelemektedir. Suya Duyarlı Kentsel Tasarım, Sürdürülebilir Kalkınma (ESD) ve Entegre Su Döngüsü temel alınarak kentsel tasarım ve suya duyarlı programları bir arada ele alıp estetik ve işlevselliği yeniden tanıtmayı amaçlamaktadır. Avustralya Hükümetleri Konseyi (Council of Australian Governments / COAG) Suya Duyarlı Kentsel Tasarımı (Water Sensitive Urban Design/WSUD); kentsel planlamanın, kentsel su yönetiminin ekolojik ve doğal hidrolojik süreçlere duyarlı olmasını sağlayan kentsel su döngüsünün yönetimi, korunması ve entegrasyonu olarak tanımlamaktadır (Johnstone, vd., 2012).

Wong ve Ashley 2006 yılında Kentsel Drenaj Ortak Komitesinde Suya Duyarlı Kentsel Tasarımı, “Suya Duyarlı” ve “Kentsel Tasarım” olmak üzere iki kısımda ele almışlardır. 'Suya Duyarlı' kavramı, kentsel alanlarda su ortamlarının korunması dahil olmak üzere su hizmetlerinin sağlanmasıyla ilgili mühendislik ve çevre bilimleri gibi çeşitli disiplinleri bütünleştiren entegre kentsel su döngüsü yönetiminde yeni bir paradigma olarak tanımlanmakta, “Kentsel Tasarım” ise geleneksel olarak su alanının dışında ortaya çıkan ancak yine de toprak ve su üzerindeki çevresel etkileri veya bunlara etkileri olan konuları kapsayan, kentsel çevrelerin planlama ve mimari tasarımıyla ilişkili iyi tanınan bir alan olduğunu belirtmektedir (Wong, vd., 2013, s. 11). Kentsel yerlerin ve mekânların kentsel tasarım süreçlerinde topluluk değerleri ile yönetilmekte dolayısıyla Suya Duyarlı Kentsel Tasarım, sosyal ve fiziksel bilimleri de bütünleştirmektedir. Bu yaklaşım, dayanıklılık, su sürdürülebilirliği ve doğal çevre alanlarına “duyarlı” ilkesi göz önünde tutularak kentsel ortamların planlanmasını ve tasarlanmasını sağlamaktadır. Suya duyarlı kentsel tasarım, kentsel su döngüsünü oluşturan yağmur suyu, içme suyu ve atık suyu doğal su döngüsünden ilham alarak devam eden bir çekim halinde ele almaktadır. Bu aşamada yağmur suyunu merkeze alarak doğal ve yapay alanlarda yağmur suyunun bir yükten ziyade kaynak olarak ele alıp aksine kente ve kentlilere kullanımı için alternatifler sunmakta ve yağmur suyunu çevresel, sosyal ve kültürel yönleri ile değerlendirmektedir.

Suya Duyarlı Kentsel Tasarım, entegre su döngüsü yönetimi çözümlerine ulaşmak için çeşitli ilkeleri bulunmaktadır;

- Su verimli cihazlar, yağmur suyu kullanımı ve gri suyun yeniden kullanımı yoluyla içme suyu talebinin azaltılması.
- Atık su oluşumunun en aza indirilmesi ve atık suyun, atık su yeniden kullanım olanakları ve/veya alıcı sulara bırakılması için uygun bir standartta arıtılması.
- Yeniden kullanım ve/veya yüzey sularına deşarj için su kalitesi hedeflerini karşılamak için kentsel yağmur suyunun arıtılması.
- Havzaların doğal hidrolojik rejimini korumak (Wong ve Brown, 2013).

Suya Duyarlı Kentsel Tasarım (WSUD) uygulamaları, kentsel alanlarda görsel ve rekreasyonel estetiği en üst düzeye çıkarmak için kentsel peyzajda yağmur suyunun kullanılması veya su geri dönüşüm sistemlerinin entegrasyonu gibi, yukarıdaki hedeflerle ilişkili tüm WSUD öğelerinin yerleşik forma (binalar ve peyzaj) entegrasyonunu benimsemektedir. İnsan faaliyetleri ile kentsel su ortamının unsurları arasındaki bağlantıyı gösteren unsurlar, yenilikçi peyzajın kullanımı, doğal su kaynaklarımızın korunması ve geliştirilmesindeki bireylerin bilinci rol ve sorumlulukları yerine getirmesi ile daha güçlü bir hale gelmektedir.

Suya duyarlı kentsel tasarım yaklaşımı, arazi kullanımı ve su yönetimini birlikte ele alan düzenleyici bir araçtır. Kentsel mekânları tasarlarlarken doğayı taklit etmekte ve kentsel su döngüsünü doğal su döngüsüne benzetmeye çalışmaktadır. Suya duyarlı Kentsel Tasarım Amaçları;

- Doğal sistemleri korumak (Havzalarda suyun doğal hidrolojik davranışı üzerindeki etkileri en aza indirmek),
- Yüzey ve yeraltı sularının su kalitesini korumak,
- Geçirimsiz (su geçirmeyen) yüzeyleri en aza indirmek
- Su şebeke sistemi ile dağıtılan suda tasarruf sağlamak,
- Su kalitesini korumak (suyun kalitesini artırmak ve doğal çevreye kirli su deşarjlarını en aza indirmek),
- Çatılardan ve diğer yağmursuyu akışlarını toplama dâhil yüzeysel akışının yeniden kullanımını sağlayacak ve kentsel gelişimden kaynaklanan yüzey akışlarındaki zirve akımları azaltacak yöntemler geliştirmek,
- Atık suyu en aza indirmek, atık suların yeniden kullanımını sağlayacak arıtma sistemlerini geliştirmek
- İmar maliyetlerini en aza indirirken katma değer olarak sıralanabilir (Wong ve Brown, 2013; Tamer, 2016). Böylece peyzaj ve entegre su yoluyla kentsel alanlarda görsel, sosyal, kültürel ve ekolojik değerleri geliştirmek için çok amaçlı kentsel alanlar tasarlanmaktadır.

Suya duyarlı tasarımlar, yağmur suyunu değerli bir kaynak olarak ele almanın faydalarını vurgulamaktadır. Doğal su döngüsünü taklit ederek sızma, depolama ve buharlaşma yöntemleri ile hidrolojik dengeyi korur, doğal ve hassas alanları kentsel gelişimin etkilerinden koruyarak kentleşme baskısını azaltır, doğal yaşam alanlarında ve konut alanlarında peyzaj

çeşitliliğini artırır ve görsel konforu artırır (Stormwater Committee, 1999). Suya duyarlı yapılan kamusal açık alanlar aracılığıyla topluluk arasındaki ilişkilerin güçlendirilmesini sağlar ve sosyal etkileşimi artırır. Geleneksel sistemin gerektirdiği arazi ve çevre düzenleme, kanalizasyon düzenlemeleri gibi inşaat ve yatırım maliyetlerini azaltır. Bu yaklaşım kentlere sosyal, çevresel ve ekonomik getiriler sağlamaktadır. Ancak Suya Duyarlı Kentsel Tasarım Yaklaşımı uygulama aşamalarında Tablo 3'te görüldüğü üzere sosyal, ekonomik ve çevresel engellerle karşılaşmaktadır. Yer altı su düzeyinin sınırlı olduğu alanlarda, parçalanmış ve eğimli arazide, kıraç arazilerde toprağın ana kayaya yakın olduğu alanlarda uygulanabilecek suya duyarlı kentsel tasarım araçları sınırlıdır. Suya duyarlı tasarlanan kentsel alanlarda kamu tepkisi gibi sosyal engeller olabilir. Bununla beraber bu yaklaşımın bakım ve maliyetleri bazı durumlarda geleneksel yöntemlerden daha fazla olması, konut alanı olarak ayrılacak yerlerin açık alan olarak ayrılması gerektiği yerlerde mülkiyet sorunları ve potansiyel kâr kayıpları gibi zorluklar yaşanabilir.

Çevresel ve Sosyal Sınırlamalar	Ekonomik Sınırlamalar
Yeraltı Su Düzeyi Yeraltı su seviyesinin yüksek olduğu alanlarda kullanılabilir suya duyarlı kentsel tasarım araçları sınırlıdır.	Piyasa sınırlamaları Suya duyarlı kentsel tasarım ile birlikte değişen kentsel formdan piyasa etkilenebilir.
Topoğrafya ve Erozyon Parçalara ayrılmış arazilerde ve yüksek eğimli topoğrafyada uygulanabilecek suya duyarlı kentsel tasarım araçları sınırlı kalmaktadır.	Bakım ve İşletme Maliyetleri Suya duyarlı kentsel tasarımın ortaya koyduğu yeni kent formunun bakım ve işletme maliyetleri geleneksel sisteme göre daha fazla olabilir.
Zeminin Durumu Kıraç arazilerde ve ana kayaya sığ derinlikteki (toprağın altındaki asıl kaya) alanlarda uygulanabilecek suya duyarlı kentsel tasarım araçları sınırlıdır.	Sınırlı Toprak Parçası Toprak kısıtlı olduğu için planlanabilir arazi sayısının azalmasıyla potansiyel kar kaybı. Bu, su yollarının geleneksel sistemle kullanıma sunulduğu alanlarda meydana gelir.
Güvenlik Algısı Kent içerisinde tasarlanacak doğal alanlarda güvenlik riskleri oluşabilir.	Fırtına Olayları ve Dik Arazi Küçük fırtına olaylarına ve dik arazilere uyum sağlamak için suya duyarlı uygulamaları borularla (yağmur hendekleri gibi) takviye etmek gerekebilir.
Suya Duyarlı Kentsel Tasarım Yaklaşımının Kabul Görmesi Suya duyarlı kentsel tasarım ile tasarlanan yeni kentsel peyzaj biçimlerine karşı kamu direnişleri ile karşılaşılabilir.	Arazi Edinimindeki Zorluk Farklı mülkiyetlerdeki araziler suya duyarlı kentsel tasarım araçlarının uygulanmasında zorluk çıkarabilir.
	Açık Alan Gereksinimi Çekici yerleşim alanlarında rayiç bedellerinin yüksek olması; konut alanı olarak ayrılacak yerlerin açık alan olarak ayrılması gerektiği yerlerde suya duyarlı kentsel tasarım araçlarının uygulanmasında zorluk yaşanabilir.

Tablo 3. Suya Duyarlı Kentsel Tasarımın Çevresel-Sosyal ve Ekonomik Sınırlamaları (Stormwater Committee, 1999).

SUYA DUYARLI KENTSEL TASARIM ARAÇLARI

Suya Duyarlı Kentsel Tasarım yağmursuyu yönetimi ve atık suyun dönüşümü koordineli bir şekilde yürütülerek, yapı ölçeğinden, bölgesel ölçeğe kadar çeşitli suya duyarlı kentsel tasarım araçları uygulanabilmektedir (Şekil 2).

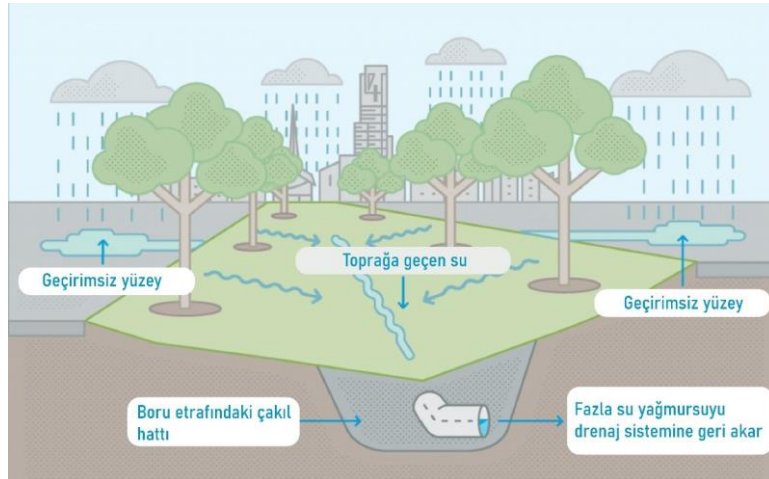


Şekil 2. Suyu Duyarlı Kentsel Tasarım Araçları (Bu çalışma kapsamında hazırlanmıştır).

Çalışma kapsamında kent ölçeğinde yağmur hendekleri, yağmur bahçeleri, geçirimsiz yüzeyler incelenirken, yapı ölçeğinde yeşil bina, yeşil çatı ve gri gibi suya duyarlı kentsel tasarım araçları incelenmiştir.

Yağmur Hendekleri (Constructed Wetlands)

Yağmur hendekleri, zeminde çim veya diğer bitki örtüsü ile kaplı doğrusal kanallar olup yol kenarlarında, kaldırım kenarlarında doğa şeridi veya refüj olarak yaygın olarak kullanılmaktadır. Kentsel alanlarda peyzaj estetiğini de kazandırmaktadır.



Şekil 3. Yağmur Hendeği Mekânizması (URL 1).

Şekil 3'te görüldüğü üzere bu hendekler, geçirimsiz yüzeylerden akan suları toplar, filtre sistemi sayesinde tortuları ve besinler kirliliği de önlemekte ardından suyu drenaj sistemine aktarmaktadır.

Yağmur Bahçeleri (Rain Gardens)

Yağmur sularının herhangi bir uygulamadan geçmeden yönlendirildiği ve üzerinde doğal bitkilerin yetiştirilebildiği toprağın emme kuvvetinden yararlanıldığı bir yöntemdir (ÇŞB Yağmur Suyu Kullanma Kılavuzu, 2018). Yağmur bahçeleri için çukur alanlar oluşturulmaktadır ve yağmur bahçeleri için uygun bitki seçimi önemlidir. Yağmur bahçelerinde gerçekleşen su çevrimi Şekil 4’te verilmektedir.



Şekil 4. Yağmur bahçelerinde gerçekleşen su çevrimi (ÇŞB Yağmur Suyu Kullanma Kılavuzu, 2018).

Çatılar, yollar ve kaldırımlar gibi geçirimsiz yüzeylerdeki kirli yağmur suyu akışını yakalayıp tekrar toprakla buluşturan yağmur bahçelerinde kullanılan bitkiler, yağmur suyuyla gelen kirletici maddeleri temizleyerek yer altı suyunu beslemektedir (ÇŞB Yağmur Suyu Kullanma Kılavuzu, 2018). Ayrıca yağmur bahçelerinde kullanılan sistem sayesinde kelebekler, arılar gibi canlılara yeni yaşam alanı sağlamaktadır. Yağmur bahçelerinin faydaları; yüzey akışla gelen yağmur sularının temizlenmesinde doğal filtre görevi yaparak suyu temizlemek ve yeraltı sularının beslenmesini sağlamak, uygulandığı yere özgü flora ve fauna için uygun ortam oluşturmak ve biyolojik çeşitliliği arttırmak, yağmur sularının etkin olarak kullanımını sağlamak, drenaj çözümlerine ekonomik ve sürdürülebilir imkan sunmak, ortamın nem dengesinin korunmasına yardımcı olmak, yağmur suyunun yüzey akış hızını düşürerek, kontrollü olarak akmasını sağlamak, beraberinde getirdiği toprak kaybını önlemek, araç yolları, yürüyüş yolları ve otoparklar gibi sert yüzeyli alanlarda istenmeyen su birikintilerini toplayıp yönlendirerek doğaya geri kazandırmak ve estetik bir görünüm oluşturmak olarak sıralanabilir (ÇŞB Yağmur Suyu Kullanma Kılavuzu, 2018).

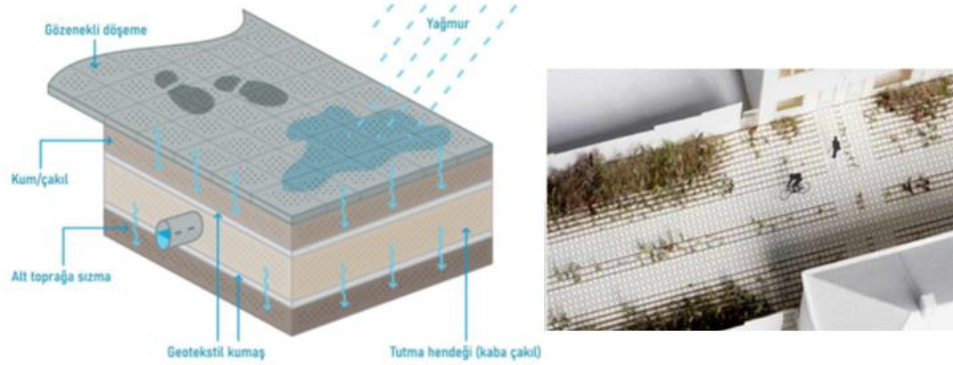


Şekil 5. Yağmur Bahçesi Uygulama Örnekleri (ÇŞB Yağmur Suyu Kullanma Kılavuzu, 2018).

Yapı parsellerinde, yol kenarı ve refüjlerde yapılacak yağmur bahçeleri, su kaynaklarının kısıtlılığına ve yağmur suyunun yeniden kullanımına dikkat çekmektedir. Tasarlanmış yağmur bahçeleri sokaklardan, park yerlerinden ve diğer geçirimsiz yüzeylerden gelen yağmur suyunu değerlendirmek için etkilidir. Bu yağmur bahçeleri, güçlü yağmur sularının olumsuz etkilerinin azaltılmasının yanında çevre kirliliğine yol açan maddelerin birikmesine engeller, kent estetiğini artırır ve kentsel ısının dengede tutulmasına yardımcı olmaktadır (Çevre Şehircilik Bakanlığı Yağmur Suyu Kullanma Kılavuzu, 2018). Yağmur bahçeleri, Türkiye özelinde nazım imar planlarında ve kentsel tasarımda da yer alabilecek tasarım esnekliğine sahiptir.

Yüzey Kaplamaları ve Geçirimli Yüzeyler (Permeable Pavements)

Geçirimsiz yüzeyler yağmur suların yeraltı suyunu karışmasına engel olup bu suyun yüzey akışına geçmesine neden olmaktadır. Dolayısıyla yağmursuları kanalizasyon sistemine ya da nehirlerle ulaştırmakta bu da sel ve taşkın olayların yaşanmasının önünü açmaktadır. Bu bağlamda geçirimsiz yüzeyler yerine, yağmur sularının yer altına geçmesini sağlayan geçirimsiz yüzeyler kullanılmaktadır.

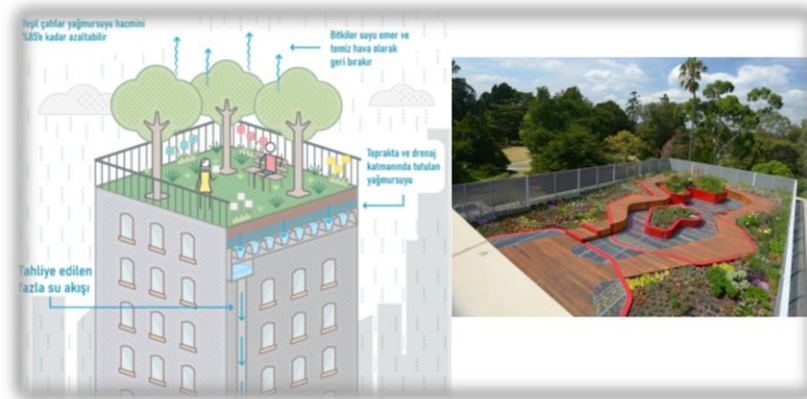


Şekil 6. Gözenekli Kaldırım Sistemi (URL-2) ve Rotterdam Yaşayan Kaldırım (URL-3).

Geçirgen kaldırım olarak yapılan uygulamalarda yağmur suyunun gözeneklerden yer altına geçmesine ve böylece toprağa sızmasına izin verir. Bu, toprak nemini ve yeraltı suyunu şarj eder. Şekil 6'da hem kendiliğinden bitki örtüsü yetişebilmesine hem de yağmur suyunun sızmasına imkân veren Rotterdam'daki "yaşayan kaldırımlar" görülmektedir.

Yeşil Çatı (Green Roof)

Yeşil çatı sistemleri, çeşitli katmanlardan oluşmakta ve geçirimsiz yüzeyler olarak tasarlanmaktadır. Çatılarda geçirimsiz yüzeyler sayesinde yağışlar bitkiler tarafından tutulmakta ve böylece su aşamalı olarak buharlaşmaktadır (Kaplan, 2020). Böylece çatılardan elde edilen yağmursuları da evlerde kullanılmaktadır. Yeşil çatılar yağmur suyunu tutmak dışında, binaların ısı kazancı veya kaybına karşı yalıtımını sağlamaktadır (Şekil 7).

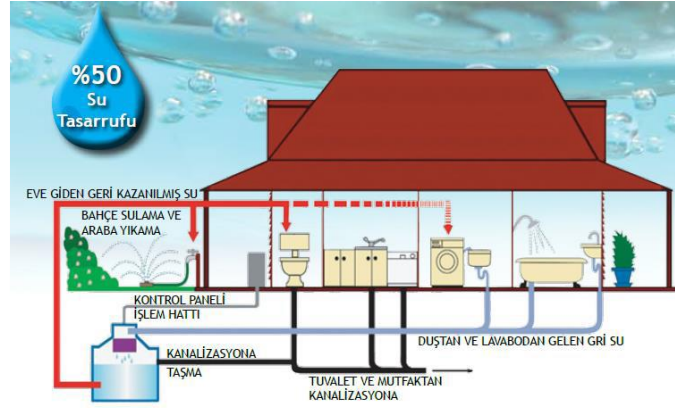


Şekil 7. Yeşil Çatı Katmanları ve Melbourne'de Yeşil Çatı Uygulaması (URL-4).

Yeşil çatı uygulamaları Türkiye'de de görülmektedir. Bu uygulamalar daha çok kamu binalarında veya özel şirketlerin bazı binalarında görülmektedir. Kamu yapılarında kullanılan bu uygulama örnek teşkil etmesi açısından olumlu bir gelişmedir.

Gri Su

2020'li yıllarda atık suların uzaklaştırılmasına çözüm aramak yerine bu suların tekrar dönüşümü gündeme gelmiş, böylece gri su, sarı su ve kahverengi su olmak üzere üç akım halinde sular sınırlandırılmıştır (Baykal ve Allar, 2007). Bu sulardan gri su, tuvalet suları haricinde banyo, lavabo, çamaşır makinesi kullanılmasıyla ortaya çıkan sular örnek oluşturmaktadır (Şekil 8).



Şekil 3. Yapı Ölçeğinde Gri Su Örneği (URL 5).

SONUÇ VE DEĞERLENDİRME

Tarihsel süreç boyunca suyun ekosistem ve insanlık için önemi tartışılmazdır. Su günlük aktivitelerimizi devam ettirmemizde olmazsa olmaz unsurlardan biridir. Suyun insanlar üzerinde fiziksel, psikolojik ve görsel etkilerinden dolayı kentsel mekânlarda yoğun şekilde kullanılmaktadır. Böylece su yapıları kentsel mekânlara estetik, serinleticilik, huzur, ses ve dinginlik gibi işlevler kazandırmaktadır. Bu bağlamda su sadece bir kaynak olarak değil kentin sürdürülebilirliğine ve yaşanabilirliğine katkı sağlayan bir öğedir. Ancak kentleşme hareketleri, artan nüfus baskısı, kentsel ısı adası, yeşil alan tahribatı, havza alanlarına yerleşme baskılarından dolayı dünyada iklim krizi ve kuraklık gibi tehlikeler ortaya çıkmıştır. Bu tehlikelerin etkilerini azaltmak için başta Avustralya, İngiltere ve ABD gibi ülkeler su yönetim planlarını ortaya koymuş ve böylece suya duyarlı kentsel tasarım kavramı ortaya çıkmıştır. Suya duyarlı kent kavramı (Sustainable Water Urban Design) geçirimsiz yüzeyleri en aza indirmeyi, suyu yerinde yeniden kullanmayı, kentsel ortamlardan alıcı ortamlara akan suyun kalitesini iyileştirmeyi ve doğal çevreye kirli su deşarjlarını en aza indirmeyi hedeflemektedir. Böylece peyzaj ve entegre su yoluyla kentsel alanlarda görsel, sosyal, kültürel ve ekolojik değerleri geliştirmek için çok amaçlı yeşil alanlar tasarlanmaktadır.

Sonuç olarak suya duyarlı planlama ve tasarım yaklaşımları benimsendiğinde gelecekte oluşabilecek su krizi ve kuraklık risklerini en aza indirmiş ve suya duyarlı kentler yaratılmış olacaktır. Dolayısıyla yağmur sularının yüzeysel akışa geçmesi ve kaybedilmesi/yararlanılamaması yerine yeraltı suları beslenmiş olacak, böylece sel ve taşkınlar da önlenmiş olacaktır. Yağmur sularının; yağmur bahçeleri ve yeşil çatılar tarafından depolanmasıyla kentlerin mikro iklimasına olumlu etkiler sağlanacaktır. Gri su kullanımıyla beraber yapı bazında tasarruflar elde edilecektir. Ayrıca nehir, dere gibi su öğelerinin ve yakın çevrelerinin kentlere kazandırılmasıyla rekreasyon alanları ve kentteki mikro klima dengesi korunacaktır. Ayrıca kentlerde yeşil alan ve kentsel kimlik oluşturacak kentsel alanlar kazanılmış olacaktır.

Ülkemizde havza alanlarının yerleşime açılması ve su kaynaklarının sanayi atıkları tarafından kirletilmesinden dolayı su kaynakları giderek azalmaktadır. İklim değişikliğinin de yarattığı olumsuz etkilerin de artmasıyla beraber, kuraklık Türkiye için önemli bir riski teşkil etmektedir. Yeşil alanların giderek yerini betona bıraktığı ülkemiz kentlerinde yerel yönetimlerin, bakanlıkların yağmur suyu yönetim planlarının ekolojik ve sürdürülebilir yönetim ilkelerini uygulamaya geçirilmesi bu bağlamdaki uygulamaları ve su yönetim planlarını artırması gereklidir. Su yönetim planlarının kent planlama kararları ile beraber ele alınması gerekmektedir. Bu doğrultuda iklimle duyarlı yeşil altyapı sistemlerini içerecek uygulamaların kentsel tasarım süreçlerine entegre edilebilmesi gerekli ve önemlidir.

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**IN SEARCH FOR THE PUBLIC AFFORDANCES OF DIFFERENT PHYSICALITIES:
COMPARATIVE CASES OF ISTANBUL AND LUCERNE SHORES**

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ABSTRACT

A coast may be defined as a threshold between land and water, a strong and sharp encounter between two different physical entities. It does not imply a fixed line; but a dynamic field that is open to the effects of various forces. It is the place where the interaction between land and water takes place; and they are often very much valued parts of the land.

The character of the coastal topography can be various. Sometimes it is a sandbank, a crag, a cliff or a fjord; and sometimes artificial additions are at stake; like a quay, steps, a console terrace, brought in rocks and so forth. All together, they define the very physicality of a coast, and therefore the dynamics that is created within the field.

The affordance of a coast is very much associated with this physicality. There's an obvious exchange between the form and the utilizer, and it can be stated that certain forms enable certain interactions. Affordance may be summarized here as what the environment "offers", "provides" or "furnishes"; and the study approaches the coasts with the affordance they carry for the publicity that is to come to life within that certain physicality.

The study of the form and the publicity that is created around is seen as a way to understand better how we engage with our environments. For this, two cases will be tackled comparatively; two very different yet occasionally similar coasts; Istanbul and Lucerne shores will be at focus. This paper is an extension, or rather a side production to the art project "Unexpected Urban Superpositions" which was a process of a search for coastal public in these two cities; juxtaposing them using photographs and drawings, creating absurd collages in order to highlight the public created around and living with water.

Key Words: Shore; affordance; Istanbul; Lucerne; public

INTRODUCTION

In 2020 just when the pandemic was officially announced in March, we were informed that our application to the Istanbuluzern Foundation for the Armin Meienberg Award was successful and that we were to spend successive 10 weeks in Lucerne to conduct our project *Unexpected Urban Superpositions*. This is an art project which aimed to focus on contrasts and diversities of İstanbul and Lucerne citizens' relationship with water. Because of the pandemic, the trip was to 2021 and our stay was a bit shorter than we expected, we spent seven weeks in total to conduct our project.



Figure 1.

The idea of the project proposal that we prepared with Dilara Tekin Gezginti was shaped around our prospective encounter with the city of Lucerne for the first time, and our long-time experience with the city of İstanbul. When the case is Lucerne and İstanbul; we are of course talking about two very different urban existentials. Lucerne, a city of eighty thousand inhabitants (Lustat, 2016) and İstanbul with about fifteen million at first seem incomparable. Lucerne City is situated around the River Reuss and Lake Lucerne with a surface area of 37.4 km², while İstanbul expands to an area of 5.461 km².

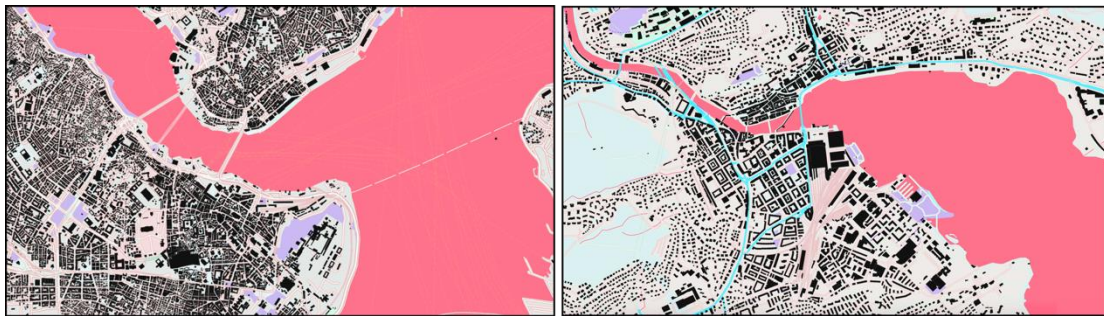


Figure 2.

Despite their obvious distinct characters, there are times when two cities may all of a sudden look alike, especially at their water borders. That was our starting point indeed, when we were trying to design the project; the city of Lucerne which we had never visited before, showed itself to us with surprisingly similar to İstanbul. One of the first inspirations for the study was coming from the mysterious resemblance of Karaköy Port and Lucerne Seabücke Area which provided the initial curiosity for us.



Figure 3. Karaköy superposed on Seebrück area of Lucerne.

The shores of Lucerne and İstanbul would be paced by us simultaneously. We hunted for the public that emerges by water, the kind that somewhat reminds us of a place in İstanbul because of a resemblance or a strong contrast. These similar or contrasting spaces are filled with citizens, with their everyday concerns and with very different approaches to the notion of public. We planned to take photographs, record sounds, make sketches at these specific places that we feel a public space emerge.

Erzen (2019) finds the social dimension of the city as its most important feature and defines the whole city as a public space. In this place, encounters with others are experienced, similar flows and actions are taken, and the culture of living together is experienced deeply. Our project, *Unexpected Urban Superpositions* could be seen as an humble attempt to understand this mentioned culture of living together, at the coasts of two urban environment; comparing and contrasting them with each other in order to make a point.

The postproduction took place with deconstructing the images to its elements, which gave us some layers and by using these layers on the canvas of the found-appropriate environment from the other city we produced a number of absurd collages. The intent of the absurd collages was to bring together specific spatializations from one city to another. These representations of impossible coastal spaces point out matching or contrasting situations and numerous approaches to urbanity and public. Various thresholds between land and water, temporary/permanent structures, how people act by water, components of everyday life, how do human and non-human agencies spatialize the waterfront and such, were at our focus.

In the following chapters, the project will be tackled with the setting it focuses of, the act that it investigates and the research that was conducted.

THE SETTING

The settings that the project addresses are the shores of Lucerne and İstanbul as mentioned. It is true that, the kind of ad-hoc spatialization that we were looking for, can be found everywhere, one could even argue that the very roots of architecture could be traced to that act. The reason for us to choose to investigate the coasts was for providing a frame.

It is true that, the kind of ad-hoc spatialization that we were looking for can be found everywhere, one could even argue that the very roots of architecture could be traced to that act. But the coasts of these two very different, otherwise maybe incomparable cities; were resembling each other with their quays, infills, bridges, parks and the places that are organized by the water. We were looking for the responses that the citizens gave to the coastal topography of the urban environment that they inhabit, and the spatialization that they construct there.

Coasts, as a common boundary of two different biographical regions are defined as places of heightened activity (Ots, 2011). The body of the land and the body of water engage here, and the mere physicality of this border outlines the relationship that

the citizens build with water. Under a set of formal and informal rules, repeated transactions/interactions between two bodies occur.

Though the notion will not be thoroughly tackled here, for the project, it was important to think the coast as a place of tension and therefore, encounters. Erkıılıç (2019), shares her mind map about the theoretical and spatial tensions that she addresses in her PhD dissertation with the following: *earth-water, urban-nature, land-sea, human-nonhuman, spatial fix-material unfixity, historical-present, near-far, micro-macro, representational-nonrepresentational, material-conceptual, architectural-geographical*.

These encounters create a dynamic field and especially in urban environment, the very physicality of the coast, in other words the coastal topography, whether it's artificialized or intentionally "left natural"; gathers certain functions around itself. A sandbank provides a different setting, a staircase or a ramp entering the water or a quay or a console terrace something else. The different physical situations provide the stage for the public that is to be recreated within. Some spaces invite for a certain type of publicity, some for another kind; and some don't invite at all. For the project, various types of coasts in both cities were encountered, remembered, studied, and compared with each other.

From this point of view, urban coasts are architectural settings that people choose to construct a particular publicity in a certain way. So how does this setting act on citizens and how the citizens act on this setting?

THE ACT

Close to the thought of the primitive trying to exist in nature when there was not a single building around, the citizen of today also tries to settle in the surrounding physical environment; make ways, take shelters. The dense, solid, and predefined urban setting acts as a *terrain vague* for the ordinary in contemporary metropolis. It is possible to observe numberless possibilities in any given definition in this *vague plateau*, which is the urban in other words the natural environment of a city dweller. From this standpoint, the city turns into a kind of physical fund, the environment is degraded to its very basic physical features like corners, gaps, surfaces, voids, slopes, heights, and sounds. The citizen makes this dwelling possible by using all these features as a material.

But how does this material act? As Ingold (2013) states; to understand any material is to pose a riddle, the answer can be discovered only through observation and engagement with what is there. Here it is suggested that the citizen keeps asking questions to the physicality of the city, receiving different replies from different attributes. Unwin (2003) says that we are constantly playing the "game" of placing ourselves according to things, people; in general forces. According to him, spaces in their simple or complex forms establish a connection between us and the outside world; they provide frameworks in which we exist or act. They make sense of the world for us when they work, or when we make sense of our world physically and psychologically through them.

The urban environment is the material that gives the citizens the chance to ask certain questions to it; therefore, construct some kind of a spatiality. These spaces may appear unintentionally; a corner is sometimes a meeting point, an urban staircase is a popular hanging spot because of the physical features that they assemble. The citizen's perception of the potential of a certain physicality arouses spatial questions, and the urban space is challenged about what answers it can provide to the dwellers.

From there, the notion of "affordance" comes forward. Gibson (1966) as the first one to suggest the concept of affordance as it is used in this study, defines it as simply what things furnish, for good or ill. The perception of constant objects' physicalities (like the shape, size, color, texture, composition, motion, animation, and position relative to other objects) guides about its affordance. Rietveld (2014, 1018) identifies it as a landscape. Robinson (2020) defines affordance as the connective tissue between animal and environment. Arbib (2020) interprets affordance as an invitation to / indication for action.

So, is it possible to talk about the public affordance of a certain site? Within the experience of the urban space, what kind of places hold the affordance for specific publicities? The suggestion here is that; a publicity is very much associated with its setting and with its physical features and what these features afford. This is an approach to define public space with the actions it allows.

With all the literature and dissent views of "the public" and what that really means; it should be stated that public is not considered as a concept with a single meaning here, but as a variable situation that needs additional expressions to define it. It may be resulting from a commercial activity, it may be intermittent, it may revolve around an occasion. Similar to the overall approach; public as a concept, when degraded to its very basic physical features, we encounter a kind of interaction for which the type, level, frequency may differ.

The research can be read as an investigation of the public situations met by different coastal states. Can these site-specific spatializations be dismantled into their pieces to provide some kind of an insight for the production of space and the discipline of architecture? Is there a way to gain some kind of a literacy for the site characteristics that make a certain public possible?

THE RESEARCH

Our research started with our first encounter with the city of Lucerne respectively, in the long walks we took by water every day. When one of us was in Lucerne, the other was in İstanbul pacing coasts (as far as the curfew allowed), that is how we provided images to each other. The approach allowed us to collect multiple images from various productions in spatial context from both cities, we created an image repository so to speak, and the one in Lucerne worked on the production of the collages. The collages were our way of investigating the urban space. We were curious to what's happening with people's decision when settling to a certain spot in a certain way and wondering if an absurd composition could be a way to express it.

The simultaneous image collection from the water borders was followed with a drawing process in Lucerne, a process that aimed to deconstruct that specific place to its components. After acquiring the layers from one city this way, the image that will act as a canvas for these layers were picked from the mentioned image repository of ours. Next is the adjustment of the drawn layers to the other city, which meant thinking two urban characters together and that provided us an interrogation in the process.

The frames created at the end, the final products, the collages provided a discussion ground to highlight a certain place, approach, usage and settlement. When a collage was completed, it was shared through the project's social media account with a text that gives information about the sites and selected elements, explains our idea, approach, and statement.

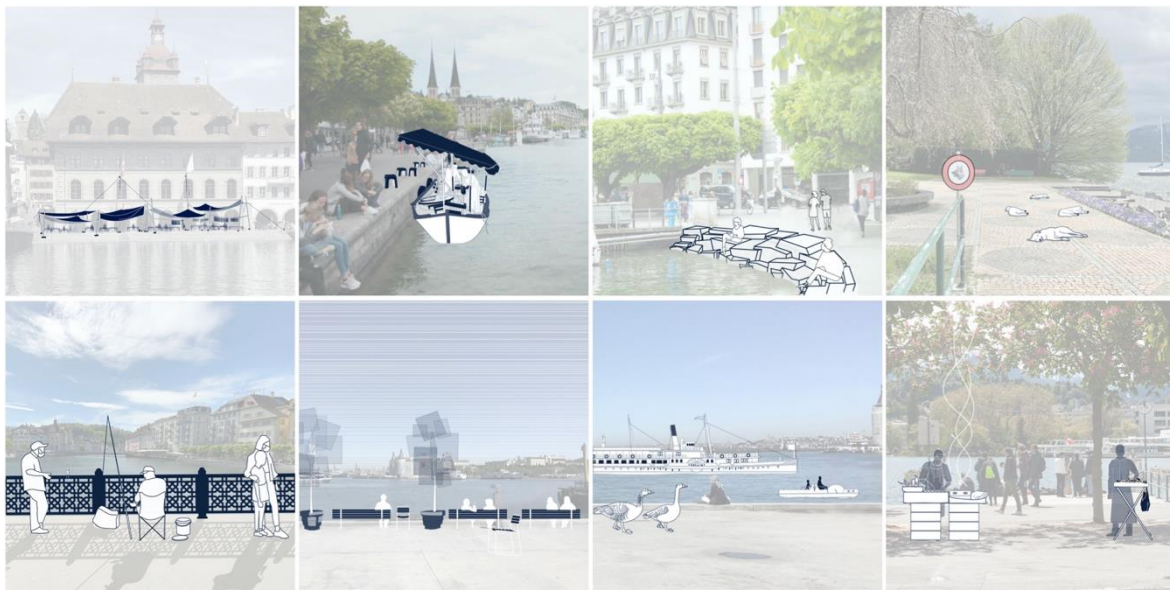


Figure 4. Collages by the author.

The huge canopy of an İstanbul Pazar that is installed in the place of Wochenmarkt; this time using the existing surrounding as the part of its structure like it does in İstanbul. From Eminönü (and its history) a fish sandwich boat which acts like a floating small kitchen and a shop that sails all its way to Schweizerquai, to profit from the sitting crowd there. The rocks could be a different threshold for the center of Lucerne acting as an urban furniture, as it always does in İstanbul. Dogs would keep lying around lazily, if they were to be somehow transferred from in front of Kadıköy pier to one of the *toleranz* zones of Lucerne. Why not a Galata Bridge scenery on one of the bridges that cross River Reuss? Would it make any difference a difference if the view of Haydarpaşa was spectated from the urban furnitures of Lucerne? The famous steampad Gallia and a pedalo from Lake Lucerne would sail in the Sea of Marmara while two geese pass by, and street food sellers of İstanbul coasts could install their styrofoam boxes and pop-up stalls at the coasts of Lake Lucerne.



Figure 5. Collages by Dilara Tekin Gezinti.

What about you could see people drifting in Maltepe stream remediation canal, like they do in the clear waters of Reuss? Mobile vendors of the huge infill coast park of İstanbul having a surprisingly broad range for the stuff that they sell, would roam in Üschotti with their specific yells. Lake Lucerne would be the wedding photo background for a bride and groom from Üsküdar shores. Historical peninsula of İstanbul would benefit from extensions like they have in Lucerne city. The mountain scenery of Lucerne would be sight, if seen from an İstanbul *vapur* trip. Holes on the walls that sperate water from land if drilled in Lucerne borders would again create an appealing sound as the waves ruffle.

It was also exciting for us to see that many different aspects of two cities caught our attention, the correspondence of images between us shaped the outcomes of the project accordingly.

CONCLUSION

This proceeding is an extension, or rather a side production to the art project “Unexpected Urban Superpositions” that we conducted in İstanbul and Lucerne simultaneously. The project was simply a search for various coastal public in two cities and looking for ways to express them comparatively. We proposed to do this by superposing the drawings of the elements that make up that special publicity and images, creating absurd collages in order to highlight the public created around water. To sum up what we did was choosing a site, deconstructing it, drawing it, choosing or remembering another site from the other city, and juxtaposing the drawing with the images to create an absurd scene that provides a ground for discussion.

The study of the form and the publicity that is created around it, is seen as a way to understand better how we engage with our environments. It was argued that the publicity has strong connection to the physicality that it emerges, therefore, the work of dismantling the places to its elements was used as a method to understand how a certain place comes out. The study used drawing as a way to dismantle the qualities, values of a space picked form the coasts of İstanbul or Lucerne to understand its public potential. Here are some insights that we got from our experience.

Citizens claim space with their everyday acts.

Coasts as an open border directed to water create a spacious feeling, provide a scenery to be in and to look at; they are popular places to hang, take pictures and just sit. And people sit where they can! Especially when they are eating, the affordance of the surrounding is taken to the full extent. They do not necessarily look for a bench, or an intentional urban furniture but take the advantage of certain heights. Providing various heights at a shore, like the rocky shores do, could create different sitting options, therefore draw people around.

The vessels, railings, lighting devices, benches, they provide a kind of urban aesthetic that has an important place in people’s memory. And at the shores many of these features come together, providing a certain composition.

Extensions stretching on water, provide a different scenery and a kind of an isolation, so it is mostly preferred by people who seem to prefer some kind of a privacy.

There are several open questions here, of course. We would like to address them as possibilities for further studies. As this was an art project, the study conducted is not a scientific one. The observations at the coasts could be more systematic and involve different time intervals. The physicality of the coasts, especially the artificial ones could be studied with categories and sub-categories, and a comparison study could be carried out, the drawn layers can be -and should be increased of course; in order to express the space more precisely and provide more insight about the act of citizens on the coasts.

ACKNOWLEDGEMENTS

The author would like to acknowledge the funding awarded by the İstanbuluzern Foundation for the art and research project “Unexpected Urban Superpositions” that she conducted with Dilara Tekin Gezginti in May-June 2021. This study would not have been possible without the Armin Meienberg Award 2020 that provided her the opportunity to spend five weeks in Lucerne and observe the shores for the project.

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A REVIEW ABOUT USER-CENTERED DESIGN (UCD) RESEARCHES AND CONSIDERATIONS ABOUT HOW TO APPLY UCD RESEARCHES IN CRUISE SHIP DESIGN FOR POST PANDEMIC WORLD

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ABSTRACT

After the coronavirus pandemic, the cruise ship industry has been affected dramatically. As a result, it is understood that the cruise ship environment needs new implementations and decisions in terms of spatial planning, hygiene, material selection, mechanical/electrical plumbing, and HVAC upgrades.

Also, flexibility has gained power for spatial planning more than ever to handle unexpected circumstances for health and safety protocols. However, these steps were taken by stakeholders, the user point must be focused on coping with the fear of cruise tourism.

So besides physical implementations and design alterations, it is crucial to try to understand user needs with the help of questioning **user experience, preferences, and satisfaction** in cruise ship environment to be able to fulfill requirements of user in terms of not only physical but also psychological way for more quality and healthier environment.

So new approaches must be thought by designers and all stakeholders. To develop unique characteristics in the practice of cruise ship architecture, user-centered design, which defines design by understanding user needs, can be helpful in post covid world. So UCD researches must be considered in the floating environment as a cruise ship.

This study discussed applying user-centered design approaches to design a cruise ship environment in a post-COVID world. For this reason, this research reviewed user-centered design researches in several fields and classifications are examined. Finally, considerations about using UCD research in cruise ship design processes are suggested and approaches are evaluated together.

Keywords: user-centered design approach, cruise ship environment

INTRODUCTION

In this study user centered design approaches will be examined in several design fields and user centered design approaches will be elaborated to develop ideas about how to use this approach in cruise ship environment as a floating architecture example.

User insight, user experience, and the information produced with these tools are crucial for the UCD design approach, which needs active user involvement. In addition, the cruise ship environment needs firsthand insights and experiences of users after covid 19. So cruise ships environment designers need more UCD studies for further designs and refit projects.

USER-CENTERED DESIGN

To review about user-centered design researches, the rise of the UCD approach and the need for UCD approach must be examined firstly.

The future user of designs taken more closely by designers progressively in the last 60 years. This condition leads user-centered design (UCD) and participatory design (PD) approaches, which are starting to affect each other nowadays (Sanders and Stappers, 2008).

The user-centered design, which is a US-driven phenomenon considers the user as a subject since the 1970s. In user-centered design approach users are missioned to have initiative roles to provide expertise and participate in informing, ideation and conceptualization for the early design stages. After that participatory approach which considers users as partners by Northern Europeans emerged. (Sanders and Stappers, 2008).

Aşıcı (2018) states that Human-Centered Design (HCD) is frequently used as a synonym with Human-Centered Design (HCD). But Aşıcı (2018) addresses the distinction between HCD and UCD by emphasizing that ucd is a more focused and concise version of HCD with a broader analysis of focus audience.

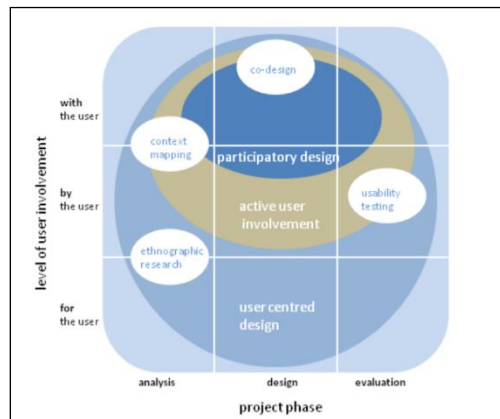


Figure 1. Relation Between user-centered Design and Participatory Design (McCartan et al.2014).

Wilkinson et al. (2016) state UCD is a multidisciplinary design practice that requires examining, analysing, interpreting and synthesizing **user needs** and **behaviors** and translating these into designed artifacts and iterative processes by experts from various disciplines.

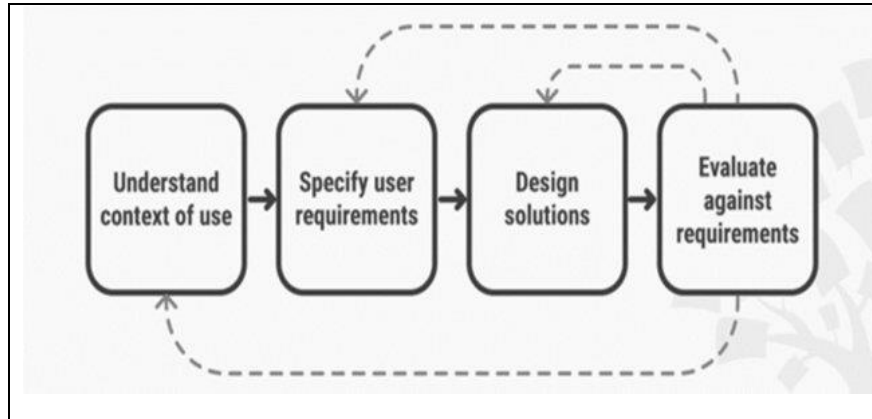


Figure 2. Iterative Process Diagram for Ucd (ISO 9241-210) (retrieved by Almeraj and Alsumait, 2019).

The general phases of the iterative cycles of UCD process understand the context of use, specifying requirements, finding design solutions with evaluating the design and finally implementation through the whole process. Understanding the context of use includes specifying user profiles and using them in the design process to fulfill successful design requirements.

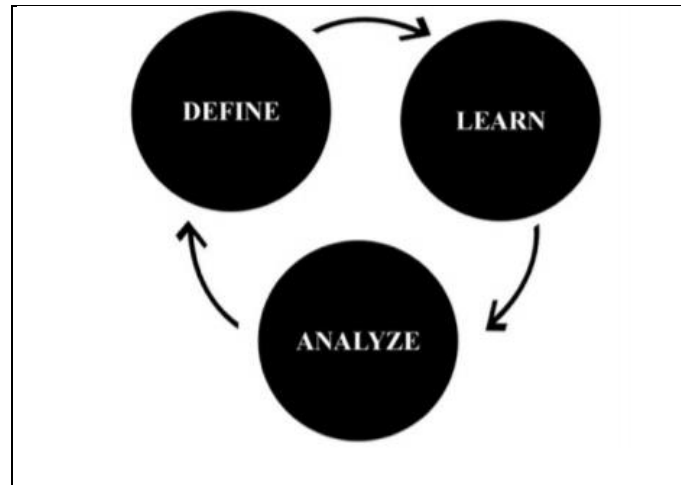


Figure 3. Workflow for the analysis phase (Aşıcı, 2018).

So these two steps can be counted for analysing phase to find design solutions for a different layer of design steps. Then evaluation with testing actual users for this iterative process to implement design alterations and decision changes for UCD approaches.

Vischer (2008) states *“The user-centred theory enables links to be made between knowledge accumulated both at the micro scale of the users’ experience and at the macro perspective of how the built environment is produced and delivered.”*

METHODS FOR IMPLEMENTING UCD

Industrial design (product design), communication design (application interfaces, service design), computer science (human-computer interaction) and architecture (built environment) which considers user needs are the most common fields which needs UCD researches and implementation of UCD approach. Methods are significantly varied according to the design field and design practice of the design field. The critical point for implementing Ucd the maximizing the involvement, in other words, user omnipresence for design.

In the following table, Abras (2004) states ways to involve users in designing and developing a product/artifact by Preece, et al., (2002).

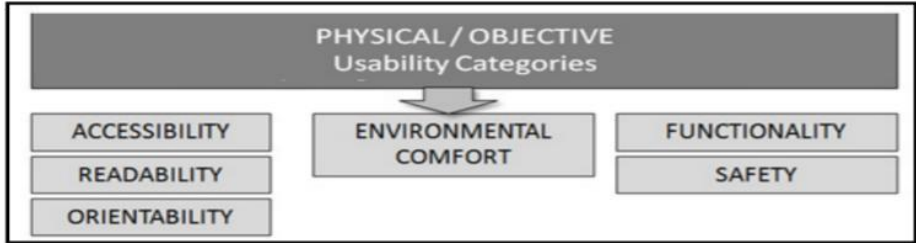
Technique	Purpose	Stage of the Design Cycle
Background Interviews and questionnaires	Collecting data related to the needs and expectations of users; evaluation of design alternatives, prototypes and the final artifact	At the beginning of the design project
Sequence of work interviews and questionnaires	Collecting data related to the sequence of work to be performed with the artifact	Early in the design cycle
Focus groups	Include a wide range of stakeholders to discuss issues and requirements	Early in the design cycle
On-site observation	Collecting information concerning the environment in which the artifact will be used	Early in the design cycle
Role-Playing, walkthroughs, and simulations	Evaluation of alternative designs and gaining additional information about user needs and expectations; prototype evaluation	Early and mid-point in the design cycle
Usability testing	Collecting quantities data related to measurable usability criteria	Final stage of the design cycle
Interviews and questionnaires	Collecting qualitative data related to user satisfaction with the artifact	Final stage of the design cycle

Table 1: Involving users in the design process (from Preece et al, 2002) retrieved by (Abras, 2004).

These techniques can be seen as: Back and sequence interviews, focus groups, questionnaires on-site observations; role-playing, walkthroughs, simulations for beginning- early design and mid-point design stages. And for the final design stage usability testing, interviews and questionnaires were listed.

USER EXPERIENCE ASSESSING

Usability concept is a vital requirement in user experience. In the following table, there are objective and subjective qualities of the built environment in terms of usability of architectural spaces.

	Physical and objective categories of built environment
	
	Subjective Categories of built environment Psycho-cognitive aspects: user/ built environment.

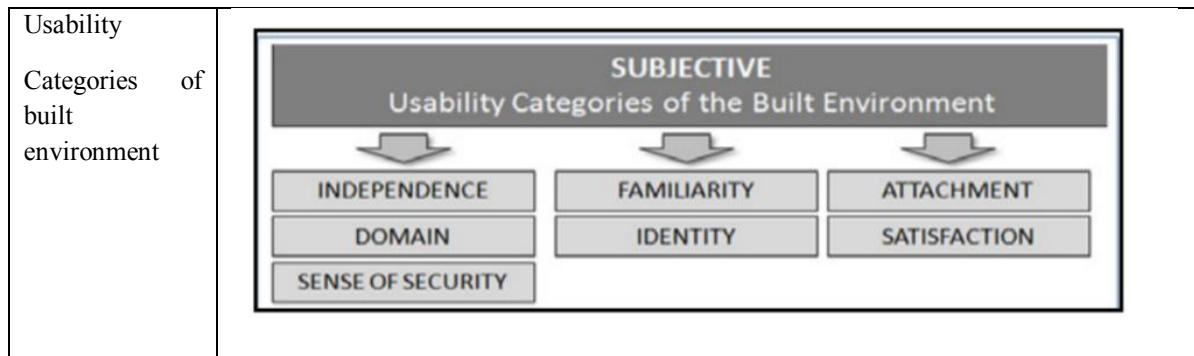


Table 2: Physical and Subjective categories of built environment adopted by (Bittencourt, et al., 2015).

Also, the other important parameter is comfort for assessing user experience in built environment. Vicher (2008) demonstrates analytic framework for assessing the user experience with three-layered comfort parameters (psychological, functional and physical) and three layered effectiveness (individual, group, organisational).

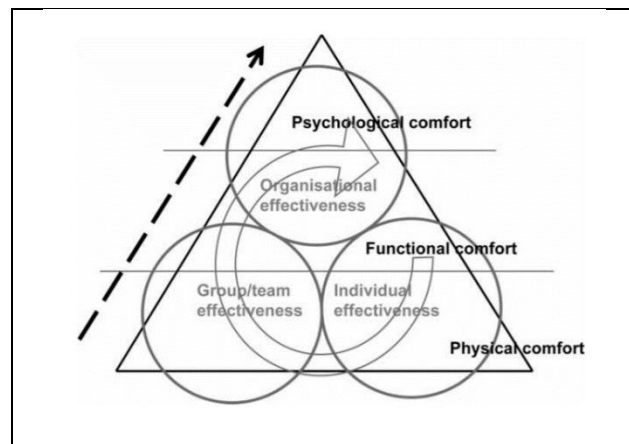


Figure 4. Analytic framework for assessing the user experience (Vischer, 2008).

“...if users indicate that environmental features or conditions support people and what they are doing, the built environment is effective and functional: ‘functionally comfortable’. However, users do not assess their functional comfort on the basis of simple physical comfort. They bring feelings, memories, expectations, and preferences into their assessment, and this increases the complexity of the outcomes being measured. Some of these psychological processes are personal and individual, but many are shared and indeed are a function of the values and habits of the culture in which we live as a society. Thus, as well as physical comfort and functional comfort, psychological comfort is included in the rating of how well the built environment performs” (Vischer, 2008).

Vicher (2008) states physical environment causes a user’s behavior and social context determines human behavior with the following figure.



Figure 5. User-centered theories of the built environment (Vischer, 2008).

According to the theory for user experience analysis, Visher (2008) explains about user experience and building performance via by context of post-occupancy evaluation, design and environmental quality indicators, or building-in-use assessment analysis.

USER-CENTERED DESIGN APPROACHES IN TERRESTRIAL ARCHITECTURE

“The first postulate of a user-centred theory is that the built environment exists to support the activities of users that it shelters” (Visher, 2008). According to this theory, buildings’ success degree can be measured by complex relationships of user-environment. So users’ experience of built space and ways of measuring it is required to ensure user-environment relationship.

Ersoy (2010) states the user-centred design as a way to convey theoretical and scientific experiences directly or indirectly to a plan, decision and design processes.

To construct information network which forms the infrastructure of ucd can be categorized by these topics in the field of space and behavior literature according to Ersoy (2010);

“1-Theoretical analyses

2-Studies about relationships in terms of human behaviour and usage and space organisation

3-Studies reveals effects of changes about socio cultural structure and transformations into built environment and space organisation

4-Cross intercultural Studies about living areas

5-Studies about methods and case studies about environmental perception, satisfaction evaluations

6-Post occupation evaluations of built environments

7-Design guide and design instructions

8-Studies about method problems and application evaluations in environment and behavior relationship and environmental design applications.”

SPACE TYPE	AIM FOR STUDY	METHOD OF DATA COLLECTION	SCOPE
health facilities			
Policlinics (Şen, 2015)	a model is developed for transforming users subjective desires into objective data for user-centered design.	Fuzzy Ahp Model for UCD approach	a research method for user-oriented design for buildings whose spatial organization will be arranged in this direction,
Hospital (Kunduracı, 2018)	to reveal insight of users' lighting design expectations from healthcare facilities	questionnaire for UCD approach	lighting design expectations of a healthcare facility are analyzed.
work environments			

Work environment (AWE) (Green et al; 2008)	to better cultivate rich, engaged and connected lifestyles for an animated work environment (AWE)	UCD approach to designing, prototyping, demonstrating and evaluating with surveys and Task analysis	presents, findings from surveys and task analyses of workers employing digital technologies, and traces how these findings informed the design of physical configurations and other aspects of the AWE robot-architecture prototype.
Workplace (Ruohomäki, et al., 2015)	aims firstly to identify the dimensions of a workspace quality that could promote human well-being,	multiprofessional empirical research, piloting and feedback from different user groups are needed	examined factors for promoting human well-being for the workspace that supports work tasks and processes; is ergonomic and accessible to all; respects the privacy and the personal need for space; strengthens a sense of control; enhances workflow and engagement; and communication and learning.
educational environments			
Campus building (Okutan, 2016)	-to develop a decision-making model for a green design of a campus -identify key green design attributes and their importance from a user perspective.	UCD approach with User Survey and Walkthrough Visits	-User needs were identified and were prioritized via Analytical Hierarchy Process (AHP) -the needs of the different user groups for library building were observed
School (Lallimo, 2014)	to expand the focus that the users as information briefers in early design phases for a long-term user involvement	interviews of the users, recordings of design meetings and design documents produced by the designers and the school users.	Explores a school building design project, which was carried out in collaboration between school staff and students, architects, design engineers and other design experts.
residential environments			
Social Housing Units (Saglar Onay et al., 2017)	to create a value that overcomes the specific case as it tries to develop a flexible model that makes various interior solutions based on user needs.	Survey – interview and prototyping process of basic modules and the design of an interface	model is characterized by a flexible expert system that leads to different spatial variations by multi-parametric layout generation based on parameters decided by user needs.

Energy-efficient Housing (Bosserez & Verbeeck, 2018)	-to promote more efficient occupant behavior to decrease the actual energy demand throughout the seasons. - decreasing the resident's actual energy demand through a user-centered design approach	analysis of residents and analysis of the built environment -transcriptions and summaries of interviews, -maps on occupant behavior-analysis of seasonal living pattern	Resulting the design that best enable a dynamic way of living throughout the seasons come from students who analyzed the dynamic properties of residents more in-depth.
hospitality			
Restaurant (Leung and Chen, 2012)	to explore users' ideas about interior ambiance.	Questionnaire and interviews.	Users were asked to describe the experienced restaurant space and ambient in terms of physical cues and personal feelings, after that data coded and analyzed.
Exhibition Spaces (El-Halawany et al, 2018)	to improve the visiting experience and better interpretations to be aware of visitors' circulation, visiting styles, behavior, patterns, tendencies, and trends.	Parametric programs (Grasshopper plug-in for Rhino, SmartSpaceAnalyser) used for interactive modeling	-explores a different UCD approach in the evaluation of the built environment. -examines parametric spatial analysis with real-time interaction in the modeling environment with instant visual feedback

Table 3: UCD Studies For Terrestrial Architecture.

Conventional methods would be inefficient to elicit the needs and latent needs. So therefore, UCD approach is gaining importance day by day. It has been applied to architecture in an increased manner to reveal insight of users are needed to find the best solution for users to be satisfied. In the following table, motivation and reasons for UCD are listed for UCD studies. Parameters like building typology, circulation and user profile and interactivity requirements can promote UCD studies.

MOTIVATION AND REASONS FOR UCD STUDIES
Complex Typologies
Heavy Circulation
Diverse User Profiles
To Reveal Diverse Needs And Goals Of User with insights
Cross Intercultural Studies
Interactivity requirements in terms of user and space

Table 4: Motivation And Reasons For Ucd Studies.

UCD approach studies enable the achievement of targets for user and space with the help of physical , physiological and psychological elements of spaces. With revealing the user profile, user needs, desires, preferences and

anticipations. Finally, Ucd studies' targets can be evaluated in terms of behavioral, perceptual, emotional and functional. In the following table, targets for ucd approach studies are listed.

TARGETS	MAIN PARAMETERS FOR SPECIFIED TARGET WITH UCD APPROACHES
Finding Route Easy	spatial organisation, distance and time etc
Safety Perception And Security	material, experience, ergonomy etc.
Privacy Feeling	affected by personal space, territory, crowding etc
Wellbeing- Health	physical and psychological comfort etc
Efficiency- Usability	facilitates tasks like working, learning etc
Green Building	required energy exploring with eliciting the usage
Flexibility	movable units, furniture, seperations etc.
Accessibility	height of riser, circulation, easily seen parts etc.

Table 5: Targets for UCD approach studies.

NEED FOR USER-CENTERED STUDIES IN CRUISE SHIP ENVIRONMENT

Complex typologies, heavy circulation and diverse user profiles enable to work with the user-centered design approaches for the designing process which is examined in the previous part. Users' role and user involvement for these types of architectural spaces should be more crucial. Cruise ships which act as a small city which has complexity in terms of spatial organization, heavy circulation and diverse user profiles because of its nature, should be examined with user-centered studies more increased and heavily manner..

Observations, interviews, and questionnaires give information about users' tasks and goals and desires to make designers informed about specific user scenarios in UCD studies. Users in cruise ship environments can be classified mainly as crew members and users.

Mccartan (2015) states *“User Centred Design (UCD) is a process in which the needs, requirements, and capabilities of crew members as end users of a vessel or system, are given extensive consideration at each phase of the design process “.*

Cruise ship experience for different user scenarios is affected mainly by user's (passengers and crews) profiles, past spatial experiences, and spatial organization. So users' insights must be considered in the very first design steps in the cruise ship design process. Also, there are other parameters that effects cruise ship experience like; finding route easy, safety perception and security, privacy feeling, well-being- health, efficiency-usability of space, flexibility and accessibility must be considered within the user-centered approach

In post covid world user experience must be well examined after chancings like social distance with promoting lesser encountering with decreased number of user, hygiene implementations and other changes with the pandemic. So faced with COVID 19, research on cruise ships can effectively impulse both user and cruise ship environment. In the following table, there are relevant works for user-centered approaches and user studies in the floating environment listed in the following table. Also, there are studies including cruise ship user studies which has been increased recently.

Study	Study Name	Aim	Method of Data Collection	End Product- Outcomes Of Study
(Ahola et al., 2014),	“Perceiving safety in passenger ships– user studies in an authentic environment”	To discuss how people perceive safety within the context of passenger ships.	user-centered design approach-User studies interview	Having identified five safety perception themes through 1. architecture of the passenger ship, 2.the life-saving appliances, 3.communication, 4.emotions 5.other people.
(Ahola et al., 2018),	“When people are the mission of a ship – design and user research in the marine industry”	“to support the bridge between the different research traditions of humancentred design and naval architecture”	Case studies and methods are examined	-visual design research methods in naval architecture can help for better experiences -the use of participatory design methods can reveal users’ perspectives, expectations and experiences.
(Aşıcı, 2018)	“Redesign Of Driver Environment For Rigid Inflatable Boat With Focus On User-Centered Design”	to add a design value for users with new solutions that suit their needs.	user-centered design methodology requirements identified from users with observation phase and unstructured interviews	a console, seating unit, and hardtop designed for that embraces the importance of ergonomics, user experience, and producibility
(McCartan et al., 2015)	“A Marine Design Approach To Wfsv Bridge Layout Development And Crew Transfer”	to improve the human factors, functionality and aesthetics of a vessel or system, and its' marketability	user-centered Design Digital Human Modelling software, used to display and evaluated in the virtual design space.	Ethnographic analysis carried out on-board to evaluate current navigational practices and other command and control activities specific to WFSV, including technician transfer to the turbine.
(Koşar, 2021)	“Come Sit With Us: Effect Of Recreational Zones’ Interior Design On Seafarers’ Well-	to explore the factors in the interior design of recreational areas and their effects on seafarers in	POE utilized with questionnaires and interviews	relationship between the evaluation of recreational zones and wellbeing explained. Interior design characteristics of Norwegian fishing vessels

	Being In Fishing Vessels”	Norwegian fishing vessels		are examined for satisfied seafarers.
Calza, et al 2020	“Testing moderating effects on the relationships among on board cruise environment, satisfaction, perceived value and behavioral intentions”	to investigate the relationships satisfaction, perceived value and behavioral intentions, and the moderating effects of gender, employment status, group composition, and the propensity to stay on board in the cruise experience.	surveys collected and analyzed with the structural equation modeling approach of partial least squares path modeling. A multi-group analysis was used to test the moderating effects.	findings suggest that the on-board environment is a good predictor of behavioral intentions, but that the relationship is strongly mediated by satisfaction and perceived value.
Wang et al 2021	Passengers’ safety awareness and perception of wayfinding tools in a Ro-Ro passenger ship during an emergency evacuation	to demonstrate the passenger’s safety awareness, the perception of emergency wayfinding tools and the demographic differences.	data were collected via a self-administrated online survey using cloud-based software - Questionnaire	results show that there are demographic differences in safety awareness, perception of wayfinding tools among passengers.
Radic et al 2021	Cruise ship dining experiencescape: The perspective of female cruise travelers in the midst of the COVID-19 pandemic	To explore how under the influence of the COVID-19 pandemic, cruise ship dining environment stimuli dimensions are evaluated by female cruise travelers.	studies on possible passengers Questionnaire	demonstrates the potency of the moderating role of a perceived health risk from the COVID-19 pandemic, which strengthens female travelers’ perceptions of the dining atmosphere and interaction with other guests by evoking positive emotions and influencing their approach behavior.

Table 6. Relevant user studies for floating environment.

HOW TO APPLY- ADOPT USER-CENTERED STUDIES IN CRUISE SHIP ENVIRONMENT

In a cruise ship environment, architectural design is essential as the service quality for experiencescape of user. So to fulfill the pleasant experience for the user studies must be done to adopt UCD design approach in the cruise ship environment. So the first step must be collecting information about cruise passengers. And taking the firsthand knowledge during the travel can help to see their preferences. Afterward, evaluation process should be provided for a better quality, healthy and comfortable environment with usability concept which should be gaining more importance in the post covid cruise ship environment.

Aiming to achieved cruise ships concept process, results of ucd approach studies must be considered in combination with a standard design procedure to better fulfill user needs. Understanding the relationship between user and cruise ship environment following model can help to reveal how these parameters can be related. User profile and cruise ship environment dimensions with the effects of the social parameters influence user behavior which is demonstrated in the table.

Cruise ship environments can be examined with user-centered approach studies with these parameters:

- a)user profile,
- b)dimension of cruise ship environment
- c)social parameters
- d)perception
- e)behavior

for promoting positive emotions, which causes positive perception and finally, positive user behavior which enables a better travel experience.

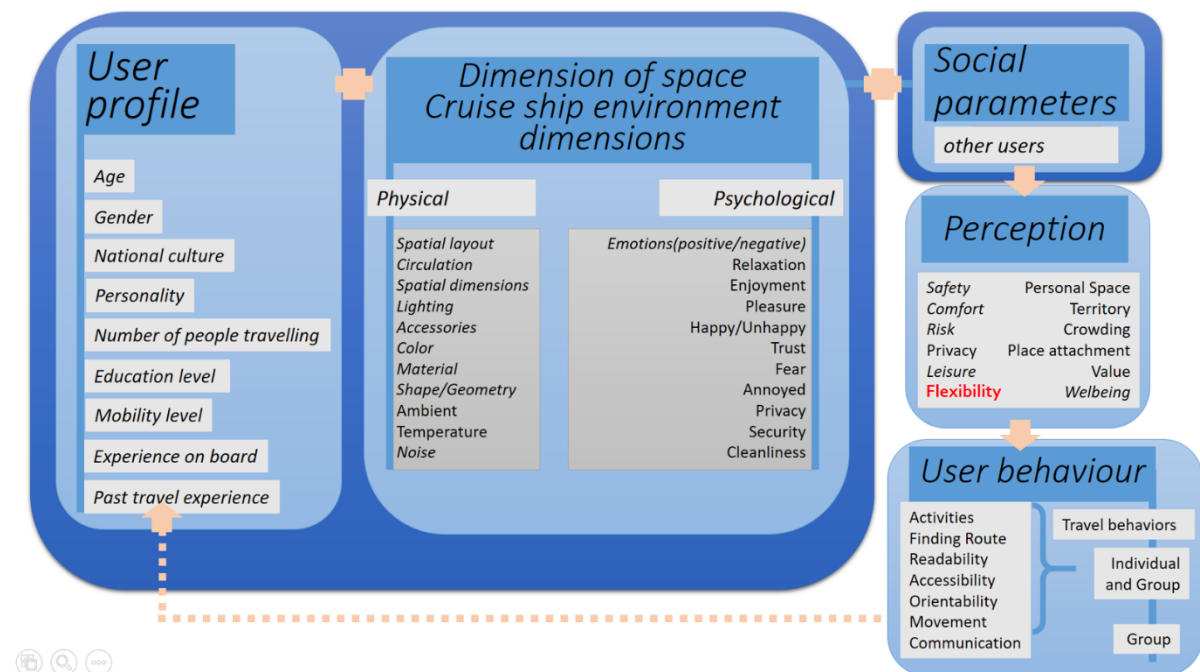


Table 7: Model For The Relationship Between User and Cruise Ship Environment.

CONCLUSION

User-centered studies in floating architecture as cruise ships and transportation vessels have begun to be considered, but these studies must be increased. Especially in post covid cruise ship environment to construct trust again and to corresponding the changed needs of user after sanitary, social distance precautions there are needs new implementation according to insight of cruise ship user which is not neglecting the human factor. The UCD approach can be used largely in the cruise ship environment studies to reveal these needs and possible dimensions.

In this sense, group interviews with users and individual interviews, questionnaires and observations must be carried out to be informed about post covid cruise ship environment. In addition, UCD studies should be helping the architects, interior architects, other design experts, users and other stakeholders to convert knowledge gathered

from the field into functional design solutions to circumvent the unpleasantness of users, both passengers and crew.

Therefore further research could unveil some user experience themes regarding user needs and expectations during the activity patterns for other topics for comfort level in the post covid pandemic. The information gathered from UCD studies should help to correspond to users' needs. So UCD studies can be a part of different scales of design from the beginning for better level of cruise ship environment quality for the future or refitting project.

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DECENTRALISED RWH INTEGRATED PROTOTYPE SYSTEM (DRIPS): A DESIGN IMPERATIVE FOR HIGH-RISES IN WATER-STRESSED CITIES

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ABSTRACT

Water-harmonious human habitations had always been our common historic past, irrespective of geographical or cultural context. With the advent of technology and the urban era, this human-nature relationship has suffered a serious setback. The consequences are evident in the complex sustainability challenges and climate crises manifested in different forms of water imbalances in different parts of the world. In many cities, urban floods may co-exist with potable water scarcity, which compels us to rethink the current water usage patterns in human spaces. This paper suggests new dynamics in rainwater harvesting for high-rise buildings in water-stressed cities, particularly in the Indian context, although the principles can be applied universally. The concept is based on the premise that high-rise properties can seldom afford to use ground space for rainwater storage in cities where land is expensive. Artificial water recharge also fails due to multiple reasons. Inability to manage the huge volume of rainwater often leads to water-logging due to the combined effects of climatic as well as anthropogenic causes including urban infrastructure short-falls. An alternative model named Decentralized RWH Integrated Prototype System (DRIPS) for rainwater storage in multi-storied buildings has been presented in this paper. It is conceptualized as part of urban water management in the building sector through innovative design intervention. DRIPS attempts to address the issue of space constraints by integrating the harvesting system in the building structure, thus minimizing the storage burden on the ground. It is also capable of supplementing the building's water supply system for non-potable uses, thus reducing stress on the freshwater supply. It has been tested with the help of a hypothetical design model in the case city of Kolkata, India by using the local climatic parameters and environmental regulations. It was found that DRIPS could accommodate two-third of the stipulated volume of rainwater storage, thus releasing substantial ground space in favour of greeneries.

Key Words: Multi-storied buildings; building integration; rainwater harvesting; water storage; urban areas

INTRODUCTION

Water is the most essential resource for sustenance and a precondition for all life forms on the planet but is distributed disparately in different parts of the world, being scarce in many countries. However, the challenge of freshwater scarcity is second only to global climate change (Kar, 2011). Hence access to water must be made in such water-stressed areas, especially urban areas, in the most efficient way. Studies show that water consumption has been increasing by 1% worldwide every year since the 1980s and will continue till 2050 when the global water demand will be 30% more than its current level. Already over two billion people live in countries with high water stress and about four billion experience severe water scarcity at least one month every year (UN Water, 2021). UNESCO estimates that about 80% of the world's population is living in areas plagued by water security issues. It also estimates that cities worldwide will experience addition of approximately 800,000 people per week in the next 40 years, putting further stress on water resources. The importance of managing freshwater is thus overarching in this scenario (UNESCO, 2021a). The UNSDG Goal 6 has, hence, been framed to ensure availability and sustainable management of water and sanitation for all by 2030.

The Intergovernmental Hydrological Programme (IHP) of UNESCO aims to link science and policy by encouraging “*innovative, multidisciplinary and environmentally sound methods and tools*” to help meeting today’s global water challenge (UNESCO, 2021b). UNESCO outlines the importance of protecting water systems, “*mitigate the impacts of water-related hazards such as floods and droughts, safeguard access to water functions and services and manage water resources in an integrated and equitable manner*” to secure water for all (UNESCO, 2021c). The IHP has identified six key thematic areas to address water security challenges. These are given in figure 1 and are listed as follows:

- i. water-related disasters and hydrological changes;
- ii. groundwater in a changing environment;
- iii. addressing water scarcity and quality;
- iv. water and human settlements of the future;**
- v. ecohydrology, engineering harmony for a sustainable world; and
- vi. water education,

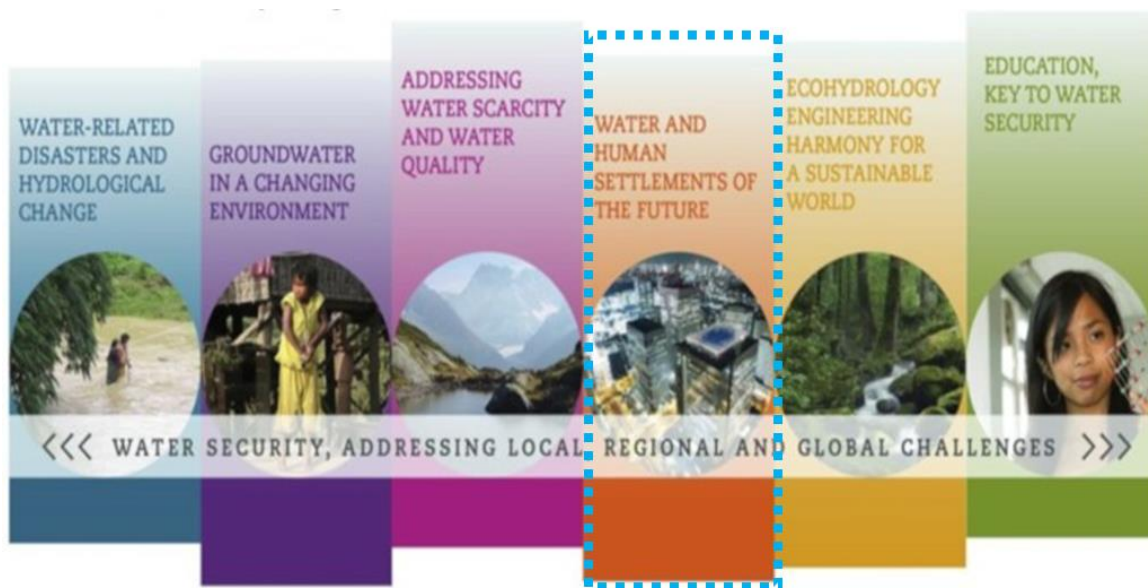


Figure 1. The six thematic areas of UNESCO’s Intergovernmental Hydrological Programme (UNESCO, 2021b).

The fourth thematic area on the water in human settlements considers the increased urban population, which coupled with infrastructure shortfalls and climate change impacts are most likely to face acute water shortages. How to manage and provide access of all to this scarcer water will be the prime challenge of future societies. Hence, it is clear that the ‘business as usual’ approach has to be altered in favour of novel ways of urban water management. In view of this, IHP has recognized that there should be ‘game-changing innovations’ as conventional ways would fall short in meeting the water scarcity challenges (UNESCO, 2021d). It emphasizes innovative approaches and technologies in urban areas to ensure optimization in water usage and costs. IHP also points towards an “all water is good water” principle by relating water quality to its purpose, so that maximum efficiency in water usage can be achieved. It urges all stakeholders to rethink ways in which reclaimed water can be reused for different purposes based on its quality (UNESCO, 2021e).

It is precisely on this premise that the paper rests on. It attempts to ideate an innovative way of urban water management through building integrated rainwater harvesting (RWH) system. This integrated system aims to reclaim the rooftop stormwater

runoff and arrange for its reuse at different levels of a high-rise building, irrespective of its typology. With rapid urbanization and premium urban land, the majority of the future urban buildings would be high rises with multiple floors to maximize space efficiency. Residential, commercial, or mixed-use buildings with continuously habitable floors as well as the futuristic vertical neighbourhoods would all be suitable cases for this new concept of integrated urban water management, named Decentralized RWH Integrated Prototype System or DRIPS.

OBJECTIVES AND CONCEPTUAL BASIS

As mentioned in the previous section, DRIPS has been conceptualized for IHP's fourth thematic area i.e. water and human settlements of the future. The primary objective of this paper is to introduce DRIPS as a potential 'game-changer' solution for addressing holistic urban water management so that water is available where it is needed. Cities often witness a strange co-occurrence of water scarcity and urban floods, meaning no water where it is needed vis-a-vis unwanted excess water. Both disrupt lives and well-being. Changing rainfall patterns seem to magnify this disparity, particularly in water-stressed cities. Thus, urban authorities have to manage both these conflicting challenges simultaneously. DRIPS offers an opportunity for addressing the dual challenges when integrated with high-rise buildings. Figure 2 explains these dynamics as the conceptual basis of this paper.

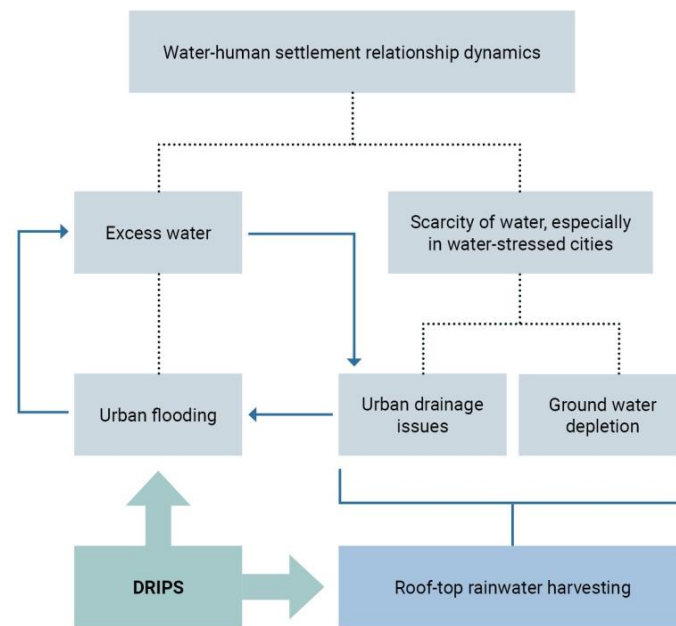


Figure 2. The Conceptual Basis Of The Paper Based On The Water And Human Settlement Dynamics.

The reason for focussing on high-rise buildings is because the operational water consumption in these buildings is very high. Although the concept and the design principle can be easily emulated and adapted for universal application for water-stressed cities worldwide, this paper considers the context of Kolkata city to validate the results. All climatic parameters and environmental stipulations are considered with respect to this city, beginning with an assessment of the current water management practices in the building sector and the relevant regulatory frameworks.

CONTEXT OF THE CASE CITY

Kolkata (formerly Calcutta), the seventh biggest city of India had been the erstwhile capital of British India and now the capital city of the Indian state of West Bengal. It is located about 180 km upstream from the sea, on the eastern bank of the sacred Indian river Bhagirathi-Hooghly with an average altitude of 6.4 meters from the sea level. The Kolkata metropolitan area (KMA) covers an area of 1480 sq. km., of which 205 sq. km. belongs to the Kolkata municipal corporation (KMC). It is a dense city with 24,760 people per km² (KMC, 2021). The city has a network of drainage canals but is still prone to flooding, especially in certain poorly drained areas (Mukherjee & Bardhan, 2021). Climatically, Kolkata falls in the warm-humid climate zone and receives 1713.5mm of annual rainfall (IMD, 2008). A culturally and historically rich city, it has several graded as well as non-graded heritage buildings. As with most cities of the world, Kolkata is also on the path of urban expansion with growing satellite townships that are characterized by high-rise buildings, particularly residential-led mixed-use developments in a dense urban setting. Figure 3 expresses this in a representative manner.

Kar (2011) identifies a multitude of water management woes in Kolkata and adjoining areas and recommended maximizing recycling and reusing water along with water consumption reduction. Rainwater harvesting (RWH) has been strongly advocated to augment the existing water supply system. This is more so as over-extraction of groundwater is not only unsustainable but

may also pose public health hazards due to the presence of exceeding amounts of iron and fluoride in many areas (Kar, 2011). RWH can also ensure natural recharging of the aquifer, thus improving the groundwater quality.

Urban rainwater harvesting, however, focuses mainly on rooftop water as the potential is huge. Wasting this water would not only result in loss of freshwater that could have supported several families for months but may also flood the low-lying areas in the city.

Thus, the importance of RWH in Kolkata lies in ensuring efficient water management and conservation of precious water as well as in substantial elimination of urban misery related to stormwater drainage, water-logging, and the consequent public suffering.

CURRENT WATER MANAGEMENT SCENARIO IN INDIAN CITIES

Alarmed by the potable water crisis in urban areas, scientists and environmentalists have recommended both storage and artificial recharge of roof-top rainwater for multi-storied buildings across most building typologies, particularly for residential buildings of large built-up areas.

The National Building Code of India (NBC, 2016) repeatedly emphasizes the importance of integrated and sustainable water management practices for the Indian building sector. NBC provides extensive guidelines for both storage and recharge of rainwater and also details out the RWH potential for a wide range of annual average rainfall, from 100 mm to 2000 mm, for the rooftop sizes varying from 20 m² to 3000 m² at 80% collection efficiency. This is to enable easy estimation by all stakeholders and help in the implementation of RWH projects across multiple scales and building typologies.

Rainwater harvesting has also become mandatory in several states and cities of India (CSE, 2001a), as given in Table 1:

States/ Cities	Applicable for plot & building areas and type of buildings
New Delhi	All new buildings more than 1000 m ² and roof area more than 100 m ²
Indore	All new buildings of area 250 m ² or more
Kanpur	All new buildings of area 1000 m ² or more
Hyderabad	All new buildings with a plot area of 300 m ² or more
Chennai	All three-storied buildings (irrespective of the size of the rooftop area) and above
Haryana	All new buildings irrespective of roof area
Rajasthan	All public establishments and all properties in plots covering more than 500 m ² in urban areas.
Mumbai	All buildings constructed on plots that are more than 1,000 m ²

Table 1. A snapshot of rainwater harvesting related mandates in different Indian states and cities (CSE, 2021a).

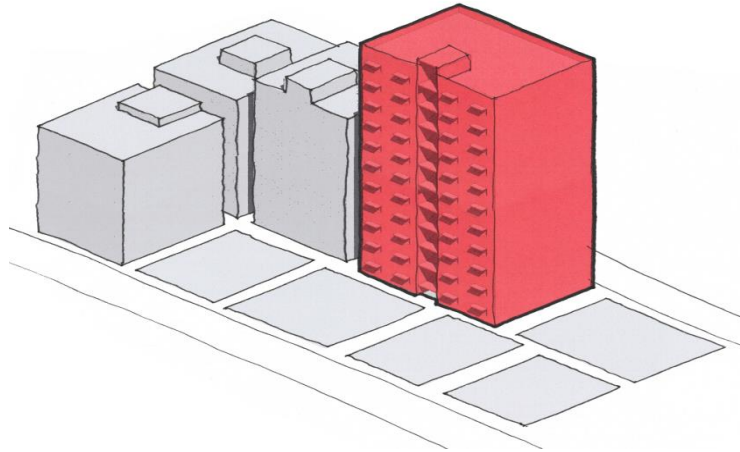


Figure 3. Typical high-rise building (new or existing construction) in a dense urban context.

The Centre for Science and Environment (CSE), New Delhi, a research & advocacy organization has been actively promoting, practicing, and implementing rainwater harvesting projects through technical and intellectual supports. It has extensive training modules and e-resources on rainwater harvesting systems (CSE, 2001b), design of storage tanks (CSE, 2001c), construction (CSE, 2001d), cost (CSE, 2001e), and maintenance (CSE, 2001f) that provide an overview of various aspects of rainwater harvesting. However, it is advisable to strengthen local networks and communities to have scientifically sound case-specific schemes to ensure high rates of success (Joshi, 2021). Annual average rainfall, rainfall distribution, and peak rainfall intensity are the main climatic parameters other than hydrogeological conditions to decide the harvesting method i.e., storage, artificial recharge, or a combination of both.

The NBC (2016) lists the following reasons while prescribing for storage of water in a building:

a) To provide against interruptions of the supply caused by repairs to mains, etc; b) to reduce the maximum rate of demand on the mains; c) to tide over periods of intermittent supply; and d) to maintain storage for firefighting.

Given the multiple benefits of storage, the sizing of rainwater storage tanks as stipulated by relevant regulations in Kolkata is examined in the next section.

STIPULATIONS ON RWH STORAGE TANK SIZING IN THE CASE CITY

Previous norm

In Kolkata, statutory authorities had specified 10% storage (for less than three-storied buildings) to 40% storage (for 11 storied buildings and above) and 60% artificial recharge of the total RWH potential* for building projects with a total built-up area of more than/ equal to 20,000 m² and more than ten storied high. However, due to space constraints, the stipulated 40% storage was seldom achieved. Given the limited space available at the ground level, building developers had expressed reluctance in following the recommendation. It had been argued that accommodating large storage tanks in the open spaces of a building complex would mean sacrificing or compromising on greenery and trees, in addition to prohibitively high construction costs.

*The guidelines also specified that the annual RWH potential for 1000 m² roof area may be considered as 768,000 litres based on the rainfall characteristics (collection efficiency ~49%). Assuming uniform utilization of harvested rainwater throughout the year from storage facilities, their capacities were further optimized and the prescribed range was kept between 150,000 - 300,000 litres depending on the height of the building.

Current norm

At a later date, the rules mandated RWH with adequate storage provisions and capacity of a minimum of one day's total freshwater requirement of the building.

Since the dearth of open space for locating huge storage tanks is a real issue and when done in place of the greenery will mean a defeat of the actual intent, a search for an acceptable and holistic answer for retaining both the 'green and blue' in our 'grey' urban life, thus, assumes critical proportion. This is the trigger for the much-needed simple, yet novel design intervention of DRIPS and the foundation of its real significance.

DRIPS: DESIGN WITH WATER FOR LIVING

DRIPS is a simple, replicable, and water responsive system consisting of a multi-tiered storage system integrated with the building floors that can potentially surpass the target amount (Bardhan, 2014). This can be achieved by a multi-level rain-water storage system placed at intermediate levels between the floors that will allow roof-top rainwater to get collected in these multi-level tanks connected in series, with the over-flow pipe of one becoming the supply pipe of the next lower and so on.

It is driven by the urgency of harnessing maximum rainwater in urban buildings and involves rainwater harvesting through vertical storage in otherwise land-constrained building complexes. Conceived as a part of academic research, the system can be adapted across building types at a nominal increase in cost but richer payback.

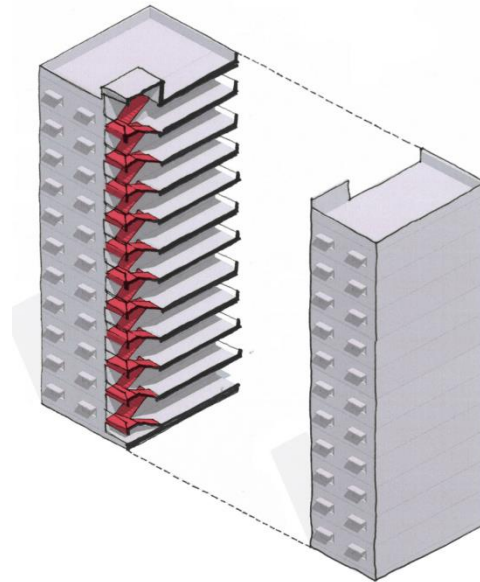


Figure 4. Common staircase as the zone for intervention: using landings for housing rainwater tanks.

The system involves multi-tiered storage tanks of smaller capacity (1 m³ maximum), which may be ascertained as per case-specific requirements, placed at intermediate levels between the occupied floors (figures 4 and 5). Once the capacity has been calculated and the size of the tanks known, the area required to hold these can be worked out. Since the tanks are placed in the mid-landing area and do not involve any additional construction, the financial implication of the system will also be minimal. These multi-level storage tanks will be connected mutually in a series such that the overflow pipe of the higher tank is the inlet pipe of the lower one.

The first flush has been visualized as a downpipe descending straight and terminating near ground level with a stop valve or cap at the bottom end to hold or drain the water as required. An appropriate filtration mechanism may be added, either in-line or by converting the topmost tank into a filtration chamber. Multiple options are available for this (CSE, 2001b). The drain valve of each tank may also be connected to the overflow pipes for ease of cleaning the whole system. The final overflow of the lowest tank may be diverted into an artificial recharge pit after further water quality enhancement, based on the suitability of hydrogeological and other local conditions. Otherwise, both the first flush and final overflow may be gainfully accommodated within the site landscape through rain gardens or bog gardens.

How DRIPS works

Post-rain, the roof-top rainwater flows through the filtration tank and gets collected in the topmost tank after the necessary first flushing. Once this tank is full, the excess water will pass through the overflow pipe into the next lower tank until this becomes full. This process repeats until all the tanks in the series are full, based on the rainfall received. Thus, in essence, for an 11-storied building, the 40 % storage is getting distributed over the entire height of the building with less than 4% storage at every level.

An additional advantage of the system is that if these tanks are connected to the wash areas or balconies of the immediate lower floor/s, several non-potable uses like floor cleaning, plant irrigation, etc. estimated to be around 40-50 litres per capita/day can directly utilize the rainwater, that too by gravity flow, saving the energy cost of using the pumped water. The cumulative impact of this volume of water per family assumes huge significance when the collective saving is considered. This also translates into reduced use of freshwater, which is the key benefit.

Thus, the DRIPS not only conserves rainwater, but also helps saving valuable potable water- groundwater or treated water saves electrical energy and power consumption, reduces electrical bills (thus financially rewarding to the users), does not encroach into green areas, and therefore, completely environment-friendly.

The next section verifies the feasibility and benefits of the proposed system through a hypothetical design case of an 11-storied residential building in Kolkata, as this is the shortest high-rise in the tall building category of RWH regulations.

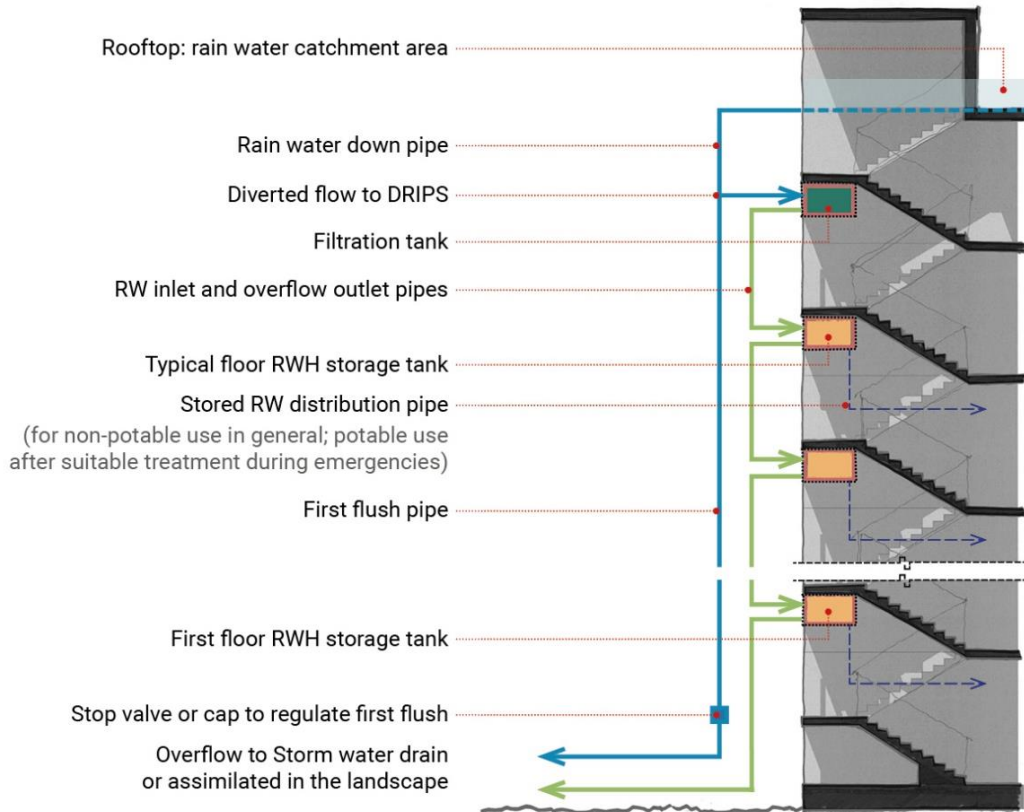


Figure 5. Sectional diagram of DRIPS in the building structure.

DESIGN CASE: ELEVEN-STORIED HIGH RESIDENTIAL BUILDING

Assuming that the hypothetical building is 11-storied high with a total built-up area of 20,000 m², it would have a roof area of approximately 1818.2 m². DRIPS is tested for this building as per the relevant RWH regulations. The storage quantity was assessed based on both the previous as well as the current norm, as follows:

Tank sizing as per the previous norm

With a rooftop area of 1818.2 m², the annual RWH potential would be 1,396,224 litres. The storage capacity needed to be provided shall have to be 40% of 1,396,224 litres or 558,489.6 litres i.e., ~558.5 m³. It is not feasible to have a single storage tank of this size and hence, would have to be distributed in smaller capacities over the site. This would increase the project cost.

Tank sizing as per current norm

Considering the other provision that recommends tank sizing based on one day's freshwater requirement, we assume habitable 10 stories with a built-up area of each dwelling unit to be 100 m², for ease of calculation. This means a total of 182 dwelling units. Following the NBC (2016) norms, with an average of 5 persons per family, 910 people would reside in the building at peak capacity. Again at 100 litres per capita per day, the one-day freshwater requirement would be 91,000 litres or 91 m³. This is only 6.4 % of the annual RWH potential and 16% in terms of the previous tank volume. The tank may be sized as 6 m x 5 m x 3 m (depth) as approximate internal dimensions. Smaller sites may still find it difficult to accommodate a single tank of this size and may again have to split into multiple smaller tanks on the ground surface.

Tank sizing as per the current norm in DRIPS

For the DRIPS, we begin with the bottom-up method and consider a 1 m³ or 1000 litres loft tank at every landing. The size of a typical market available tank of such capacity is given as 72" x 44" x 20" i.e., roughly 1.8 m x 1.1 m x 0.5 m (height), which would fit fine with the staircase landing. The height of the tank with service space above is also reasonable considering the floor-to-floor height between the landings and clear headroom requirements as per norms. With 10 staircase landings of a single common staircase, 10,000 litres or 10 m³ of water can be stored.

For a spread-out building of 1818.2 m² area, there could be as many as six common staircases in compliance with the fire safety regulations. Thus, a total of $6 \times 10 \text{ m}^3 = 60 \text{ m}^3$ of rainwater could be stored through the DRIPS in the form of vertical stacks. The balance volume of $(91-60) = 31 \text{ m}^3$ can be comfortably accommodated on the ground as a 2.5 m x 4.2 m x 3.0 m (depth) as approximate inner dimensions. Thus, 2/3rd of the stipulated volume of rainwater can remain in the body of the building, releasing a lot of ground space for plantations. As the number of floors increases, a greater volume of rainwater may be possible to store, although the trade-off between height and number of the staircases would decide the actual capacity of the system, which is likely to vary from case to case.

Figure 6 indicates the schematic placing of the loft tanks integrated into the body of the building. These are in the overhead position in the landing area of a typical common staircase leaving clear headroom below. Distribution pipes attached with each tank would allow use by individual floor residents mainly for non-potable purposes. However, it may be noted that specific items of plumbing, sizing appropriation of inlets, outlets & vents, pressure reduction aspects are the details that have to be taken up while designing DRIPS as a case-specific solution.

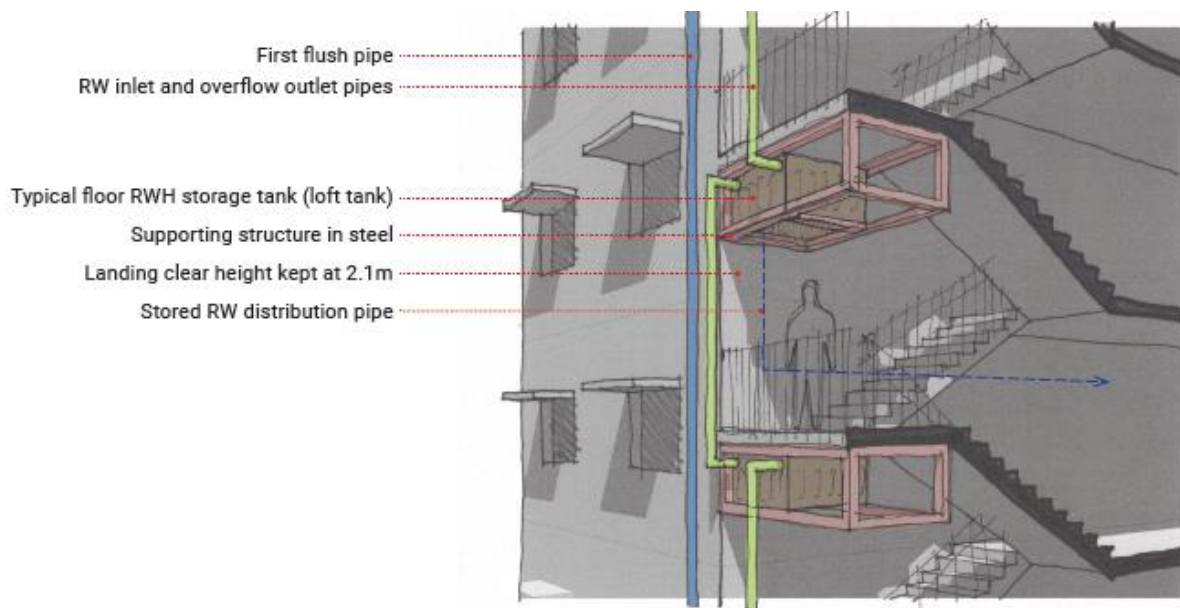


Figure 6. Sectional perspective sketch of the typical floor with DRIPS.

Structure

Structurally, the tanks in their overhead positions are proposed to be supported by a steel framework fixed with the building structure with the choice of capacity and size as per specific site conditions but can remain independent of the architectural character. The tanks have been visualized as market available polyvinyl chloride (PVC) tanks.

Cost

In general, the cost of integrated systems in new building projects is very low compared to retrofitted options. Moreover, careful planning and design can bring down the cost of a rainwater system substantially (Eldho, 2020). The estimated investment cost is as low as 0.16% of the total construction cost with instant recovery potential for commercial projects. A fast payback is indicated in scenarios with paid water service. Cost assessments against conventional methods indicated that DRIPS can be executed at costs half of that of a stand-alone underground/ semi-underground storage tank. However, retrofitting DRIPS into an existing building would be relatively costlier as the initial sharing of costs would be absent.

MERITS AND BENEFITS OF DRIPS

Water security in urban areas

DRIPS is an alternative to conventional ways of rainwater harvesting in urban complexes that encroach open yards by a stand-alone underground storage tank. It aids in freeing ground areas for increased plantation and permeable surfaces on one hand while eliminating the use of energy to pump the harvested water to an overhead tank on the other. It suggests integration of this system directly with the building structure so that the whole performs as one unit and reaps multiple benefits for users.

DRIPS utilizes the verticality of contemporary urban constructions by having a series of inter-connected multi-storied rainwater storage tanks that are easily accessible; serviceable; works both singularly and collectively; extends beyond meeting sanitary water demands during power supply failures; and transferable-cum-adaptable to buildings of most climatic zones/types/shapes and sizes.

Kolkata, like many other cities around the world, is also vulnerable to tropical cyclones that often interrupt the power supply. The city experienced such a disastrous situation during the Amphan super cyclone in 2020 when citizens had to bear long periods of no-power and consequently, no-water condition as they could not pump water to the roof-top tank from the underground reservoir (Scroll.in). Ironically, cyclones bring in heavy spells of rainfall that often result in inundation, causing paradoxical events of dry homes but flooded cities. DRIPS acts as a solution in such contradictory situations by supporting the basic sanitary functions of the household. The water may also be used for drinking purposes in acute emergencies, after suitable treatment and disinfection.

Figure 7 graphically expresses the advantages of DRIPS over the conventional rainwater storage practices occupying a substantial ground area. A snap-shot of the general attributes, merits, and possible demerits of DRIPS is given in Table 2.

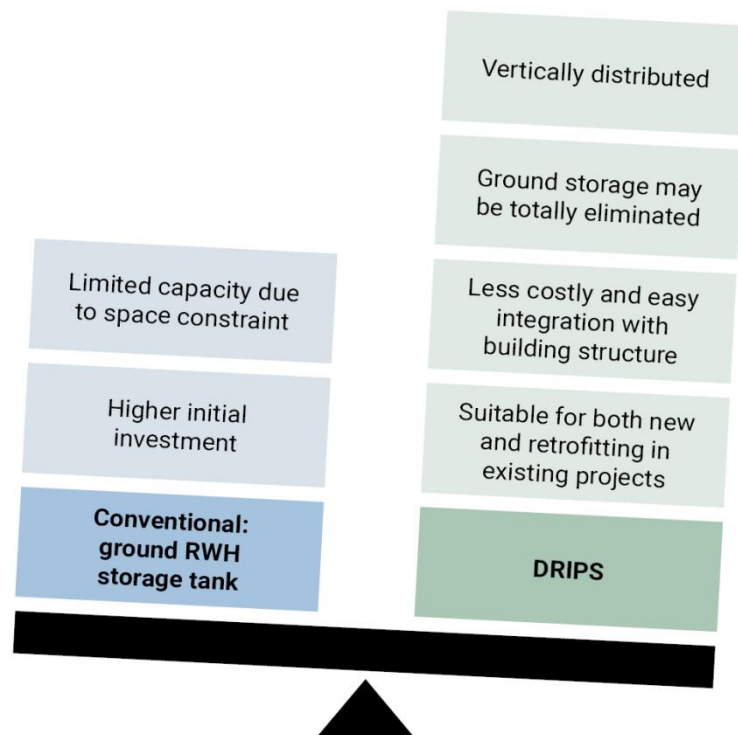


Figure 7. Merits of DRIPS compared to the conventional ground storage tank for rainwater harvesting.

Conventional ground RWH storage tanks	DRIPS
Attributes i. Surface-based underground or semi-underground storage tanks ii. One or more tanks depending on space availability iii. Usually a reinforced cement concrete (RCC) construction iv. Standard plumbing system	i. Multi-level loft tanks for rainwater storage housed at staircase landing levels ii. Series of connected tanks iii. Market available PVC tanks can be used iv. Improvised plumbing system v. Possible to retrofit even in existing buildings
Merits i. Stand-alone and independent of the building ii. Standard design iii. Implementation and operational aspects easy and doable by average skilled manpower iv. Maintenance and cleaning follow simple procedures.	i. Building-integrated innovative solution ii. Scalability – can be scaled up with taller buildings; or downscaled for smaller buildings iii. Replicability – can be replicated in all buildings across various typologies iv. It is possible to surpass the roof-top RWH potential for tall buildings and thus, maximize water conservation and reuse v. Can feed the immediate lower floor/s by gravity flow- thus also conserving energy vi. Use for non-potable purposes will reduce freshwater use vii. Reduce operational energy by saving the number of overhead tank refills viii. Reduce energy bills ix. Can be used for balcony or window gardens/ vertical gardens or vertical farming on each floor x. Flexible system; can be disassembled and removed/ replaced in parts xi. Lower initial investment xii. Lower repair and replacement costs xiii. Possible for both new as well as existing buildings xiv. Can bridge the gap of ‘dry taps but flooded city’ during cyclone induced power failures
Demerits i. Scalability and storage capacity gets limited due to space constraints ii. Energy-dependent iii. In most cases, the use is ill-defined or unclear, as the recycled STP water is used for non-potable purposes iv. Substantial initial investment v. High repair costs	i. Implementation and operational aspects of technical components like pressure reduction, plumbing joints, first flush, and filtration need to be handled by highly skilled manpower, which may be a constraint in certain cases. ii. Maintenance of the filtration tank may be challenging in certain cases.

vi. Limited possibility for existing buildings

Table 2. A comparative portrayal of DRIPS vis-a-vis the conventional ground RWH storage tanks.

DRIPS, thus, caters to all three dimensions of sustainable development – environmental, economic, and social. The specific benefits towards these three pillars of sustainability are represented in figure 8.

DRIPS also aligns well with four of the sustainable development goals (UNSDG, 2017), particularly goals 6 (Clean water and sanitation) and 11 (Sustainable cities and communities), as articulated in figure 9. These are given below; quoting their expanded connotations and the specific target that DRIPS tries to address:

- i. **Goal 6: Clean water and sanitation-** ensure availability and sustainable management of water
Target 6.a: By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies
- ii. **Goal 9: Industry Innovation and Infrastructure:** Build resilient infrastructure... and foster innovation
Target 9.1: Develop quality, reliable, sustainable, and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
- iii. **Goal 11: Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
- iv. **Goal 13: Climate action:** Take urgent action to combat climate change and its impacts
Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

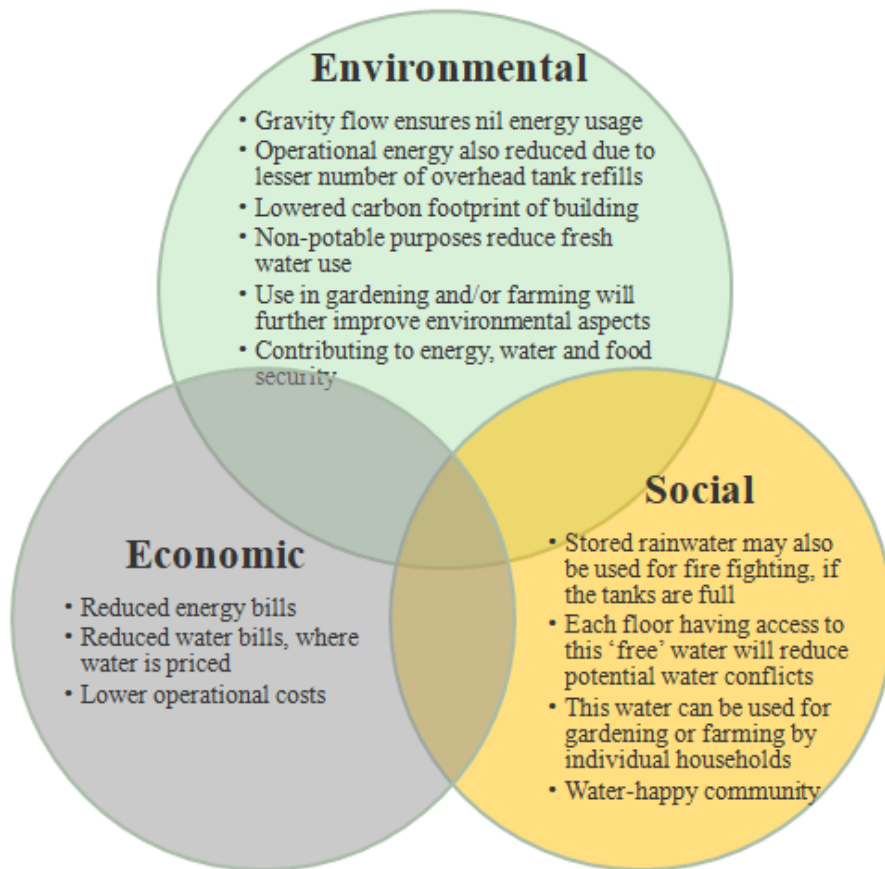


Figure 8. Benefits of DRIPS through sustainable development three-pillar representation.

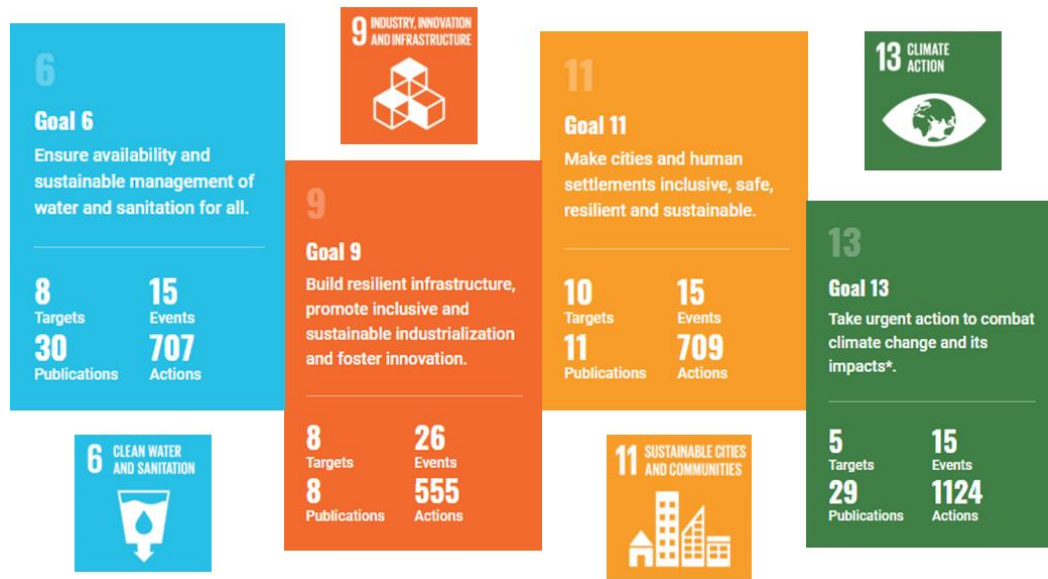


Figure 9. DRIPS and related SDG17 goals (UNSDG, 2017).

CONCLUSION

Demand-side management of water resources has been the recent global focus, as freshwater resources continue to get depleted. Integrated water resource management involves syncing water use patterns with the needs and demands of different users, including the environment (UN Water, 2021). While urban areas are plagued by water-stressed conditions, 45% of fresh water is wasted for non-potable uses like flushing, yard washing, irrigation, etc. because the conventional water-supply system does not apply this discretion.

Decentralized RWH integrated prototype system (DRIPS) is presented here as an alternative model for rainwater storage in multi-storied buildings as part of water resource management for cities under high water stress. The system attempts to address the issue of space constraint by integrating the harvesting system in the building structure, thus minimizing the storage tank size on the ground. It can supplement the primary water supply system and enable direct reuse of the stored water for non-potable uses, contributing to water security. The system has been quantitatively tested through a hypothetical design case of an 11-storied residential building in Kolkata to assess its viability. The results indicated that DRIPS fulfilled two-third of the stipulated volume of on-site water storage as per current norms. Further, DRIPS allows water to reach every apartment by simple gravity flow, thus avoiding any use of electrical energy, making building projects more water, energy & land efficient. It is a robust system that ensures water-cum-land use efficiency in urban areas. It assimilates building infrastructure and services with building form and structure to deliver a close-knit value-added entity.

As a concept, DRIPS can be adapted universally across the world, particularly for water-stressed cities. Spatial and physical aspects of buildings can be innovatively designed to maximize the utility of the system in the given context. The specificities of plumbing arrangements, layout, and capacities must be based on local environmental and social conditions within its generic framework. It is expected that multi-storied buildings adopting this method through their own RWH structures would be able to avoid acute shortage of water during climate emergencies, especially with reduced piped water supply in the summer season.

It addresses the sustainability concerns in human settlement areas and relates to the goals of SDG17. Hence, it is also important to collate DRIPS with appropriate policy-backed regulations for a sustainable water future for water-stressed cities and societies.

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RE-BUILDING FLOOD AFFECTED COMMUNITIES IN INDIA WITH ADAPTIVE ACTION BUILDING.

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ABSTRACT

Climate change is not happening in ten years, or it's not happening in one year, It's happening now. We are changing the Climate and Climate changing us. Rising sea levels, flooding cities affecting countries around the world. Its impact is on economy, environment, social and political. As per the stats major coastal cities at high risk, which are New York, Miami, Shanghai, Osaka, Indonesia and Mumbai, etc. These cities are with high population, high economy, land and living costs. As per United Nations the ocean conference it is estimated that more than 600 million people (around 10 percent of the world's population) live in coastal areas that are less than 10 meters above sea level.

By 2030, UN-HABITAT estimates that 3 billion people, about 40 percent of the world's population, will need access to adequate housing. It's estimated that the governments are spending three times more money in building cities. One, which was built, got demolished due to flooding, second is cleaning the damage and third is rebuilding again. Taking the problem as opportunity Adaptive Action Building (AAB) is a collective approach to make better communities that emphasizes people participation in collective research, design speculation and building. AAB makes a concerted effort to integrate three basic aspects of the work: Adaptive (local climate, context, materials and socio-economic status), Action (people engagement, experience and history), and Building (comprehensiveness in thought and realization).

The aim of the research is 'Go Local' in documenting and rebuilding the flood-affected areas in India with (AAB) Adaptive Action Building. Encourage local people to participation in documenting, planning, designing floating architecture and building their own communities to set an example and bench mark for other communities and cities. The quest is to make hybrid flexible typologies based on local environment, socio-economic status, context and local materials. The typology design form, space and functional organization are in the course of human behavior (time, space and activity) of the area, which can be adapted as per rising sea level, family growth and need. It does so through fusion of design, science, engineering and technology along with people participation in building 1:1.

Key Words: Flooding Cities, Collective Approach, People Participation, Adaptive Architecture, Flexible Typologies, and Floating Architecture.

INTRODUCTION

Food, Water and Shelter are three fundamental elements of human survival. Shelter helps to protect against nature adversaries. This crucial element of survival has evolved all through human existence. Urbanization and climate change are co-evolving in such a way that they place a much higher risk. This problem rather demands or calls for solutions to develop cohesive responses in both mitigation and adaptation of strategies to deal with climate change.



Figure 1. World – Change and Shift (Drawing by Author).

Why? Climate Change

One of the biggest threats to cities around the world is raising sea levels, caused by the expansion of water at higher temperatures and melting ice sheets on the north and south poles. UN climate negotiators met for summit in 2017, there is a new figure on the table: 3C. Until now, global efforts such as the Paris climate agreement have tried to limit global warming to 2C above pre-industrial levels. However, with latest projections pointing to an increase of 3.2C by 2100, these goals seem to be slipping out of reach. (1)

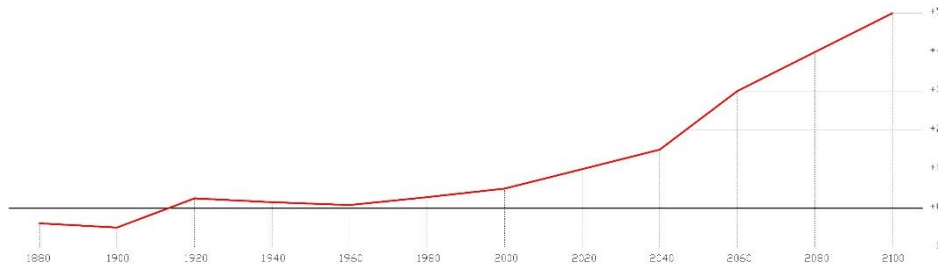


Figure 2. Global Temperature Rise (Drawing by Author).

What? Flooding Cities

When it comes to flooding, the coastal cities are most vulnerable. Millions of people live in the urban areas and sea-level rise will have a great impact on reshaping densely and sparsely populated areas, which has great impact on environment, economy, social, and political. It is estimated that countries spending three times more money in infrastructure of cities (one is to build, two is to clean and three is to rebuild again due to flooding) and developing countries cannot afford that. Many of Asia's fast-growing coastal megacities, with populations of 10 million or more, are vulnerable to multiple flood threats.

FLOODING SCENARIOS

Nature's fury raging across the nations has brought people closer to stand united in the face of such unforgiving adversity. Year's erratic monsoons have brought misery to many. While some parts of the country are parched with people fighting over water, other parts are wading neck-deep in water. Floods have consumed numerous lives, caused severe damage to property and have plunged vast sections of the population into despair.

Coastal floods accounted for only 1% of the flood events, while riverine floods accounted for the vast majority. River flooding in many areas actually deposits fertile sediments that aid food production. Flash floods that bring a level of unpredictability accounted for almost a sixth of the total, as did events that are unclassified. (2)

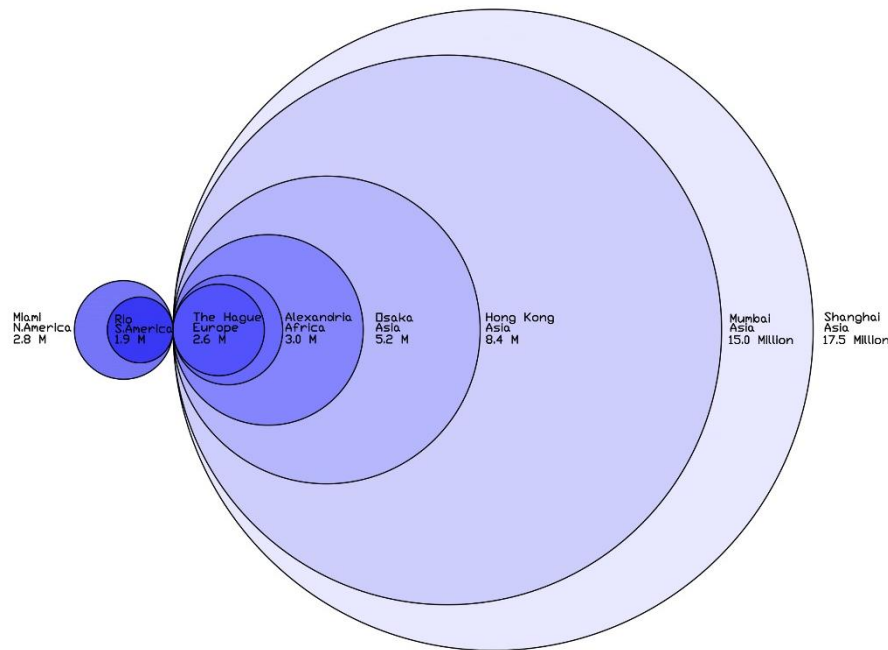


Figure 3. Flooding Around World Affecting Millions of People (Drawing by Author) *source: The Guardian, three-degree world cities drowned global warming.*

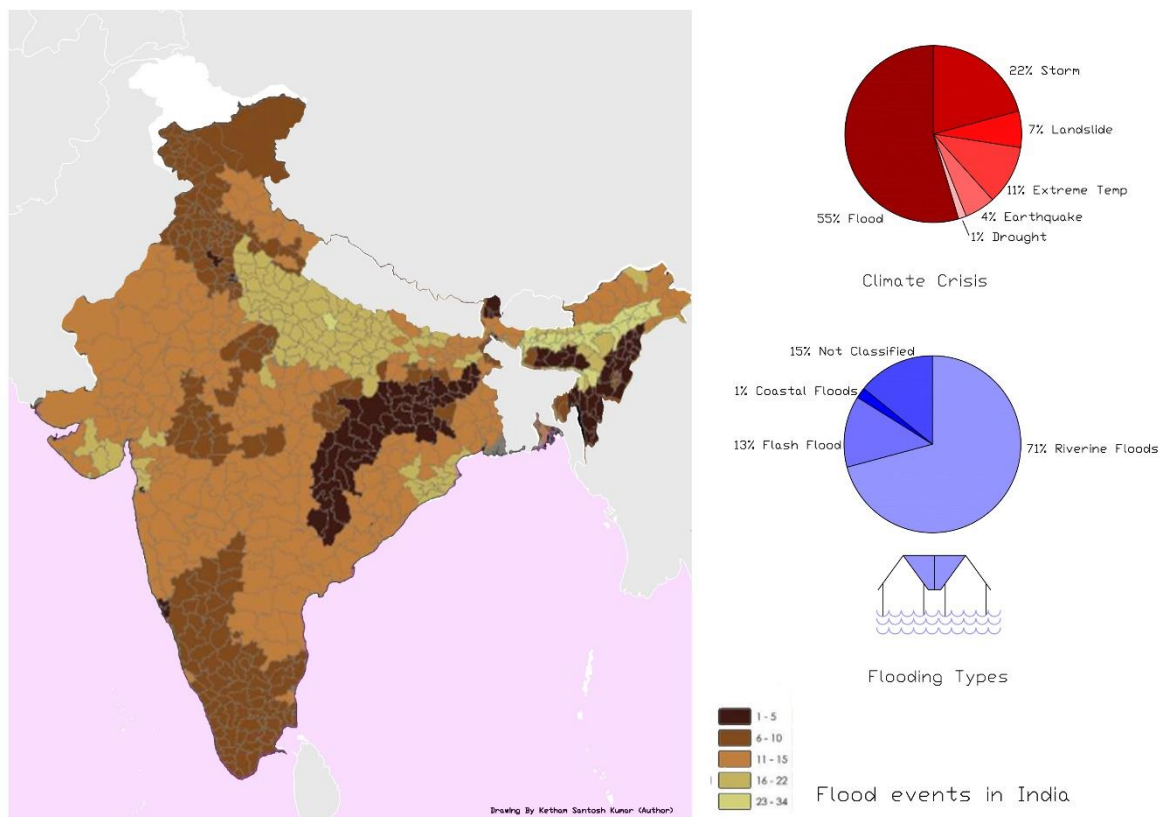


Figure 4. Flooding Events in India (Redrawn by Author) *source:Decoding the monsoon floods, SEEDS and CRED, New Delhi, January 2018.*

COASTAL CITY MUMBAI, INDIA

Mumbai, capital city of the state of Maharashtra, according to United Nations, as of 2018, is the most populous city of India and seventh-most populous city in the world with a population of roughly 20 million. A large island was created from the former seven smaller ones (Colaba, Little Cloaba, Bombay, Mazagaon, Worli, Parel and Mahim) and the largest land reclamation projects were completed by 1862. Mumbai is the result of intensive land reclamation measures that continue to this day.

Mumbai's flood risk makes the city a "high-risk" place for climate change vulnerability (according to VeriskMaplecroft's 2018 hazard index). Mumbai's high population density, high poverty rates and poor sewage and drainage systems "heighten the risk posed by climate-related events like flooding.

Mumbai "is an extremely important city in terms of the economic wealth it generates." The city's economy rivals that of some developed nations in Europe. Its stock exchange is valued at around \$2.2 trillion - almost twice the entire GDP of Mexico or Australia. Its Hindi-language Bollywood entertainment industry generates billions of dollars in global revenues each year.(3)

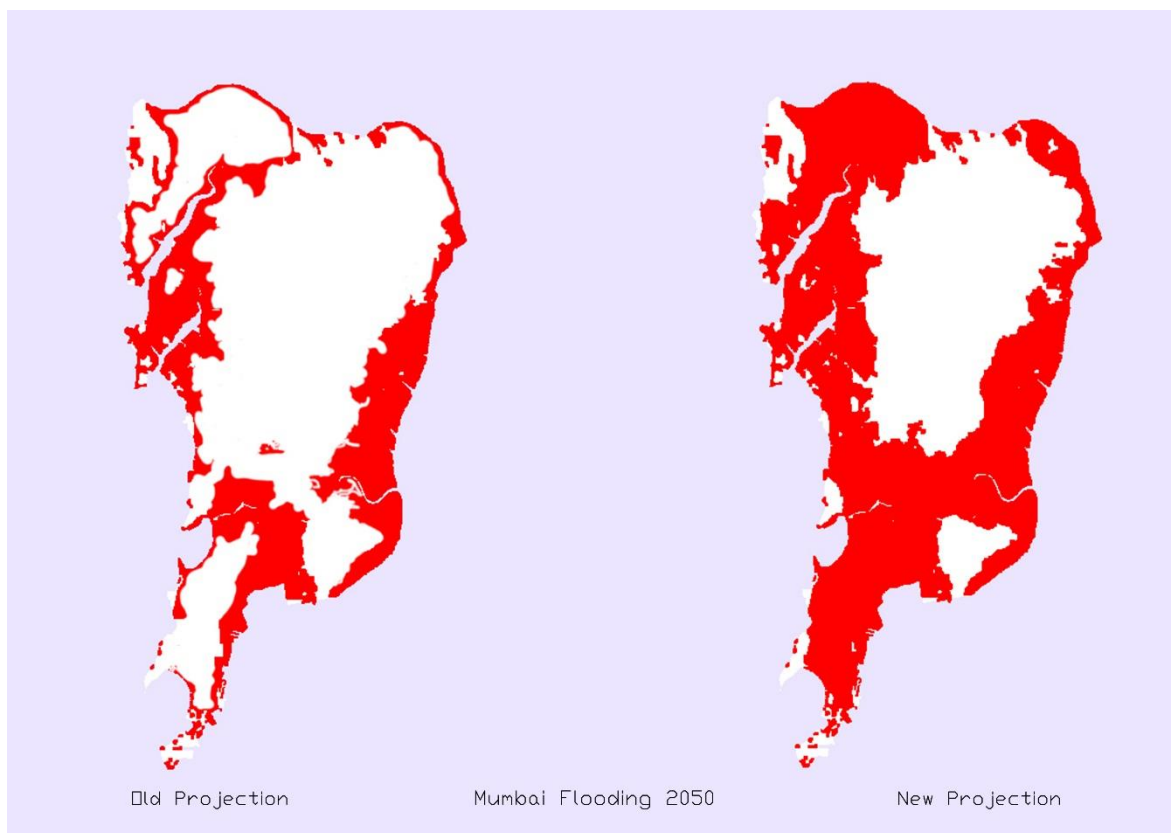


Figure 5. Mumbai Flooding 2050 (Redrawn by Author) *source:climate central organization and Indiatoday news.*

NON-COASTAL CITY HYDERABAD, INDIA

Hyderabad is the capital and largest city of the Indian state of Telangana. It occupies 650 square kilometers (250 sq mi) on the Deccan Plateau along the banks of the Musi River, in the northern part of South India. With an average altitude of 542 meters (1,778 ft), much of Hyderabad is situated on hilly terrain around artificial lakes, including the HussainSagar lake, predating the city's founding, in the north of the city center.(4)

The 2020 Hyderabad floods were a series of floods associated with Deep Depression BOB 02 that caused extensive damage and loss of life as a result of flash flooding in Hyderabad, India in October 2020. The fourth tropical cyclone and third deep depression of the 2020 North Indian Ocean cyclone season, BOB 02 formed on 11 October over the west-central Bay of Bengal and slowly drifted towards the east coast of India over the following three days.(5)The communities of people that are the most vulnerable to these disasters are those living in squatter settlements, slums, pavement dwellers, living in suburban and low-

lying areas that remain waterlogged many days after flooding also. People end up living without services, shelter, and potable water, food. These floodwaters with untreated solid waste and faecal matter flow around these squatter settlements and become responsible for outbreaks of diseases such as malaria, dengue, diarrhea.(6)

SUSTAINABLE ADAPTIVE ACTION BUILDING

Case studies examples from around the world to adapt (Climate) Change

PAKISTAN

Sindh Flood Rehabilitation Sindh Region, Pakistan, since 2010, By Yasmeen Lari

Every year hundreds of people die in Pakistan as a result of floods, and thousands lose their homes and livelihoods with the loss of livestock and seeds. Are these recurring disasters inevitable and why does massive state and international aid not provide sustainable solutions. The strategy developed by Heritage Foundation CEO Ar. Yasmeen Lari, in the light of research on construction materials and techniques carried out in various districts of Sindh. Flood-resistant houses are built by developing traditional construction methods, for example, by combining mud and lime. About 40,000 houses have already been completed and the dependence on development aid funds has been minimized: Low-cost, low carbon footprint. (7)

BANGLADESH

Friendship Centre, Gaibandha, Bangladesh, 2012, Kashef Mahboob Chowdhury/URBANA

The Friendship Centre is built on low-lying land surrounded by fields. Despite the threat of flooding, the cost of raising the building above the flood plain was too great so instead the designers created their own defense by building up the earth surrounding the site. Its position in an earthquake zone and the low bearing capacity of the silty soil added further complications. Therefore, the design relies on the surrounding embankment for flood protection while building directly on existing soil, using load-bearing masonry. Rainwater and surface run-off are collected in internal pools and the excess is pumped into an excavated pond, also used as a fishery. The spaces are carefully interwoven and form interplay of light and shadow. Architecture is inspired by Buddhist monasteries and the ruins of a nearby ancient settlement. (8)

SOUTH AMERICA

Sustainable post-tsunami reconstruction master plan, Alejandro Aravena, Elemental Architects

This master plan was developed after the 2010 earthquake and tsunami that struck Constitución, a city of 46,000 people located on the shore of the Pacific Ocean and 300km southwest of Chile's capital, Santiago. 8.8 Earthquake Chile - Sustainable reconstruction master plan proposes a strategy to respond with "geographical answers" to the "geographical threats" of the earthquake and tsunami risk. Construction of 484 dwellings in Villa Verde, the Cultural Center, and coastal cycle path has been completed, with additional reconstruction works, public buildings, and bridges underway. (9)

AFRICA

Kibera Public Space Project Nairobi, Kenya, since 2006 By Kounkuey Design Initiative

In densely packed Kibera - where around 250,000 people live in a space two-thirds the size of New York's Central Park—residents have long been struggling for land and tenancy rights. The Kibera Public Space Project (KPSP) is a network of interconnected hubs that transform crime hotspots, hazardous and polluted sites, dumps and polluted waterways into Productive Public Spaces. Bringing together economy, ecology and labor, such sites are turned into vibrant community hubs, integrating gardens, laundry pads, sanitation blocks, small business kiosks and playgrounds. Working with green infrastructures, including flood adaptation, reconstructed wetlands, planted revetments, stabilized riverbeds, composting toilets and income generating urban agriculture, is key to caring for people and planet, for human and ecological systems. (10)

EUROPE

Practicing Civic Ecology: Venice and the Lagoon, Jane Da Mosto

Today, Venice and the integrity of the lagoon ecosystem are seriously threatened by erosion caused by the strategic waterways that service the port, a major component of the local and regional economy. We are here Venice (WahV) is a research-based, activist-led, non-profit organization founded in 2012 to put the Venetians at the heart of efforts to protect and build the future, to restore attention to the lagoon and contribute scientific rigor to activist-led campaigns for change while ensuring that research is more responsive to the urgent challenges of the territory and inclusive of a variety of inputs from everyday life. All the stakeholder groups and economic interests need to be brought together to delineate their respective limits of possibility in terms of critical parameters. An area of common ground will emerge and, within this "area," final strategies can be located. (11)

SPECULATIVE DESIGN

Speculative Design may be understood as a new design approach – an open set of tools, techniques, and methods; ready to be used and adapted to various contexts in which we live and act – that emerged in the developed centers of the West around the turn of the last century. Over the past two decades it has increasingly taken on a more global character and influence. (12) A speculative design method can act as a catalyst for collectively redefining our relationship to reality. Cities need to develop coherently; a shared conversation needs to emerge from these various narratives.

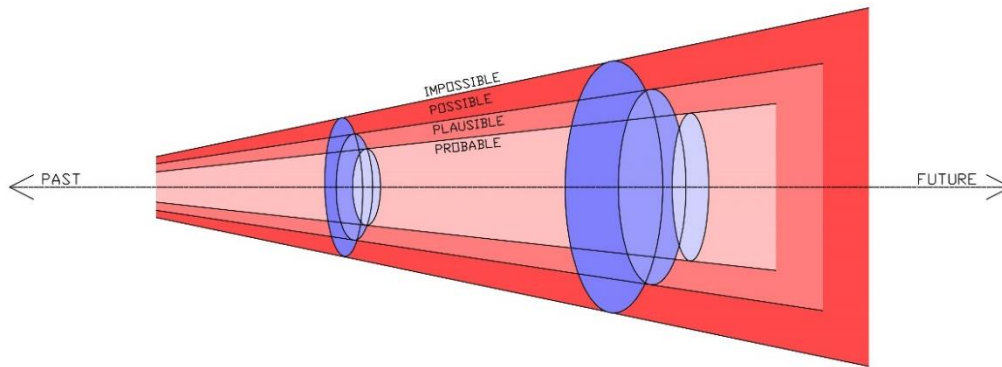


Figure 6. Speculative Design (Redrawn by Author) *source: Elliott P. Montgomery.*

Author applies speculative design as a method in practice for flooding cities. Speculative design is an evolving design practice that encourages the world to think further ahead and be more comprehensive in possibilities. The speculative design combines design-thinking methods with the story-telling and future-world-building techniques of speculative fiction to produce prototypes of future or experiences. These fantastic artifacts may be in the form of a physical or digital product, video, documentary, book, manual, website, sculpture or something else. Their purpose is to generate discussion, debate, and awareness beyond projected or plausible futures so that designers, companies, and the public not only live with more awareness of how their actions contribute to manifesting and hindering the future, but so they also begin to imagine and articulate their preferred futures. (13)

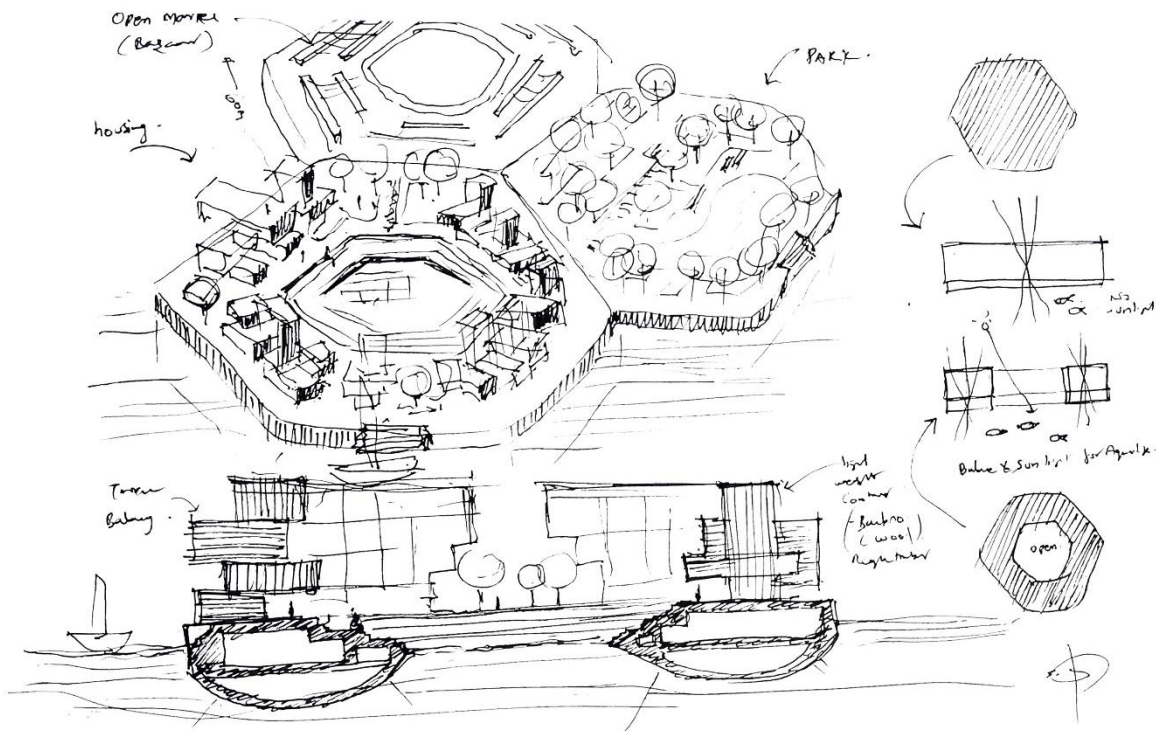


Figure 7. Speculative Design – Floating Architecture Sketch's by Author (Ketham Santosh Kumar).

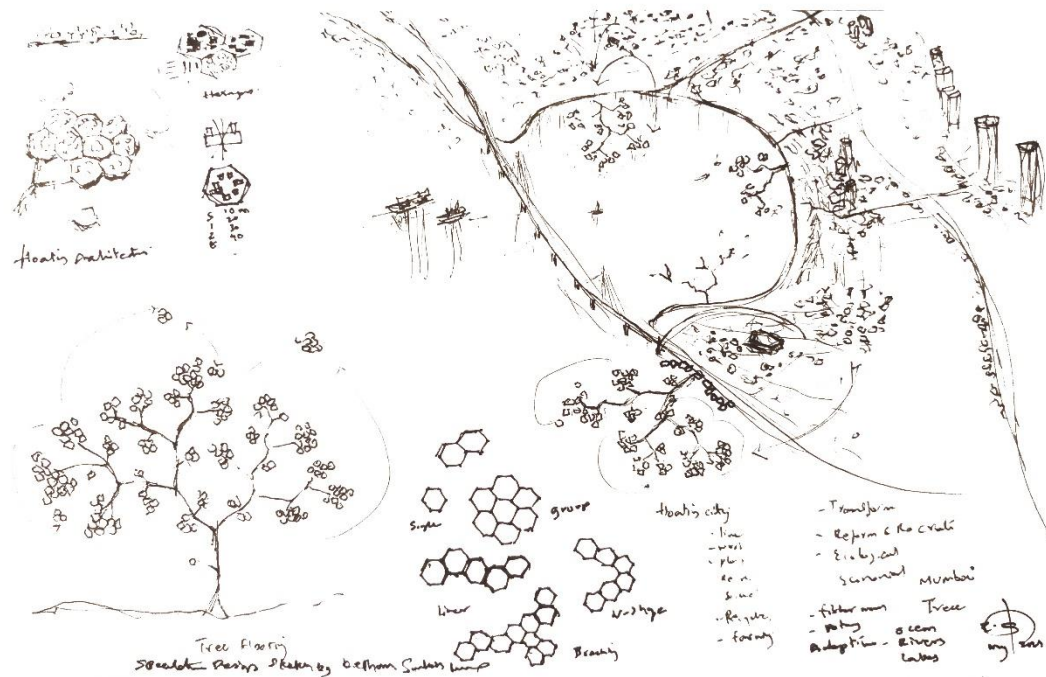


Figure 8. Speculative Design – Floating Architecture for Mumbai, Sketch's by Author (Ketham Santosh Kumar).

COLLECTIVE APPROACH BY THINKING HAND NGO

Collective approach is a method to act, react and reflect together for adaptive action building for flooding cities. Thinking Hand NGO follows collective approach as method in empowering and building communities. Thinking Hand is a non-profit organization; I (author) started in 2015, together with friends and students of planning and architecture institutions in Hyderabad, India. The name Thinking Hand is inspired by the idea of thinking and building with hands simultaneously emphasizing its hands-on approach. The work includes doing collective case studies, workshops, exhibitions, talks and building 1:1 projects with community participation, local & international students, academic institutions, government and private collaboration to bring change i.e. collective research, collective speculative design, and collective evaluation and making collective decisions. (14)

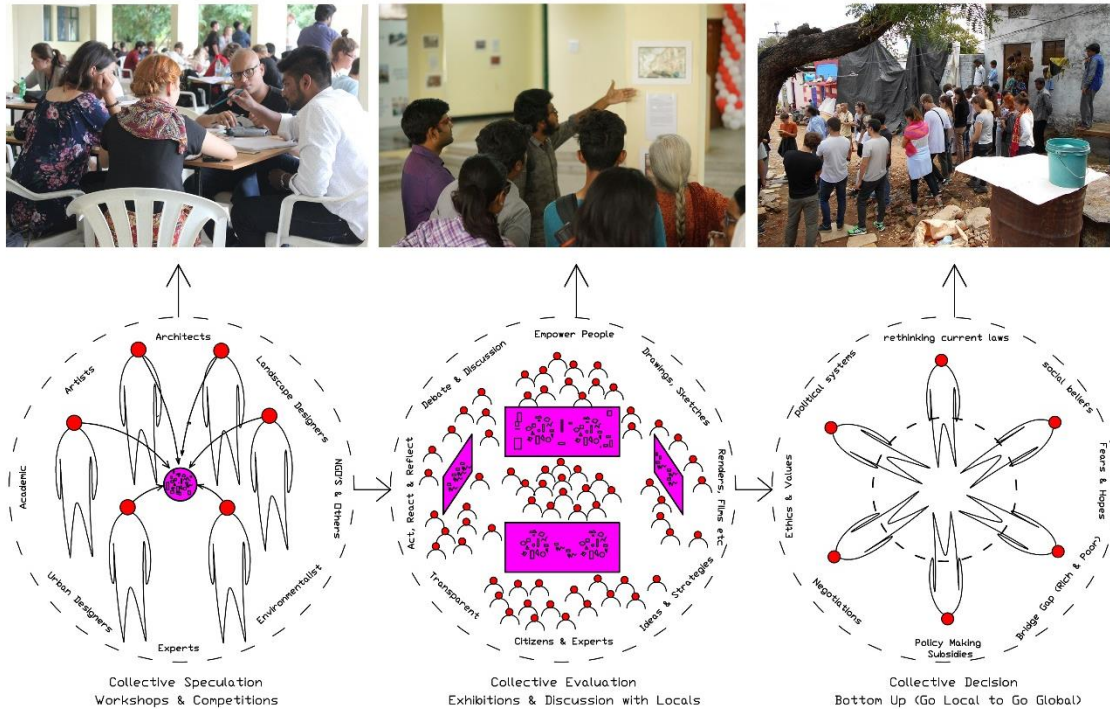


Figure 9. Collective Approach (Drawing by Author) *Image copyrights Thinking Hand NGO and Ketham's Atelier.*

Collective speculation is a method where architects, engineers, designers, filmmakers, artists, environment specialties and other experts come together working in form of workshops and competitions in speculating and designing's flooding cities. Workshops and competitions have had a defining role in architecture. They give a chance to experiment with new tools and new concepts in design; they are a way to build future narratives, and in a very realistic way, to learn from mistakes. Workshops and competitions can bring creative and out-of-the-box ideas to the table often developed in the form of images, stories, movies, animations, renderings, models, mockups and drawings. They give an opportunity to speculate on design and test the limits of what architecture can do for society.

Collective evaluation and decision making is an open and transparent method, which is in the form of exhibitions showcasing "what if scenarios" speculative ideas and designs produced in collective efforts. Citizens have a chance to collectively debate, discuss and choose what's relevant and apt to their community. Our ethos is that everyone should have equal opportunity, and the right to share their opinions, suggestions and thoughts in building healthy and sustainable cities, with no room for corruption and discrimination on the grounds of gender, race or religion. They can act as catalysts in negotiations and to bring a sense of responsibility in various communities, and professionals, and additionally put pressure on authorities to make better policies.

CONCLUSION

Cities are in critical conditions around world due to flooding scenarios affecting environment, economy, infrastructure, social and health. Therefore, it's high time to act, react and reflect collectively to rethink on flooding cities and communities. Research paper shows problems of two cities and also some real examples of adaptive action building for change. Research follows Thinking Hand NGO speculative design method i.e. collective approach to reform cities. Meaning collectively research, speculate, evaluate, discuss and make decisions so that cities can develop coherently. Research will be based on 'What-if scenarios' for probable, plausible, and possible future flooding cities. This can act as a catalyst for collectively redefining our relationship to reality. I believe, that if architects, designers, engineers, students and others experts can be on one platform the synthesis of their ideas and collective building will help in producing sustainable cities. Further collective action can create an impact on rethinking current laws, political systems, social beliefs, ethics, values, fears and hopes. This can start at smaller community level to set an example and later can be adapted to region, cities, states and countries.

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A STUDY ON THE REDUCTION OF WATER CONSUMPTION DUE TO SELECTION OF FIXTURES IN INTERIOR DESIGN

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ABSTRACT

Alternative sources can be offered instead of rapidly decreasing energy sources, it is very difficult to recommend alternative water sources for rapidly decreasing water sources. For this reason, the rational use of water resources is very important in terms of protecting the ecological balance and ensuring the sustainable development of human beings. When the annual amount of usable water per capita in our country is analyzed by years; It is seen that it is 1652 m³ in 2000, 1544 m³ in 2009 and 1346 m³ in 2020. Looking at the projections for the next year, it is predicted that the population of Turkey will be 100 million in 2040. In such a scenario, the amount of usable water per capita is expected to be approximately 1,120 m³.

The fact that the amount of water consumed in buildings is approximately 15%, necessitates the effective use of water in building design. Environmental problems such as water scarcity, air pollution and reduction of natural resources have revealed the necessity of designing buildings with reduced environmental impacts. This concept, also called green building; It includes requirements for healthy, energy efficient building design with reduced environmental impact.

One of the most widely used Green Building Rating systems in the world and in our country is the LEED. LEED stands for Leadership Energy and Environmental Design. As of September 2021, there are 452 LEED certified buildings in our country.

In this study, LEED ID+C (Interior Design and Construction), one of the LEED categories followed for interior spaces, and Water Efficiency from its sub-headings were followed. In the first step, the annual water consumption amount (liter/year) was calculated according to the baseline values given in the EPAct 1992 standard in an office building. In the second step, calculations were made with water efficient fixtures. Two separate calculations; water consumption values for toilet, kitchen faucet, lavatory faucet, showerhead, urinal are included. With the use of fixtures with EPAct baseline values, 662,350,00 liters of water is consumed annually in an office building. With the selection of water efficient fixtures, 326,300,00 liters of water is consumed annually. Thus, it has been revealed that an annual water efficiency of 50.74% has been achieved.

Key Words: LEED ID+C, EPAct, Water efficiency

INTRODUCTION

In parallel with the rapid population growth, the need for water increases, but water resources are limited. The total amount of water in the world is 1 billion 400 m and covers three quarters of the earth. While 97.5% of the water is found in the seas and oceans as saline water, 2.5% is fresh water [1]. The distribution of water resources on earth is shown in Figure 1.

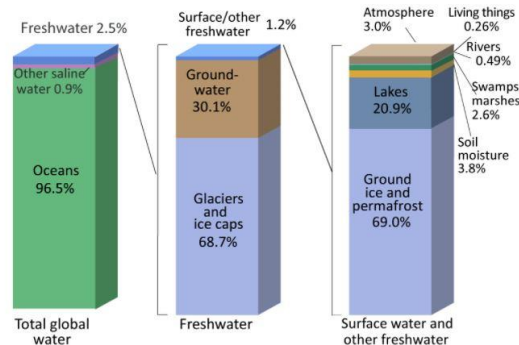


Figure 1. The distribution of water on, in, and above the Earth. (usgs.gov).

Increasing environmental pollution, unconscious water consumption and uneven distribution of water resources according to population density cause intense water stress in some regions. As a result of this situation, 1.2 billion people in the world do not have access to safe drinking water, and 2.4 billion people do not have access to water suitable for sanitary conditions [2]. Only 12% of the population consumes 85% of the water used in the world [3]. According to the United Nations, global water consumption has increased nearly 6 times in the last 100 years. [4].

When the water consumption rates in our country are examined; It is seen that 74% (40 billion m³) is used for irrigation, 13% (7 billion m³) for drinking water and 13% (7 billion m³) for industrial water need [5]. When the annual amount of usable water per capita in our country is examined from past to present; It was seen that it was 1652 m³ in 2000, 1544 m³ in 2009 and 1346 m³ in 2020. It is estimated that the population of our country will be 100 million in 2040. The amount of usable water per capita for 2040 has been calculated as approximately 1.120 m³. Thus, it is possible to say that Turkey will be a country that stress from water shortages and in the future [6].

WATER USE IN BUILDINGS

The fact that the amount of water consumed in buildings is approximately 15% makes it necessary to use water efficiently in buildings. When we look at the factors affecting water consumption in buildings; we see that there are climate-related factors, building-related factors, and user-related factors.

Climate Related Factors : Directly affecting water consumption; factors such as soil, air temperatures, humidity, amount of precipitation, vapor pressures, wind speed and solar radiation can be considered in this group [7].

Factors Related to Building : Variables such as the function, location, layout and landscaping of the building can be considered in this group [7].

User Related Factors : Water consumption in buildings is directly related to user behaviors. The amount of water consumption of users varies according to race, age, gender, socio-economic status, social, cultural and religious influences.

ENSURING WATER EFFICIENCY IN BUILDING DESIGN

Water efficiency in buildings is possible with the elimination of water losses, the use of innovative wastewater technologies and the use of rain water by collecting, the use of water-effective sanitary wares and water-effective fixtures.

Water Savings By Eliminating Water Losses And Leaks : The way to minimize water loss-leakage in buildings is to determine the loss-leakage points. When the main reasons are examined; High water pressure, poor quality pipe material, insufficient pipe diameters, poor workmanship and poor water quality are seen in the installation [7]. Some examples of water loss points in buildings are given in Figure 2 and Figure 3.



Figure 2. Water Leak in Plumbing (<https://www.ul.com/news/understanding-new-leak-detection-technology>).



Figure 3. Water Leak in Plumbing (<https://metroplexleaklocate.com/6-signs-of-a-water-leak-that-every-homeowner-should-recognize/>).

Water Saving With Innovative Wastewater Technologies : With the increase in population, agricultural activities and industrialization, ground and surface waters are insufficient. Many countries are turning to the reuse of wastewater to meet their water needs [8]. Applications for the recovery of wastewater in buildings are listed below.

- **Reuse Of Gray Water :** Waste water from places other than toilets and urinals. Generally, gray water is used in landscape irrigation and reservoirs. The potential sources and use of gray water are shown in Figure 4.

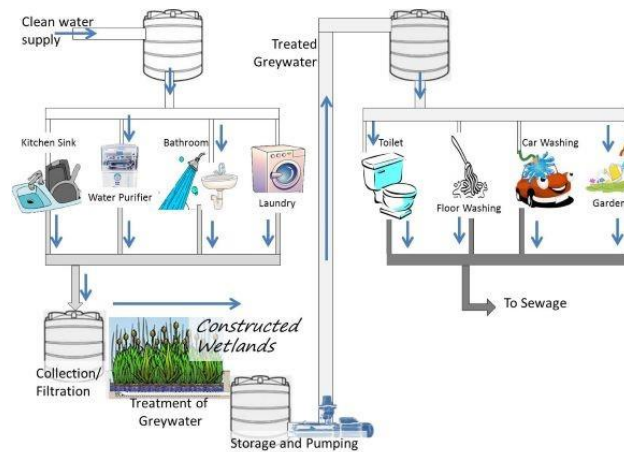


Figure 4. Example Of Gray Water Usage (<https://www.iamrenew.com/wp-content/uploads/2019/06/Grey-Water-Usage.jpg>).

- **Rainwater Use :** The main purpose of using rain water in buildings; to provide reliable water supply in areas where underground and surface resources are limited and access to water resources is extremely costly. Rainwater collected in the building can be used both indoors and outdoors. Example use of rainwater harvesting in non-residential commercial projects is shown in figure 5.

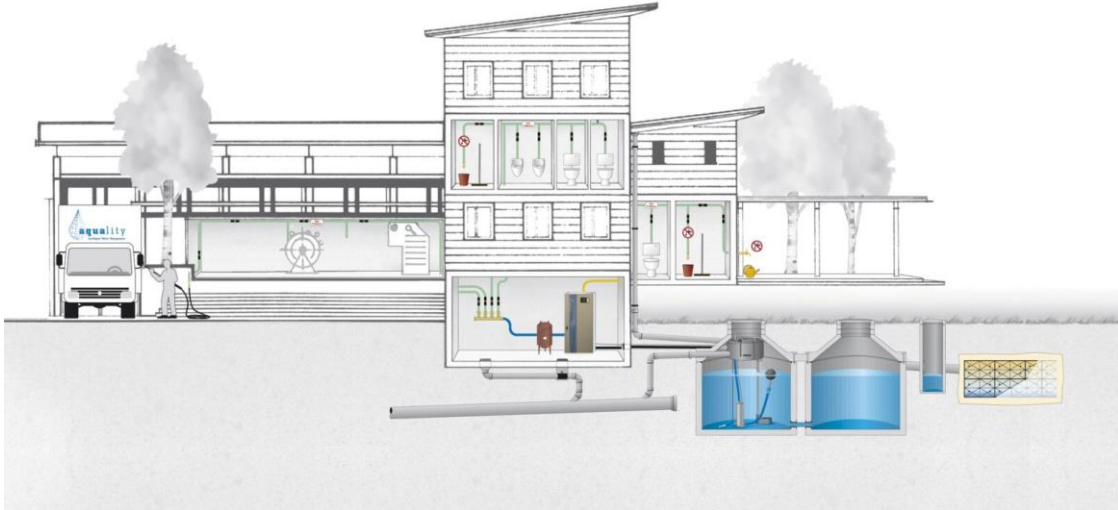


Figure 5. Example Use Of Rainwater Harvesting In-Non Residential Commercial Projects
(<https://www.architectsjournal.co.uk/archive/rain-water-harvesting>).

Water Conservation With The Use Of Water Efficient Fixtures : Office buildings also have high water consumption and it is more complicated to calculate water consumption in such buildings. Water consumption in this type of buildings is defined and listed according to the following factors;

- 1) Number of staff, visitors;
- 2) The daily usage time of the building;
- 3) Average daily usage hours of staff;
- 4) Average daily visit times of visitors;
- 5) Visitor and staff female/male ratio [9].

With today's technology, sanitary wares, which can work effectively or even without water, have started to be produced for use in wet places. For example, waterless urinals have been developed to replace the urinals that are frequently used in offices. In this application, a small amount of gel is used instead of water.

LEED INTERIOR DESIGN CONSTRUCTION (ID+C) AND REDUCING WATER USE IN INTERIOR DESIGN

LEED, one of the most widely used green building rating systems in the world and in Turkey, was established in 1993 by the United States Green Building Council to guide sustainable built environment studies in the United States. There are categories that can be applied for different building types. As of September, there are 452 projects in Turkey whose LEED certification process has been completed. Within the scope of this study, the LEED v4 Interior Design and Construction category, which was developed directly for interior spaces, was discussed. There are 41 projects certified in the ID+C category in Turkey [10].

In the LEED v4 ID+C, the sustainability criteria of buildings are evaluated in 8 main categories. These categories are; Integrative Process, Location and Transportation, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation and Regional Priority. Points are earned by meeting the prerequisites set under each category and completing credits. The prerequisites and credits for the categories are shown in Table 1.

LEED ID+C Main Categories	Points
Integrative Process	2
Location and Transportation	18
Water Efficiency	12
Energy and Atmosphere	38
Materials and Resources	13
Indoor Environmental Quality	17
Innovation	6
Regional Priority	4

Table 1. Categories of LEED ID+C.

Within the scope of LEED, the water efficiency category is evaluated under two separate headings as reducing water consumption indoors and reducing water consumption outdoors. However, since the ID+C category evaluates water efficiency at the indoor scale, this category consists of a prerequisite for reducing indoor water use and a credit for reducing indoor water use. A maximum of 12 points can be earned from this credit. In order to be able to follow up the credit, first of all, the prerequisite must be met.

The scores of the projects certified in the ID+C v4 category in Turkey in the “Water Efficiency” category are given in table 2.

Project Name (LEED ID+C v4)	Water Efficiency-Awarded
Nike Factory Store Eskisehir	10 / 12
Credit Suisse Zorlu Office	12 / 12
Google Istanbul Office Level 5	10 / 12
Denizbank Headquarters	10 / 12
Anadolu Hayat Emeklilik Manzara Adalar	8 / 12
Citi New Istanbulasya Corporate Branch	12 / 12
Nike Factory Store Nazilli	10 / 12
Nike Factory Store Istanbul 212	10 / 12
Mc Istanbul Expansion	12 / 12
Nike Factory Store Samsum	10 / 12
P&G Istanbul General Office	12 / 12
Nike Factory Store Ankara Optimum	10 / 12
Basf Turk Headquarters	8 / 12
Turk Ytong Headquarters	6 / 12
Alternatif Bank Headquarters	10 / 12

Table 2. Points Earned by Water Efficiency Credits, LEED ID+C Projects in Turkey [10].

A Prerequisite For Reducing Indoor Water Use : In order to meet the prerequisite, the annual amount of water consumed in the building must be reduced by at least 20% compared to the baseline values specified in the EPAct 1992 (Energy Policy Act) standard. In addition, it is expected that the selected fixtures will have a water label such as WaterSense or Water Label containing water consumption information, and equipment such as laundry, dishwasher, ice machine to be used in the building are expected to be energy efficient.

Indoor Water Use Reduction Credit : The intent of this credit is to reduce indoor water consumption and a maximum of 12 points can be earned. In order to follow this credit, the annual amount of water consumed in the building must be reduced by at least 25% compared to the baseline values specified in the EPAct (1992) standard. The maximum water consumption values (baseline values) of the fixtures that should be used in the building according to the EPAct 1992 standard are shown in table 3.

Maximum Installed Flush/Flow Rate	
Fixture Type	(SI)
Toilet	6 lpf
Urinal	3,8 lpf
Public lavatory (restroom) faucet	1,9 lpm
Private lavatory faucet	8,3 lpm
Kitchen faucet	8,3 lpm
Showerhead	9,5 lpm

Table 3. Baseline Water Consumption of Fixtures and Fittings [11].

If 25%, 30%, 35%, 40%, 45% water efficiency is achieved, 2, 4, 6, 8, 10 points can be earned, respectively. In case of 50% water efficiency, the points earned vary depending on the building type; 12 points can be earned for commercial interiors and 11 points for interior projects with accommodation function.

CASE STUDY

In this study, it is assumed that an office building operates 260 days a year and has 100 employees. Weekends and public holidays are not taken into account when calculating the annual days of operation. It is accepted that 50% of office users are female and 50% and male. According to the number of users-square meter calculations given in LEED, it is stated that the square meter per person in office buildings is 23 square meters. For this reason, the area of the office building where 100 people work is calculated as 2300 m². In the default calculations to be made, the number of visitors for the office building is set to 0. Therefore, the number of visitors is not included in the calculations. The values to monitor for default calculations are shown in Table 4.

	Gross square meters per occupant	
	Employees	Transients
General Office	23	0
Retail, general	51	12
Restaurant	40	9
Grocery Store	51	11
Hotel	139	65

Table 4. Default Occupancy Numbers [12].

The following parameters are taken into account in the annual water consumption calculations:

- Number of days the building was operated,
- Number of building users,
- The maximum water consumption values that should be in sanitary ware and fixtures are determined in EPAAct standards,
- Fixture usage frequencies,
- Water consumption values of the fixtures used in the building.

The calculator produces the following:

- Annual baseline water consumption (liters per year)
- Annual design case water consumption (liters per year)
- Percentage savings between baseline and design cases

The formula followed is shown in Tables 5 and 6.

Daily water use for each fixture type	=	Fixture flush or flow rate	x	Duration of use	x	Users	x	Users per person per day
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Table 5. Basic indoor waste use reduction calculation [12].

$$\% \text{ improvement from baseline} = \left\{ \frac{\text{Baseline volume} - \text{Performance volume}}{\text{Baseline volume}} \right\} \times 100$$

Table 6. Indoor waste-use reduction [12].

CALCULATIONS

For the fixtures used in the building, the product catalogs of the manufacturers were examined and calculations were made by considering the most efficient water consumption values below.

Fixture Type	SI
Toilet	2,5-4 lpf
Kitchen faucet	5 lpm
Lavatory faucet	1,3 lpm
Showerhead	5,7 lpm
Urinal	Non-water

Table 7. Alternative flush/flow rates.

The duration of use, number of users, and uses per person per day are calculated the same in both the baseline and the design cases. The value of 3.25 lpf, which is the average of dual flush (high flush:low flush), is taken into account for the design flush value. The values in Table 7 are directly included in the calculation.

The values taken for the duration of use and uses per day are shown in Table 8. All employees included in the account are full-time employees (FTE).

Fixture Type	Duration (sec)	Uses per day
		Employees(FTE)
Water closet (female)	n/a	3
Water closet (male)	n/a	1
Urinal (female)	n/a	0
Urinal (male)	n/a	2
Public lavatory faucet	30	3
Shower	300	0.1
Kitchen faucet	15	1

Table 8. Duration of use and uses per day are calculated using defaults [12].

Firstly, annual water consumption calculations are made for toilet and urinal. The results are shown in table 9.

Fixture Information		Flush Rate		Uses per Day		Total Daily Uses	Total Daily Water Use	
Fixture Family	Fixture Type	Baseline Flush Rate (lpf)	Alternative Flush Rate (lpf)	Employees (FTE)	Visitors		Baseline (liters)	Alternative (liters)
Toilet(male)	Dual-flush Water Closet	6,00	3,25	1,00	0,00	50,0	300,00	162,5
Toilet(female)	Dual-flush Water Closet	6,00	3,25	3,00	0,00	150,0	900,00	487,5
Urinal	Non-Water Urinal	3,80	0	2,00	0,00	100,0	380,00	0
Baseline case annual flush volume(liters/years)			410.800,00					
Design case annual flush volume(liters/years)			169.000,00					

Table 9. Annual flush volume (liters/years).

Secondly, annual water consumption of public lavatory faucet, kitchen faucet and showerheads were calculated. The results are shown in table 10.

Fixture Information		Duration	Flow Rate		Uses per Day		Total Daily Uses	Total Daily Water Use	
Fixture Type		(second)	Baseline Flow Rate (lpm)	Alternative Flush Rate (lpf)	Employees (FTE)	Visitors		Baseline (liters)	Alternative (liters)
Public lavatory (restroom) faucet		30	1,90	1,3	3,00	0,00	300,0	285,00	195,00
Kitchen Faucet		15	8,30	5	1,00	0,00	100,0	207,50	125,00
Showerhead		300	9,50	5,7	0,1	0,00	10,0	475,00	285,00
Baseline case annual flow volume(liters/year)			251.550,00						
Design case annual flow volume (liters/year)			157.300,00						

Table 10. Annual flow volume (liters/year).

Baseline Case (Liters/Years)			Alternative Case (Liters/Years)		
Annual Flush Volume	Annual Flow Volume	Annual Consumption	Annual Flush Volume	Annual Flow Volume	Annual Consumption
410.800,00	251.550,00	662.350,00	169.000,00	157.300,00	326.300,00

Table 11. Annual baseline and design water consumption (liters/year).

The efficiency obtained from the selection of efficient fixtures used indoors is shown in Table 12.

Annual baseline water consumption (liters/year)	662.350,00
Annual alternative water consumption (liters/year)	326.300,00
Percent water use reduction (%)	50,74%

Table 12. The percentage of water reduced indoors.

CONCLUSION

In this study, water consumptions were calculated separately for baseline values and for design values in order to reveal the efficiency resulting from the selection of fixtures. While the values in table 3 were taken into account for the baseline values, the values in table 7 were taken into account for the design values. In the calculation made with baseline values, the total annual water consumption in the office was 662,350,00 liters. The annual water consumption was calculated as 326,300,00 in the calculation made with the most efficient fixtures available in the manufacturers. 336,050,00 liters of water can be saved annually due to the choice of fixtures by interior architects. This amount corresponds to 50.74%. Interior architects can calculate annual water consumption for buildings using the method in tables 5 and 6.

Calculation of annual water consumption in office buildings is more complicated than in residential. The number of days the building is operated, the users of the building, the frequency of use of the fixtures and the water consumption values of the fixtures should be included in the calculations. Interior architects have a great importance in solving environmental problems. Due to limited water resources, interior designers should definitely consider water consumption as a design decision when choosing fixtures. Water consumption values are clearly stated in the manufacturers' catalogues. If this information is not qualify, additional product information should be requested from the manufacturers.

This study is just a sampling. Considering the skyscrapers where thousands of people work, it is obvious that a very serious savings will be made. This savings makes a great contribution to the economy of country and future.

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RIVERS AS AN URBAN ELEMENT OF CHANGE

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ABSTRACT

River banks, traditionally, have been a suitable ground for establishment of settlements and for their urban growth. As there wasn't a specific *Modus Vivendi* in development of the settlements, this advantage shaped the urban forms in variety of ways and created diversity of urban patterns along the rivers. This also affected the way(s) in which the water elements were engaged in setting and designing urban spaces.

This paper will elaborate on how the areas along the river enhance public space qualities. Accordingly urban forms will be categorized as those where the life was developed along the river or else those where the life was set on the river, and in both inevitable element of water is constantly present.

Examples from the major European cities that have been shaped by their grand rivers, such as London, Dusseldorf...will provide a brief conclusion on the impact that the rivers have on urban life especially after the rapid urban growth in which some of the external industrial areas were included to become inner city.

Key Words: public space, urban life, rivers, urban development

INTRODUCTION

In historical sense, the regeneration of the waterfronts and riverbanks in particular, has important place in development of cities and its neighborhoods. The Greeks, Romans and Byzantines all engaged in harbour-building and waterfront renewal in response to changing political, economic and geological circumstances (Smith & Garcia Ferrari, 2012, p.12).

Beyond its significance as a main source of life, water was used for irrigating land, and in some cases as transportation routes or even as a part of the defense system of the settlement. As Wylson (Wylson, 1986, p.71) suggests, over the centuries the urban waterfront provided for religious activities, civic ceremonies, defense, and transportation, access for maritime trade and fishing, warehousing and waterside industry.

Rivers also assured sustainability of the inhabited area from several aspects. In first place its positive environmental effects on the surrounding. Furthermore, specific socio cultural environment along the river emerged, as well as a distinct own identities that are site specific (Timur, 2013). Presence of water shapes urban forms in a visually positive way contributing to the overall observable architectural qualities of the space. These forms take different shapes as a response to the relationship between the water and the land. As Moore cited, ever since cities were built along river streams the configuration generated variety of urban layouts (Moore,1994). Cities that have developed their river banks gained significance in urban life. Moore mentioned that the edge created between river and the city is major factor of *river cities*, particularly the transition created between river and city (Moore,1994, p.97).

The developed areas carry an element of estheticism related/customized to environment which plays an important part and has a positive effect on socio cultural attitudes and experience of the spaces.

Apart from spontaneously developed river banks and the introduced (urban) elements that have been more the result of life experience than active planning, modern urbanization has brought new trends in civic development. By the late 18th century, in parallel to the modern industry growth, urban growth brought changes of land use. Urbanization negatively affected river basins due to increased pollution, migration etc. Gradually river banks that served as the frontiers of the large industrial complexes were abandoned and became unattractive spaces within the urban areas. Last twenty years of the 20th century saw changes in rejuvenating these areas. Many European cities showed positive examples such as the Docklands area on river Thames in London (Church, 1988, pp.187-208) and Medie Hafen on river Rhine advertised as the Dusseldorf's culture, communication and creativity centre (City of Düsseldorf,2018, p.1).

This papers aim is to discuss the relation of the water on the urban development of the riverbanks. including major urban rejuvenation. A general review of areas associated with rivers provides us conclusions of the quality of the spaces developments through the aspects of urban functionality (activities), form and socio cultural qualities.

URBAN FORMS AND RIVERS

The relation of urban form and river is an inevitable topic in discussing aspects of urban form development and the natural settings and environment influences. Following natural morphological settings many urban areas used that as an advantage creating distinguished urban form.

According to Wrenn urban waterfronts have been distinguished in five categories depending on their location on/with water (Wrenn, 1983, p. 218).

1. *Urban area located on peninsula,*
2. *Urban area located on a bay,*
3. *Urban area located on banks of a river,*
4. *Urban area located on banks of intersecting rivers,*
5. *Urban area located on a large body of water.” (Timur, 2013).*

Further on, Pattacini (2021) summarized relation of urban layout and rivers which are proposed by different authors, to be distinguished into *river city*, bridge city or hybrid one, stressing that rivers are integral part of urban open space network. Further on, type of open spaces along the river are categorized as linear or else as squares.

Alexander (Alexander et al., 1977, p. 137) stresses importance of preserving belt of land immediately bedside the water which depend on settlement type and its density which affect the size of the belt of land. The water is an enjoyable element of the urban setting appreciated by the users who choose to be close to the water. This is why the river banks are occupied in a different way, and currently rethought to be more closely engaged in urban form development.

RIVERS AND URBAN LIFE

Character of the place is determined with form, activities and its meaning. In the *river cities*, rivers affect the space arrangement and consequently the space experiences as well. Particularly, the path set along the river or the banks arranged or even the built up area with the facade facing the river may gain much of qualities including those of aesthetic values, socio cultural, etc. This also may include some of the symbolic meaning associated to the specific river.

If the public spaces set along are arranged to utilize many of public activities they would be better perceived, while also engaging all senses. Woolley (2003, p. 123) stressed that water in an urban situation can provide three sensual opportunities sight, sound and touch while not all of them are always engaged in the experience. However it might be managed in a way to allow complete sensory experience.

Further on, the spatial patterns of settlements may, but not necessary, provide knowledge about the social norms of societies. (Crooks, 2012). Which is to say when associated with water it will bring more knowledge about how the water stream was valued from the past till the presence and if the river stream was acquired as advantage or disadvantage for the users of the surrounding area (beyond valuing it as an essential life element), and if the spaces set around are acquired as a borders/limits or as a guiding liner path. This is also how we respond today to the spaces which are set along the river.

Natural element of water, rivers in particularly, may be spontaneously but actively used to engage more activities into urban life, followed with more or less urban interventions. However, many cities have kept tradition of using spaces along the river as a liner park s and walkways. They are usually distinguished by levels or in some cases, where the shoreline provides naturally formed spaces, as a sort of meeting point(s) which gain that character of public use.

URBAN REDEVELOPMENT OF RIVERBANKS

Urban waterfronts are a unique part of the urban setting of many waterside cities. Since the 1960s, more of these spaces are being provided in an attempt to bring more people to waterside areas. While some cities have been successful in striking a balance between their economic needs and the public's demand for access to the water, others have failed.

As Al Ansari (2009, p.20) claims that the waterfront development was stimulated by public demand for better access to the water through the provision of public space on the waterside. The phenomenon spread from North America to the rest of the world to become one of the outstanding contemporary urban trends. Overall, many of these projects were successful in bringing the public to the waterside.

One of the good examples which illustrate river bank redevelopment is Media Harbour in Dusseldorf where the old harbour on river Rhine went on a drastic transformation. Old warehouses used to form the skyline of harbour district today they have become complexes of contemporary buildings designed by nationally and internationally known architects. The redeveloped area owns its special qualities to the mix of the old and new in which some old buildings have been protected, preserved and classified as historical monuments (URL 1). The MedieHafen is today home to many companies from the field of media and communication, fashion and architecture as well as art and culture. The area offers guided tours and is packed with bars and restaurants crating a specific socio recreational gathering point.



Figure 1. Media Harbour in Dusseldorf (Source: <https://www.duesseldorf.de/international/tourism/discover/media-harbour.html>).

Another example is unofficially named Docklands area on river Thames in London. Use of the docks can be traced back to the Roman and medieval times but contemporary docks were originally built and managed by a number of competing private companies up until the 1980s when the big redevelopment of the entire area started introducing new content creating fashionable dwelling and working areas. The population of the Docklands has more than doubled during the last 30 years, and the area has become both a major business centre and, for many, an increasingly desirable area to live. Canary Wharf has become one of Europe's biggest clusters of skyscrapers and a major extension to the financial services district of the City of London. Although most of the old wharfs and warehouses have been demolished, some have been restored and converted into flats. Most of the docks themselves have survived and are now used as marinas or watersports centers. The revival of the Docklands has had major effects in run-down surrounding areas creating job and living opportunities (URL 2).



Figure 2. Nowadays London Dockland (source: <https://www.dailymail.co.uk/news/article-2325399/Canary-Wharf-How-busy-financial-centre-thriving-port-taking-sugar-rum-elephants.html>).

The major idea behind these and similar examples was to rehabilitate the area from the economic, socio cultural, ecological point of view. Becoming inner part of the cities the areas of land used for the industries, warehouses etc. are inevitably matter of redevelopment and sustained usage of the water fronts in the future while more attention should be given for the open public spaces along the water.

CONCLUSIONS

In the river cities the aesthetic aspects of urban forms gain much from the water presence which also trigger more activities. This is especially easy to determine in the city sites which have traditionally used river banks as a path, line intersected with activities. This is how social aspect of such spaces is improved and overall Space qualities. On the other hand revitalized water side area within the cities are positive example on reusing abounded sites while the new functions influence how the public spaces are used.

Rejuvenating old outmoded areas on the banks is especially important as there is congestion of the urban areas and the new fresh faced public spaces are better valued. These spaces are also perceived as more desirable as they leave positive effects on the users. Public areas are important segment of an urban development, where activities are taking place, and their significance is associated with socialization, recreation, etc. Being identified with water, functional and aesthetical dimension of public spaces are brought to another level.

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A STUDY OF OFF-LAND STRUCTURES: PARADIGM SHIFT AND DESIGN CONSIDERATIONS

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ABSTRACT

There will be crisis of land leading to the need of development of the infrastructure for residential, commercial, industrial and agricultural use due to exponential growth in population, current and projected. The metropolitan cities are developing at a very high rate and the expecting rise in population is putting pressure on these cities to grow further by expanding their boundaries continuously. But in the case of cities like Mumbai, Chennai and international coastal cities, the sea is behaves like a boundary for urban settlement, resisting its further expansion. This situation has produced challenges for urban planners to deal with lack of space and demand for basic amenities. In such condition coastal metropolitans, oceans can be used to develop the floating form of satellite towns, urban pockets and structures as a coastal expansion of city boundaries due to the enormous flexibility and limitless possibilities which water offers. The objective of this paper is to highlight the possibilities of off land development on water. In this paper qualitative research method has been used. The systematic literature review of the construction systems of the off-land structures have been explored through internet and secondary data from relevant published academic literature from journals articles and research papers. A critical analysis of the possibilities of off-land structures on water has been done. The paper discusses the need of floating structures and their scope for the development and growth of urban centers. Further the paper validates the research by five case studies of off-land structures and the paper finally presents different types of design methodology with which these ideas can be implemented

INTRODUCTION

The earth contains all kind of resources to sustain life and need of all human beings, plants and animals, but we humans are exploiting these resources to fulfil our endless greed. The basic and the most important resource for the survival of human being is the land. In a long-term perspective for our future land will become a major issue. According to US Geological survey, presently we have a land area of about 148,300,000 sq km, as about 29% of the total surface area of the earth, from which almost 50% is unsuitable for habitation and agricultural purpose due to poles, deserts and hard rocks and mountains. the remaining 71% surface area of planet earth is occupied by water (Perlman & USGS, n.d.), and from this total quantity, 96.54% founds in Oceans, Seas, and Bays (White, 1993), which is about 68.54 of total surface area (Figure.1). The majority of the population growth in upcoming years is likely to occur in urban areas of developing countries. According to the medium variant of the 2010 Revision of World Population Prospects as showing in Figure.2, the world population is expected to increase from 6.9 billion in mid-2011 to 9.3 billion in 2050 and to reach 10.1 billion by 2100 (United Nations , July 2011).

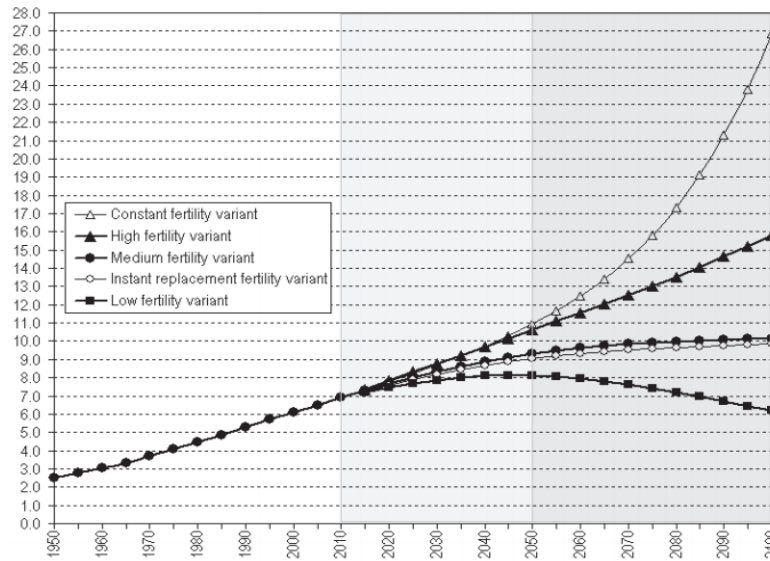


Figure 1. The total population of the world by projection variant.

Indicators	World	Latin America and Caribbean	Middle east and North Africa	Sub-Saharan Africa	East Asia	South Asia
1 M SLR						
Area	0.31	0.34	0.25	0.12	0.52	0.29
Population	1.28	0.57	3.20	0.45	1.97	0.45
GDP	1.30	0.54	1.49	0.23	2.09	0.55
Urban Extent	1.02	0.61	1.94	0.39	1.71	0.33
Ag. Extent	0.39	0.33	1.15	0.04	0.83	0.11
Wetlands	1.86	1.35	3.32	1.11	2.67	1.59
5M SLR						
Area	1.21	1.24	0.63	0.48	2.30	1.65

Population	5.57	2.69	7.49	2.38	8.63	3.02
GDP	6.05	2.38	3.91	1.42	10.2	2.85
Urban Extent	4.68	3.03	4.94	2.24	8.99	2.72
Ag. Extent	2.10	1.76	3.23	0.38	4.19	1.16
Wetlands	7.30	6.57	7.09	4.70	9.57	7.94

Table 1: Summary of world regional impacts due to rise in sea level.

According to forecasts of the Gregory (2013), the ocean level will rise from 20 to 90 cm during the 21st century (versus 10 cm in the 20th century). According to the research, published in the Proceedings of the National Academy of Sciences (2013), a global mean temperature elevation of 1°C will lead to the rise of 2 meters in mean sea level (Bora, 2013). The increase of 1 m would bring out the world to lose of approximately 0.31% of ground and 1.30% of GDP. A further effect of this rise of 1M in MSL is given in Table 1 and Figure 2. It shows the most impacted countries according to land area (Dasgupta, Laplante, Meisner, Wheeler, & Yan, 2007).

Therefore we need to find out proper solutions for upcoming problems due to population explosion, increase in sea level and a limited amount of available land. Development of off-land structure is the option where we can look forward to the solution of our requirements of housing, employment, infrastructure and investment. This kind of development in the sea will definitely reduce the load on the shoulders of our mother earth. The development of such kind of structure is a very new concept presently, but it has the capacity to become the necessity and trend, within a very short span of time in future.

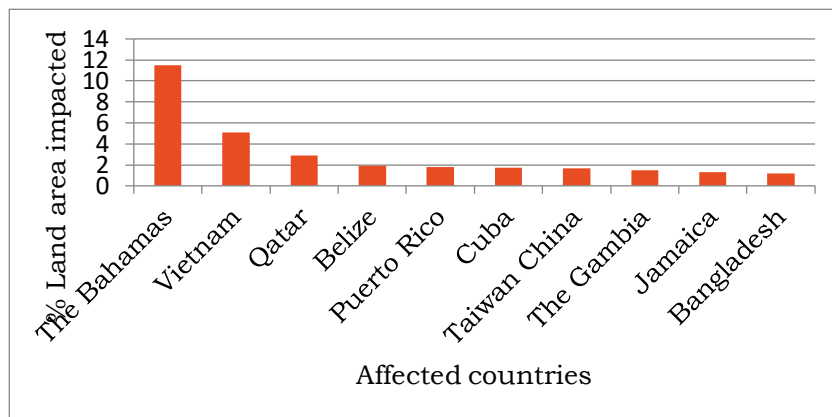


Figure 2. Percentage land area of the most impacted countries.

HISTORICAL DEVELOPMENT OF OFF-LAND STRUCTURES

The development of off-land structures is not a new concept for the world. Early applications of floating structures were the form of floating boat bridges over rivers that date back to antiquity. Figure 3 shows About 480 BC, King Xerxes of Persia led his army across the Hellespont, now called the Dardanelles, using two rows of floating bridges, each consisting of about 300 boats laid side by side (Hammond & Roseman, 1996). Such kind of floating bridges was mainly built as a necessity of war, to permit the movement of soldiers and equipment between ground bases and marine vessels. Later on, many bridges were constructed on this concept of tying the boats and ships. Other than the bridges there are many examples of very old floating villages throughout history. They have appeared in different parts of the world due to various needs and reasons. Figure 4 shows in the sixteenth or seventeenth century, Ganvie's floating city (Sometimes called the Venice of Africa) was established by the Tofinu people, as a protective measure from Dahomeys which was a slave trading tribe who dominated the region during the time (Afritorial & Mtango-Zadarnowska, 2012). Vietnam, Indonesia, Thailand, China, Peru and Bolivia also have a history of floating villages. There are many countries which have floating habitation not for permanent living but for the tourism purpose like In India, boat houses in Kerala and Kashmir.

In our contemporary history use of floating structures other than bridges, primarily starts after the industrial revolution. The original concept of floating habitation begins by the primitive man who built small boats as a means of navigation. Later on, as the man started progressing he built bigger boats, which were used to cross the sea. It took him several days, months. He

had to stay on these boats and this gave rise to the concept of boat houses. With the development of technology, men designed huge ships (cruises) as warships and as a mode of transport that can accommodate more than thousands of people.

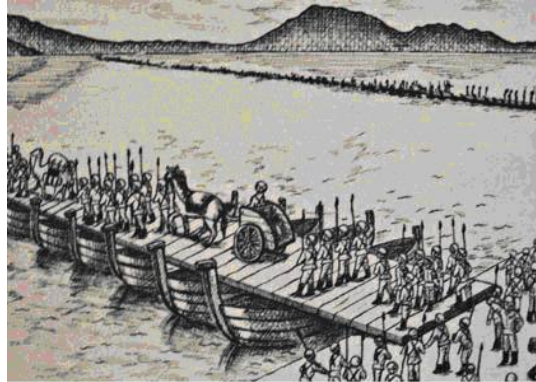


Figure 3. The floating boat bridge by King Xerxes of Persia.

Numerous proposals have been made for very large floating structures. Proposed applications range from the visionary floating city to floating airport, military bases, wave power generators and Deep Ocean mining platforms. Till now, most of the off-land buildings and structures have been developed for oil exploration and tourism only but due to the need of future, off-land structures are going to become a need with the mix of technological advancement. Advancement in terms of technologies can be of construction, development of new materials, energy generation system, security and control system



Figure 4. Ganvie's floating city, Africa (Source: afritorial.com).

SCOPE OF OFF-LAND STRUCTURE

The Scope of neighborhood-sized, self-sustained independent 'off-land' structure can be defined on the basis of the requirement of land for different purposes. Other than this, the cost-benefit analysis also has to play an important role in this. For example, the agricultural and industrial requirement would be needed to be promoted on the ground because these kinds of manufacturing and production based facilities require heavy concentrated load and need not to be used in a luxurious way, which may help us to get reduced maintenance, operational and transportation cost. Another purpose of building the 'off-land' structures can be to provide an isolated, peaceful and efficient environment for working and living. For this kind of structure, preferably residential, office, institutional, academic, commercial or recreational buildings are needed to be developed as single or mixed use form. For example, IT parks with all required amenities and residential features for its employees can be developed in the form of off-land structures. Residential townships can be developed to cater the requirements of farmhouses, beach houses, and bungalows. This kind of specific block would be self-sustained in itself.

Educational buildings like colleges, universities with hostels, specific research labs can also be developed in form of off-land structure. This category of the building requires a bigger area in a peaceful environment so these kinds of structures can be accommodated in such urban pockets. Jails and prisons can be designed in such structures in isolation from the main town. In such case, it will be very easy to handle safety and security based issues. Ashrams, Yoga centres, Meditation centres and Spiritual centres also needed an isolated and peaceful environment, so these structures can be designed here in form of off-land structures. Entertainment facilities and utility plants are also one of the important categories of buildings which can be designed in off land form. Emergency rescue bases in off land form can be developed in earthquake prone areas like Japan, (sea facing earthquake-prone countries) and in flood-prone areas.

Psychological, as well as the social requirement of such places, can easily be fulfilled in this non-conventional system of development. These off-land structures ought to be designed as net zero energy buildings as well as with net zero carbon footprint and self-sustained in terms of energy by using renewable energy resources to make it environmentally favourable. Habitants of such areas can feel physically and socially isolated with the remaining world. But today's digital revolution is beyond all physical barriers. Psychologically-the structures will be very efficient due to the peaceful and clean environment. Economically-the development cost will be very high so it will target a specific category higher income group.

CASE STUDIES

Various off-land structures have been constructed and few are under construction by land reclamation technique and in the form of floating structure. Few prominent examples have been summarised as below:

CASE STUDY 1: GREEN STAR, MALDIVES (FLOATING STRUCTURE)

A floating hotel and conference centre named as Greenstar in Maldives has been designed by Water Studio, Netherlands as shown in Figure 5 and Figure 6. It contains 800 rooms and a Conference Center for up to 2000 participants. The Greenstar will blend in naturally with the existing surrounding islands. The green covered star-shaped building symbolises Maldivian's innovative route to conquer climate change. This will become the next location for conferences about climate change, water management and sustainability. A unique Floating Restaurant Island will be built next to it (waterstudio, n.d.).

Being a floating structure there are only the sea anchors which are permanent so the location of the whole structure can be changed without leaving anything behind unlike the land reclamation technique based off-land structures. According to the census given in Figure 2, Vietnam is the second most vulnerable country under the effects of the rise in sea level. Such kind of floating structures are capable of, to give a new life to the victims in future without affecting the present.



Figure 5. The Greenstar, floating hotel and conference center, Maldives (Source- waterstudio.nl).



Figure 6. Floating Hotel and Conference Center Greenstar, in Maldives.

CASE STUDY 2: PALM JUMEIRAH (LAND RECLAMATION TECHNIQUE BASED)

The Palm Jumeirah is an artificial archipelago in the United Arab Emirates, created using land reclamation by Nakheel, a company owned by the Dubai government, and designed and developed by Helman Hurley Charvat Peacock/Architects, as a flagship project (Figure 7). It is one of three planned islands called the Palm Islands (Palm Jumeirah, Palm Jebel Ali and Palm Deira) which would have extended into the Persian Gulf, increasing Dubai's shoreline by a total of 520 kilometres (320 mi).

Following a number of years of feasibility studies, the Palm Jumeirah was launched in 2001, with reclamation starting in the same year. The purpose of the design of this island was largely to solve the problem of limited development space. With the use of 94 million cubic meters of sand and 5.5 million cubic meters of rock through the process of rainbowing (Figure 8) followed by 'vibrocompaction', this island has been created (Hoff, 2005).



Figure 7. Form of Palm Jumeirah Island.



Figure 8. Process of ‘rainbowing’ to deposit the sand above sea level.

Geological survey completed in 2009 claims that the island is sinking by 5 mm annually even after the extensive vibrocompaction process (Hoff, 2005). According to the developer of the island, Nakheel, the island has settled slightly, it is well within a reasonable limit, and that the island is going through a natural process. The island is expected to settle 25mm over the course of 100 years, and should not have any significant impact on the development (Hope, 2009). Other post-construction impacts including erosion of the surrounding geography, disruption in parts of a naturally occurring ecosystem also have been observed. It is an example to study the behaviour of land reclamation technique (where off land structure started to behave differently after execution) & its impact on surroundings.

CASE STUDY 3: LILYPAD-THE FLOATING ECOPOLIS

In 2008 a conceptual model of The Floating Ecopolis (Figure 9 and Figure 10), also known as the Lilypad, was designed by Belgian architect Vincent Callebaut for climatic refugees. According to him, it is a true amphibian, half aquatic and half terrestrial city, able to accommodate 50,000 inhabitants and inviting biodiversity. Callebaut imagines his structure at 250 times the scale of a lilypad, with a skin made of polyester fibres coated with titanium dioxide which would react with ultraviolet light and absorb atmospheric pollution. In its conceptual design, Lilypad comprises of three marinas and three mountain regions with streets and structures strewn with foliage, with a central fresh water lagoon acting as ballast. The whole construction would be carbon neutral utilising solar, thermal, wind, hydraulic, tidal and osmotic energies. Its creator believes, could be the answer to mass human displacement that global warming is predicted to cause (Knight, 2008). Though lily pad is at a conceptual level but the implementation of such projects can be a wise decision because it can help us to solve our problem of land shortage in urban areas without creating adverse effects on the environment.



Figure 9. The Lilypad.



Figure 6. The ariel view of Lilypad.

CASE STUDY 4:

Seasteading Institute, a San Francisco-based nonprofit has been developing the concept of floating cities since the foundation of the organization in 2008, and it has reached an agreement with the government of French Polynesia to begin testing in its waters (Figure 11). This floating city should consist of about a dozen structures, including homes, hotels, offices, and restaurants (Figure 12). Engineers and architects have already visited an undisclosed location where the project should emerge. The main aim of the idea is to “liberate humanity from politicians” and “rewrite the rules that govern society”.

It has been estimated that building this utopian offshore will cost about \$167 million. The Seasteading Institute has already received seed funding from PayPal founder Peter Thiel, however for the next phase of the project the institute hopes to hold an “initial coin offering,” a crowdfunding campaign which raises money by creating and selling virtual currency. (boredpanda.com, 2021)



Figure 11. A floating city in French Polynesia.



Figure 12. Floating city shall be having many structures, including homes, hotels, offices, and restaurants.

DESIGN METHODOLOGY

With the increment in urban population of cities facing scarcity of land, countries along the coastline, and island countries, planners and engineers has started to think about the methods to control the pressure on existing land by land reclamation. For this purpose, they are carrying the materials from hills, sea beds and importing it from other countries too. These land reclamation techniques to develop the off-land structures are suitable for shallow water depth. But in the case of deeper depth and soft seabed, these reclamation techniques are no longer suitable. In such conditions floating structures are the best suitable option to generate land from the sea.

Transportation and connectivity to the floating structure are the important issues of concern not only to connect them with land but also for evacuation. There have to be proper means of access to boat, ship, submarine and helicopter. In case of transportation, huge energy is consumed so, the design of mega floating structure should be designed to minimise the horizontal distance of travel. A clustered form of planning in the form of vertical towers can be a suitable solution for this. This condition would be further validated by concentrated load bearing capacity of these structures.

At site level condition, a breakwater (usually needed if the significant wave height is greater than 4 m as a thumb rule) is needed for reducing wave forces impacting the floating structure (Figure 13). This breakwater will be formed by the ring of columns around the structure with the option to bear the turbines for generation of energy by the movement of waves. The mooring system (Figure 14) must be well designed so that it can ensure the stability of very large floating structure to keep it in position so that the facilities installed on the floating structure can be reliably operated and to prevent the structure from drifting away under critical sea conditions and storms.

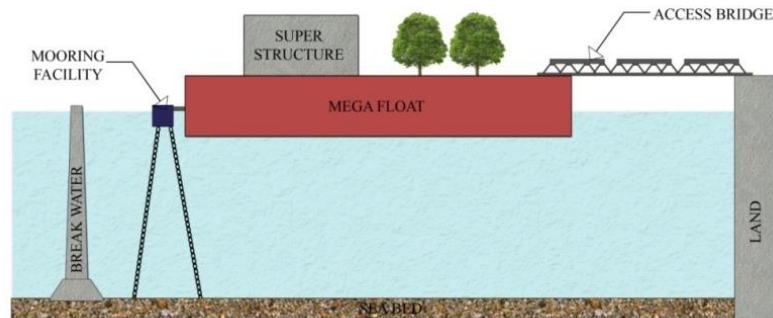


Figure 7 Components of off-land structures.

A freely drifting floating structure may lead to damage not only the surrounding facilities but also the loss of human life if it collides with ships. Note that there are a number of mooring systems such as the dolphin-guide frame system, mooring by cable and chain, tension leg method and pier/quay wall method, as shown in Figure 13 (Watanabe, Wang, Utsunomiya, & Moan, 2004). Another feature could be the design of the edges of the structure. By proper choice of edge layout, the propagation of the incident waves into the main part of the structure can be reduced by efficient scattering or reflection of the incident waves on the weather side.

The materials to be used for the floating body may be steel, concrete or steel-concrete composite and the relevant specifications have to be followed for the main structure. This concrete will be in category of special water tight, light weight concrete to increase water tightness of structure and to decrease overall density by reducing its dead load. In the case of the building units of the structures, recyclable materials having lesser energy consumption according to their life cycle assessment can be used to make such structure environment-friendly.

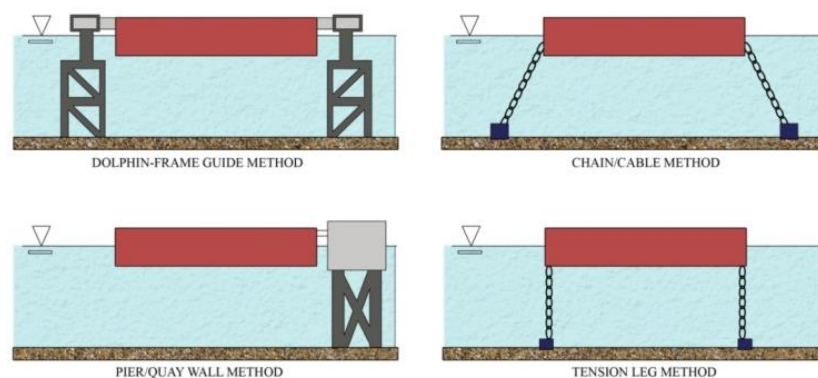


Figure 8. Different types of mooring systems.

Almost 40% of the total produced energy is used by the buildings. Heating, cooling and lighting are big contributors in this. So optimised positioning of window and light shelves can save this energy. Windows can become the cause for great heat loss and heat gain so it must be optimised as per requirement of different climatic conditions to reduce heat gain and heat loss through windows and ventilators but without compromising with the view and natural light. Light shelves and fibre optic cables can be used to provide more light inside the interiors. With the help of today's smart and composite materials, it has become very easy to achieve our task. Climatic conditions should be one of the major factors to decide the material and design related parameters.

DESIGN CONSIDERATIONS FOR OFF-LAND STRUCTURES

Adequate performance of offshore structures has to be ensured by designing them to comply with serviceability and safety requirements for a long lasting service life of 100 years or more. Serviceability criteria are to ensure that the structure should fulfil the function required to perform as, even during movement of waves. An important design issue regarding the safety of personnel is evacuation and rescue during a disaster. Having a specially designed land-based stationary station can serve this purpose for multiple off-land units. It can be an Effective safety measure for such units to provide a safe place where people can be survived or boarded after an accident.

Failure modes of floating structures can include capsizing, sinking, structural failure and drift-off due to any natural or manmade disaster. For such condition design of the installed units over the main floating body should also be of floating type independently in itself. This can be an extra safety measure. If main structure tends to submerge in water due to any disaster, these structures will start floating independently. Planning wise it can be designed in form of radial planning form with a control centre and main building as a nucleus. Other buildings can be planned in a concentric ring from to be placed as per decreasing priority form centre to the periphery.

Technically there will be some other considerable load based factor in design of floating structures such as abnormal loads like impact loads due to collision of ships with the floating structure, effects of earthquakes including dynamic water pressure, effects of temperature change, effects of water current, effects of tidal change, effects of seabed movement, snow load, effects of tsunamis, effects of storm surges, ship waves, seaquake, brake load, erection load, effects of drift ice and ice pressure, effects of drifting bodies, effects of marine growths etc.

Like the land mass, oceans also have various attributes which can further influence the design, location and position of these off-land structures. There would be a strong need to form a special authority for such type of structures to define standards, laws and regulations related to design, construction, security, control and environmental concerns as well as to coordinate and monitor such structures at not only at local level but at global level too because in case of water, one single activity happened at one end of world is likely to affect the another part of world very easily in comparison to land mass.

CONCLUSIONS

Presently off land structures are not our necessity but according to the projections, this kind of non-conventional systems of urbanisation would be needed strongly in future. Based on the analysis of case studies and literature review, advantages of Mega-floats have been identified by the authors over the traditional land reclamation techniques for space creation in many ways. Mega floats are efficient in cost in case of large water depth. These are environmental friendly as there will not be any damage to the marine eco-system or silt-up deep harbours. Mega floats produce no disruption to the tidal/ocean currents. Mega floats can be produced at higher speed because of having modular components. These modular components can be taken to site for assembling and therefore sea-space can be exploited speedily. Unlike the land reclamation technique, mega floats are easy to remove (if the sea space is needed in future), expand (since they are of a modular form) and easy to protect from seismicity since they will be inherently base isolated. There will be no issue of differential settlement, liquefaction and sinking in the case of floating structures. As per the available technology, materials and resources cost of construction of floating structures will be very high. By considering needs of future it is recommended to explore other new materials, technologies & design parameters by research and development for such kind of innovative systems.

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İSTANBUL KIYILARI DOLGU ALANLARINDA YER ALAN KENTSEL KAMUSAL MEKÂNLARIN MEKÂN KALİTESİ YÖNÜYLE İNCELENMESİ

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ÖZET

Kentler yıllar içerisinde morfolojik olarak birçok değişime uğramaktadır. Bu değişimler kent ve kentlilerin ihtiyaçları doğrultusunda planlanarak oluşturulması beklenir. İstanbul kentinde hızlı kentleşme ve yoğun yapılaşma kentin çeperlerine doğru genişleyerek büyümesine yol açmıştır. İstanbul kent merkezleri ise yapı ve nüfus yoğunluğundan dolayı özellikle kentsel kamusal mekânlar olmak üzere bazı fonksiyonların nitelik ve nicelik açısından yetersiz kalmasına yol açmıştır.

Kentin kıyı alanlarına dolgu yapılarak yeni mekânlar türetilmiş olmaktadır. Bu alanların ilgili mevzuatlarda yer aldığı fonksiyona tabii olarak alanların kamu yararı düşünülerek üretilmektedir. Bu dolgu alanlarının büyük ölçüde kamusal mekânlar-rekreasyon alanı-olarak tasarlandığı görülmektedir. Kentin kıyısına dolgu alanlarının oluşturulması ile toplumsal kullanımlara-miting alanları- ve yeşil alanlarla rekreasyon alanları kazanılmaktadır. Bu durum alanların toplumsal kullanımlara açılarak kentin boş vakitlerini geçireceği alanların yalnızca sayıca artması ve kişi başına düşen m²'yi arttırmasının sağlanması nicelik olarak etki etmiştir. Ancak bu alanların kıyıda yer almalarına rağmen su ile ilişkisi, mekân kalitesi gibi nitelikleri konusu araştırılması gerekliliği ortaya çıkarmıştır.

Çalışma kapsamında, dolgu alanlarında yer alan bu kullanımların mekânsal tasarım kalitesi yönüyle değerlendirilmesi amaçlanmıştır. Bu doğrultuda İstanbul kenti kıyılarında yer alan iki adet kentsel kamusal mekân olarak kullanılan dolgu alanı çalışmanın kapsamını oluşturmaktadır. Bu alanlar kente sonradan eklenen ve oldukça büyük alanlar olması amacıyla seçilerek incelenmiştir. Çalışma konusu kamusal alanlar Yenikapı ve Maltepe dolgu alanlarında yer alan kamusal alanlar olarak belirlenmiştir.

Çalışmanın yöntemi, alanlara dair hava fotoğraflarının yıllara göre değişimi üzerinden haritalandırılması ve değerlendirilmesi ve belli ölçütler ile değerlendirilmesi olarak belirlenmiştir. Konu mevcut alan tasarımlarının değerlendirilmesi yönüyle ele alınacaktır. Çalışmanın mevcut çalışmalardan farkı ise coğrafi ve mimari açıdan literatür de yer almakta çalışma ise dolgu alanlarının işlevlerinin kentsel ölçekte sürdürülebilirlik ve tasarım ilişkisi bağlamında incelenmiştir.

Sonuç olarak kıyı alanlardaki kentsel kamusal mekân tasarım yönüyle niteliksel açıdan kullanımına etkisi incelenmiştir. Kıyı kimliğini koruyan mekânların tasarlanması kenti tasarım ve mekân kalitesi yönüyle geliştireceği düşünülmektedir.

Anahtar Kelimeler: Sürdürülebilirlik, Kentsel Dönüşüm, Dolgu Alanları, Kamusal Mekân, Mekân Kalitesi.

GİRİŞ

İstanbul kenti ortasından İstanbul Boğazı geçerek denizle bölünmüş olması nedeniyle iki bölüme ayrılarak oldukça uzun bir kıyı şeridine sahip olmaktadır. Kent; kentleşme ve göç ile birlikte yıllar içerisinde hızlı kentleşme ve nüfusun yoğunlaşmasına sebep olarak kentin yayılarak bu uzun kıyı şeridinde de nüfus ve yapılaşmanın artması ile sonuçlanmıştır. İstanbul kentinde kişi başına düşen yeşil alanların m²'si donatı standartlarının oldukça altında kalması kente yeni yeşil alanlar eklenmesi zorunluluğunu doğurmuştur. Bu durum yeni alanlara ihtiyaç yaratmış ve arazinin kıt bir kaynak olması sebebi ile kıyıların doldurularak kente yeni alanlar türetilmesine neden olmuştur.

İstanbul kenti kıyılarında yer alan dolgu malzemeleri ile doldurularak oluşturulan iki adet dolgu alanında yer alan kentsel kamusal mekânlar çalışma kapsamında seçilmiştir. Bu kamusal alanlar; Yenikapı ve Maltepe dolgu alanları olarak belirlenmiştir. Öncelikle bu alanların özellikleri incelenerek hava fotoğrafları ile tarihsel değişimi ve morfolojik açıdan ortaya konularak nitelikleri ve mevcut durumu incelenmiştir.

Çalışma kapsamında İstanbul kıyılarında dolgu alanlarında yapılan kentsel kamusal mekânlar incelenerek mekân kalitesi yönüyle değerlendirilmiş ve bu alanların nicelik olarak değil nitelik açısından da değerlendirilmesinin önemi ortaya konulmaya çalışılmıştır. Bu alanlarının işlevlerinin kentsel ölçek sürdürülebilirlik ve tasarım ilişkisi bağlamında incelenerek kente olumlu ve olumsuz etkileri üzerinde tartışılmıştır.

Bu iki adet projenin kentsel kamusal mekânlar olarak tasarlanmasının yanı sıra bu alanların ulaşılabilirlik, kentlinin ihtiyacına yeterli otopark bulunması, yeşil alanların su/deniz ile temasının hangi düzeyde olduğu gibi sorulara cevap aranarak bu mekânlar özellikleri bakımından mekân kalitesi bağlamında incelenmektedir.

DOLGU ALANLARI, KENTSEL KAMUSAL MEKÂN VE MEKÂN KALİTESİ ÜZERİNE

İstanbul kentinde zaman içerisinde yoğun bir nüfus yer alması ve kentin genişlemesi kentsel sistemlerin yetersiz kalmasına neden olarak yeni çözümler üretilmesi gereklilikleri doğurmuş ve ulaşım, yeşil alan gibi yeni kentsel sistemlerin kurgulanacağı ve uygulanacağı alan gereksinimini ortaya çıkarmıştır. Böylece yeni dolgu alanları ile birlikte kente yeni kent parçaları eklenmesi için plan ve projeler üretilmeye başlanmıştır.

Bu gereklilikler nedenleriyle kent kıyılarında yer alan dolgu alanları kentte kısıtlı olan arazilere ek yeni araziler türetilmesine yol açmıştır. Kıyılarda yapılan dolgu alanları, İstanbul kentinde yapılan yoğun kentsel dönüşüm sonucunda ortaya çıkan, yıkılan yapıların malzemeleri ve hafriyat malzemeleri ile doldurularak kente farklı bir yoldan eklenen kent parçalarını oluşturarak kentin yeni bir biçime dönüşümüne sağlamaktadır.

Bu dolgu alanlarına yapılacak fonksiyonlar, yapılaşmalar belli bir doğrultuda yapılması amacıyla bu durumu denetleyici ve düzenleyici olarak 1990 yılında 3621 sayılı Kıyı Kanunu çıkartılarak mevzuat oluşturulmuştur.

Söz konusu mevzuatta “*doldurma ve kurutma yoluyla arazi kazanma ve bu araziler üzerinde yapılacak yapılar belirtilmiştir. 01.07.1992 tarihinde kabul edilen 3830 sayılı kanun değişiklikleri ile kıyıda ve doldurma ve kurutma yoluyla kazanılan arazilerde inşaa edilebilecek yapılar tekrar belirlenmiştir. Günümüzde de yürürlükte olan mevcut kanun, devletin hüküm ve tasarrufu altındaki, kurutma ve doldurma yoluyla kazanılan arazilerde, “...kanunun 14. maddesinde belirtilen, iskele, liman, barınak, tersane, gemi söküm yeri, sabit olmayan, duş, gölgelik, soyunma kabini 6 m²'yi geçmeyen büfe, kirletici etkisi olmayan fosseptik yapımını gerektirmeyen seyyar tuvalet, ahşap iskeleler, kara, deniz, hava ulaşımına yönelik altyapı ve tesisler, park, çocuk bahçesi, açık spor alanları ile açık alan ağırlıklı olmak üzere ve emsali aynı amaçla ayrılan alanın % 3'ünü yüksekliği 5.50 m. 'yi aşmayan takılıp sökülebilir elemanlarla, inşa edilen lokanta, gazino, çay bahçesi, sergi üniteleri ve idare binalarını içeren fuar, piknik, eğlence alanları yapılabilir...*” hükümleri bulunmaktadır (Küçükakça, 2014).

İstanbul kıyılarına ilişkin plan kararlarında; 1/100.000 ölçekli İstanbul İl Çevre Düzeni plan kararlarında tanımlanan ekolojik koridorların alt ölçekli ve parçalı plan kararları ile zarar gördüğü, plan kararlarının yasa ve yönetmeliklerde tanımlanan minimum standartlara göre geliştirilmesi dolayısıyla doğal değerler, farklı kimlik ve karakterdeki bölgelerin korunması ve geliştirilmesinde yetersiz kaldığı, kıyı bölgelerinde kıyıyı yerleşmelerden bağımsız olarak ele alan parçalı plan kararlarının, kıyı bölgesinin hem yatayda hem de düşeyde erişim ve kullanımını sağlayamadığı aynı zamanda kıyılarda kullanım çeşitliliği ve yere özgü planlama anlayışının planlama kararlarına yansıtlamadığı sonuçlarına ulaşılmış olduğu belirtilmiştir (Kılıç, Akın & Koç, 2014).

Deniz, göl ve akarsu kıyılarında planlama, uygulama ve denetim sürecine ilişkin planlama çalışmaları 3621 sayılı Kıyı Kanunu ve Uygulamasına Dair Yönetmelik çerçevesinde yürütülmekte ve böylelikle kıyı alanları, doldurma yolu ile elde edilen dolgu alanları ve sahil şeritlerinde yapılması istenilen uygulamalar için imar planı yapılması zorunlu tutulmuştur. İlgili kurum ve kuruluşlar tarafından hazırlanan imar planı teklifleri, Çevre ve Şehircilik Bakanlığı tarafından incelenmekte ve sonuçlandırılmaktadır. Kıyı Kanunu kapsamı dışında olan sahil şeridi gerisinde kalan alanlara ilişkin planlama süreci, 3194

sayılı İmar Kanunu çerçevesinde ilgili kurumlar tarafından yürütülmektedir. Bu nedenle, Kıyı Kanunu kapsamındaki alanlar ile kara tarafındaki devamı niteliğindeki alanlar birbirinden bağımsız ve kopuk bir biçimde planlanmaktadır. Çevre düzeni planlarında ise, kıyı alanlarına yönelik olarak yalnızca yasal düzenlemelere uyulması hususuna vurgu yapılmakta ve kıyı alanlarına ilişkin mevcut imar planları çevre düzeni planlarına işlenmektedir (Gülbitti & Özöduru, 2020).

Söz konusu mevzuatlar gereği dolgu alanlar konut gibi yoğun kullanımlara açılması yerine bu alanlar zemin açısından risk taşıma ihtimaline karşı ağırlıklı olarak ulaşım, yeşil alan, rekreasyon alanları ve toplanma alanları olarak tasarlandığı görülmektedir. Böylece kentin ve kentlinin ihtiyacı olan kentsel kamusal alanları ile kente katkı sağlaması sağlanırken aynı zamanda bu dolgu alanlarını da en az risk taşıyacak şekilde kıyılarda estetik bir fonksiyonda kazandırması da amaçlanmıştır.

Kamusal mekânlar, toplum için önemli olan ‘yüksek değer’ i temsil eden mekânlardır. Kutsal ya da sembolik toplanma alanları bu tür kamusal mekânlardan biri olarak planlanırlar. Taşıdıkları ya da temsil ettikleri kültürel, tarihi, dini, toplumsal ve siyasal gibi değerler nedeniyle bu tür kamusal alanlar bir grup ya da toplum için sembol hale gelirler. Sembolik anlamlarıyla kamusal mekânlar bir toplumun ya da grubun ‘süreklilik hissi’ nin yaratılmasına katkı sağlarlar (Loukaitou-Sideris, 1988; Akkar, 2016).

Yapısal dengeyi kurmada büyük rol oynayan bu alanlar, hem insanlara güven sağlayacak kadar çevrelenmiş, hem de alanın açıklığını vurgulayacak derecede ferah olmalıdır. Mekân içinde yönelme hissinin verilebilmesi de kamusal alanın sağladığı bir özellik olmaktadır. Bazı sosyal aktiviteleri gerçekleştirebilmek ya da sadece durup dinlenmek amacıyla kullanılan kamusal alanlar, kentin çeşitli bölgeleri arasında tampon görevi görmektedir. Bu alanlar özellikle kentleşmenin yoğunlaştığı bölgelerde, kişilerin gün ışığından, temiz havadan ve doğal çevrenin sağladığı psikolojik rahatlama faydalanmalarına olanak sağlaması noktasında da büyük önem taşımaktadır (Kandemir, 2010).

Dolgu yapımında amaç kamu yararının oluşmasıdır. Kamu yararı kavramı farklı çevrelerce farklı değerlendirmelere tabi tutulsa da kamu yararının sürdürülebilir olması esastır. Bölgede yapılması ticaret ve denizciliğin gelişmesinde önemli rol oynayacak ve başka bir bölgede yapılması mümkün olmayan bir limanın yapımında kamu yararından bahsetmek isabetli olurken, dolgu alanına yapılacak bir otel inşaatının kamu yararından bahsetmek mümkün değildir. Ayrıca yapılacak dolgu kapsamında ortaya çıkacak olan kamu yararı kavramı o projenin yapılacağı yere ve zamana göre değişiklik gösterebilecek kavramlardır (Küçükakça, 2014). Bu nedenler ile dolgu alanlarında maksimum fayda sağlanarak kamu yararının oluşturulması bu alanlara kentsel kamusal mekânlar tasarlanması ile mümkün hale gelmektedir.

Kentte yer alan kentsel kamusal alanlar kentin ve kentlinin yaşam kalitesinin artmasını sağlamakta yaşam kalitesinin en önemli kriterlerinden olmaktadır. Mevcut planlama sistemi eğitim, sağlık, rekreasyon alanı gibi kentsel kamusal alanları kişi başına düşen m² olarak nicelik açısından değerlendirmektedir. Bu mekânlar sayıca ve alansal olarak da yoğun bir nüfusu bulunan kent için yetersiz kalmış olsa da mevcut olanların nitelik, ihtiyaçlara cevap verme ve tasarım yönüyle de değerlendirilmesi oldukça önemli bir hale gelmektedir. Özellikle kent kıyısına yapılan kentsel kamusal alanlar kente sonradan eklenen büyük alanlar olması nedeniyle yaşam kalitesine ek olarak mekân kalitesi konusunu da tartışılabilir bir duruma sokmuştur.

Kentsel kamusal mekânlar, kentin belli bir yönde büyümesini etkileyen önemli etkenlerdendir. Büyük ölçekli alansal olarak büyük ve etki alanı geniş bir nüfusa etki etmesi planlanan bu projelerin gereksinimleri de bu ihtiyaç ve ölçeği karşılayacak ölçüde çözümler sunması beklenmektedir. Dolgu alanlarında yapılan kentsel kamusal mekânların kent içerisinde veya mahalle ölçeğinde yapılan kamusal mekânlardan ölçek ve nitelik yönüyle farklılaşmaktadır. Mahalle ölçeğinde yer alan kamusal mekânlar mahallede yaşayan nüfus ve ihtiyaca göre şekillenirken dolgu alanlarına yapılan bu alanlar kent ölçeğinde alansal olarak büyük ve daha kapsayıcı fonksiyonlu mekânlar olarak tasarlanmaktadır.

Ancak dolgu alanlarının özel kullanımlar yerine kamu kullanımlarının fonksiyon olarak tercih edilmesi alanın kamu tarafından erişilebilir olmasını ve kullanım yönüyle çeşitliliği sağlamaktadır. Bu sebeplerle dolgu alanlarında yer alan kentsel kamusal alanlar çalışmada seçilen bölgelerin öznelilikleri incelenerek mevcut durum ortaya konulmaya çalışılmıştır. Sonrasında bu iki adet alan işlev ve tasarım yönüyle incelenerek mekân kalitesi yönüyle değerlendirilmiştir.

SEÇİLEN DOLGU ALANLARINA YAPILAN KENTSEL KAMUSAL MEKÂNLARIN ÖZELLİKLERİ

Çalışmada inceleme konusu Yenikapı ve Maltepe dolgu alanları seçilmiştir. İstanbul kentinde büyük ölçekli ilk dolgu alanı Yenikapı bölgesinde yer almakta olup 2011 yılında inşasına başlanmıştır. Sonrasında Yenikapı dolgu alanının bir benzeri Anadolu Yakasında Maltepe kıyı bölgesine yapılmıştır. Bu alanlar son yıllarda yapılan ve güncel örneklerden olup aktif olarak kullanıma açılmıştır.

Seçilen incelemeye konu alanlar; alan büyüklüğü, yapım yılı, fonksiyonları ve aktörleri incelenmiştir (Tablo-1).

	m ²	Başlangıç/Bitiş Tarihi	Fonksiyon/Önce	Fonksiyon/Sonra	İlgili Kurum/Aktör
Yenikapı Dolgu Alanı	546.820 m	2011-2014	Boş	Yeşil Alan/ Miting Alanı/ Açık Hava Gösteri Merkezi/ Otopark	Çevre ve Şehircilik Bakanlığı ve İBB/Emlak Konut GYO Müteahhit
Maltepe Dolgu Alanı	1.200.000 m	2012-2014	Boş	Yeşil Alan/ Miting Alanı/ Açık Hava Gösteri Merkezi/ Otopark	Çevre ve Şehircilik Bakanlığı ve İBB Müteahhit

Tablo 1. Seçilen Alanların Genel Özellikleri.

YENİKAPI DOLGU ALANI

Yenikapı dolgu alanına yapılan proje; Yenikapı kentsel ve arkeolojik sit alanlarına komşu bir konumda Kennedy caddesine paralel bir alanda bulunmaktadır. Alan için hazırlanan plan ve projeler 2012 yılında hazırlanan imar planına karşı oluşacak araç trafiğine çözümler getirememesi gerekçeleriyle mahkeme 2016 yılında planları iptal etmiştir.

Çevre ve Şehircilik Bakanlığı tarafından onaylanan 2018 yılındaki planda toplamda 625.598 m²'lik bir arazide yapılan rekreasyon projesidir. Toplam alanın 546.820 m²'si proje kapsamında denizin doldurulması ile kazanılmış bir alan olup; proje; rekreasyon alanı olarak planlanan alanın plan kararlarında; 'hava, deniz, kara ulaşımına yönelik altyapı tesisleri, sahne, seyirci tribünleri ve gölgelikleri, otopark, yer altı otopark bağlantılı yollar, park, çocuk bahçesi, açık spor alanları, piknik, eğlence alanları, emsali alanın %3'ünü, yüksekliği 5.50 m'yi aşmayan; teknik birimler, satış birimleri, umumi tuvaletler, güvenlik birimleri, idare binaları, lokanta, büfe, kafeterya, gazino, çay bahçesi, sergi üniteleri, fuar yer alabilir' şeklinde ve 1 milyon 250 bin kişilik miting, konser, festival veya fuar alanı olarak tasarlanmıştır. Alanda 2 bin 200 kişilik araç ve 760 otobüs kapasiteli iki açık otopark vardır. Projede, meydanın altında İleri Biyolojik Arıtma Tesisi, meydana da bir sahne, sağlık, idari ve güvenlik birimleri, kafe, büfe, restoran, sergi alanları tasarlanmıştır. Bunların dışında yürüme alanları, oturma elemanları ve yeşil alan mevcuttur (Uslanmaz, 2020).

Ayrıca son dönemlerde İBB tarafından Yenikapı'da İstanbul Açık Hava Gösteri Merkezi kurulmuştur. Yenikapı'da İstanbul'un ilk arabalı konserleri gerçekleştirilmiştir, yaynevleri ile kitapevlerinin bir arada olduğu bir kitap fuarı kurulmuştur (İBB, 2020). Son dönemde Yenikapı dolgu alanın 6-7 geminin yanaşabileceği kruvazör liman olarak işlevlendirileceği gündeme gelmiştir.



Şekil 1. Yenikapı Dolgu Alanı (D.A.) Yapım Süreci (URL-1).

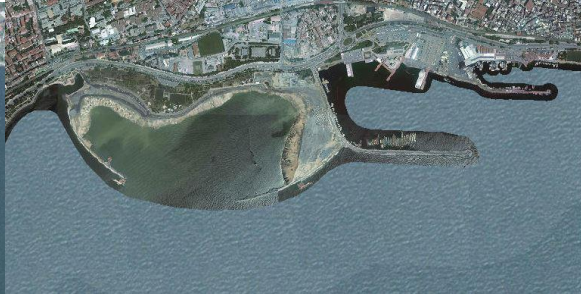


Şekil 2. Yenikapı Dolgu Alanı (URL-2).

Alanın doldurulması yıllara göre değişimi uydu görüntüleri ile net bir biçimde görülmektedir.



Şekil 3. 2011 Yılı Yenikapı D.A Uydu Görüntüsü.



Şekil 4. 2013 Yılı Yenikapı D.A Uydu Görüntüsü.



Şekil 5. 2014 Yılı Yenikapı D.A Uydu Görüntüsü.



Şekil 6. 2021 Yılı Yenikapı D.A Uydu Görüntüsü.

MALTEPE DOLGU ALANI

Maltepe Dolgu Alanı Projesi; sahil yolunun Maltepe ve Kartal İlçesi sınırları içinde kalan 7 km'lik bölümünün kara ve deniz tarafında yer alan “Dolgu Alanı” bu çalışma kapsamında projelendirilmiştir. İlçe Belediyesi'nin talebi üzerine otobüs durakları ve otoparklar ile kesintiye uğrayan bisiklet yolunun güzergah boyunca devamlılığı sağlanması hedeflenmiş, mevcut su depolarının üstü seyir tepeciği/ bakı noktası olarak değerlendirilmiş; soğuk piknik alanları, çok amaçlı açık gösteri alanı, spor sahaları, çim seyir terasları, kafeterya, büfe, güvenlik birimi projelendirilmiş (URL-3).

Alan içerisinde bulunan fonksiyonlara göre 9 adaya ayrılmıştır. bu adalar su sporları adası, 2 adet spor adası, çocuk dünyası, spor bitki-rekreasyon adası, kültür-aktivite adası, eğlence adası, gösteri alanı, çayır gösteri alanı olarak adlandırılmıştır. 4 adet araç, 10 adet yaya, 5 adet bisiklet parkuru girişi bulunmakta toplamda 2865 adet araç otoparkı (engelli otoparkı dahil), 76 adet otobüs otoparkı mevcuttur. Toplam 20 adet basketbol, futbol, voleybol, tenis sahaları, 1 adet nizamî futbol sahası, 1 adet uluslararası maçları karşılayabilecek tenis kortu, 2 adet mini golf sahaları ve parkın genelinde 289.000 m² alana sahip 7610 m bisiklet parkuru, 1900 m uzunluğunda da koşu parkuru mevcuttur (Demir, 2018).

Son dönemde İBB tarafından Maltepe’de 2 büyük İstanbul Açık Hava Gösteri Merkezi kurulmuştur. Maltepe Açık Hava Gösteri Merkezi’nde hem konser ve tiyatroların gerçekleştirilebileceği 500 kişilik bir alan oluşturularak, yaynevleri ile kitaplarının bir arada olduğu bir kitap fuarı kurulmuştur (İBB, 2020).



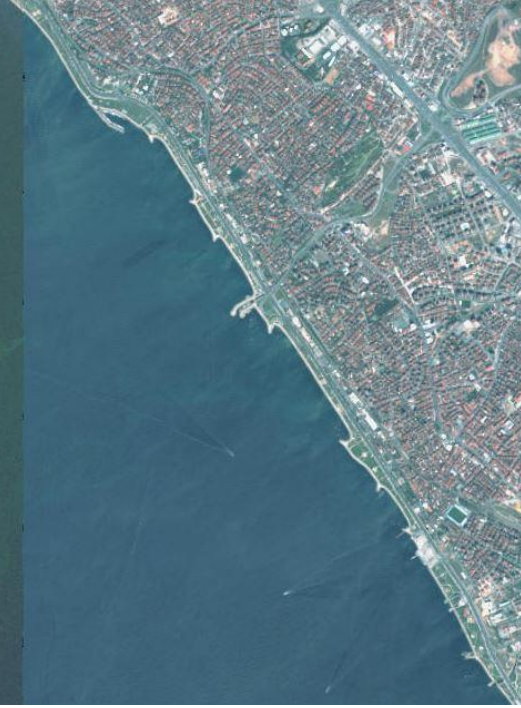
Şekil 7. Maltepe Dolgu Alanı Yapım Süreci (URL-3).



Şekil 8. Maltepe Dolgu Alanı Yapım Süreci (URL-4).



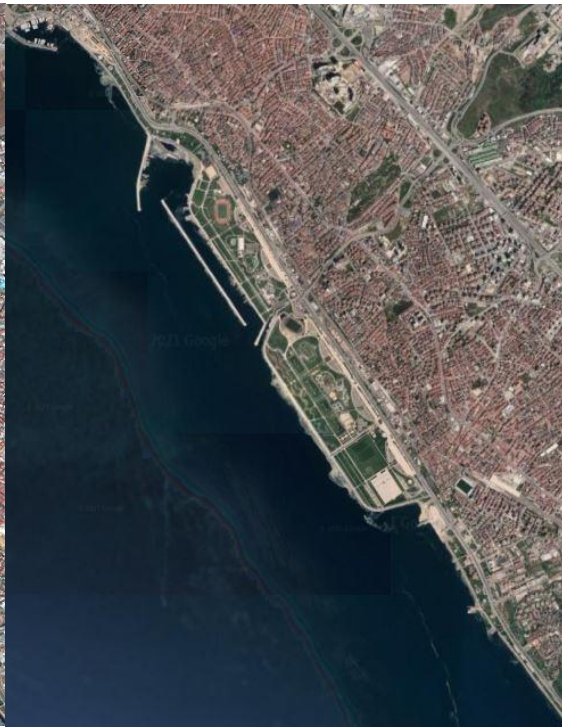
Şekil 9. 2009 Yılı Maltepe D.A. Uydu Görüntüsü.



Şekil 10. 2011 Yılı Maltepe D.A. Uydu Görüntüsü.



Şekil 11. 2014 Yılı Maltepe D.A. Uydu Görüntüsü.



Şekil 12. 2021 Yılı Maltepe D.A. Uydu Görüntüsü.

YENİKAPI VE MALTEPE DOLGU ALANLARINDA YER ALAN KENTSEL KAMUSAL MEKÂNLARIN MEKÂN KALİTESİNİN DEĞERLENDİRİLMESİ

Yıllar içerisinde geçirdiği büyük değişimler ortaya konulan bu iki adet dolgu alanında yer alan kentsel kamusal mekânların nicelik açısından büyük bir oranda ihtiyacı karşıladığı söylenebilmekle birlikte niteliksel açıdan değerlendirilmesinin sağlanabilmesi amacıyla işlev ve tasarım yönüyle de mekân kalitesini incelenme gereksinimi ortaya çıkmıştır.

Gülen (2006)'e göre, kamusal mekânlarda başarıya ulaşmak için tanımlanan, Avrupa konseyi tarafından da kabul edilen ana ilkeler doğrultusunda Yenikapı ve Maltepe dolgu alanlarında yer alan kentsel kamusal mekânların mekân kalitesi bu ölçütler doğrultusunda değerlendirilmiştir.

	Yenikapı Dolgu Alanı	Maltepe Dolgu Alanı
Mekânın Kullanılır Durumda Ve Kullanıma Açık Olduğuna Dair Mesajlar Vermesi	+	+
Estetik Çekiciliği Olması	+	+
İç Ve Dış Mekânlar Arasında Maksimum Ölçüde Geçiş Sağlaması (Ulaşılabilirlik)	-	-
En Çok İhtiyaç Etkinliklerle Donatılmış Olması	+	+
Güvenli ve Korunmalı Bir Ortam Sağlaması	+	+
Kentsel Stresi Aşmaya Yardımcı Olacak Doğal Ortamlar Sunması	+	+
Kullanma Olasılığı En Fazla Olan Kullanıcı Grubunun Gereksinimlerine Uygun Olması ve Kullanımda Çeşitlilik Sağlaması	+	+
En Yoğun Kullanımın Gerçekleştiği Zamanlarda Güneş, Gölge, Rüzgâr ve Benzeri Doğal Çevre Öğeleriyle İlintili Olarak Rahat Bir Çevre Sunması	-	-
Çocuklar ve Özürlüler İçin Erişilebilir ve Kullanılabilir Olması	+	+
Kolay ve Ekonomik Bakımın Sağlanması	-	-
En Uygun Malzeme Seçimiyle Karşlanması, Kullanımda Farklılıkların Malzeme Değişimiyle Vurgulanması	-	+
Mekânın Hem Görsel Sanatın İfade Edildiği Bir Yer, Hem De Sosyal Bir Ortam Olarak Tasarlanması	+	+

Tablo 2. Yenikapı ve Maltepe Dolgu Alanlarında Yer Alan Kentsel Kamusal Mekânların Mekân Kalitesinin Değerlendirilmesi.

Kentsel açıdan mekânın kalitesini pek çok faktör olumlu-olumsuz olarak etkilemektedir. Bu faktörlerin alanın kimliği, mekân bütünlüğü, çok fonksiyonlu oluşu, kullanım çeşitliliği ve ihtiyaçlarına cevap vermesi, ulaşılabilirlik, otopark yeterliliği, mekânın çevresine etkisi ve sürdürülebilirliği, estetik olarak sıralanması mümkündür.

Alanlardan kimlik açısından Yenikapı dolgu alanının Yenikapı arkeolojik alanı ve tarihi surlara yakın bir konumda yer almasının yanı sıra oluşturulan kamusal alanların kimliği semtin ve bölgenin kimliği ile paralel mekâna özgü olarak tasarlanmayarak kentin büyük ölçekte ihtiyaçlarına cevap verecek düzeyde tasarlanarak mekânın bulunduğu bölge ile mekân algısının farklılaşmasına neden olduğu görülmektedir.

Dolgu alanları planları mevcut planlara ek olarak yapıldığından mevcut alanlar ile mekân bütünlüğü açısından bir takım sorunlar oluşturmaktadır. Bu alanlar doldurulmadan öncesi kara ve deniz arasından geçen sahil yollarının etkisi ile bir sınır/duvar görünümü kazanarak parsel bazında ve parçacıl bir durumda kalmaktadır.

Her iki alanda da açık yeşil alanlar, spor tesisleri, fuar alanları, toplanma alanları gibi farklı birçok fonksiyonu bulunması sosyo-kültürel açıdan çok yönlü bir kullanıcı kitlesinin alanda konumlanmasına sebep olurken bu durum çeşitliliği sağlamaktadır. Farklı fonksiyonların bir arada bulunması dinlenme ve boş vakit geçirmenin daha kaliteli bir hale gelmesini sağlamaktadır.

Alanların kentin önemli ulaşım akslarında yer almaları ulaşılabilirliği sağlamakla birlikte büyük yoğunlukla hafta sonları kullanımları özellikle özel otomobiller ile ulaşım sağlanacak şekilde artan kullanım sebebi ile ulaşım ve parklanma konularında yoğunluk oluşmasına neden olmaktadır. Bu durum kentte diğer yaşayanlar ve bu alanların kullanımında dinlenme amacının bir miktar dışına çıkmaktadır. Daha kaliteli bir ulaşılabilirliğin sağlanması tek bir ulaşım aracı ile erişimin sağlanarak yoğunluğu arttıran değil yoğunluğu azaltan çeşitli ulaşım araçları ile desteklenmesi beklenmektedir. Büyük ulaşım yollarının bu alanlar ile kent arasında bariyer oluşturması kentlinin yaya yolları ile erişmesini zorlaması da gün içerisinde kullanımların yoğun olmamasına neden olan bir başka sebep olmaktadır. Bu durum günün belli saatlerinde bu alanların atıl kalmasına neden olmaktadır.

Alanların hem işlevsel hem estetik açıdan tasarlanması rekreatif alanların nitelik olarak iyileştirmesini ve dolayısıyla kullanımının oranlarını etkilemektedir. İşlevsel olarak artan kullanımların getirisi olarak yeterli otopark alanlarının bulunmaması, bölgeye yoğun bir trafik oluşturması, uzun araç kuyruklarının oluşumuna sebebiyet vermesi, alanların işlevleri dışında kullanılıp (piknik alanı vs.) mekânın kalitesini etkilemektedir.

Dolgu alanları su üzerine yapılarak su kenarında konumlanmış olması bu alanlardaki kullanımların su ile temas halinde olması beklenirken hem Yenikapı hem Maltepe’de bulunan alanların kullanımları suya temas olmadan gerçekleşmektedir. Bu durum mekânın işlevinin ve kullanımlarının kıyıda bulunma özelliği taşımadığı net bir biçimde açıktır.

Doluluk-boşluk açısından her iki alanın da boşluk oranının yüksek geniş açık yeşil alanlardan oluşmaktadır. Bu durum geniş dinlenme ve etkinlik alanlarına yer vermesinin yanı sıra mekânı algılamak ve ölçeklendirmede zorluk oluşturmaya da sebep olmaktadır. Alanlar su kenarında yer almasına rağmen tasarlanırken ve uygulanırken su ögesinin hemen hemen hiç kullanılmadığı görülmektedir.

Tüm bu faktörler doğrultusunda mekân kalitesinin yüksek olup olmaması kentlinin yaşam kalitesini de etkilemekte ihtiyaç duyulan bir mekânın yalnızca var olmasının yanı sıra daha fazla yaşanabilir mekânlar ihtiyacına yol açacağı düşünülmektedir.

SONUÇ

- Bu çalışma dolgu alanları ile kente büyük ölçekli kamusal alanlar eklenmesi ile birlikte niceliğin artarak kamusal alan miktarının artmasına katkı sağlarken nitelik açısından da değerlendirilerek tasarlanmasının sağlanmasının gerekliliğinden yola çıkmaktadır.
- Her iki dolgu alanının bulunduğu bölgelerde; kentin yayılması sonrasında oluşturulan mevcut fonksiyonların bir dönüşüm geçirdiği görülmektedir. Bu bölgelerin kentin yeni gelişim bölgeleri haline dönüşmesiyle birlikte bu fonksiyonlara ve artan nüfusa kentsel kamusal alanların yetersiz kalması dolgu alanlarını bir çözüm olarak görülmesine neden olmuş kente büyük ölçekli rekreasyon/spor/toplanma alanı ihtiyacı doğrultusunda bu alanlar planlanarak yapılmıştır.
- Dolgu alanları kente ve kıyı ekosistemine zarar vermeden dönüştürülmesini sağlamak projelerin çevresel açıdan daha sürdürülebilir olmasını sebep olacaktır.
- Dolgu alanları boğaz/deniz kıyısında suyun yakınında planlamasına rağmen kentlinin suya değeceği bir tasarım öngörülemediği görülmüştür.

- Alanların her ikisinde de kentlinin ihtiyacı olan alanlar, gündelik kullanımları karşılayan fonksiyonların yer almadığı daha yoğun olarak yılın belli dönemlerinde programlar/gösterilerin yapılması mekânların belli dönemlerde atıl kalmasına neden olurken bu gibi durumları engelleyici aktif kullanımı sağlayacak çözümler üretilmesi gerektiği önemli bir hale gelmiştir.
- Parsel ölçeğinde değişiklikler yapılarak üst ölçek planlar ile uyumsuz olması bütünsellik ve tüm kıyı alanlarının bütünü ve kent ölçeğinde alınan kararlar ile bağlantısının yeteri kadar güçlü olmadığını ve bulunduğu bölgenin kimliğini taşımasının mümkün olmadığını göstermektedir. Yapılan projelerin üst ve alt ölçek plan ve projeler ile birlikte düşünülerek tasarlanması mekânın kalitesinin artışına, daha nitelikli projeler haline dönüşmesine ve böylece yaşam kalitesinin artışına da katkı sağlayacağı düşünülmektedir.

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TARİHİ ÇEŞMELERDE SUYUN BİR TASARIM ÖĞESİ OLARAK KULLANIMI: TAKSİM SUYOLU ÇEŞMELERİ

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ÖZET

Gerek İslam öncesi kültürün izleriyle, gerek İslam düşüncüsüyle manevi bir anlam kazanan su, Türk mimari geleneğinin bir parçası olmuştur. Türklerde su için yapılan hayır, ibadetlerin en makbulü olmuş, bir yere su getirmek, bir çeşme yaptırmak sevap olarak kabul edilmiştir. Suyu ilgili Osmanlı yapıları, cami içlerine konan ve su küpleri ya da teknelerinden oluşan basit sebillerden, büyük kanal-havuzlara ya da birkaç kapalı birimden oluşan büyük ve anıtsal meydan yapılarına kadar pek çok çeşide sahiptir. Bu yapılar içinde Osmanlı su kültürü açısından mahalle çeşmeleri özel bir yere sahiptir. 1718'den sonra İstanbul'un, Kasımpaşa kıyılarına ve Beyoğlu yönüne doğru yayılması neticesinde bu bölgeler için sürekli su sağlayacak tesislerin yapılması gündeme gelmiş, I. Mahmut'un tahta geçmesinden sonra ele alınan ilk imar projesi de bu proje olmuş; su yolu tesislerinin tamamlanması ise 1731'de gerçekleşmiştir. Kaynaklarda Bahçeköy Suları ya da Tophane-i Amire Suyolu olarak da anılan tesis, bugün Taksim Suyu olarak tanınır. Hattın yapılış tarihi olan 1731-33 yıllarına tarihlenen ve bu vesileyle yapılan 30 çeşmenin ismi tespit edilebilmektedir. Beyoğlu'ndaki bu yapılar, kentin karakter kazanmasında ve kent mekânlarının tanımlanmasında önemli bir rol oynamalarının yanı sıra devrin sanat anlayışının ve sosyal yaşantısının da göstergeleri olarak karşımıza çıkmaktadırlar. Bu çeşmeler üzerine yapılacak çalışmalar bize su kültürünü anlama açısından önemli ipuçları verebilmektedir. Çeşmelerin önemli özelliklerinden biri mermer üzerine rölyef olarak işlenmiş olan naturalist meyve ve çiçek kompozisyonlarıdır. Çeşmelerde vazo içinde çiçek, saksı içinde meyve ağacı ve sepet içinde meyve kabartmaları işlenmiştir. Çiçek ve az da olsa meyve, farklı bağlamlarda İslam sanatında her zaman simgesel önem taşımış, örneğin, cennetin ya da aşkın temsili olarak kullanılmıştır. Çiçek ve meyve bezemelerinin, özellikle suyun aktığı yer etrafında yoğunlaşmış olması "su-çiçek-meyve" üçlemesiyle "cennet" imgesine bir gönderme olarak düşünülebilir. Böylece yapının, içinden akan suları ile "cennet bahçesi içinde köşk" tablosunu yansıttığı söylenebilir. Sonuç olarak Taksim Suyolu'na ait ve aynı dönem içinde yapılmış olan bu çeşmeler, su kültürünün somut birer örnek olarak mimariye ve taşla yansıdığını göstermesi açısından önemlidir.

Anahtar Kelimeler: Kültürel Miras; Mimarlık Tarihi; Çeşmeler; (Heritage; History of Architecture; Ottoman Fountains).

GİRİŞ

Geçmiş zaman boyunca hemen her yapı, su ile ilişkilendirilmiştir. Yaşam, suyu temel alarak oluştuğundan ve insanlar içmek, temizlenmek veya görüntüsünden/sesinden yararlanmak için suya muhtaç olduğundan mimarlıkla su arasındaki bu ilişki doğaldır. Gerek İslam öncesi kültürün izleriyle, gerek İslam düşüncesiyle manevi bir anlam kazanan su, Türk mimari geleneğinin de bir parçası olmuştur. Suyla ilgili Osmanlı yapıları, cami içlerine konan ve su küpleri ya da teknelerinden oluşan basit sebillerden, büyük kanal-havuzlara ya da birkaç kapalı birimden oluşan büyük ve anıtsal meydan yapılarına kadar pek çok çeşide sahiptir. Ancak bazı yapılar vardır ki, özellikle su için yapılmışlardır. Fonksiyonel olarak suyu kullanan bu yapılar, “su yapıları” olarak adlandırılabilirler. Bu yapılar içinde Osmanlı su kültürü açısından, mahalle çeşmelerinin özel bir yeri vardır.

Bu çeşmelerin bir proje kapsamında bir arada yapıldığı nadir uygulamalardan biri Taksim Suyolu ve ona bağlı çeşmelerdir. 18. yüzyılın önemli projelerinden olan Taksim Suyolu Tesisleri’nin yapılması ile İstanbul Galata, Beyoğlu, Kasımpaşa, Tophane semtleri yeni çeşmelere kavuşmuş, yeni mahalleler kurulmuştur. Mustafa Cezar’ın ifadesiyle “su ananın doğurduğu Beyoğlu” yakası (Cezar 1991 s24) bu su yolu sayesinde mahalle çeşmeleri açısından bir açık hava müzesine dönüşmüştür. Kaynaklarda 40’ın üzerinde olduğu belirtilen söz konusu çeşmeler içinde bugün ancak 30’unun ismi tespit edilebilmektedir. Sultan ailesi ve dönemin devlet ileri gelenleri eliyle yaptırılan bu çeşmelerden ne yazık ki bazıları yok olmuş, bazısının da yeri değiştirilmiştir. Bir semte hayat vermek için, bütüncül bir proje kapsamında ve kısa sürede yapılmış bu çeşmelerden günümüze ulaşabilmiş olanların incelenmesi hem dönem sanatının özelliklerini hem de çeşmelerin su kültüründeki yerini anlamak açısından önemlidir.

TAKSİM SUYU TESİSLERİ

III. Ahmet’in saltanat yıllarında, özellikle 1718’den sonra şehrin Galata yakasının, Kasımpaşa kıyılarına ve Beşiktaş yönüne doğru yayılması neticesinde, mahalli kaynak suları ile ihtiyacı karşılamaya çalışılan¹ bu bölgeler için sürekli su sağlayacak tesislerin yapılması gündeme gelmiştir. Proje çalışmalarının ve ilk hendek hafriyatının III. Ahmet zamanında yapıldığı Fındıklılı Şemdanizade Süleyman Efendi’nin Mariüt Tenvarih adlı eserinde belirtilmektedir (Aktepe 1976 c1 s30). 1728 yılında Üsküdar’da tamamlanan su yolu ve çeşmelerinde olduğu gibi (Şahin 2012) burada da kapsamlı bir imar faaliyetinin düşünüldüğü anlaşılmaktadır. Ancak Patrona Halil isyanı ve III. Ahmet’in tahttan indirilmesi ile çalışmalar durakladı. I. Mahmut’un tahta geçmesinden sonra ele alınan ilk imar projesi de yine Galata, Tophane ve Kasımpaşa bölgelerine düzenli su sağlayacak olan bu proje olmuştur. Suyolunun tamamlanması, padişahın da katıldığı bir törenle, 8 Rebiülahir 1144 / 10 Ekim 1731 günü gerçekleşmiş², tesisler padişahın annesi Saliha Sultan’ın vakfı olarak kaydedilmiştir³ (Yüngül 1957 s7, Aktepe 1976 c1 s31, Aydın 2007 s166). Kaynaklarda “Bahçeköy Suları” ya da “Tophane-i Amire Suyolu” olarak da anılan tesis, bugün Taksim Suyolu olarak tanınmaktadır⁴.

Suyolunun ana kaynağı Bahçeköy’de doğan, önce Acı Elma, oradan Kâğıthane deresinin bir parçası olan Eskibağ Deresi’nin sularıdır. Kaptajlarla Eskibağ Deresi’nin kaynağından toplanan sular, Balaban Deresi katmasını da alarak Ayazağa, Mecidiyeköy, Harbiye yolu ile yaklaşık 25 kilometrelik bir hat üzerinden⁵, şehir içine dağıtım yapıldığı Taksim’deki tesislere ulaşmaktadır. Bu ilk yapılışında şehre isale edilen su miktarının 13,5 lüle (702 m3/gün) olduğu tahmin edilmektedir⁶ (Yüngül 1957 s7). Taksim Suyolu Tesisleri, İstanbul şehrinin 18. yüzyıl ve sonrasındaki gelişimi için önemli bir proje olmuştur. Galata, Beyoğlu, Kasımpaşa, Tophane, Beşiktaş semtleri yeni çeşmelere kavuşmuş, bu bölgelere yeni mahalleler kurulmuş, nüfus artmış, nüfus arttıkça Taksim Suyolu da elden geçirilmiş ve yeni eklemeler yapılarak zaman içinde geliştirilmiş, ihtiyacı karşılamak için kapasitesi artırılmıştır. Beyoğlu yakası yeterli suya kavuşunca saraylar ve kışlalar başta olmak üzere buradaki resmi yapılar daha da artmış, yeni yapılan kollarla Boğaz’ın Rumeli yakasındaki köylere de su verilmiş olmuştur⁷. Bunun yanı sıra hat, şehrin fiziksel gelişimini de belirlemiştir denebilir. Beyoğlu’nun, Harbiye, Şişli Mecidiyeköy, Zincirlikuyu, Maslak yönündeki kuzey aksının omurgası, topografyaya da bağlı olarak, su yoluyla aynı güzergâhı izlemiştir. Bugünkü Büyükdere Caddesi, su yolunun Bahçeköy’den Taksim’e izlediği yol ile örtüşmektedir.

¹ Taksim Suyolu yapılmadan önce buralarda en yaygın şekliyle suyun kuyular açılarak veya sarnıçlar vasıtasıyla temin edildiği bilinmektedir. Hatta, suyun azaldığı zamanlarda İstanbul’dan ve civar kaynaklardan fıçılarla Galata’ya su taşındığı da bazı kaynaklarda belirtilmektedir. Taksim Suyolu yapılmadan önce bu bölgenin bilinen tek su tesisi, II. Bayezid tarafından yaptırılan, Levend Çiftliği bölgesindeki kaynaklardan toplanan ve kısıtlı bir su kapasitesi olan (yaklaşık 3 lüle) “Galata Sarayı Suları”dır (Cezar 1991 s20).

² Törende, tesisin yapımından sorumlu olan başta Sadrazam Topal Osman Paşa, Bina Emini Saray Pazarbaşı Hacı Ahmed Ağa, Mimarbaşı Kayserili Mehmed Ağa, Su Nazırı Hacı Osman Ağa ve Mimar Mustafa olmak üzere 28 kişiye hilatler giydirilmiştir (Yüngül 1957 s7, Erdoğan 1962 s11,12, Aydın 2007 s166).

³ Bu hattın beslenen, zamanında yapılmış pek çok çeşmede de Valide Sultan’ın adı yâd edilmiş bu nedendir.

⁴ İstanbul su tesisleri genelde suyun kaynağına göre (Halkalı, Kâğıthane, Terkos gibi), tesisin hizmet ettiği nihai yapıya göre (Kırkçeşme, Laleli gibi) nadiren de tesisi yaptıran kişiye göre (Süleymaniye, Hamidiye gibi) isimlendirilmiştir. Bu bağlamda I. Mahmut’un yaptırdığı tesisleri, suyun kaynağından ötürü “Bahçeköy” ya da tesisin su verdiği en önemli yapıya istinaden “Tophane” su yolu olarak adlandırılması normaldir. Ancak ilginç bir şekilde tesisin bir yapısı bir semte, bu semt de tesise isim olmuş ve “Taksim Suyolu” ismi yerleşmiştir.

⁵ Daha önce yapılmış su yolları ile karşılaştırıldığında hat uzunluğu bakımından Taksim Suyolu, Kırkçeşme Suyolu’nun (55 km) ardından ikincidir. Onu, Köprülü Suyolu (21 km) ve Süleymaniye Suyolu (Çınarkolu 17 km) takip eder.

⁶ Taksim Suyolu, debi bakımından Kırkçeşme Suyolu (ilk yapılışı 81 lüle) ve Süleymaniye Suyolu (19 lüle) ardından üçüncüdür. Onu, Bayezid Suyolu (8 lüle) ve Köprülü Suyolu (8 lüle) takip eder.

⁷ Daha 1750 yılında hattın kurucusu olan I. Mahmut tarafından Eski Bağlar Deresi üzerine Topuzlu Bent yapılarak tesisin 13,5 lülelik kapasitesi 23,5 lüleye çıkarılmıştır. 1786-1787 yıllarında Kaptan-ı Derya Cezayirli Gazi Hasan Paşa bu bendin yüksekliğini artırmış, Sadrazam Yusuf Paşa da hattı tamir ettirmiştir (Yüngül 1957 s7). Daha sonra hatta başka eklemeler de yapılmıştır; 1797 yılında III. Selim’in annesi Mihrîşah Sultan ve 1839 yılında I. Mahmut tarafından Arabacı Mandırası Deresi kollarına birer bent yaptırılarak suları (ilki 23, ikincisi 73 lüle olmak üzere) hatta katılmıştır. Böylece hattın ilk yapılışından yaklaşık 100 yıl sonra toplam debisi yaklaşık 10 kat artırılmış, su dağıttığı bölge de Kasımpaşa’dan Yeniköy’e kadar uzanmıştır.

I. Mahmut'un yaptırdığı suyunun son noktası ve kente dağıtım merkezi, Taksim'de, bugünkü Cumhuriyet Meydanı'nın yanında yer alan yapı topluluğudur⁸. Bu topluluk, büyük bir su deposu ve suyun belirli nispetlerde çeşitli kollara aktarıldığı maksem binasından oluşur (Şekil 1). Yapı, maksemin giriş kapısı üzerinde yer alan üç beyitlik kitabenin son iki satırına ve debi ölçme sandığı üzerindeki tek satırlık kitabeye göre 1145/1732-33 tarihinde tamamlanmıştır. Fındıklılı Süleyman Efendi'nin Mariüt Tevarih adlı eserinde de 1145 yılı olayları anlatılırken Tophane'ye suyun gelişinden bahsedilmiş; Padişah, Valide Sultan ve Harem-i Hümayun'un da makseme gelerek, dualarla buradan çeşmelere su salımını başlattıkları belirtilmiştir (Aktepe 1976 c1 s31).

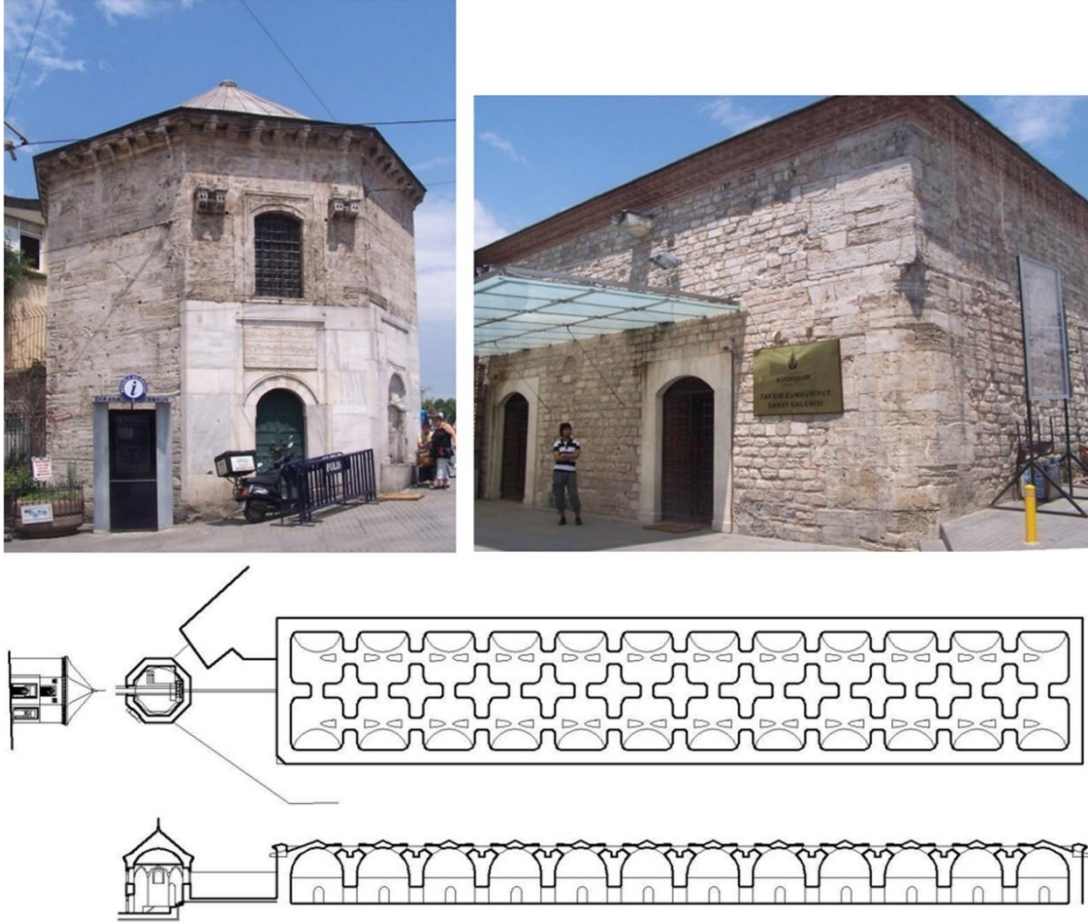
Sular maksemde taksim edilmeden önce yapı topluluğunun bir parçası olan 24 hücreli depoda biriktirilmektedir. Deponun dolusavak kotuna kadar toplayabileceği suyun hacmi 2.730 m³'ü bulur. Suyolunun yapıldığı ilk dönemde hattın kapasitesinin 13,5 lüle (702 m³/gün) olduğu düşünüldüğünde deponun tamamının hattan gelen suyla yaklaşık 4 günde dolduğu tahmin edilebilir. Bir başka deyişle depo tam olarak doldurulduğunda hattan çeşmelere yaklaşık 4 gün boyunca kesintisiz su verilebilmekteydi. Su, depodan makseme deponun taban seviyesinden çıkan borularla iletilmektedir. Maksem, sekizgen planlıdır ve içten kubbe, dıştan sekiz köşeli piramidal bir örtüye sahiptir. Cephelerinde kesme taş ve mermer kullanılan yapının çatısı kurşun kaplıdır. Maksemin cephesinde bir de çeşme bulunmaktadır⁹. Genel hatlarıyla sade olan çeşme, çok derin olmayan bir çeşme nişine ve yelpaze şeklinde bir niş örtüsüne sahiptir.

Maksemin iç mekânı da sekizgen planlıdır. Girişte sol tarafta, üç merdivenle çıkılan, etrafı mermer plaklarla çevrili bir mahfil bulunmaktadır. Bu mahfilin sol ucu maksem duvarının içerisine girmiştir. Girişe göre sağ tarafta ise maksemin üç kenarı boyunca uzanan taş bir sedir yer alır. Girişin karşısındaki duvarda, debi ölçme ve taksim kısmı yer alır. Depodan gelen su, duvardaki mermer oluktan önündeki küçük su teknesine akmakta, buradan teknenin dalgalı profilli duvarları üzerine yerleştirilmiş olan bronz lüleler vasıtasıyla ikisi önde, biri yanda olmak üzere üç dağıtım havuzuna aktarılmaktadır. Öndekilerden biri Tophane-Kabataş; diğeri Galata yönüne, yandaki havuz ise Kasımpaşa yönüne gidecek suyun havuzlarıdır. Bu havuzların ortalarındaki düşey delikten sular, toprak altındaki kanallara akar¹⁰.

⁸ Su hattı gibi, bu yapı topluluğu da şehrin gelişiminde önemli bir belirleyici olmuştur. Hattın şehir içine dağılmadan önceki nihai noktası olan, bir zamanlar yerleşimden uzak boş bir alanın ortasındaki su taksim tesisleri "Taksim" adı ile semte ismini vermiş, zamanla şehrin odaksal noktalarından birine dönüşmüştür. Suyolunun ana hattının bitip şehre dağıtımının yapılacağı yer olarak bu noktanın seçilmesi topoğrafik nedenlerden kaynaklanıyor olmalıdır. Burası, suyun iletileceği son noktalar olan Tophane, Galata ve Kasımpaşa semtlerine üstten bakan sırtın en kuzey ucudur. Tesisin yapıldığı yıllarda, Galata Surları dışında Gatata Sarayı önündeki dörtyol ötesinde pek yerleşim olmadığı da düşünüldüğünde (Dökmeci-Çıracı 1990 s25) bu boş alanın, düşünülen büyük depo ve maksem için en uygun yer olarak tercih edilmesi anlaşılır bir durumdur.

⁹ Kapının sol tarafında, makseme bitişik duvar üzerinde geç tarihli bir çeşme daha yer almaktadır. Sade, mermer bir levha şeklindeki çeşmenin üzerindeki sivri kemerli kitabelikte "Ve cealnâ mine'l-mâi külle şey'in hayy" ayeti ("Herşeye su ile hayat verdik" Enbiyâ 30) istifi olarak hakkedilmiştir. Bu kitabenin altında 1333 (1914-15) tarihi yer almaktadır.

¹⁰ Bugün suyun dağılımı şu şekildedir; Tophane-Fındıklı yönüne 10 oluktan toplam 18 lüle (modern ölçümlere göre 15.6 lüle), Beyoğlu-Galata yönüne 10 oluktan toplam 18 lüle (modern ölçümlere göre 16.8 lüle), Kasımpaşa yönüne 4 oluktan toplam 5 lüle (Yüngül 1957 s51, Çeçen 1992 s77) su verilmektedir. Şehre isale edilen su miktarının 13,5 lüle olduğu tahmin edildiği (Yüngül 1957 s7) ilk dönemde suyun nasıl taksim edildiği konusunda ise bir bilgi bulunmamaktadır. 1750 yılında Topuzlu Bent yapılarak tesisin 13,5 lülelik kapasitesi 23,5 lüleye çıkarılmış, yukarıda belirtildiği gibi 1786-1787 yıllarında Kaptan-ı Derya Cezayirli Gazi Hasan Paşa ve Sadrazam Yusuf Paşa tarafından hat elden geçirilmiş, sonuçta makseme gelen su ve suyun taksimatı zaman içinde değişmiştir.

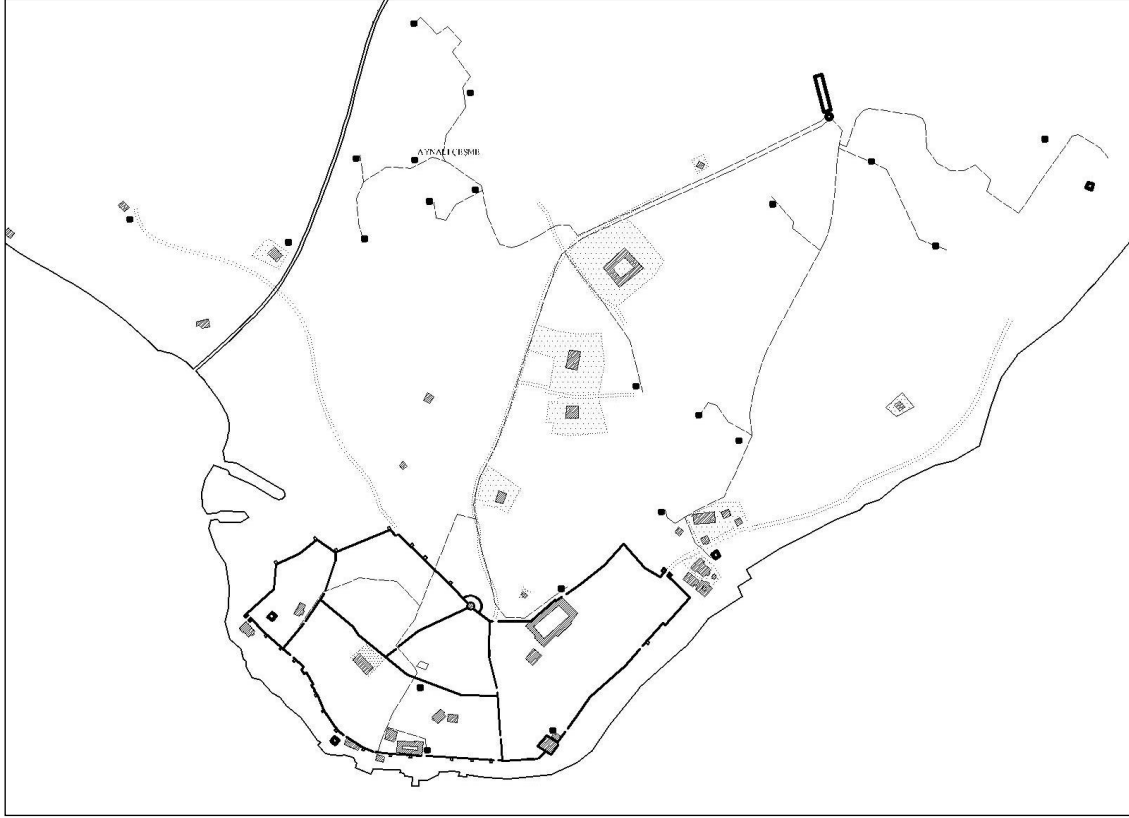


Şekil 1. Taksim Maskemi ve Su Deposu.

ÇEŞMELER

Sultan I. Mahmut, Bahçeköy sularını İstanbul'un Galata-Beyoğlu yakasına getirmesinin ardından, başta tesisin vakıf sahibi Saliha Valide Sultan olmak üzere devlet ileri gelenleri ile beraber bölgede, hattın sularından beslenen pek çok çeşme yaptırılmasını sağlamıştır. Her ne kadar dönemin kaynaklarında 40'ın üzerinde çeşmenin yapıldığından bahsedilse de¹¹ bugün bölgedeki çeşmeler ve yazılı kaynaklar incelendiğinde Taksim Suyolu vasıtasıyla yapılmış ve 1731-33 arasında inşa edilmiş 30 çeşmenin ismi tespit edilebilmektedir. Çeşmelerden, yeri tespit edilebilenlerin su dağıtım kollarına göre sayısal dağılımı şöyledir: Tophane-Kabataş bölgesinde 10 çeşme, Beyoğlu-Galata bölgesinde 6 çeşme, Kasımpaşa bölgesinde 10 çeşme (Şekil 2). İsmi bilinen ancak yeri tespit edilemeyen çeşme sayısı ise 4'tür.

¹¹ Suphi Tarihi'nde, tesisten "kırk çeşme mütevaciz" beslendiği (kırktan fazla çeşmenin yapıldığı) belirtilmekte, bunlardan 13 tanesini de ismen sayılmaktadır (Aydiner 2007 s169). Mariüt Tevârih'te de 14 çeşmenin ismi sayılmakta, "ve sair ricalin sair mahallere bina eyledikleri cem'an kırk aded çeşme" denmektedir (Aktepe 1976 c1 s31).



Şekil 2. Taksim Suyolu ilk yapılışına ait mevcut çeşmeler ve hattın muhtemel kent içi dağılımını gösteren harita (Çeçen 1992'den yararlanılarak çizilmiştir).

Sultan ailesi ve dönemin devlet ileri gelenleri eliyle yaptırılan çeşmelerin yoğunlaştıkları noktalar göz önüne alındığında dört bölgeden söz edilebilir: 1.Tophane sahili ile Galatasaray arasında kalan vadi (Bugünkü Yeni Çarşı-Boğazkesen Caddesi), 2.Fındıklı-Kabataş sahilinden başlayıp Taksim'e doğru çıkan vadi ve sırtlar, 3.o zamanlar ayakta olan Galata Surları içinde kalan bölge ve sahil şeridi, 4. Kasımpaşa Deresi Vadisi (Bugünkü Bahriye Caddesi) ve Dolapdere'ye kadar karşılıklı sırtlar. Genelde yaptırılanların isimleriyle anılan bu çeşmelerin bu bölgelere dağılımı şu şekildedir: Tophane'den Galatasaray'a çıkan yol üzerindeki çeşmeler: Tophane I. Mahmut Meydan Çeşmesi, Topçubaşı İsmail Ağa Çeşmesi (Kadiriler Çeşmesi), Ömer Ağa Çeşmesi, Defter Emmini Çeşmesi, Tersane Emmini Hacı Ahmet Ağa Çeşmesi (1). Fındıklı-Kabataş sırtlarındaki çeşmeler: Hekimoğlu Ali Paşa Meydan Çeşmesi (yeri değişmiş), Cebecibaşı Abdullah Ağa Çeşmesi, Hacı Beşir Ağa Çeşmesi (yeri değişmiş), Tevkii Hafız Ahmet Paşa Çeşmesi, Yeğen Mehmet Paşa Çeşmesi (Solak Çeşmesi). Galata Sur içinde ve çevresindeki çeşmeler: Azapkapı Saliha Sultan Meydan Çeşmesi, Kethüda Yahya Ağa Çeşmesi, Reissülküttab İsmail Efendi Çeşmesi, Mihrişah Kadın Çeşmesi, Defterdar Mehmet Efendi Çeşmesi (Bereketzade Çeşmesi) (yeri değişmiş), Verdina Kadın Çeşmesi. Kasımpaşa semtindeki çeşmeler: Süruri Çeşmesi, Silahdar Yakub Ağa Çeşmesi, Vuslat Kadın Çeşmesi, Kiblelizade Mehmet Efendi Çeşmesi, Ziver Efendi Çeşmesi (Karanlık Çeşme), Kaptan Hacı Hüseyin Paşa Çeşmesi (Murabıt Çeşmesi), Tersane Emmini Ahmet Ağa Çeşmesi (2), Kethüda Hacı Mehmet Ağa Çeşmesi, Yeniçeri Ağası İsmail Paşa Çeşmesi (Aynalı Çeşme) (yıkılmış), Defterdar İzzet Ali Paşa Çeşmesi (yıkılmış). Bugüne ulaşamadığı için yeri kesin olarak tespit edilemeyen çeşmeler: Sadrı Anadolu Şehzade Mehmed Efendi Çeşmesi, Valide Kethüdası Osman Efendi Çeşmesi, Sadrazam Kethüdası Gül (Kel) Ahmed Ağa Çeşmesi, Sadullah Efendi Çeşmesi.

Bu çeşmeler arasında en görkemli olanları meydan çeşmeleridir. Bunların ilki I.Mahmut'un, Taksim Suyolu'nu tamamlatmasının bir nişanesi olarak kendi adına, Tophane semtinde, Galata Surları'nın hemen dışına yaptırdığı çeşmedir (Şekil 3). Yapı, dört cephesindeki kitabelerden anlaşıldığı üzere 1145/1732 senesinde, tesisin maksemi ile aynı yılda, tamamlanmıştır. Bulunduğu semitten dolayı Tophane Çeşmesi olarak da bilinen yapı, dört yüzlü meydan çeşmesi tarzında yapılmıştır. Böylece bu çeşme, ilk olarak bundan beş yıl önce, III. Ahmet devrinde, Topkapı Sarayı Bab-ı Hümayun önünde ve Üsküdar iskelesinde yaptırılan meydan çeşmesi tipinin Osmanlı mimarlığındaki üçüncü örneği olmuştur. Yapı, Kılıç Ali Paşa Camisi'nin yanındaki alanda, vaktinde Galata Surları'nın Tophane Kapısı'ndan çıkıp Beşiktaş'a giden ana yol üzerinde yapılmıştır. Burası aynı zamanda biraz yukarı kottaki Tophane-i Amire yapılarından başlayıp denize kadar inen genişçe bir alandır¹². Buranın, zamanında denize hayli yakın olduğu, önündeki meydanın eskiden sık çınar ağaçları ile süslü olduğu ve ağaçların altında ganimet olarak alınmış toprakların dizildiği de belirtilmektedir (İnciciyan 1956 s95)¹³.

¹² Çeşmenin yapıldığı yerde daha evvelce dükkânların bulunduğu, çeşme yapılacağı zaman bunların yıktırılarak meydanın açıldığı bilinmektedir (Aktepe 1962 s13).

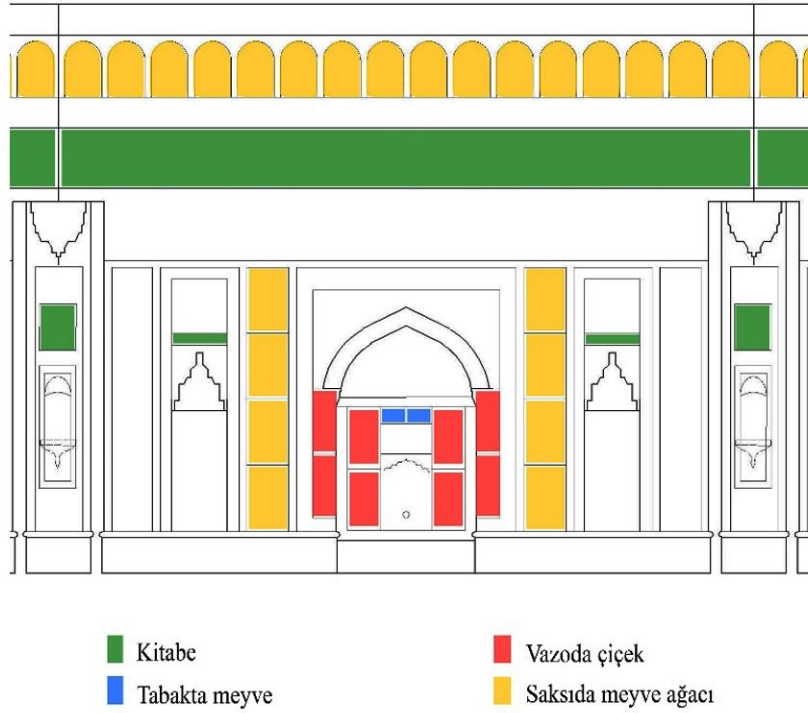
¹³ 1792-1793 arasında toprakların kaldırıldığı ve meydanın bir kısmının Nizam-ı Cedid askerlerinin talimine tahsis edildiği de söylenmektedir (İnciciyan 1956 s95).



Şekil 3. I. Mahmut Meydan Çeşmesi.

Tophane I. Mahmut Çeşmesi genel hatlarıyla, dört yüzünde aynı özellikte birer çeşmenin yer aldığı kare planlı bir meydan yapısıdır. Yapının pahlanmış dört köşesinde ise yelpaze kemerli küçük birer niş bulunmaktadır. Nişlerin alt yarısı stilize edilmiş deniz kabuğu motifi ve “S”, “C” kıvrımlarını ihtiva eden mermer bir pano ile kapatılmıştır. Mermer panolarda, daha evvel başka bir yerde rastlanmayan ve yapının genel tasarım diline de uymayan “Barok” motiflerin yer almasından bunların daha sonraki senelerde ilave edildiği bellidir. Muhtemelen bu değişiklik, çeşmenin üzerindeki yaldızlı süslerin de tamir edildiği 1792 ve 1793 senelerine (İnciciyan 1956 s95) aittir. Özgün halinde, Üsküdar’daki örnekte olduğu gibi buralarda suluk da denen; kurnalı, küçük çeşmeciklerin yer aldığı düşünülebilir. Bu durum, Fındıklılı Süleyman Efendi’nin Mariüt Tevarih’inde çeşme anlatılırken “*Tophane meydanında adem-ül-misil, hoştarh sekiz musluklu çeşme*” tabirinin kullanılması ile (Aktepe 1976 c1 s31) uyumaktadır. Böylece dört ana çeşmeye ek olarak köşelerde dört çeşmenin daha bulunduğu anlaşılmaktadır.

Tüm yüzleri mermer kaplı olan yapı, ana çeşmelerin bulunduğu kısımlarda mermer üzerine işlenmiş kabartmalardan oluşan yoğun bir bezeme programına sahiptir. Çeşme nişleri içinde, vazo içinde çiçek ve sepet içinde meyve kabartmaları işlenmiştir. Kemer ayaklarında da vazo içinde çiçek motifleri bulunmaktadır. Çeşmelerin iki yanında, saksı içinde meyve ağacı kabartmalı panolar üst üste dörder tane olmak üzere düşey bir hat oluşturacak şekilde yerleştirilmiştir (Şekil 4). Yapının üst kısmında, kitabe sırasının üzerinde iki sıra halinde yatay bezeme şeritleri ve onun üzerinde de her gözde bir tane olmak üzere saksıda ağaç motifinin yer aldığı, “kemer dizisi” kabartması yer alır. Lale Devri mimarisinde bu motifler daha çok “çinihane” kartuşlar içine alınırken burada iki sütuna oturan birer yuvarlak kemer gözünün içine yerleştirilmiş olmaları ilginçtir. Her cephede 16 gözün bulunduğu kabartma kemer sırasında, kabartma sütunçe başlıklarının klasik Osmanlı başlıklarından farklı olarak akantus yapraklarına benzer, bitkisel bezemeli olması dikkat çekicidir.



Şekil 4. I. Mahmut Meydan Çeşmesi cephelerinden birinde motiflerin dağılımını gösteren çizim.

Yapının prizmatik gövdesi mukarnas ve bitkisel bezemeli mermer saçak şeritleri ile son bulur. Bunun yukarısında bugün görülen tüm ahşap saçaklar ve çatı örtüsü, 1956-1957 yıllarında, İstanbul Sular İdaresince yürütülen restorasyonda, eski gravürlere izafeten tamamen yeniden yapılışına dayanmaktadır. Çeşmenin altındaki insanları ve su haznesini hava şartlarından ve güneş ışınlarından koruyup serin tutan bu saçaklar oldukça geniş bir alanı örtmektedir. Kubbe sayesinde bu geniş çatı yüzeylerinin monotonluğu kırılmıştır. Tophane I. Mahmut Meydan Çeşmesi genel hatları ile 1718 yılında başlayan Lale Devri mimarisinin yenilikçi sanat anlayışının özelliklerini yansıtmaktadır. Her ne kadar odak noktasını oluşturan çeşmeler sivri kemeri ile klasik çeşme tasarımını yansıtsa da, bunun dışında kalan yüzeylerin genişliği Osmanlı sanatçıları için yeni bir tasarım problemi olmuştur. Tophane I. Mahmut Çeşmesi'nde de geniş yüzeyler; niş, suluk, kitabe panosu ve şeritlerle sınırlanmış rölyefler gibi yapı elemanlarıyla doldurulmuştur. Özellikle cephe tasarımının, Topkapı Sarayı "III. Ahmet Yemiş Odası" olarak bilinen küçük odanın tasarım anlayışını yansıttığı söylenebilir. Her ikisinde de görülen; üst tarafta yatay, alt tarafta düşey hatlara bölünmüş yüzeyler; yüzeyler arasında çepeçevre dolanan kitabe sırası ve çerçevelenmiş çiçek-meyve motifleri ile I. Mahmut Meydan Çeşmesi, Topkapı Sarayı'ndaki bu odanın dış mekânda tersyüz edilmiş hali gibidir. Böylece sivil mimaride, iç mekânlarda, ahşap üzerine yoğunlukla uygulanan bezeme anlayışı, ilk defa bu büyüklükteki bir kamu yapısında, dış yüzeyde, mermer üzerine uygulanmış; I. Mahmut Meydan Çeşmesi, içine girilen değil dıştan seyredilen kentsel bir "sivil" yapı haline getirilmiştir. Bu durum, meydan çeşmelerinin "bahçe içinde, suların aktığı birer köşk" gibi düşünülmesi fikrinin (Şahin 2009 s284) bir yansıması olarak görülebilir. Bir zamanlar yeşillik bir alan içinde bulunan Tophane I. Mahmut Meydan Çeşmesi, alt kısmındaki düşey çerçevelerin, üstteki yatay kuşaklara sahip satırları taşıdığı ahşap köşk temasının, daha önceki meydan çeşmelerine göre daha da belirginleştiği bir yapıdır. Yapının, revakları temsil eden kemer frizi ve geniş saçaklı kubbe çatısı da bu tabloyu tamamlamaktadır.

I. Mahmut'un Bahçeköy'den Galata'ya su getirmek için yaptırdığı tesisleri, annesi Saliha Sultan vakfına kaydettirmesinden dolayı suyunun önemli son noktalarından biri de Saliha Sultan'ın yaptırdığı çeşme-sebildir (Şekil 5). Kitabesine göre 1145/1732-1733 yılında yapılan çeşme için, Galata Surları'nın batısında, Hacı Âmâ semti seçilmiştir. Burası, bugün tanınmayacak derecede değişmiş olsa da, zamanında Galata surları içinde Tophane Kapısı'ndan başlayan ana yolun Haliç'e açılan ucudur. Bu bakımdan Saliha Sultan'ın yapısı için seçilen yer, Tophane'de I. Mahmut yapısı için seçilen yerle benzerlikler göstermektedir. İki yapı da Galata surlarının dışa açılan iki önemli kapısına yakın yapılmıştır.

Bulunduğu semtten dolayı Azapkapı ya da Galata çeşmesi de denen Saliha Sultan Meydan Çeşmesi'nin konumu¹⁴, mimarisini de etkilemiş görünmektedir. Kare planlı bir su haznesi, bir köşe sebili ve sebinin iki yanındaki birer çeşmeden oluşan yapıda, sebil ve çeşmeler ana yola bakan cephe üzerine toplanmış, mahalle içine bakan üç yüze yalnızca küçük abdest muslukları konmuştur. Saliha Sultan Meydan Çeşmesi'nde, ana kütlein sivrilene köşesinde yer alan dairesel sebil yarattığı dramatik etki

¹⁴ Bugün yapının konumuna referans oluşturabilecek hemen hiçbir kentsel öge kalmamış, bunun için özellikle W. Müller-Wiener'in çalışmasında (Müller-Wiener 2002) özetlenen eski haritalardan yararlanılmıştır

ile dikkat çeker. Böylece Lale Devri etkisindeki bu dönemde, sebillerin yapıların köşelerine alınarak vurgulanmasının¹⁵ devam ettiği görülmektedir.



Şekil 5. Saliha Sultan Meydan Çeşme-Sebili.

Sebilde ayrı bir hücre kısmı yoktur. Giriş dairesel kısım üzerinde, doğrudan sebil pencerelerinin bulunduğu kısımdır. Bu uygulama daha önceki sebillerde görülmez; genelde sebil pencerelerinin bir yanında, ayrı bir kapı bulunur, önce bir ön mekâna oradan da sebil pencerelerinin bulunduğu kısma geçilir. Saliha Sultan Meydan Sebili'nde pencerelerin her iki yanında büyük çeşmeler yer almasından dolayı olsa gerek kapı, sebil pencerelerinin olduğu kısma açılmıştır.

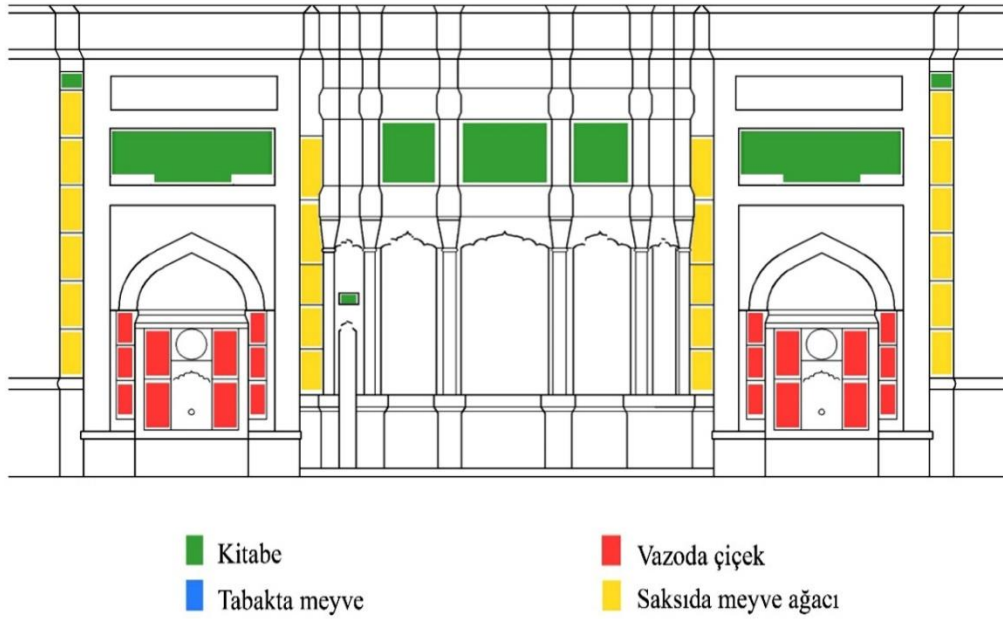
Sebilin cephesi, Lale Devri'nde geliştirilen stile uygun olarak, zeminden yukarıya doğru “etek - sütunlu pencereler - sağır alın” bölümlerinden oluşur. Eski gravürlerde¹⁶ zeminden iki basamakla yükseltildiği görülen sebil, bugün bu özelliğini yitirmiştir. Dantelli kaş kemer şeklinde söve kemerlerine sahip servis pencerelerinin üzerindeki alın kısmında, sütunlarla aynı hizada pilastrlar vardır¹⁷. Alın kısmı yatay şeritlere bölünmüş, her şerit değişik desenli kabartma sıralarıyla doldurulmuştur. Ortaya, üst üste dört kartuş içinde, kitabe yerleştirilmiştir. Alın kısmı, saçağın altında mukarnash, geniştir bir korniş ile son bulur.

Sebilin iki yanındaki çeşmeler, sebil yüksekliğince ve birbirlerine göre simetrikler. Çeşme kemerini oluşturan taşların üzeri hariç, çeşmelerin her noktası kabartmalarla bezenmiştir. Ayna taşları, sehpalar üzerine yerleştirilmiş çiçek vazosu kabartmalarla sahiptir. Kemer ayaklarına da üst üste üç tane olmak üzere “vazo içinde çiçek” motifleri yerleştirilmiştir. Bunun dışındaki kısımlar dolamadal ve benzeri bitkisel motiflerle bezelidir. Çeşmelerin ana kütesinin iki yanında, üst üste beşer ve altışar tane olmak üzere saksı içinde meyve ağacı kabartmaları yer alır. Meyve ağaçları sırasının en üstünde birer “maşallah” yazısı bulunur (Şekil 6).

¹⁵ Lale Devri mimarisinin özelliği, sebillerin iki sokağın kesiştiği köşelere yerleştirilmesi ve çevreleyen sokak ya da meydanın her iki tarafından da sebilin kullanılabilir olmasıdır: Şehzadebaşı Damat İbrahim Paşa, III. Ahmet Meydan Çeşmesi'nde olduğu gibi (Şahin 2009 s290).

¹⁶ J. Pardoe “The City of Sultan and Domestic Manners of Turks” adlı 1837 tarihli eserinde yer alan W. H. Bartlett imzalı gravür (Pardoe 1997)

¹⁷ Sebillerde alın kısmını sağır yapmak ve buralara pilastrlar yerleştirmek Lale Devri mimarisinin bir özelliğidir. Yalnız buradaki pilastrlar diğer sebil örneklerinden (Şehzadebaşı Damat İbrahim Paşa ve Bab-ı Hümayun III. Ahmet Sebilleri) farklı olarak alın kısmında daire değil yarım sekizgen kesitlidir.



Şekil 6. Saliha Sultan Meydan Çeşmesi'nde motiflerin dağılımını gösteren açılım çizimi.

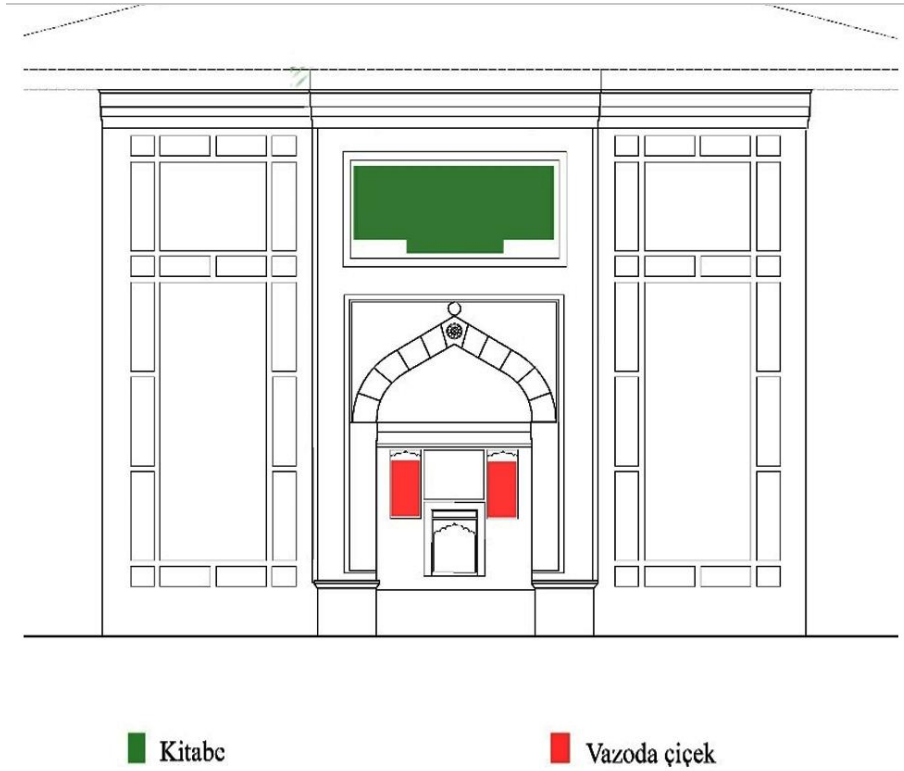
Meydan yapısının, sebil ve çeşmelerin yer aldığı yüzeyler dışında kalan, üç cephesi yine mermer kaplıdır, ancak bu cepheler sebil ve çeşme cephelerine göre oldukça sadedir. Tüm yapıyı saran mukarnaslı korniş, bu cephelerde de yer almaktadır. Ayrıca, yarım daire kesitli, balık pulu (ya da hurma ağacı gövdesi) motifli bir silme de bu cepheleri dolanmaktadır. Her üç cephede de, silmenin altındaki kısımlara abdest muslukları sıralanmıştır. Daha önce çeşmelerde ve meydan yapılarında rastlanmayan bu fonksiyonun bu yapıda yer alması dikkat çekicidir. 1930'larda ahşap çatı örtüsünü tamamen kaybetmiş olan yapının, 1952–1953 yıllarında Ali Saim Ülgen tarafından yapılan onarımı sırasında, çatısı eski gravürlere bakılarak tamamlanmıştır. Yapı bugün, dört yöne doğru eğimli, geniş saçaklara sahip ahşap bir çatı ile örtülüdür. Ayrıca su haznesinin üzerine, silindirik kuleciklerle çevrili bir kasnağa sahip büyükçe bir kubbe; sebilin tam üstüne gelen kısma da, dilimli bir kasnağa sahip bir kubbecik yerleştirilmiştir.

Galata-Tophane-Kasımpaşa bölgesine suyun getirilmesiyle bu bölgelere çeşme yaptırma faaliyetine Padişah ve Valide Sultan yanında dönemin sadrazamı Hekimoğlu Ali Paşa da Kabataş'ta büyük bir çeşme yaptırarak katılmıştır (Şekil 7). Kare planlı, hazneli, yapının iki yüzünde birer çeşme ve 1145/1732 tarihini veren iki kitabe bulunur. Bugün Kabataş sahilinde bulunan yapının, ilk yapıldığında Kabataş set üstünde olduğu bilinmektedir. Pervititch'in çizdiği haritadan anlaşıldığına göre orijinal yeri, Kabataş iskelesinin karşısında, Mezarlık Sokağı (bugünkü İnebolu Sokağı) çıkan merdivenlerin sonundadır. 1958 yılı yol çalışmalarında (Barişte 1993 s6–7) yeni açılan arter için, çeşmenin bulunduğu alan, merdivenler de dahil tüm yapı adasıyla beraber ortadan kaldırılınca, çeşme de sökülüp bugünkü yerinde yeniden kurulmuştur. Kare planlı gövdenin iki yüzünde birer çeşme yer alır. Her iki yüzde de sivri kemerli çeşme ve üzerindeki kitabeyi de içine alan ve zeminden saçağa kadar uzanan çerçeve, ana gövdeden bir miktar ileri taşırılmıştır. Yapıda, rölyef bezemeler de bu çerçevenin içinde yoğunlaşmıştır (Şekil 8). Saliha Sultan Meydan Çeşmesi'ne benzer şekilde yan yüzler bezemesizdir. Sadece mukarnas bezeli saçak korniş tüm yüzlerde dolanmaktadır. Bu özellikleri ile Hekimoğlu Ali Paşa Çeşmesi, bir meydan çeşmesinden çok, çift yüzü bir çeşme niteliğindedir. Özgün çatı örtüsünü kaybeden yapı, bugün, ahşap kırma bir çatı ile örtülüdür. Taksim Suyolu'nun bir parçası olan I. Mahmut Meydan Çeşmesi, Saliha Sultan Meydan Çeşmesi ve Hekimoğlu Ali Paşa Meydan Çeşmesi'nden sonra Osmanlı Mimarlığında bu çapta ve nitelikte meydan çeşmelerinin bir daha yapılmadığını da belirtmek gerekir¹⁸.

¹⁸ Kadirga Esma Sultan Meydan Çeşmesi (1781), Emirgan Çeşmesi (1782), Süleymaniye Hesap Meydan Çeşmesi (1792), Küçüksu Mihrîşah Sultan Meydan Çeşmesi (1806), Maçka Bezmialem Valide Sultan Meydan Çeşmesi (1839) sayılı örneklerdir.



Şekil 7. Hekimoğlu Ali Paşa Meydan Çeşmesi.

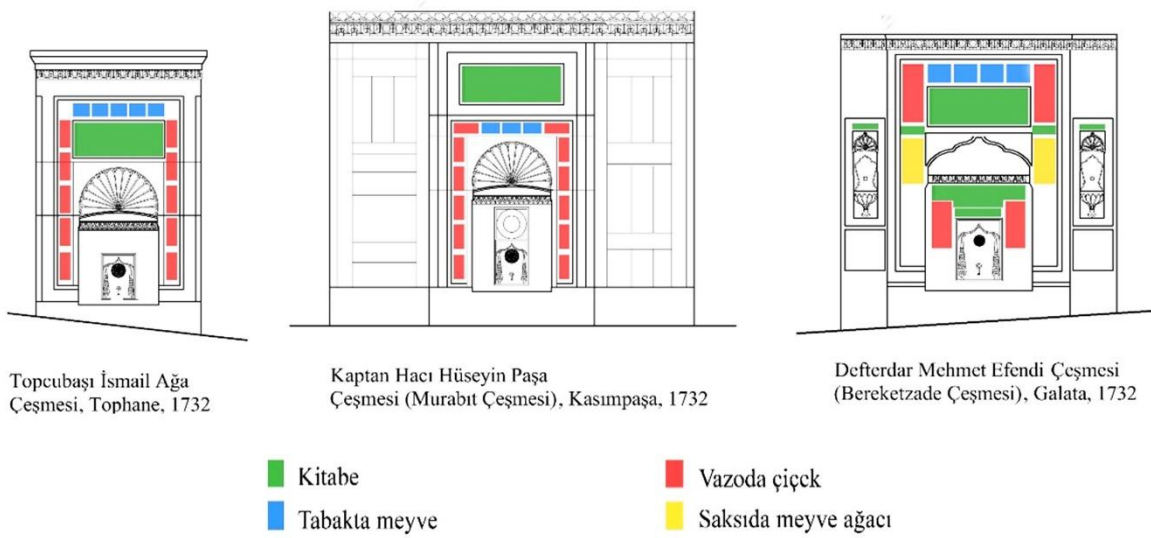


Şekil 8. Hekimoğlu Ali Paşa Meydan Çeşmesi'nin bir yüzündeki motiflerin dağılımını gösteren çizim.

Taksim Suyolu çeşmeleri içinde dikkate değer diğer çeşmeler; Topçubaşı İsmail Ağa Çeşmesi (Kadiriler Çeşmesi), Kaptan Hacı Hüseyin Paşa Çeşmesi (Murabıt Çeşmesi) ve Defterdar Mehmet Efendi Çeşmesi'dir (Bereketzade Çeşmesi). Bunlar, üzerlerindeki meyve ve çiçek kabartmaları ile öne çıkan örneklerdir. Topçubaşı İsmail Ağa Çeşmesi (Kadiriler Çeşmesi) ve Kaptan Hacı Hüseyin Paşa Çeşmesi (Murabıt Çeşmesi) yelpaze kemerli nişleri ile birbirine benzer iki çeşmedir. İkisinde de çeşme nişinin iki yanında vazoda içinde çiçek demeti, üstünde tabak içinde meyve kabartmaları bulunur. Defterdar Mehmet Efendi Çeşmesi (Bereketzade Çeşmesi) ise dantel kemerli nişi ve iki yandaki sulukları yanı sıra, çiçek-meyve kabartmalarının çokluğu açısından da diğerlerinden farklıdır. Burada, vazoda içinde çiçek demeti, tabak içinde meyve motifleri ile birlikte saksı içinde meyve ağacı motifleri de çeşmeyi bezemek için kullanılmıştır (Şekil 9).



Şekil 9. Topçubaşı İsmail Ağa Çeşmesi (Kadiriler Çeşmesi), Kaptan Hacı Hüseyin Paşa Çeşmesi (Murabıt Çeşmesi) ve Defterdar Mehmet Efendi Çeşmesi (Bereketzade Çeşmesi).



Şekil 10. Topçubaşı İsmail Ağa Çeşmesi (Kadiriler Çeşmesi), Kaptan Hacı Hüseyin Paşa Çeşmesi (Murabıt Çeşmesi) ve Defterdar Mehmet Efendi Çeşmesi (Bereketzade Çeşmesi) üzerinde motiflerin dağılımını gösteren çizim.

SONUÇ

Taksim Suyolu'nun yapılması ile hayat bulan çeşmeler, kentin karakter kazanmasında ve kent mekânlarının tanımlanmasında önemli bir rol oynamalarının yanı sıra devrin sanat anlayışının ve su ile tasarımın da göstergeleri olarak karşımıza çıkmaktadırlar. Bu çeşmeler üzerine yapılacak çalışmalar bize su kültürünü anlama açısından önemli ipuçları verebilmektedir. Çeşmelerin önemli özelliklerinden biri mermer üzerine rölyef olarak işlenmiş olan naturalist meyve ve çiçek kompozisyonlarıdır. Çeşmelerde vazo içinde çiçek, saksı içinde meyve ağacı ve tabak içinde meyve kabartmaları bol bol kullanılmıştır. Çiçek demetleri arasında lale, gül, karanfil ve kasımpatı tercih edilmiştir. Tabak içinde gösterilen meyveler arasında ise armut, nar, incir ve şeftali bulunmaktadır. Saksı içindeki meyve ağaçları arasında limon, armut, şeftali, erik, elma, kayısı, ayva, nar ve hurma ağaçları sayılabilir. Çiçek ve meyvelerin natüralist olarak betimlenmesi ve vazo altlarında gösterilen bazı sehpalardan perspektif etkisi verecek şekilde betimlenmesi dönemin yenilikçi sanat anlayışını da yansıtmaktadır.

Çiçek ve az da olsa meyve, farklı bağlamlarda İslam sanatında her zaman simgesel anlamlarda, örneğin, cennetin ya da aşkın temsili olarak, kullanılmıştır. Çeşmeler de, içinden akan suları ile cennet bahçesi tablosunu yansıtmaktadırlar: çiçek ve meyve bezemelerinin, özellikle suyun aktığı yer etrafında yoğunlaşmış olması "su-çiçek-meyve" üçlemesiyle "cennet" imgesine bir gönderme olarak düşünülebilir (Ögel 1999 s78). Böylece yapıların, içinden akan suları ile dönemi açısından "cennet bahçesi içinde köşk" tablosunu yansıttığı söylenebilir. Sonuç olarak Taksim Suyolu'na ait ve aynı dönem içinde yapılmış olan bu çeşmeler, su kültürünün, somut birer tasarım örneği olarak mimariye ve taşla yansıdığını göstermesi açısından önemlidir.

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