CEDESU 2021
2ND INTERNATIONAL CITY AND ECOLOGY CONGRESS
WITHIN THE FRAMEWORK OF SUSTAINABLE URBAN DEVELOPMENT

December 2-3, 2021, Trabzon, Turkey

Proceedings Book

Editors

Prof.Dr.Öner DEMİREL

Assoc.Prof.Dr. Ertan DÜZGÜNEŞ

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CITY
ECOLOGY
DEVELOPMENT
SUSTAINABILITY

asos YAYINLARI

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Abstract

The green spaces and its qualities, which show a development in parallel with the civilization level of societies, have become indispensable elements of planned developing cities today, while on the other hand, they have become an indicator of the socio-cultural quality of life in the concept of modern urbanity. Studies on the urban forests and its close surroundings represents a value as a sustainable ecological and hydrological based holistic blue-green infrastructure model regarding to the protection of the natural water cycle known as today's urban green network planning and rainwater management systems, rainfall water management, stream repair, improving water quality, and designing recreation areas with acoustic comfort. It is possible for urban forests to fulfill the social and environmental functions expected of them, to be under appropriate natural ecological conditions, to make the benefits based on sustainable management and to keep them under natural status legally and administratively (Örücü, 2014). Based on this holistic approach, it is necessary to adopt a conservation-oriented planning approach for urban forests that are subject to various and intensive uses, due to the functions it offers for all living beings. In Turkey, a new period has been started with the declaration of urban forests by the "Urban Forest Project" implemented in 2003 under the management of the General Directorate of Forestry. The urban forests project, which was created by re-reforestation with the existing forest presence in and around the cities, was implemented as a phenomenon aimed at improving the quality of urban life as part of the urban green network with its aesthetic, psychological and ecological functions. Nowadays, "Urban Forest Planning" is based on the principle of establishing urban groves and green belts around cities where natural and cultural plants is absent or insufficient, as well as balancing the urban-rural fusion by rehabilitating the existing plants. In addition to the qualitative and quantitative condition of natural vegetation, the level of social, cultural, and economic development of the city, which is subject to urban forestry, should be considered in the planning related to the management and organizations of the urban forests. In this study, urban forests application studies, which are discussed to reveal their multi-faceted functions, will be evaluated in terms of aesthetic and functional services and contributions, including ecological, economic, socio-political, and for the short and long-term planning target, it will be more efficient to use the workforce, time, and monetary resources. Planning, implementation, and management problems for the solution of management and institutional organization problems, which will enable them to be used in a rationally and sustainably, will be addressed with multidimensional approaches.

Keywords: Urban, Forest, Urban Forest, Urban and Planning, Management

INTRODUCTION

Today, environmental pollution increases due to environmental problems that reach large sizes in proportion to the growing population, the amount of green space per capita in and around the city center decreases and the mental and physical health of the community is negatively affected (Yılmaz et al., 2006). The green space and qualities of societies, which have developed to the level of civilization, have become indispensable elements of planned developing cities today, while on the other hand, they have become an indicator of the socio-cultural quality of life in the concept of modern urbanity. Especially in industrial cities with large populations, it is necessary and mandatory to create an ecological environment in significant proportions. In addition to ensuring ecological environmental development in the city, the necessity of urban forest studies has emerged in order to realize the aesthetic appearance, i.e. the increase in quality of life (Demirel, 1998).

In developed countries, reforested areas, woodlands in the inner city and in the countryside that created to balance the physical structure of the city and to make positive contributions to human and environmental health have gained importance as green islands that can meet the recreational activities of urbanites as a result of increased conservation efforts and care shown in recent years. Due to these phenomena, the concept of "*urban forestry*" has revealed as community needs and become an important element of Urban and Landscape Planning and Management (Demirel et all., 2005).

Konijnendijk and Randrup (2004) defined the urban forest as "green areas covered by trees in and around urban areas". The following table briefly summarizes the concept of urban forest (Table 1).

Table 1. The Urban Forestry Matrix, Responding The Scope of Urban Forestry

	The urban forest		
	Individual trees		Urban woods and woodlands
	Street and roadside trees, and associated vegetation	Trees in parks, private yards, cemeteries, fruit trees, etc., and associated vegetation	(forests and other wooded land, e.g., natural forests and plantations, small woods, orchards, etc.)
Form, function, design, policies and planning			
Technical aspects (e.g., selection of plant material, establishment methods)		URBAN FORESTRY	
Management aspects			

The concept of urban forestry was first expressed by Jorgenson in Canada in 1965 (Konijnendijk, 2003). It was introduced in Europe in the early 1980s as a new field of study with studies in the

UK and the Netherlands (Raundrup et al., 2005). Working groups on urban forestry began to establish in the 1990s and the first urban forestry conference was held in Dublin (Ireland) in 1991. The National Urban Forestry Unit (NUFU), which covers many areas of study in the UK, including the planting, protection and management of trees in cities, was established as an independent organization in 1995 (NUFU, 1999).

The Urban Forestry Meeting organized by the Committee of the Forest Research Association of Northern Countries (SNS) in Reykjavik in 1996 and the Urban Forestry Meeting organized by IUFRO (International Association of Forestry Research Organizations) in Europe in 1998 constituted the leading figures in urban forestry studies (Sağlam and Elvan, 2017).

The largest and largest cooperation on the subject is COST Action E12 (COST, 1999), which was established in 1997 under the umbrella of the European Union. Cost Action E-12-"Urban Forests and Trees Event", which was established in Brussels in September 1997 with the participation of 15 Member States of the European Union (EU), was implemented in accordance with the "Memorandum of Understanding Protocol" signed on June 12, 1997 (Konijnendijk, 1997; Konijnendijk et. all. 2005).

Cost Action E12 is divided into three working groups;

- Purposes, current condition and functions of urban forest and urban trees
- Reforestation and urban forest creation for usage to improve urban ecology
- Management, maintenance and repairment of urban forest and urban green network

More than 100 experts from 22 countries participated in the studies under the title "Urban Forests and Trees" until 2002 and many seminars and conferences were organized on the subject. In 2001, after the establishment of the European Urban Forestry Research and Information Center (EUFORIC), studies on the subject gained even more momentum. The current "COST. FP 1204. Green Infrastructure Approach: Linking Environmental with Social Aspects in Studying and Managing Urban Forests" is one of the major organizations attended by many experts in Europe (Konijnendijk, 2003).

2. HISTORICAL DEVELOPMENT OF URBAN FORESTS AND THE CURRENT ISSUES IN OUR COUNTRY

Increasing needs for green spaces in cities and diversifying the expected benefits were taken into consideration by the T.C. Ministry of Forestry and Water Affairs as well as in municipalities and the studies on the subject in our country were accelerated. The First National Urban Forestry Congress was held in 2004.

The concept of urban forest was first mentioned in the "National Programme for the Adoption of the EU Acquis" held on 24.03.2001. In this program, it is stated that "The establishment of urban forests and commemorative forests which created in the form of green belts and parks will be encouraged and expanded in order to reduce the social pressure on natural forests for social, cultural and environmental reasons" (Çoşkun and Velioğlu, 2004).

The legal description of the urban forest was first made in Article 4/ğ of the "National Parks Regulation" (Regulation on Promenade Places) dated December 12, 1986 and numbered 19309. According to this definition; "Urban Forest; apart from the traditional picnic concept, it is defined as "areas organized in or around the adjacent or around settlements such as metropolises, provinces and large districts" in order to introduce the flora and fauna in the region with technical forestry activities, which offer the social functions of forests such as health, sports, aesthetics, cultural and similar to the public service" (Sağlam and Elvan, 2017).

In this context, the "Urban Forest Project" implemented by the General Directorate of Forestry in 2003 has started to be implemented (Atmış, 2016).

The Directorate of Promenade Places, which is now responsible for the management of urban forests, was established as a Branch Directorate of the Department of Non-Wood Products and Services established within the scope of the "Decree on the Organization and Duties of the Ministry of Forestry and Water Affairs" with the KKK no. 645 issued in the Official Gazette dated 04.07.2011 and numbered 27984 (repeated).

The "Promenade Places Regulation" no. 28578 dated March 5, 2013, which is in force today, redefined the types of promenade locations and re-explained the urban forest in this context. According to the regulation, type of promenade A, B and C has defined and in addition, the urban (city) forest is defined as type D (Table 2).

Table 2 A, B, C and D Type Forest Recreation Areas

TYPE	NUMBER	TOTAL AREA (ha)
A	130	4 066
B	234	4 302
C	953	7 890
D	142	1 0444

3. PLANNING URBAN FORESTS

A new process has been started with the declaration of urban forests in our country. Urban forests, which are re-reforested with the existing forest presence in and around our country's cities, aim to improve the quality of urban life as part of the urban green network with their aesthetic, psychological and ecological functions (Demirel and Kelkit, 2003; Miller, 1997).

In recent years, the importance of local actors has been emphasized in urban forest policy creation and planning processes. Residents, interest groups, administrators and local media are the main elements in urban forestry policy. This approach defines urban forests as "forest ecosystems in or around the urban area, where the priorities, norms and values of local urban actors and decision-making processes and uses are determined" (Örücü, 2014).

Today, Urban Forest Planning is based on establishing urban groves and green belts around cities where natural and cultural plants is not present or inadequate in principle, as well as balancing urban-rural fusion by rehabilitating existing plants. All these studies are seen as a movement that goes beyond traditional boundaries in urban forestry studies, aims for a more holistic approach to the urban green network and develops day by day.

In addition to the qualitative and quantitative state of natural vegetation in the planning related to the management and organizations of the urban forest, the level of social, cultural and economic development of the city, which is the subject of urban forestry, should be taken into account (Lawrence et al., 2013).

In today's urban forestry practices, different planning approaches are adopted according to the development levels of countries and their use of industrial and other areas around the city (Miller, 2015). While it is aimed to improve the quality of life of urban environments in developed countries, ensuring planned and regular development of cities in underdeveloped countries and preventing illegal construction are among the priority objectives.

The effectiveness of the public participation in the planning process is extremely important and these studies can be grouped into three main groups;

- Giving duties to public representatives in the official bodies carrying out the planning
- Establishing necessary contacts with relevant NGOs
- The necessary meetings with private sector representatives.

Any area must have certain characteristics and criteria in order to become an urban forest (Konijnendijk, 2003; Uslu and Ayaşlıgil, 2007).

- It should be located in or in the inner city and should be open to the integrity of the city and have wide impact area. It should be 50 km from the center of the city or less.
- It must have the self-renewal feature, which is the character property of the forest.
- It should be at least 10 ha large enough for visitors to benefit from its location and area.
- It should strengthen the green texture of the city and ensure integrity.
- The physical structure, ecology and landscape of the area should have functional and aesthetically rich values.

It is possible to carry out conscious planning and management on an urban scale in order to be purposeful and sustainable. Therefore, the optimal choice of location for the urban forest is a first must-do for rational planning and management of the urban forest. For urban forest location selection, it is of great importance to investigate the suitability and feasibility of these areas for balancing or strengthening recreational, ecological and urban structure (Gezer and Gül, 2009).

For an urban forest to provide satisfactory multifaceted services and contributions to the city and its people today or in the future, it is imperative that the criteria for being an urban forest be tested and its viability tested at the beginning. To achieve this, first of all, a urban forest management model needs to be developed. This model will be a useful and reliable tool in the holistic process from the initial stage of urban forest location selection to the implementation and management stages (Gezer and Gül, 2009).

When Choosing an Urban Forest Location, the following basic goals and criteria should be taken into account (Rose et al., 2006),

a- Recreational Goals,

b- Ecological Goals,

c- Goals to Strengthen the Physical Structure of the City

In recent years, an intensive effort is being made to balance and improve the ecological, economic and social functions of forests in the international forestry process, which aims at "Sustainable Forest Management", that our country is under obligation and actively participating in with international conventions. T.C. Ministry of Environment and Forestry (T.C. Ministry of Agriculture and Forestry) has taken a step forward by implementing the "One Urban Forest in Every Province" project aimed at providing all the benefits of forests to the service of urban people in natural environments away from the stresses of urban life. With this project, the woodlands near or adjacent to the city are organized as urban forests and it is aimed to create environments where people will be alone with nature. After this project was implemented in 2003, 1 0444 ha. 142 urban forests were established and put into the service of the public.

4. MULTIFACETED CONTRIBUTION OF URBAN FORESTS TO PLANNING

The benefits and functions of each of the urban groves (forests) with their own existence are the contributions made to public health through the greenhouse effect and climatic function through carbon accumulation, oxygen production and filtering dirty air (Asan and Özdemir, 2002).

The Protective Functions of Urban Forests can be discussed in the following topics. Planning work should rise on these foundations (Sağlam and Özkan, 2011);

- Soil Protection and Erosion Control Function
- Water Conservation and Hydrological Function
- Determination of Aesthetically Functioning Areas
- Sport Events and Recreational Use
- Wildlife Function and Wetlands

Urban forests, which are in ecologically/economically and socially sustainable areas within the city, offer the social functions of forests such as health, sports, aesthetics, cultural and similar to the public, apart from the traditional picnic concept, blue-green infrastructure systems, which produce natural solutions for urban green network functions, form healthy and high quality of life spaces in the city because they connect fragmented hydrological networks and green space networks.

5. LEGAL/POLITICAL DECISIONS AND NEGATIVE CONSEQUENCES

By changing the articles 1-12 in the "Tourism Promotion Law" no. 2634 and "Law on The Amendment of the Tourism Promotion Law" published in the Official Gazette dated June 01, 2019 and numbered 30791; in conservation areas, forest areas and treasury lands, especially the Forestry Promenade, which is affiliated to the General Directorate of Forestry and whose number has reached 1500s with urban forests, with article 8 of the new law, the transfer to the T.C. Ministry of Culture and Tourism, there are negatives and ecological losses related to the practices that will initiate natural destruction in these areas.

Currently, the management of these areas is under the 'Promenade Locations Branch Office' of "Non-Wood Products and Services Department" operating within the General Directorate of Forestry. With the new regulation defined in article 5 of article 10 of the "Law on The Amendment of the Law on Promoting Tourism" published in the Official Gazette dated June 01, 2019, and numbered 30791, the authority to manage and allocate these areas, whose number reaches 1459, is transferred to the T.C. Ministry of Culture and Tourism.

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GREEN ARCHITECTURE IN URBAN PLANNING DURING THE COVID-19 EPIDEMIC

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Abstract
Recently, cities have been growing unplanned, nature has been disappearing and as a result of these, the world has been facing with crisis situations such as climate change and epidemics with factors such as the increase in population density and the development of technology, consumption has been increasing rapidly. When examined the researches on the causes and consequences of epidemics in the past, it is seen that also a part of the source of epidemics is the deficiencies and mistakes in the planning of cities and buildings, and the changes made in the planning of cities and buildings are extremely important also in their solutions. The aim of this study is to emphasize the importance of green architecture in urban planning in the covid-19 process by examining the studies done so far on the subject, the effects and results of past epidemics, and sample projects designed under the effect of pandemics. It has been observed that sustainable and resilient cities are the basis of the solutions of covid-19 and similar epidemic diseases, and that green-ecological concepts constitute an extremely important place in the basis of sustainable and resilient urban planning, and the importance of green architecture is emphasized in this context. It is expected that this sustainable architectural approach can be a step against preventing future epidemics, and when faced with a similar situation, people will be able to fight better physiologically and psychologically.

Keywords: Covid-19 Outbreak, Green Architecture, Ecological Design, Sustainability, Resilience, Climate Change.

Özet
Son zamanlarda nüfus yoğunluğundaki artış, teknolojiinin gelişimi gibi etkenlerle birlikte hızla tüketim artıyor, kentler plansız bir şekilde büyüyor, doğa tahrip oluyor ve bunların sonucu olarak dünya iklim değişikliği, salgın hastalıklar gibi kriz durumlarıyla karşı karşıya kalıyor. Geçmişte yaşanmış salgın hastalıkların nedenleri ve sonuçlarına yönelik yapılan araştırmalar incelendiği zaman, salgın hastalıkların kaynağının bir parçasının da kent ve binaların planlamalarındaki eksiklikler ve yanlışlıklar olduğu, çözümlerinde de kentlerin ve binaların planlamalarına yönelik yapılan değişikliklerin son derece önemli olduğu görülmektedir. Yapılan bu çalışmanın amacı; konu ile ilişkili şimdiye kadar yapılmış çalışmalar, geçmiş salgınların etkileri ve sonuçları, pandemi etkisinde tasarlanmış örnek projeler incelenerek covid-19 sürecinde kent planlamasındaki yeşil mimarinin öneminin vurgulanmasıdır. Covid-19 ve benzeri salgın hastalıkların çözümlerinin temelinde sürdürülebilir ve dirençli kentlerin yattığı, sürdürülebilir ve dirençli kent planlamalarının temelinde ise yeşil-ekolojik kavramların son derece önemli bir yer teşkil ettiği gözlemlenmiş ve bu kapsamda yeşil mimarinin önemi vurgulanmıştır. Bu sürdürülebilir mimari yaklaşımın, ileride ortaya çıkabilecek salgın hastalıkların önüne geçilebilmek adına bir adım niteliğinde olabilmesi ve benzer bir durum ile karşı karşıya gelindiği zaman ise insanların fizyolojik ve psikolojik açıdan daha iyi mücadele verebilmeleri beklenmektedir.

Anahtar Kelimeler: Covid-19 Salgını, Yeşil Mimari, Ekolojik Tasarım, Sürdürülebilirlik, Dirençlilik, İklim Değişikliği.

1.INTRODUCTION

The Covid-19 epidemic, which started in Wuhan city of Hubei province of the People's Republic of China in December 2019, spread to other countries in a short time, affecting people and their lives in a way that led to changes in many habits. Before the vaccination studies were carried out, it was said by the authorities that the most effective form of defense against the pandemic was to change the living habits (Çam, 2020, p.68). The reflections of changing these living habits can be observed in the planning of cities and structures. Similar to the Covid-19 epidemic, many epidemics in the past have affected the world, people, and life, and have caused changes in many design and engineering fields, from urban planning to planning of buildings. Climate change is the changes that occur in the components that make up the climate, such as temperature and precipitation. Especially with the industrial revolution, the increase in the amount and type of harmful gases emitted into the atmosphere has started a big and rapid change process on the climate (Türkeş, 2008). According to the World Health Organization, it is expected that viruses living in polluted waters will spread and cause various diseases such as covid-19 between 2030 and 2050 due to many diseases as a result of climate change, water and food crisis. Tolunay, 2020). Along with migrations that occur as a result of climate change, pathogens that can cause disease spread. For example, with mosquitoes, pathogens that can cause many diseases can be transported to different geographies. Likewise, the inability of bears to hibernate due to overheating increases the risk of transmission of pathogens. Dr. Richard Dixon says that the melting of glaciers as a result of climate change and global warming can reveal many deadly viruses. Climate change is the trigger of many possible epidemics such as covid-19. Considering the data of the Intergovernmental Panel on Climate Change (IIPC), that climate change is mostly caused by human activities (url-1) and the link between climate change and epidemics, the city and human factor are among the most important causes of today's covid-19 epidemic. Cities, which are a part of the problem, will likewise be a part of the solution. Cities, planners and architects have the biggest task in combating the epidemic. The most correct and important factor that can be done in this direction is to create a sustainable city. At the point of creating a sustainable city, it is extremely important to integrate green with architecture and the city, and to use it as a design element. With green architecture, resilient cities will be created and possible epidemic diseases that may occur later will be prevented. In this study, it is aimed to discuss the importance of the concept of green architecture in urban planning during the epidemic process, by firstly explaining the concepts related to the subject, then examining the past epidemics and the relationship of the city, the relationship between covid-19 and the city, the relationship between covid-19 and architecture, with case studies and literature review.

Green Architecture

The concept of green architecture is a design approach that serves a common purpose with the concepts of "sustainable architecture" and "green building", designed and built in harmony with environmental principles. The most basic goal of green architecture is to be fully sustainable (Ragheb et al., 2015). According to Roy (2008), green architecture is a design approach that aims to reduce the possible negative effects on human health and the environment by using environmentally friendly construction materials and construction techniques. According to Tümer (1993), integrating green into architecture and using it as a design element are among the main sgoals of green architecture. Terms such as green, ecological, sustainable, smart, passive, environmentally friendly are architectural design approaches that can be used interchangeably and aim to protect nature (Atalan, 2018). With this design approach, unnecessary energy use will be reduced. For example, with a design that uses the available natural light in the best and most accurate way, the dependency on artificial light sources will be reduced. Unnecessary energy use can also be avoided with good and correct window, door and wall insulation (Lacroix and Stamatiou, 2007). As a result, an important step will be taken to prevent climate change and the effects of climate change will be reduced by creating more sustainable and resilient cities.

Green Architecture Components

In order for any project to be suitable for the green architectural approach, it must have some criteria covering the design and construction stages. These criteria are;

Appropriately designed ventilation systems for efficient heating and cooling,

Energy efficient lighting system,

Water-saving plumbing system,

Landscape with natural vegetation,

Minimum damage to natural habitat,

Alternative renewable energy power sources such as solar and wind energy,

Non-synthetic, non-toxic materials used inside and outside,

Efficient use of space,

Rainwater harvesting and reuse of gray water (Güler, 2000).

Projects designed and built according to these components are in accordance with the understanding of green architecture and support cities to be more sustainable and resilient, making them prepared for crisis situations such as climate change and epidemics.

Green Building

The concept of green building, also known as sustainable and environmentally friendly, is a means of increasing the efficiency of buildings and their areas. A more sustainable design approach is aimed to reduce the negative effects of buildings on humans and nature by recycling energy, water and used materials (Lacroix and Stamatiou, 2007). The demand for environmentally friendly buildings has increased with climate change, global warming, the rapid destruction of natural resources and the crises they bring. Thanks to the green building concept, more sustainable, resilient and healthy cities will be created by creating new living spaces where energy, water and materials are recycled and their consumption is reduced, greenhouse gas emissions are reduced and the indoor life quality is increased (Bora, 2012). Another definition of green building is made as buildings that are respectful to people and nature and can contribute positively to human and nature health in all processes from the construction stage to the demolition stage (Yüksel and Acarkan, 2021).

A green building can be defined for buildings that have preventive effects on crisis situations such as climate change and global warming that will adversely affect the world, by reducing the consumption of resources in the world, enabling the use of renewable energy sources, respecting nature and having traces from nature.

In order for any building to be a green building, it must meet certain criteria. These criteria are;

Site Selection-Management: Binanın yapılacağı alanların özellikleri göz önüne alınmalı ve doğaya zararı The characteristics of the areas where the building will be built should be taken into consideration and the selection and layout of the area should be preferred in a way that minimizes the damage to the nature.

Access to the Building: The residents of the building should be provided with the opportunity to use public transportation and the necessary infrastructure systems should be established for alternative transportation methods.

Water Use: Water should be used effectively in the design and usage processes of the building, and water consumption and waste should be avoided by using alternative ways.

Energy Use: Unnecessary energy expenditures should be avoided by using renewable energy sources.

Material Supply and Use: Recyclable materials should be preferred and the damage of the material to nature should be minimized.

Indoor Comfort: Design should be done by considering factors such as lighting, ventilation and sound inside the building and unnecessary expenditures should be avoided.

Waste Management: The recycling and distribution of wastes generated as a result of various uses should be done correctly, and the damage to the environment should be minimized (Bora, 2012).

Past Epidemics and the City

Periodic developments and events in cities affect people's lifestyles and trigger the emergence of various epidemics and diseases. With these epidemics, it is inevitable for cities to undergo some changes and transformations.

The origin of epidemic diseases is based on the ancient cities of the first settlement periods (figure 1). During periods when agriculture was the main source of livelihood and cereals were important for human life, diseases emerged due to famines, animal diseases, and poor conditions of food (Jakob, 2008). The absence of any measures on waste and fertilizers, sanitation and sewers has triggered the emergence and spread of diseases (Lewis Mumford, 2013). Examples of diseases that spread during this period are schistosomiasis, typhoid fever, leprosy, dysentery, cholera, mumps, measles, chicken pox (Jakob, 2008).

Roman Period cities (figure 2) are also among the cities where epidemics due to planning were experienced intensely. The grid plan in Greek cities continues in Roman cities as well. This planning brought along problems such as congested streets, intertwined life and population density, and triggered the emergence and spread of epidemic diseases. The inability to separate the wastes and remove them from the cities with an appropriate method made the emergence and spread of epidemics inevitable in Roman cities. Waste is dumped directly on the street and collected waste is dumped into rivers. This situation has brought along water pollution and epidemic diseases such as plague and malaria (Havlicek and Morcinek, 2016; Cilliers and Retief, 2012; Jakob, 2008; Coppala, 2007; Mumford, 2013).

Medieval cities (figure 3) do not have a specific plan and the cities are in the form of a circle. Between the buildings are fields and gardens. With the development of trade in Europe, cities grew outward, became crowded and urban planning became unhealthy. The lack of suitable systems for treatment and waste and the use of water resources as sewerage in these cities caused water pollution and triggered the black plague epidemic. Some precautions have been taken against this situation. Cleaning the cities, quarantine practices, and going to a planning process again by expanding the city outward in order to eliminate the congestion and density caused by the unplanned growth of the city are among the measures taken (Cilliers and Retief, 2012; Pirenne, 2014; Lubell, 2020).

With the Industrial Revolution that started in the 18th century, the population of the cities increased as a result of the increasing labor force in the cities (Figure 4) and the financial difficulties experienced in the rural areas. People who have to work in factories for a long time live in unhealthy conditions near the factory, in houses. The lack of suitable systems for waste and treatment in these regions, increased workplace chimneys, air pollution from residences, and various diseases such as typhoid, cholera, dysentery, tuberculosis, yellow fever have occurred. Diseases that occurred with the developing transportation conditions (road, steamship, railway, etc.) during this period spread rapidly. Such negativities brought the understanding of urbanism back to the agenda and caused decisions to be taken to plan cities in a healthier way. Wider street-public space formations, correct waste treatment systems are among these decisions (Chambliss and Eglitis, 2018; Çınar, 2000; Wilde, 2019; Lubell, 2020).

After the 20th century, with the Information Revolution, cities started to develop and grow rapidly and moved away from nature. This growth has brought along various problems (Chambliss and Eglitis, 2018). Diseases such as tuberculosis, typhoid fever, polio, Spanish flu have been seen. These diseases have brought along innovations such as the transformation of slums at the point of planning of cities, the renewal of houses, and the introduction of system proposals for waste treatment (Lubell, 2020; Coppala, 2007).

In 1898, Ebenezer Howard designed the Garden City model to support sustainability (Çınar, 2000). The garden city model (figure 5) was proposed in order to integrate nature and the city together and to reduce pollution and diseases caused by the conditions of the period; It is a multi-centered design model that works together in the whole, with its breath-taking garden-open housing areas, where agricultural areas, forests, industrial areas and residences operate in a systematic manner.

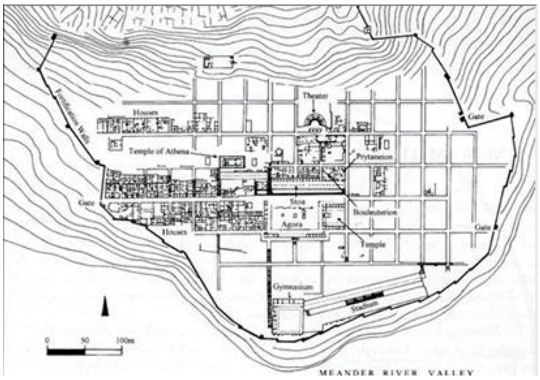
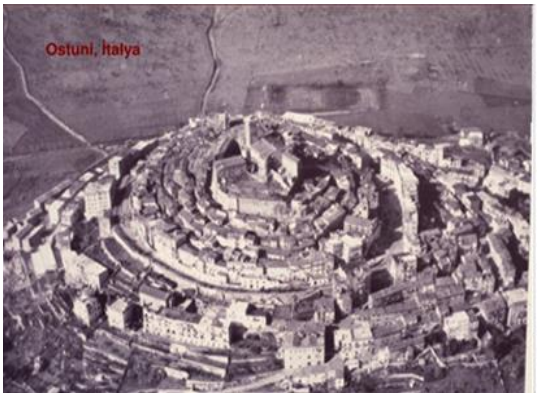


Figure 1. Ancient City of Priene/ Gelebeç, Söke- Aydın Figure 2. City of Timgad / Algeria



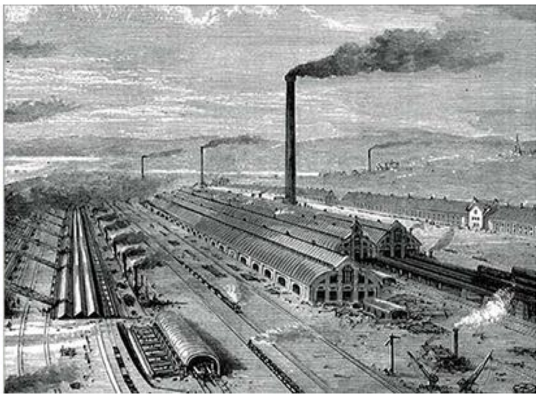


Figure 3. Ostuni, Italy

Figure 4. Industrial Revolution City

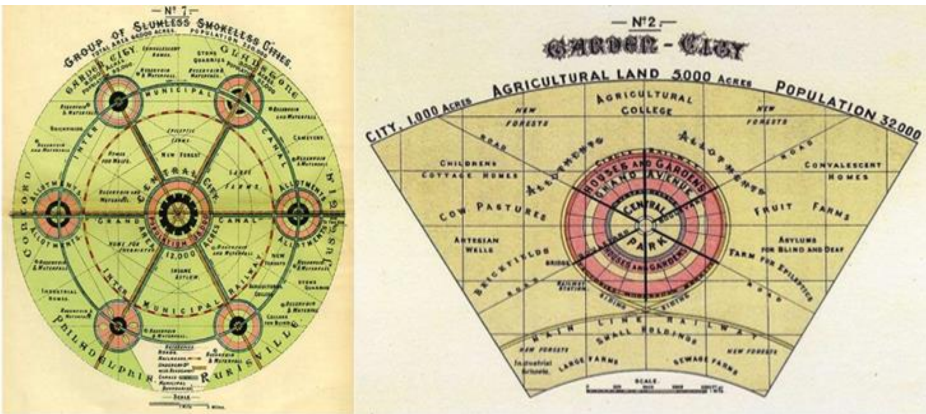


Figure 5. Garden City Model

In order to prevent uncontrolled growth in case of a possible population increase and growth, the plan is designed to expand outward and connect with transportation arteries. It is a self-sufficient city model economically and administratively. It was applied for the first time in Letchworth, England (url 2).

When Tuğaç (2020) associates pandemics in the historical process with cities, it is seen that the main source of many of the epidemics that occurred at various times in history is cities and people, and also decisions for urban planning were taken and arrangements were made for the solution of all these epidemics.

Covid-19, City and Architecture

At the beginning of the Covid-19 epidemic process, restaurants-cafes, shopping malls, various places where people can socialize, sports-entertainment-cultural activities were closed, restrictions were imposed on various social activities and people were allowed to spend time in their homes. The increase in the time spent at home and some restrictions on the social spaces opened during the epidemic have brought to mind the question marks regarding the planning of existing cities and buildings (Yılmazsoy et al., 2021). According to Eltarabily and Elghezanwy (2020), epidemics bring some changes in the planning of cities and buildings.

According to Crutzen (2006), the order of nature is changing, the nature is negatively affected and the consumption of natural resources accelerates with the increasing human population and people's interventions to nature and resources. Such environmental problems also trigger crises such as the covid-19 epidemic. The Secretary General of the United Nations also pointed out the relationship between nature and human health, saying that the covid-19 epidemic spread from the wild (Tuğaç, 2020).

With the new urbanism approach after 1990, the importance of the concept of ecology-green in the planning of cities and buildings was emphasized and brought to the fore. In the eleventh development plan (2019-2023), the importance of sustainable environment and livable cities is emphasized with the rapid increase in the human population and the increase in consumption. Housing is sustainable and resistant to crisis situations such as climate change and epidemics; It has been stated that cities should be respectful to nature and natural resources, human-oriented, accessible and sustainable.

Ecology-green concepts have an important place in city and building planning in order to balance the use of natural resources at the point of combating possible crisis situations such as the Covid-19 epidemic and to provide a more sustainable understanding of life (Yılmazsoy et al., 2021).

A large percentage of the number of cases due to the Covid-19 outbreak has been seen in cities. With this epidemic, cities; will be significantly affected economically, environmentally and socially. In order to best manage these effects, the planning of cities should be reviewed and various policies should be developed for change-transformation (United Nations Habitat, 2020). Urban sustainability and resilience concepts are at the forefront of these urban change-transformations. Because sustainability and resilience problems have brought along epidemics. The concepts of urban sustainability and resilience, which are part of the problem, are a part of its solution (Tuğaç, 2020).

Tuğaç (2020) listed the strategies within the scope of urban sustainability and resilience as follows;

The importance given to the ecosystem and biodiversity should be increased,

Necessary studies should be carried out with an integrated interdisciplinary cooperation against climate change,

Scientific studies should be supported,

Population distribution in cities should be balanced,

Nature-based, ecological planning approaches should be adopted,

Policies and governance need to be improved.

During the Covid-19 epidemic, people spent most of their time at home, along with curfews and restrictions, and this brought with it the emergence of some inadequate conditions in the residences. The importance of adequate conditions in residences in terms of human health was realized. For example, until this time, functions such as balconies and terraces were generally considered unnecessary in housing designs and were evaluated with different functions. In this process, it has been realized that factors such as the lack and insufficiency of terraces and gardens, which are a way of breathing, increase the stress and pressure on people, and the importance of these uses has been understood. In order to be able to fight better against such crisis situations, more environmentally friendly and special solutions should be introduced in housing planning (Alessandro et al., 2020). It can be predicted that after the epidemic, such housing designs will increase and people will tend to such uses, that they can be more prepared and planned in the face of a possible epidemic that may occur in the future, and thus the process can be overcome in a more smooth and experienced way (url-3).

Covid-19 and related social limitations have brought along some mental disorders. Robinson et al. (2021) associated people's mental health with nature in their research. In the research surveys they conducted, the existence of areas that would allow them to grow food around their living spaces attracted attention. This situation revealed that being in touch with nature and spending time with nature have positive effects on human health. During the covid-19 pandemic, people preferred to go out to nature and spend time with nature in order to feel healthier and better. The presence of green cover around living spaces is strongly associated with a high level of mental health status. In the face of this situation, we must protect and restore the natural environment and design nature-related spaces in order to protect resilient societies and public health (Robinson et al., 2021).

Projects Designed under the Effect of Pandemic

Housing Project Designed under the Effect of Pandemic

It is a design project by Spanish architectural firm Guallart Architects, which is planned to be held in Xiong, China, and won the first place as a 'Self-Sufficient City Project' in a design competition. It will be located in the Hebei region, 80 km from Beijing.

Figure 6. Housing Project Under the Effect of Pandemic (url-4)

It will be able to produce its own energy thanks to the solar panels on its roofs. It will also be able to meet its nutritional needs with its greenhouse areas. Waste will be recycled in a way that does not cause environmental pollution. There will be units serving different functions such as office, market, fire department, kindergarten, swimming pool. Cross laminated wood material, which is a renewable resource, is preferred. There will be a pedestrian and bicycle-based transportation system in the area. With this design project, it is aimed to revive the provincial city model of Europe (url 4).

Figure 6.1. Greenhouse Area (url-4)

Figure 6.2. Energy Panels on Roofs (url-4)

Figure 6.3. Buildings (url-4)

Figure 6.4. Buildings (url-4)

Figure 6.5. Inner Garden (url-4)

Figure 6.6. Indoor (url-4)

Office Project Meeting Post-Pandemic Needs

Figure 7. Office Project Meeting the Post-Pandemic Needs (url-5)

It is a design project carried out in collaboration with Behave and Ronald Lu et al., aiming to increase work efficiency, contribute to sustainability and meet the needs of employees, offering much more than a classic workplace can offer.

With the use of balconies and the planting in it, intertwinedness with nature has been ensured, and spaces where employees can spend more quality time have been created. The use of green not only on the balconies but also inside is an investment for the physiological and psychological health of the employees (url-5).

Figure 7.1. Indoor (url-5)

Figure 7.2. Balcony Usage (url-5)

Figure 7.3. Climbing Wall-Plant Area (url-5)

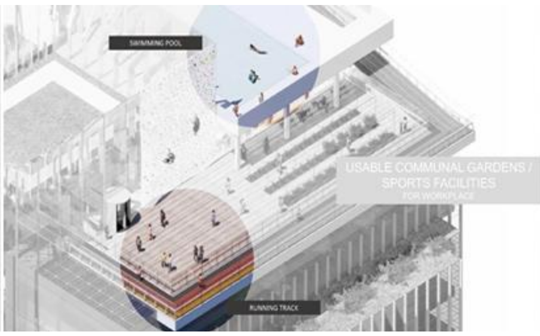


Figure 7.4. Running Track-Swimming Pool (url-5)

Various social activity areas are planned that will allow different activities that will increase the productivity of the employees. Swimming pool on the roof, jogging track, garden areas where planting can be done can be given as examples of these activity areas.

Tirana Riverside Neighborhood Project Designed for Covid-19 Needs

Figure 8. Tirana Riverside Neighborhood Project Designed for Covid-19 Needs (url-6)

It is a project designed by Stefano Boeri for Tirana-Albania as a green, sustainable and technological neighborhood project with a capacity of 12 thousand people for the needs of Covid-19. It was aimed to create a self-sufficient, smart, resilient city model and to prevent the current climate crisis.

This project, which is an urban transformation project, includes the needs of people of different ages and social groups and offers a solution as a whole. It provides an accessible solution to energy, water, food and utilities. Basic public services are located at 3 different points in an accessible way. It includes public and administrative functions, a school, a university, commercial centers, a bicycle and pedestrian-dominated transportation system.

Figure 8.1. Site Plan (url-6)

Figure 8.2. Model (url-6)

The green dominating the project continues on the surfaces and roofs of the buildings. It will be able to produce its own energy with the solar panels used. Thus, a sustainable city model will be created. The designer of the project is Stefano Boeri Albania-Tirana; It is among the first countries to accept the responsibility of creating a smart, environmentally friendly, self-sufficient space that can respond to crisis situations such as earthquakes, epidemics, and climate change. At the same time, Tirana represents one of the most advanced areas in terms of urban and sustainable planning, stated the happiness they experienced because they signed a project that contributed to the planning (url 6).


Figure 8.3. Green Covering on the Surfaces of Buildings (url-6) Figure 8.4. Green Cover on Floors and Roofs (url-6)

2. MATERIAL AND METHOD

In this study, articles, theses, internet resources and sample projects designed under the influence of covid-19, obtained as a result of the literature review, constitute the material of the study.

As a method, by making content analysis of the literature related to the documentary scanning method; The concepts related to the subject were explained, the past epidemics and the city relationship, the relationship between covid-19 and the city, the relationship between covid-19 and architecture were evaluated, the projects designed under the influence of covid-19 were examined, and finally, inferences about the importance of the concept of green architecture in the process of the covid-19 epidemic were made. recommendations have been made.

3. DISCUSSION AND CONCLUSION

When the studies and case studies in the literature are evaluated, the conclusions can be listed as follows;

The origin of epidemic diseases such as Covid-19 is based on urban and human factors. Human and urban factors, which are part of the problem, are also part of the solution.

In the fight against such epidemics, it is important for people to change their habits and lifestyles.

On the basis of this change; With the right cooperation between the disciplines of urban design, engineering, health and social sciences, creating a more sustainable city in every field, and bringing cities to a point where crises such as covid-19 can be better combated.

At the point of creating a more sustainable city, the existing planning system and architecture of cities will show some changes.

At this point, cities, planners and architects have great responsibilities.

Among these responsibilities, the integration of green with architecture and the city, its use as a design element, and the fact that greener-ecological planning is on the agenda are important.

In the light of all this, it can be seen how important green architecture is in terms of creating resilient cities in the fight against the epidemic and helping people better fight this process.

Considering that the changing habits not only in the fight against the epidemic, but also during this struggle will continue after the epidemic and that the expectations from the living areas will show some differences, it can be predicted that the understanding of green architecture should continue and become widespread afterwards.

In addition, with this sustainable architectural understanding, possible epidemics that may occur later will be prevented.

If it is necessary to fight against a possible epidemic such as covid-19, it can be said that better physiological and psychological struggles can be given with the changing habits and the spread of this architectural understanding.

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EVALUATION of URBAN PLANNING BASICS of CLIMATE CHANGE STRATEGY IN TURKEY

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ABSTRACT

From the industrial revolution to the present, the greatest impact of humanity on the environment increases release of greenhouse gases. As the world we live in is warmed with the release of greenhouse gas; average temperatures measured during the year was increased in land, sea and air. Thus, variability has emerged in the natural climate. This situation brought the climate change which is the most important problem of today and the future. Factors such as unplanned urbanization, industrialization, faulty areas are accepted as the basic resources of this question. Today, more than half of the world's population lives in cities. Because cities are the center of technology and innovation and also the economic engine of countries. However, rapid, dense and unplanned urbanization brings many problems; transforming cities into the source of climate change. Climate change makes these cities vulnerable to environmental problems and natural disasters. Factors such as unplanned urbanization, industrialization, faulty areas are accepted as the basic resources of this question. This study was developed on the basis of examining the awareness of climate change in the planning of the cities where the environmental impact of human beings is most intense. In this paper, urban planning solutions in the climate change strategy in Turkey was examined and evaluated. Results clearly showed that urban planning approach in Turkey is quite insufficient points in the adaptation to global climate change.

Keywords: Global climate change, Urban planning, Climate change action plans, Turkey.

1. INTRODUCTION

Today, climate change is one of the biggest environmental problems facing the world today. The United Nations Framework Convention On Climate Change, which entered into force in 1994 defines as: "*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"*(UN, 1992)

According to the Intergovernmental Panel on Climate Change (IPCC), which is accepted as the main institution in climate change studies in the world, climate change is the changes in the nature and/or characteristics of climate caused by human activities or natural changes over time. The report also states that these changes should last for a period of ten years or more (IPCC, 2007).

It has been proven that climate change is caused by an increase in the concentration of greenhouse gases in the atmosphere. In the 6th Assessment Report of the IPCC, which is considered the most up-to-date reference in this regard, it is stated that the greenhouse gases that have the most important share in climate change are CO_2, CH_4 and N_2O gases. It is specified in the report that since 1750, there has been an increase of 47% in CO_2 gas, 156% in CH_4 gas, and 23% in N_2O gas. In parallel with this rise, the global surface temperature also increased. It stated that the temperature was 1.09 (0.95 to 1.20) °C higher in 2011–2020 than 1850–1900. This increasing trend was greater on land (1.59 [1.34 to 1.83] °C) than in the ocean (0.88 [0.68 to 1.01] °C. It is given in the report that climate change projections for the 21st century are compared to 1850-1900 for 5 different scenarios (based on greenhouse gas concentration ratio) for short-term (2021-2040), medium-term (2041-2060) and long-term (2081-2100). In the long term i.e. until 2100; it is predicted that even under the very low greenhouse gas emission scenario (SSP1-1.9) the earth will warm 1.0°C to 1.8°C more. These values are 2.1°C to 3.5°C in the medium scenario (SSP2-4.5) and also 3.3°C to 5.7°C according to the very high greenhouse gas emissions scenario (SSP5-8.5) (IPCC, 2021).

It has been verified today that climate change is definitely caused by human activities. (IPCC, 2021). Cities are the living spaces where human activities are most intense. Population growth in cities and expansion towards rural areas is increasing day by day. This situation has made cities the most important actor causing climate change (UN, 2019). However, cities that are both perpetrators and victims of climate change are also one of the most important solution areas. At this point, physical (spatial) plans for cities have many potentials and opportunities to produce necessary solutions to reduce the devastating effects of climate change. Because the said physical plans are one of the most important regulatory tools in which decisions regarding the most basic areas in terms of mitigation and adaptation measures are taken. The most important examples of these areas are *"land use, urban form and urban structure order, transportation, water resources management, disaster management, urban green infrastructure, waste management, buildings"* (Demiroğlu, 2021). As a matter of fact, Talu (2019) also underlined that the most important local regulatory tool in cities regarding climate change is physical planning and that planning decisions affect the climate, and therefore, planning is an important tool in the development of cities according to climate change sensitivity.

According to the World Bank data, more than half of the world's population (56.15%) lives in urban areas (URL-1). It is predicted that this rate will be 68% in 2050 (UN, 2019). It is clear that the increase in greenhouse gas emissions in the world, especially carbon dioxide emissions, parallels this increase (IPCC, 2021) As a matter of fact, it has been proven in the relevant report that cities are responsible for 71-76% of global carbon emissions, 75% of natural resource consumption, and 60-75% of primary energy consumption. (UN,2018). The 100 cities with the largest carbon footprints worldwide are responsible for 18-20% of global carbon emissions (URL-2). If there is no change in the energy use practices dependent on fossil fuels in cities, it is predicted that urban carbon emissions will increase three times in 2050 compared to 2005 (Uncu, 2019). Therefore Cities play a vital role in the global response to climate change by reducing greenhouse gas emissions and adapting to the effects of a changing climate.

In the United Nations Climate Change Report (2014), it is emphasized that the intensity of the impacts that cities experience or may experience due to climate change depends on geographical location, certain geographical characteristics, sensitivity to climate change hazards and the rate of vulnerable population (vulnerable groups - poor, women, youth, elderly, etc.). The said effects, which are detailed in the report, are given under the headings of temperature increase, precipitation increase and sea level rise and summarized within the scope of potential primary effects and secondary effects as in Table 1.

It is seen that the concepts of mitigation and adaptation come to the fore in order to cope with these effects. Mitigation is activities that help reduce the rate or magnitude of climate change by reducing anthropogenic greenhouse gas emissions. Adaptation is adjustments in ecological, social or economic systems in response to current or expected climatic stimuli and their effects or consequences. It refers to changes in processes, practices and structures that occur to mitigate potential harms or take advantage of climate change-related opportunities. Adaptation does not mean avoiding negative effects. it just means it will be less severe because no planning is done (UN, 2014).

As a result, while cities are at the center of activities that cause climate change, on the other hand, they are the places most affected by climate change. It is very important to define the risks and threats that cities may face in an accurate and comprehensive manner, as well as the effects experienced due to climate change, in the decisions to be taken regarding the cities and the policies/strategies to be determined. In this way, it will be possible to determine effective adaptation measures in line with the nature of the risks and threats that cities face. In this way, it will be possible to determine effective adaptation measures in line with the nature of the risks and threats that cities face (UN, 2014; Abeygunawardena et al., 2003)

Table 1. Effects of Climate Change (UN, 2014)

Climate Hazard	Potential Primary Impacts	Potential Secondary Impacts
Increased Temperatures	• Groundwater depletion • Water shortages • Drought • Degraded air quality (smog)	• Water shortages • Distress migration to cities/towns due to droughts in rural areas • Reduced food supply and higher food prices • Potential energy price increases (e.g. from reduced hydroelectricity generation in places where it exists) • Exaggerated urban heat island effect • Increased energy demands for cooling • Need for higher or additional wastewater treatment • Population health impacts (e.g. increased mortality during heat waves, decreased access to food/nutrition)
Increased Precipitation	• Increased flooding • Increased risk of landslides or mudslides on hazardous slopes	• Reduced food supply and higher food prices • Property damage (homes and businesses) • Disruption of livelihoods and city/town economies • Damage to infrastructure not designed to the standards necessary to withstand the occurrences being experienced • Distress migration to cities due to floods in rural areas • Displacement and population movement from informal settlements built on steep slope hazard lands, etc. • Increased vector borne diseases (malaria, dengue,encephalitis) and water borne diseases (acute diarrhoea, cholera, dysentery)
Sea Level Rise	• Coastal flooding • Salt water intrusion into • groundwater supplies in coastal areas • Increased storm surge • Hazard • Coastal erosion	• Displacement and population movement from coastal areas • Property damage (homes and businesses) • Damage to infrastructure not designed to the standards necessary to withstand the occurrences being experienced • Disruption of livelihoods and city/town economies • Reduced food supply and higher food prices • Population health impacts (e.g. injuries, increased mortality and illness) • Loss of productive/residential land due to erosion
Increased Extreme Weather Episodes (storms, cyclones, hurricanes)	• More intense flooding • Higher risk of landslides/ mudslides on hazardous slopes • Intense and disastrous wind speeds	• Property damage (homes and businesses) • Damage to infrastructure not designed to standards of occurrences being experienced • Population health impacts (e.g. injuries, increased mortality, distress) • Disruption of livelihoods and city/town economies • Reduced food supply and higher food prices

The development and implementation of climate change adaptation and mitigation plans, actions and strategies, taking into account the economic, cultural and geographical conditions of the cities, plays an important role in minimizing the said effects (UN, 2018). At this point, climate change action plans prepared at the local level in recent years appear as guiding studies at the point of producing policies regarding mitigation and adaptation studies in the fight against climate change (Peker and Aydın, 2019).

The climate action plan is the roadmap for the steps that a local government will take to stop climate change quickly and fairly, while at the same time adapting to the consequences of climate change (Uncu, 2019). Local governments are at the center of these efforts, leading climate action by creating strategies and programs, integrating such actions into ongoing urban development, and forging partnerships for effective climate response. In the related report, the climate action planning process at the city level is explained in the following 7 basic steps. (UN,2015)

Step 1- Establishing the overall vision for climate change mitigation and adaptation: Cities should take into account the challenges faced and their capacity to solve them. This will form the basis of climate action plans and determine their scope.

Step 2- Securing political commitments to achieve the vision: Strong leadership is needed for climate action planning to be successful. In many cities, strong approval from the mayor and senior leadership is needed to accelerate action.

Step 3- Developing a communication plan: Cities must have a coordinated strategy to engage with the target audience. A good communication plan includes outreach and participation processes during the planning phase, publication of the plan, and implementation after the plan.

Step 4- Ensuring multi-stakeholder and cross-sectoral support: Effective planning requires a comprehensive and integrated cross-sectoral approach with actors working across administrative borders. Some cities may find support from the key private sector and non-governmental stakeholders may be vital. After the first 4 steps, **mitigation and adaptation measures** that can be created against the effects of climate change in the city are clearly revealed.

Actions to be taken within the scope of **mitigation** can be summarized under 4 headings;

Establishing the city's greenhouse gas inventory: Greenhouse gas inventories, key emissions and key emission sources and reduction opportunities are determined. In particular, cities seeking compliance are encouraged to use an international reporting methodology to ensure international compliance while complying with local requirements.
Managing scenario analysis: Cities perform scenario analysis to identify possible future emissions trends based on different socio-economic growth and climate reduction assumptions or scenarios. Analysis results form the basis for goal setting and action.
Assessment of local capacity to reduce emissions: Cities assess their capacity to take action and consider how they will benefit from other existing policies, plans and actions, such as those related to energy, the environment and urban management.
Determining greenhouse gas emission reduction targets: The city's short, medium and long-term emission reduction targets are determined based on scenario analysis and capacity assessment results, and political commitment to the targets is assured.

The actions to be taken within the scope of **adaptation** can be summarized under 4 headings.

Managing the climate change vulnerability assessment: Cities manage vulnerability assessments to identify current and future risk/impacts of people on community assets and community functions. A comprehensive vulnerability assessment addresses physical, environmental, economic, social vulnerability and focuses on those most vulnerable to impacts.
Managing scenario analysis: Scenario analysis defines risk levels based on different scenarios for climate impacts and these definitions inform potential climate impact adaptation options.
Assessing local capacity to address climate impacts: Cities assess their local capacity to adapt to the impacts of climate change. The analysis begins with an inventory of the existing community's policies, programs, assets, capacities, and wisdom.
Setting adaptatio targets: Based on the results of the cities scenario analysis and capacity assessment; they set short, medium and long-term cohesion goals and provide political commitment to them. The targets should comprehensively address the physical, environmental, economic and social impacts of climate change.

Step 5- Define and prioritize actions: Effective plans define comprehensive and integrated actions covering multiple sectors of urban development and include action at multiple different scales. Actions are prioritized based on a transparent multi-criteria evaluation in coordination with other city planning efforts and are institutionalized within all municipal processes and functions.

Step 6 - Developing a plan for implementation: Action plans should contain sufficient detail. It should be actionable and the responsibilities of appropriate institutions and organizations to achieve the desired goals should be clearly stated.

Step 7- Monitoring, Reporting, Evaluation, Update and Improvement: At this stage, feedback should be received at all steps related to the process and the plan should be updated and its continuity should be ensured.

Although it is useful to inform about the climate action planning process at the city level, it should be accepted that the planning processes will vary from city to city. In addition, urban climate action planning should be flexible, dynamic and repeatable, taking into account the changing activities depending on the conditions of the city. Climate action planning is not an isolated process. Rather, it is integrated and directly linked to other socio-economic, spatial, disaster risk reduction and environmental planning processes at both the regional and national, city and other levels of government. Integrating climate action planning, especially into long-term urban planning processes, increases the effectiveness of urban responses to the climate problem. Achieving this type of integration involves knowledge sharing between different sectors and stakeholders. It also includes promoting the incorporation of climate mitigation and adaptation goals, policies and initiatives into other relevant plans and policies (UN, 2015).

The main documents in the international arena aiming to reduce the effects of climate change are the United Nations Framework Convention on Climate Change (UNFCCC), which was opened for signature in 1992 and entered into force in 1994, and the Kyoto Protocol of 1997. In the Conferences of the Parties (COP) that have continued over the years, the issue has been on the agenda of many countries in the international arena and policies have been developed in this regard (UNFCCC, Paris Agreement, 2016).

Especially in recent years, when the policy process on a global scale is examined, it is seen that the necessity of increasing the adaptation and mitigation actions in the cities has been emphasized. In the 13th COP held in 2007, the need for action planning for climate change in cities was underlined and a "Climate Roadmap" was created for local governments. In Paris, France, in December 2015, the Paris Climate Agreement regarding the post-Kyoto process (post-2020) was adopted unanimously by 196 countries that are party to the UNFCCC and the EU as a result of the 21st COP. The main objective of this universal agreement is "*to strive to keep global temperature rise below 2 °C this century and to limit it to 1.5 °C above pre-industrial levels".* With the Paris Agreement, it was revealed that climate action plans should be made in cities and road maps were determined to guide this (UNFCCC, Paris Agreement, 2016). The provision of international cooperation is particularly emphasized in the text of the said agreement. In addition to all these, local government networks have also been established in which city or state governments are members, provided that certain criteria are met in processes related to climate change. The most familiar examples of these are structures such as C40 (Climate Leadership Group), ICLEI (Local Governments for Sustainability), EC (Energy Cities), CoM (Covenant of Mayors). Some financial and technical support is given to the relevant cities/states in these climate-related network structures for example carrying out risk assessments in cities/states, emission analysis, developing various collaborations between local governments, providing memberships to different networks, creating solution environments for local governments' problems, monitoring, evaluating, reporting climate change, ensuring adaptation of cities to climate change and combating climate change, and making the presentation etc. As can be seen, in the globalizing world, there are some studies and legal structures regarding the fight against and adaptation to climate change at different levels. (Özcan, 2018). Today, with the increasing effects of global warming on a global scale, taking measures in the administrative structure has accelerated.

The purpose of this paper is to examine and evaluate the local climate action plans (LCAP) in Turkey at the urban planning/spatial planning scale.

1.1. Current Situation and History of Action Plan on Climate Change in Turkey

Urbanization rate in Turkey is over 95[1]%. (TSI, 2021a). This is a quantitative way of expressing how threatening the factor causing global warming is. Today, it has been proven that cities are responsible for global carbon emissions. In this sense, the cities that are most responsible are listed. In this ranking, Turkey ranked 26th with Istanbul and 80th with Ankara (URL-2).

According to TSI (2021b) data, the amount of greenhouse gas equivalent to 4 tons of CO_2 in 1990; it was calculated as 6.4 tons of CO_2 equivalent in 2018 and 6.1 tons of CO_2 equivalent in 2019. Parallel to this increase, it has been revealed by the data of the General Directorate of Meteorology (GDM) that the temperature in the country also increased. Today, this temperature has increased to 16.1 °C, the average temperature of the first 10 months of 2021.(URL-3) (Table 2). In addition, the report *"New Scenarios and Turkey's Climate Projections and Climate Change"* includes predictions regarding climate change for Turkey, covering 3 different periods. In the report, it is estimated that the temperature will increase and the precipitation will decrease according to the RCP4.5 and RCP8.5 scenarios (Table 3) (GDM, 2020).

Table 2. Turkey's 1970-2021 temperature change (URL 3)

Yıllar	Yıllık Ortalama Sıcaklık Değeri (°C)
1970	12,9
1981-2010	13,5
2010-2019	14,1
2021 (first 10 months)	16,1

The evaluations regarding Turkey in the 6th Evaluation report, which is the most up-to-date report of the IPCC, also confirm this information. In the related report, it is stated that the scenarios and projections regarding climate change show geographical differences and it is emphasized that especially North Africa, Italy, the Balkans and Turkey will be more affected by climate change. In the report, it is estimated that the summer warming rates of the Mediterranean region will be 40-50% higher than the global annual warming (IPCC,2021).

Table 3. Climate Change Projection for Turkey (according to RCP4.5 and RCP 8.5 scenario) (GDM, 2020)

Year	According to the RCP 4.5 scenario		According to the RCP8.5 scenario	
	Temperature rise (°C)	Decrease in precipitation (%)	Temperature rise (°C)	Decrease in precipitation (%)
2016-2040	0,5-1,5	50 (nationwide)	0,5-1,5	%30-%40 (spring) %50-%70 (summer)
2041-2070	Winter: 1,5 Other seasons: 1	30 (autumn)	Spring/Autumn: 1,5-3 Summer: 4-5	%50
2071-2099	Summer: 3	60-70 (summer)	Winter: 2°C-4°C Other seasons: 5°C	%50 (spring) %70 (summer)

[1] According to TSI data, those living in districts and provincial centers are considered as urban population. With the law numbered 6360, which entered into force after the 2014 local elections, the borders of the metropolitan municipalities were expanded to the provincial administrative borders, and the villages on the provincial border were turned into neighborhoods. The inclusion of this population in the urban population has officially increased this rate.

It is predicted that the annual average temperature change in Turkey, especially in the Southeastern Anatolia region, will increase above the global average temperature change. In addition, in the relevant scenarios in the report, there is a very serious decrease in the annual average precipitation, especially in the Mediterranean belt where Turkey is located (IPCC, 2021).

The current situation regarding climate change in Turkey and the forecasts in international platforms have enabled the administrative structure to take action in this regard. At this point, issues related to climate change were included for the first time in the eighth 5-year development plan (2001-2005). In 2000, the *"Climate Change Specialization Commission Report*" was prepared within the scope of the said Plan (Turkey 6th Statement on Climate Change, 2016). In addition to these, before Turkey became a party to the UNFCCC, institutional structuring was carried out and the *"Climate Change Coordination Board"* was established in 2001.The said board was restructured in 2013; It was named as *"Climate Change and Air Management Coordination Board"*.

The developments as a result of Turkey's signing of the UNFCCC in 2004 and the Kyoto Protocol in 2009 clearly show that the country is engaged in some activities in combating and adapting to climate change. The KENTGES (Integrated Urban Development Strategy and Action Plan 2010-2023) plan is very important, especially in terms of dealing with climate change issues in cities for the first time in a broad scope with a participatory approach such as transportation, spatial planning, green spaces, energy efficiency and renewable energies, infrastructure and waste management. In addition, the change of the country's Ministry of Environment and Urbanization to the Ministry of Environment, Urbanization and Climate Change on October 11, 2021 can be considered as an indicator of the country's high-level sensitivity to the issue. With the relevant regulation dated April 8, 2020, it was possible to establish Climate Change Departments and Climate Change Branch Offices in provincial and district municipalities. This change shows the importance given to the subject at the local level. The legal history of climate change in Turkey is included in Table 4. The dates of all these developments show that the legal struggle and administrative structure related to climate change in Turkey is quite new.

When the situation in the legislation on the issue of climate change is examined, first of all, the Zoning Law is encountered. In Article 8 (*subparagraph h*) of the **Zoning Law No. 3194**, the statement "*surveying and projects of buildings in villages and other settlements with rural characteristics ... energy efficient, climate sensitive and ecological plans and projects can be prepared or have them prepared...*". With this expression, it is mentioned that climate sensitive plans and projects can be prepared / can be prepared. In addition, in the 7th article (f, g and ğ subparagraphs) of the **Spatial Plans Construction Regulation** that entered into force on 14.06.2014, it is stated that the necessary rehabilitation decisions are included in the plans and the plans are based on data such as disaster, geological and natural data. In addition, in the 8th article of the relevant regulation, it is emphasized that studies such as urban risk analysis can be carried out according to the natural and cultural characteristics of the planning area, and that risk-reducing measures for disasters and other urban risks can be taken as a basis in the plans. In the data structure and analyzes heading of the regulation (Article 17), it is stated that during the preparation of spatial strategy plans, data can be obtained from relevant institutions and organizations in areas where there is a certain danger such as climate change, and studies and analyzes can be made within the scope of these data. These articles show that the concept of climate change and its scope are defined in the planning legislation of the country, albeit limited, and the subject is evaluated within the scope of urban risk analyzes rather than the guiding principles regarding climate change.

Table 4. Legal-administrative history of climate change in Turkey

International Agreements	
UNFCCC	*2004*
Kyoto Protocol	*2009*
Paris Climate Agreement	*2015*
National Strategic Documents	
National Climate Change Strategy	*2010–2023*
National Climate Change Action Plan	*2011 – 2023*
National Climate Change Adaptation Strategy and Action Plan	*2011 – 2023*
Integrated Urban Development Strategy and Action Plan	*2010 – 2023*
Turkey Transport and Communication Strategy Document	*2011-2023*
National Smart Transportation Systems Strategy Document and Action Plan	*2014–2023*
National Strategy and Action Plan to Combat Desertification	*2015-2023*
National Waste Management and Action Plan	*2016 – 2023*
National Drought Management Strategy Document and Action Plan	*2017-2023*
Strategic Plan of the Ministry of Environment and Urbanization	*2018–2022*
Regulations	
Regulation on the Monitoring of Greenhouse Gas Emissions	*Date: 17/5/2014 No. 29003*
Energy Performance Regulation in Buildings	*Date: 05.12.2008 No. 27075*
Green Certificate Regulation for Buildings and Settlements	*Date: 23/12/2017 No. 30279*
Regulation on Substances that Deplete the Ozone Layer	*Date: 12.11.2008 No.27052*
Industrial Air Pollution Control Regulation	*Date: 03.07.2009 No. 27277*
Administrative Structure	
Changing the Ministry of Environment and Urbanization to the Ministry of Environment, Urbanization and Climate Change	*Date: 11/10/2021*
Enabling the establishment of Climate Change Departments and Branch Offices in provincial and district municipalities with the "Regulation Amending the Regulation on the Norm Staff Principles and Standards of Municipalities and their Affiliates and Local Administration Unions"	*Date: 08/04/2020 No: 31093*

In the Climate Change National Action Plan (2011-2020) of Turkey, local governments are specified as *"relevant organization"* in some targets and "*responsible / coordinating organization"* in some targets in the implementation of climate action plans. Although all these legal and administrative developments show that the fight against climate change by local governments in Turkey is still in its infancy, it has mobilized some local governments that want to combat climate change more effectively and strengthen their adaptation capacity at the local level. Istanbul-Kadıköy Municipality participated in the Climate Friendly Cities Campaign in 2009 and became one of the first municipalities to initiate climate action in Turkey. Gaziantep Metropolitan Municipality was the first municipality in Turkey to prepare a climate change action plan in 2011. The climate change action plan, which was revised in 2016, was followed by Bursa Metropolitan Municipality's 2014 action plan, and then by district municipalities such as Karşıyaka, Sarıyer, Bornova, Tepebaşı, Kadıköy and Seferihisar. All these efforts have led Istanbul to prepare its own climate action plan (Talu, 2019). Currently, only 9 of the 30 metropolitan municipalities in the country (Antalya, Bursa, Denizli, Gaziantep, Hatay, Istanbul, Izmir, Kahramanmaraş, Kocaeli) have created their climate action plans. However, in the strategic plan of the relevant ministry (2018-2022), it is foreseen that all metropolitan municipalities should have created climate action plans by 2022. (T.R. Ministry of Environment and Urbanization Strategy Plan, 2021). Among these 30 metropolitan municipalities, Erzurum, Kayseri, Muğla, Sakarya, Trabzon municipalities do not have a local climate action plan and only have greenhouse gas inventory. Unfortunately, the remaining 16 metropolitan municipalities (Adana, Ankara, Aydın, Balıkesir, Diyarbakır, Eskişehir, Konya, Malatya, Manisa, Mardin, Mersin, Ordu, Samsun, Şanlıurfa, Tekirdağ, Van) do not even have a greenhouse gas inventory.

The only C40 member city in Turkey is Istanbul (URL-4). CoM member cities are Istanbul Metropolitan, Izmir Metropolitan, Antalya Metropolitan, Eskişehir Metropolitan, Bursa Metropolitan, Gaziantep Metropolitan Municipalities and Bornova/İzmir, Bayındır/İzmir, Karşıyaka/İzmir, Seferihisar/İzmir, Tepebaşı/Eskişehir, Çankaya/Ankara, Beşiktaş/İstanbul, Kadıköy/Istanbul, Şişli/Istanbul, Bagcilar/Istanbul, Pendik/Istanbul, Maltepe/Istanbul, Nilufer/Bursa municipalities (URL-5). EC member cities are Gaziantep, Seferihisar / İzmir, Bornova / İzmir, Karşıya / İzmir, Büyükçekmece / İstanbul, Nilüfer Bursa (URL-6). ICLEI member cities are Seferihisar/İzmir, Kadıköy/ İstanbul, Şişli/İstanbul, Kartal/ İstanbul, Tepebaşı/Eskişehir, Gaziantep Metropolitan, Konya Metropolitan Municipality (URL-7)

3. MATERIAL AND METHOD

The primary material of the study is the action plans checklist, which was created by focusing on urban planning solutions. The said checklist was created on the basis of Krellenberg and Turhan (2016) and UN (2015) publications. The list in question consists of 29 items in total (Table 5). As a result of the examination; each action plan was evaluated depending on whether it gives the specified subject; "included (I), partially included (PI) or not included (NI).

The climate action plans of the metropolitan municipalities of Antalya, Bursa, Denizli, Gaziantep, Hatay, Istanbul, Izmir, Kahramanmaraş and Kocaeli constituted the secondary material of the study. The relevant action plans have been accessed from the web pages of the metropolitan municipalities. General information on these action plans is summarized below.

Antalya Metropolitan Municipality Climate Action Plan: The project of Antalya Metropolitan Municipality on "Antalya's Carbon Footprint Inventory and Sustainable Energy Action Plan" was financed by the Western Mediterranean Development Agency. It was created with the target of 23% reduction in total emissions in 2020 compared to the 2012 level.

Bursa Metropolitan Municipality Climate Action Plan: Studies on the plan started in 2014. The plan, which was completed in October-2015, was revised in 2017 in accordance with the CoM in line with the decisions taken after the COP21 Paris meetings held in 2015, and was prepared under the title of "Bursa Sustainable Energy and Climate Change Action Plan". In the mitigation and adaptation measures in the plan; urban development; transportation; renewable energy; solid waste and wastewater management; industry and services; agriculture, livestock, forestry; focused on awareness campaigns and natural energy efficiency. With the reduction measures put forward for each sector in the Action Plan, it is foreseen that Bursa will be able to realize its development until 2030 with 22% less greenhouse gas emissions, and that it can provide a reduction of approximately 40% in per capita emissions in 2030 compared to 2014.

Denizli Metropolitan Municipality Climate Action Plan: In the plan approved in 2019, 2016 was chosen as the inventory year. In the plan prepared with the vision of 2030, a target of 21% less greenhouse gas reduction was determined as a realistic target covering all emission sources at the provincial level. Within the scope of Denizli LCAP, a total of 12 objectives and 36 actions were established under 6 action areas (buildings, agriculture and livestock, energy, transportation, waste/waste water, industry) specific to greenhouse gas reduction. In terms of harmonization, a total of 18 goals and 36 actions were established under 6 action areas (Agriculture and Ecosystems, Water and Wastewater, transportation, industry, energy, public health).

Gaziantep Metropolitan Municipality Climate Action Plan: Gaziantep Metropolitan Municipality prepared Turkey's first local climate action plan in 2011 with the support of the French Development Agency. Gaziantep Metropolitan Municipality, in 2016 (developed with EU support. 1. In the prepared plan, it is aimed to reduce the CO_2 per capita by 15% in 2023; In the 2nd plan, this target was increased by 5% and stated as 20%. Gaziantep Metropolitan Municipality became a member of CoM in 2017.

Table 5. Action Plans Checklist

No	Issues
I1	Based on the future scenarios, the city vision has been put forward so that the city can create the response to climate change. In this context, a long-term vision statement was made, supported by clear targets and targets according to short-medium-long-term terms and various strategic areas/sectors groups.
I2	An introduction had made explaining how the plan was developed, including the public participation processes.
I3	There is a technical and scientific summary with an explanation and baseline assessment of the science behind climate change and forecasts of climate impacts. E.g; a greenhouse gas emissions inventory, a vulnerability assessment and health effects or a local renewable energy potential assessment, etc.
I4	Main working groups/stakeholders (*local government officials, different units of the Municipality, academics, non-governmental organizations, private sector, etc.)* were formed.
I5	There are local climate trends (*temperature, precipitation, extremes, etc*.).
I6	Global and regional climate scenario interactions are examined.
I7	Greenhouse gas emission (*GHG*) projections are available.
I8	Socio-economic status (*such as demographic structure, demographic information, access to services*) has been revealed.
I9	The environmental situation (*such as land use, ecosystem services*) is revealed.
I10	Existing local political priorities, decisions, commitments (*current development strategies, especially policies, disaster risk, energy, land use plans and strategies*) have been revealed.
I11	In the study area, sensitivity-vulnerability-risk maps have been prepared for climatic disasters that may occur due to climate change. In addition, the most risky regions and infrastructure areas were determined, thus creating a base for spatial plans. (*Climatic disasters: landslide, erosion, collapse, avalanche, drought, desertification, flood/flood, hurricane/tornado, hot/cold weather fluctuations, fire, etc.)*
I12	Scenarios were developed within the scope of impact and affectibility analysis. In scenarios, especially land use, energy and water supply-demand etc. focused on the connection points between the headers.
I13	Within the framework of the studies and vision, short (*such as 10 years*), medium (*such as20 years*) and long (*such as30 years*) term targets have been established in the fight against climate change in the city.
I14	On adaptation and mitigation, actions have been formed that take into account the general objectives and spatial planning problems of the city. Also, actions are gradabled and sequenced to maximize their benefits.
I15	Within the framework of the determined actions, priority actions have been determined on the basis of both climate and development. In this process, cost-benefit analyzes were made, multi-criteria decision-making processes were completed, and evidence in a fair logic was presented. To the extent possible, stakeholders were informed; recommendations and approvals were reflected.
I16	Priority actions are grouped by strategic area (*which may correspond to sectors or specific geographic areas of urban development or regeneration*).
I17	An overview of current adaptation or mitigation initiatives is given.
I18	These goals and actions are integrated into spatial plans.
I19	The law and institutional framework plan and strategy that will affect the implementation process of the actions have been put forward and resolved. In addition, links with local socio-economic and environmental targets were established in this process.
I20	The organization chart of the main working group was created in the context of the vision and goals. Distributed duties and responsibilities, limitation of authority, etc. has been made. Actors and actions differing in time and space are coordinated within the team.

I21	During the implementation of the actions, information-action unification was ensured among the stakeholders. Feedback mechanisms have been established.
I22	Public awareness and participation was ensured in the realization of the actions.
I23	A strategy has been developed for outreach, education, communication and dissemination.
I24	An explanation is given of how climate action planning is linked to other national and regional goals, regulations, plans and processes.
I25	Indicators have been determined for the monitoring and evaluation process.
I26	A mechanism and correction system has been established regarding the feedback process regarding the monitoring and evaluation phase.
I27	A framework has been established to report results and ensure accountability.
I28	There is a glossary explaining technical mandatory terms.
I29	There is the use of graphs, charts, maps to illuminate key findings, objectives and strategies.

Hatay Metropolitan Municipality Climate Action Plan: The plan was created with the title of "Greenhouse Gas Emission Inventory and Climate Change Action Plan". A greenhouse gas emission inventory has been prepared for the province of Hatay and the reduction targets and the actions to be taken to achieve these targets have been determined on a sectoral basis. The calculated emissions reflect the greenhouse gas emissions in the province of Hatay in 2017. With this plan, it is aimed to reduce the emissions of Hatay province by 23% until 2030.

Istanbul Metropolitan Municipality Climate Action Plan: The plan consists of 7 work packages (creation of roadmap; preparation of greenhouse gas inventory; preparation of climate scenarios; determination of risks, opportunities and vulnerabilities; stakeholder meetings) with the vision of "to ensure that Istanbul is a world city with a high quality of life and respectable". It is one of the most detailed plans prepared with the support of academicians who are experts in the field (creating an action plan, creating awareness and capacity building). As a result of the work carried out since 2016, the "Istanbul Climate Change Action Plan (İİDEP)" has been published. As a result of these 7 work packages, the Greenhouse Gas Inventory Report, the Climate Scenarios Report, the Climate Change Risk, Opportunity and Vulnerabilities Analysis Report and the Climate Change Action Plan Final Report in 2018 were published. It is predicted that Istanbul will reduce its emissions by 33% in 2030 compared to the baseline scenario. Within the scope of the project, the greenhouse gas inventory of the city in terms of reduction was prepared for the year 2015 and this year formed the basis for the planning. The projection of this inventory for the years 2030 and 2050 has been made in the light of current national policies.

Izmir Metropolitan Municipality Climate Action Plan: Izmir Metropolitan Municipality (IMM) became a party to the CoM regarding the reduction of greenhouse gases within the borders of Izmir province in 2015 and has committed to reduce its emissions by 20% until 2020. For all sectors, including industry and agriculture, Izmir province emissions inventory and 26 different actions have been taken to reduce emissions. CoM has set the greenhouse gas reduction target of 40% by 2030, in line with the EU's Paris Climate Agreement declaration of intent, and all parties that are party to it have set the target. It stipulated that it should reduce its emissions to cities by 40% compared to the base year and develop adaptation policies and actions against climate change. In accordance with the CoM targets, IMM has renewed its reduction and adaptation targets in accordance with the CoM with the parliamentary decision on 15 August 2019. İzmir is one of the 11 cities in Turkey that have made a commitment to mitigation and adaptation as a party to the CoM. As per the commitment, IMM will prepare the Sustainable Energy and Climate Action Plan (SECAP) for the roadmap to combat climate change until 2030 and submit it to the CoM

Kahramanmaraş Metropolitan Municipality Climate Action Plan: The plan has been prepared to cover the years 2018-2030, according to the 2016 inventory data. In the plan; Under the headings of "Urban Development - Built Environment, Transportation, Renewable Energy, Solid Waste and Waste Water Management, Awareness Campaigns, Industry Sector, Agriculture, Animal, Forestry, Natural Energy Efficiency", 39 actions were defined within the framework of 23 objectives. It is aimed to reduce 8.58 tons of CO_2e per capita in 2016 to 5.59 CO_2e in 2030.

Kocaeli Metropolitan Municipality Climate Action Plan: The plan, which was prepared with the vision of a model climate-friendly city that systematically combats climate change in Kocaeli, was prepared in 2018 with the title of "Greenhouse Gas Inventory and Climate Change Action Plan". As a signatory to the "Global Covenant of Mayors for Climate and Energy", the relevant municipality has committed to fulfill its reduction responsibility from the 21% increase it has committed until 2030. In the plan, a total of 16 objectives and 54 actions have been established for a total of 6 action areas, namely buildings, energy, transportation, waste/wastewater, industry and land use.

Within the scope of the study, the 9 action plans in question were examined within the framework of the existing issues in the checklist and an evaluation was made according to the situation in which the relevant subject was included in the plan [*included "I"; partially included "PI" and "NI"*]. These evaluations were evaluated subjectively by the researchers and the study is a preliminary study. These evaluations were evaluated subjectively by the researchers and the study is a preliminary study.

3. RESULTS

Actions are the cornerstone of climate action plans. Actions to achieve ambitious goals, can cover multiple sectors (construction, energy, transportation, waste, water, health) of urban development and involve action at different scales (UN, 2015). Action plans; changing according to the conditions of the city, flexible and dynamic, feedback at every stage, participatory, holistic at local-national and international scale, supported by plan-policy and legislation, having evidence, having future projections, etc. should have qualifications. In action plans; traditional-innovative projects/works should be integrated (eg ecosystem management, etc.) and coordination betwen action should be established (use of ecosystem services for flood management, etc.). To illuminate key findings, objectives and strategies; graphs, charts, maps, etc. should be given (UN, 2015). In Table 6, a form was created in which the subjects that should be included in an action plan are indicated. As a result of the examination; each action plan was evaluated depending on whether it gives the specified subject (Table 6).

In the action plans examined within the scope of the study, it was seen that the following subjects were given **adequately** (Table 6):

- Technical and scientific summary. Summary includes an explanation and basic assessments of the science behind climate change and forecasts of climate impacts.
- Key working groups/stakeholders and stakeholder definitions
- Greenhouse gas emissions (GHG) projections
- Grouping of priority actions by strategic area
- An overview of current adaptation or mitigation initiatives.

In the action plans examined within the scope of the study, it was seen that the following subjects were given **partially** (Table 6):

- Vision
- introduction explaining how the plan was developed, including public engagement processes
- Local climate trends
- Global and regional climate scenario interactions
- Socio-economic status
- Scenarios developed within the scope of impact and vulnerability assessments
- Actions on adaptation and mitigation, taking into account the general objectives and spatial planning problems of the city

- Phasing and sequencing actions to maximize benefits
- Legislative and institutional framework plans and strategies and solutions that will affect the implementation process of actions.
- Existing local political priorities, decisions, commitments Information-action coupling-feedback mechanisms among stakeholders in the implementation of actions
- Explanations on how climate action planning is linked to other national, regional goals, regulations, plans and processes
- Public awareness and participation in the realization of actions
- Framework that provides accountability to report on results
- Use of graphs, charts and maps to illuminate key findings, objectives and strategies

In the action plans examined within the scope of the study, it was seen that the following subjects were given **unadequately** (Table 6):

- Sensitivity-vulnerability-risk maps for site-specific disasters that may occur in the context of climate change
- The most risky zone and infrastructure areas in the city
- Short (10 years), medium (20 years) and long (30 years) term goals of the city in combating climate change
- A mechanism for the feedback process and a correction system for the monitoring and evaluation phase
- Indicators for the monitoring and evaluation process
- Glossary topics explaining terms.

Table 6. Action plan evaluation for provinces

	Antalya	Bursa	Denizli	Gaziantep	Hatay	İstanbul	İzmir	Kahramanmaraş	Kocaeli
I1	PI	I	I	I	I	I	I	I	I
I2	I	PI	I	PI	I	I	I	I	I
I3	I	I	I	I	I	I	I	I	I
I4	I	I	I	I	I	I	I	I	I
I5	PI	I	I	I	I	I	I	I	I
I6	PI	I	I	PI	I	I	I	I	I
I7	I	I	I	I	I	I	I	I	I
I8	PI	I	I	I	I	I	I	I	I
I9	NI	PI	NI	NI	NI	PI	NI	NI	I
I10	PI	PI	PI	PI	PI	I	I	PI	I
I11	NI	NI	NI	NI	NI	NI	NI	NI	NI
I12	PI	PI	PI	PI	PI	I	I	PI	I

I13	NI	NI	PI	NI	NI	NI	NI	NI	NI
I14	PI	PI	PI	I	PI	I	PI	PI	PI
I15	PI	PI	I	I	I	I	I	I	I
I16	I	I	I	I	I	I	I	I	I
I17	I	I	I	I	I	I	I	I	I
I18	NI	PI	NI	NI	NI	PI	PI	NI	NI
I19	PI	PI	PI	PI	PI	I	I	PI	PI
I20	NI	NI	PI	I	NI	I	I	NI	I
I21	PI	I	I	I	I	I	I	PI	I
I22	PI	PI	PI	PI	I	I	I	PI	I
I23	NI	I	I	I	I	I	I	NI	NI
I24	PI	PI	PI	PI	PI	PI	PI	PI	PI
I25	NI	NI	NI	NI	NI	PI	PI	NI	NI
I26	NI	NI	NI	NI	NI	PI	NI	NI	NI
I27	PI	I	I	I	I	I	I	PI	I
I28	NI	NI	NI	NI	NI	NI	NI	NI	NI
I29	PI	PI	PI	PI	PI	I	PI	PI	PI

I: Included PI: Partially Included NI: Not Included

4. CONCLUSION AND RECOMMENDATIONS

Today, climate change reveals its existence and all its power with the disasters it causes. Change is the result of many years and its effects are increasing day by day. This is about combating climate change; has made it urgent and compulsory to take measures from local to national, from national to transnational. However, the cities that feed the climate change the most; is considered a priority for taking measures. This situation has led to the start of many studies on the urban scale. Climate action plans prepared at urban scale is one of these studies. In this regard, climate action plans have begun to be prepared in Turkey, albeit delayed, incomplete and inadequate.

Climate action plans draw a very important road plan in the fight against change. At the same time, it has a structure that directs development in this process. When the content of the action plans is examined, we come across an approach that has been emphasized for years under the title of ecology-based spatial plans. Plan; In cooperation with stakeholders, the current situation is revealed (of course, in the light of all spatial data), impact and vulnerability analyzes are made (at this point, loss of life and property at risk is determined) vision and goals are determined, measures and prioritization are established, actions and measures are implemented and monitoring. Climate action plans have a detailed content and application in which a flexible and extensible system is created with control and inspection. As stated in the United Nations climate action plans guide (UN, 2015), climate action plans should include sufficient detail for them to be implemented by institutions and organizations, to be actionable in this context and to achieve the desired goals. The details mentioned here are given below;

Specificity: Actions should be sufficiently specific, easily implemented and measurable.
Cost, benefits and financing: Actions should, as far as possible, include estimates of net costs and benefits (both climate and otherwise), their distribution, and potential sources of financial support.
Co-benefits, synergies and trade-offs: Actions should consider potential co-benefits, synergies and trade-offs related to local development priorities and adaptation and mitigation goals.
Timelines and prioritization: Actions should be prioritized and include clear timelines for implementation.
Assigning responsibilities: Actions should be assigned to specific agencies, organizations or stakeholders so that these organizations can be held accountable for implementation.

Today, the preparation of urban action plans in Turkey, in other words, the planning authority is under the responsibility of the local governments with strategic plans, not laws. By planning here, a planning approach that shapes and gradually increases the quality of life of people -and all living things- with not only spatial but also economic, ecological and social opportunities is essential. However, when we look at the local government structure in Turkey - both the infrastructure and the experienced personnel - there are hesitations about preparing such a plan. Ultimately, all of the action plans examined in the study were made by different companies within the scope of EU projects. At this point, it should be noted that the time elapsed since 2004, when the issue of climate change was on the agenda in Turkey, is very short. In this short period of time, at least the establishment of awareness in the institutional structure and the start of a movement on the subject is a hopeful situation.

When the checklist developed on the basis of 29 criteria is examined in order to examine the content of the climate action plans created within the scope of the study; It has been observed that the fight against climate change in Turkey is quite inadequate at the local level or is at the very beginning. In the plans; greenhouse gas emissions causing global warming and their projections; stakeholder definitions; vision; targets; actions; obstacles and suggested solutions in this process; even the feedback of the system and the details about these issues are given adequately or partially. However, risk maps (data) that will reveal sensitive and vulnerability places (landscapes) against the impact of global warming and that will enable to evaluate the loss of life and property that will be affected as a result are not included in the plans. These data will not only reveal the magnitude of the danger and improve its precaution, but will also enable to produce a reliable scenario for the future. However, the scenarios created in this context; It is incomplete because it is based only on greenhouse gas emissions and some environmental and socio-cultural data. In addition, short, medium and long-term goals are not specified. This situation may also cause confusion at the point of prioritization of actions. In addition to these, the monitoring and supervision framework, the indicators in this process and the mechanism for feedback, which are indispensable for a successful planning, are not given. The points mentioned here are the basic building blocks of combating climate change. It should be noted that these issues are not present in most of the action plans reviewed. This situation shows that; action plans are a report in which only local carbon emissions are given, and within this framework, theoretical knowledge and current practices are fed.

As a result, the following issues should be re-evaluated first in order to be successful in the climate struggle today, where the effects of climate change have reached crucial dimensions in Turkey.

- An institutional structure with a strong hierarchy from general to local should be established. This authority should be taken away from local administrations and given a participatory role (after all, they do not produce their own action plans).
- Combating climate change and national action plans should be integrated with spatial plans of all scales, and the implementation of these plans should be among the priority targets.
- Legislation and management structure in climate change action plans should be arranged in a way to eliminate issues that may hinder actions and targets. In the fight against climate

change, laws and regulations on the management structure, authorities and implementation of action plans should be developed.

- Spatial and other data that will form a basis for action plans should be gathered under one roof. The scale problem in maps that reveal natural and cultural landscapes, especially at the urban scale, should be resolved. The scale used in sensitivity, vulnerability and risk maps is produced from 1/25000 data. These data provide very superficial data for the city scale. This situation undermines credibility about climate change.
- Short, medium and long-term goals and priorities should be defined in detail.
- Monitoring and supervision activities, indicators in this process, periodic calendar and feedback mechanism should be given correctly.
- Participation planning should be clearly stated in action plans. This business should not be the business of companies.
- Action plans must be checked and audited before implementation. It should be repeated if necessary.

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VERTICAL GARDEN APPLICATION RECOMMENDATIONS IN LANDSCAPE DESIGN CLOSE TO NATURE: CASE OF KAYSERI

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Abstract

The rapid urbanization process and irregular construction result in the damage to green areas in city centers and cause a decrease in the quality of life. In cases where it is not possible to place green areas horizontally in city plans, vertical landscape applications are recommended as an alternative method. In this study, it is aimed to determine the potential areas where vertical landscape application can be made and which plants and systems can be used in these areas in Kayseri, which is one of the important centers affected by industrialization and where roof/vertical garden application cannot be determined. Mimar Sinan Park and surrounding structures in Republic Square, the Governor's Office, the facade facing the tram stop entrance of the Kayseri Forum shopping center, and the Osman Ulubaş Mansion Anatolian High School retaining wall have been determined as working areas where vertical landscape design can be made through satellite images and field studies. In the selection of these areas, criteria such as green areas, which are the meeting points of people, where there are dense constructions that reduce the visibility of open green areas, buildings that are adjacent but whose facades cannot be used efficiently, and retaining walls were taken into consideration.

Keywords: *Felt system, Kayseri city center, panel system, suspended system, vertical landscape*

Introduction

Intensive migrations with industrialization cause an increase in the population in cities and negatively affect the quality of life.

Green spaces are natural environments where people spend time in cities and contribute to psychological well-being processes by reducing the effect of concrete (Kahraman, Aktaş and Yurtsever, 2018).

For example, increasing demands for living spaces result in ignoring the need for green spaces and the damage to green spaces in urban centers with increased construction. This situation causes deterioration of city plans and decrease in quality of life in the long term. In order to eliminate these negative effects, city plans should be re-evaluated and necessary arrangements should be made, taking into account the need for green space. In cases where it is not possible to place green spaces horizontally in city plans, vertical landscape applications are among the methods recommended as an alternative (Kahraman, Aktaş and Yurtsever, 2018).

Roof gardens and vertical gardens are among the examples of vertical landscaping (Figure 1). Roof gardens are applied in two different ways in terms of plant design. The first of these is sparse (extensive) vegetation, which can be applied on flat or sloping areas and has a low cost. Drought-resistant plants that do not require irrigation are used in extensive vegetation. Another example is the active roof gardens where people can spend time with intensive vegetation. These systems are systems that add additional load to the buildings and require high cost drainage systems due to irrigation and fertilization processes (Kahraman, Aktaş and Yurtsever, 2018).

Figure 1. Roof garden example (URL-1)

Studies aimed at integrating a plant community that spreads vertically over a certain area into constructions are called “vertical gardens” (Ekren, 2017; Kahraman, Aktaş and Yurtsever, 2018) (Figure 2). Vertical gardens applied to building surfaces are divided into two different groups as facade systems and living systems. Facade systems can be created with plants that attach directly to building surfaces, as well as panel, mesh and modular systems. Living wall systems can be designed in three different ways: landscape, living walls and planted walls (Kahraman, Aktaş and Yurtsever, 2018).

Figure 2. Vertical garden example (URL-2)

Vertical gardens are landscape designs that not only increase the green spaces in the city, but also undertake some functions such as improving air quality through radiation, sound and heat insulation, photosynthesis and filtering (Çelik, Ender and Zencirkıran, 2015), creating more natural living spaces by increasing biological diversity, contributing to aesthetics and making positive contributions to human psychology (Ekren, 2017; Kahraman, Aktaş and Yurtsever, 2018). On the other hand, in addition to the positive features of vertical gardens listed above, there are also some financial and structural disadvantages such as putting a load on the structure, development of irrigation systems and maintenance. However, considering the long-term positive effects of these systems on urban life, it is seen that the investments made can be compensated in a short time (Kahraman, Aktaş and Yurtsever, 2018).

In this study, it is aimed to show how vertical gardens can be used at points where the green spaces needed by the city of Kayseri cannot be placed horizontally.

1. Historical Development of Vertical Gardens and Vegetated Roofs

Epiphytic plants are the first vertical gardens to be seen in history. Lithophyte plants are other examples of vertical gardening (Figure 3).

Figure 3. Epiphyte And Lithophyte Plants (URL-3)

The idea that plants can be used in buildings has an important place in the emergence of vertical gardens. In this context, the Hanging Gardens of Babylon, which is predicted to have been built by the King of Babylon in 605 B.C. to satisfy his wife's longing for homeland and is still one of the seventh wonders of the world, is one of the examples of the first vertical garden applications in history (Figure 4) (Kırıt and Sağlık, 2018). Large-bodied species were grown, as in their terraces. In these terrace gardens, there were cool corners reserved for entertainment, fountains with moving waters, shady trees and decorative flowers. (Akpınar-Külekçi, 2017).

Figure 4. The hanging gardens of Babylon (URL-4)

Vertical gardening practices are seen in Pompeii, the Vikings, India, Spain, 16th and 17th century Mexico, and 18th century France. Vertical gardening practices were first brought to the agenda in the 20th century, thanks to the French botanist P. Blanc (Kırıt and Sağlık, 2018).

The ziggurats, the temples built by the ancient Mesopotamian civilizations, can be regarded as the first examples of vertical gardens in history (Figure 5). Examples of walls and roofs covered with seaweed or grass to protect them from rains and winds are found in Newfoundland and Nova Scotia in Canada (Figure 6).

Figure 5. Ziggurat (URL-5) **Figure 6.** Newfoundland Green Roof (URL-6)

Grass Roof Samples, which were produced for thermal insulation during the Vikings Period, later reappeared in the buildings in Scandinavia in the 1800s under the name of "Green Roof". The green roofs on the buildings were used extensively, and then similar applications spread in Northern Europe (Akpınar-Külekçi, 2017).

2. Vertical Garden Details

Plant selections in vertical gardens vary in irrigation, feeding and applications. The selection of plants suitable for the climatic conditions of the region where the application will be made ensures that the vertical gardens have a long life. Hanging, felted, modular, metal fence and panel systems are preferred in vertical garden applications.

2.1. Metal Fence System

It is aimed to create a semi-permeable green screen by using poles or potted plants in the metal fence system, which can be used for different areas of all sizes (Figure 7) (Kırıt and Sağlık, 2018).

Figure 7. Metal Fence System (URL-8)

2.2. Modular System

Different plant choreographies can be created by applying different designs in modular vertical garden systems created by using plant pots of different shapes and sizes on the building facades. In the modular system, holes are drilled at certain points between the pots in order to ensure the liquid flow in the vertical direction for the effective application of the irrigation system (Kırıt and Sağlık, 2018).

Figure 8. Modular System (URL-8)

2.3. Panel System

The "panel system", which is a preferred type of application due to its resistance to different climatic conditions, can be applied directly on both the facade and the constructional structure and makes a positive contribution to the compensation of temperature differences. In addition, the seasonal changes of the plants used cause the formation of various color combinations and provide an aesthetic appearance (Kırıt and Sağlık, 2018).

Figure 9. Panel System (URL-9)

2.4. Hanging System

In this type of application where drip irrigation is chosen, twining plants are generally used. In this method, plants can be easily placed on the construction elements where the plants will twine with a potted system (Kırıt and Sağlık, 2018).

Figure 10. Hanging System (URL-10)

2.5. Felt System

In this system, the minerals needed by the plants are not transmitted through the soil, but the mixtures added to the irrigation water are transmitted to the plants through the felt. In this method, where mechanical irrigation is preferred, in order to increase the durability of the plants used and not to damage the application surface of the moist felts, the junction points are insulated with waterproof material (Kırıt and Sağlık, 2018).

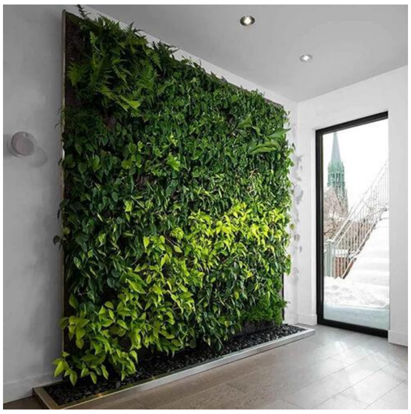


Figure 11. Felt System (URL-11)

Table 1 shows some examples of vertical landscape applications.

Table 1. Sample Vertical Landscape Applications

 **Figure 12 (URL-12)**	Nine Houses	Nine houses, designed as family residences, were completed in 1993 and the total green roof area of this building, which was built with the idea of increasing only the surface area in order to integrate with the environment, is 3,9950 m^2 (Akpınar-Külekçi, 2017).

 **Figure 13 (URL-13)**	Acros Building	Architect Emilo Ambasz designed any park that can be located in a city on the terraces of Acros by moving it to vertical space. On each floor of the designed vertical park, there is a series of relaxation and meditation gardens in order to get away from the chaos of the city, while the upper terrace is seen to be a viewing feature for the surrounding landscapes (Akpınar-Külekçi, 2017).
 **Figure 14 (URL-14)**	Quai Branly Museum	On the north wall of the Quai Branly Museum, designed by Jean Nouvel, there is an example of a vertical garden created by Blanc. Close to 15,000 plant species were used in vertical gardening (Kırıt and Sağlık, 2018).
 **Figure 15 (URL-15)**	Meydan Shopping Center	Meydan Shopping Center has been designed in accordance with modern architecture and ecological life. The entire roof, of which thirty thousand square meters is a green area, is approximately fifty-five thousand square meters. It is seen that a roof system with different slopes is covered with green texture (Akpınar-Külekçi, 2017).

 **Figure 16 (URL-16)**	Park Royal Otel	In intensive roofs, which are generally preferred in newly constructed buildings, the additional loads that the system will bring to the building should be calculated in advance and the roofs should be designed accordingly. It is seen that such roof systems, which have a high aesthetic capacity due to the diversity of plants, resemble parks (Aras, 2019).
 **Figure 17 (URL-17)**	Turkcell R&D Building	The four-storey building with a roof surface of 2500 m^2 was completely covered with grass and the land was transformed into a natural recreation area (Akpınar-Külekçi, 2017).
 **Figure 18 (URL-18)**	Singapore Nanyang Technical University	The curved green roof of Nanyang Science, Technology and Research University in Singapore, which has a 60% slope, is designed to adapt to the natural structure of the environment and was built on an area of approximately 18000 square meters (Akpınar-Külekçi, 2017).
 **Figure 19 (URL-19)**	Zorlu Center Shopping Mall	60,000 square meters of Zorlu AVM, located in Ulus, Istanbul, is structured with a green roof (Akpınar-Külekçi, 2017).

Figure 20 (URL-20)

Swissotel Resort Bodrum Beach, Bodrum

Swissotel Resort Bodrum Beach vertical garden application includes 72 independent vertical garden applications of the hotel. For the first time in our country, a total of 1584 square meters of vertical landscape was designed with 72 different applications in a project. There are 40 thousand plants in total (Kırıt and Sağlık, 2018).

Figure 21 (URL-21)

Athenaeum Hotel, Londra

Athenaeum Hotel was created by Blanc designing 280 plants together. It is Blanc's first work in England. Made with felt system. The application continues for 8 floors in the corner of the building facing the street (Kırıt and Sağlık, 2018).

Material and Method

Kayseri, one of the important industrial centers of Turkey, is the third largest city of Central Anatolia after Ankara and Konya (URL-22). The rapid urbanization process and irregular construction in Turkey also affected the province of Kayseri. This study was carried out in Kayseri city center between March 2021 and May 2021. In the satellite images analyzed via Google Earth, the roof and vertical garden could not be detected in the city center of Kayseri. Working areas where vertical landscape design can be made have been determined by means of satellite images. These areas have been determined as Mimar Sinan Park and its surrounding structures in Cumhuriyet Square, the Governor's Office, the facade facing the Kayseri Forum Shopping Center tram stop entrance and the Osman Ulubaş Mansion Anatolian High School retaining wall. In the selection of these areas, criteria such as green areas, which are the meeting points of people, where there are dense constructions that reduce the visibility of open green areas, buildings that are adjacent but whose facades cannot be used efficiently, and retaining walls were taken into consideration.

3. Kayseri Province Map Image

In Figure 3, the mapped version of Kayseri province is given. Some areas with vertical gardening potential are shown on this map.

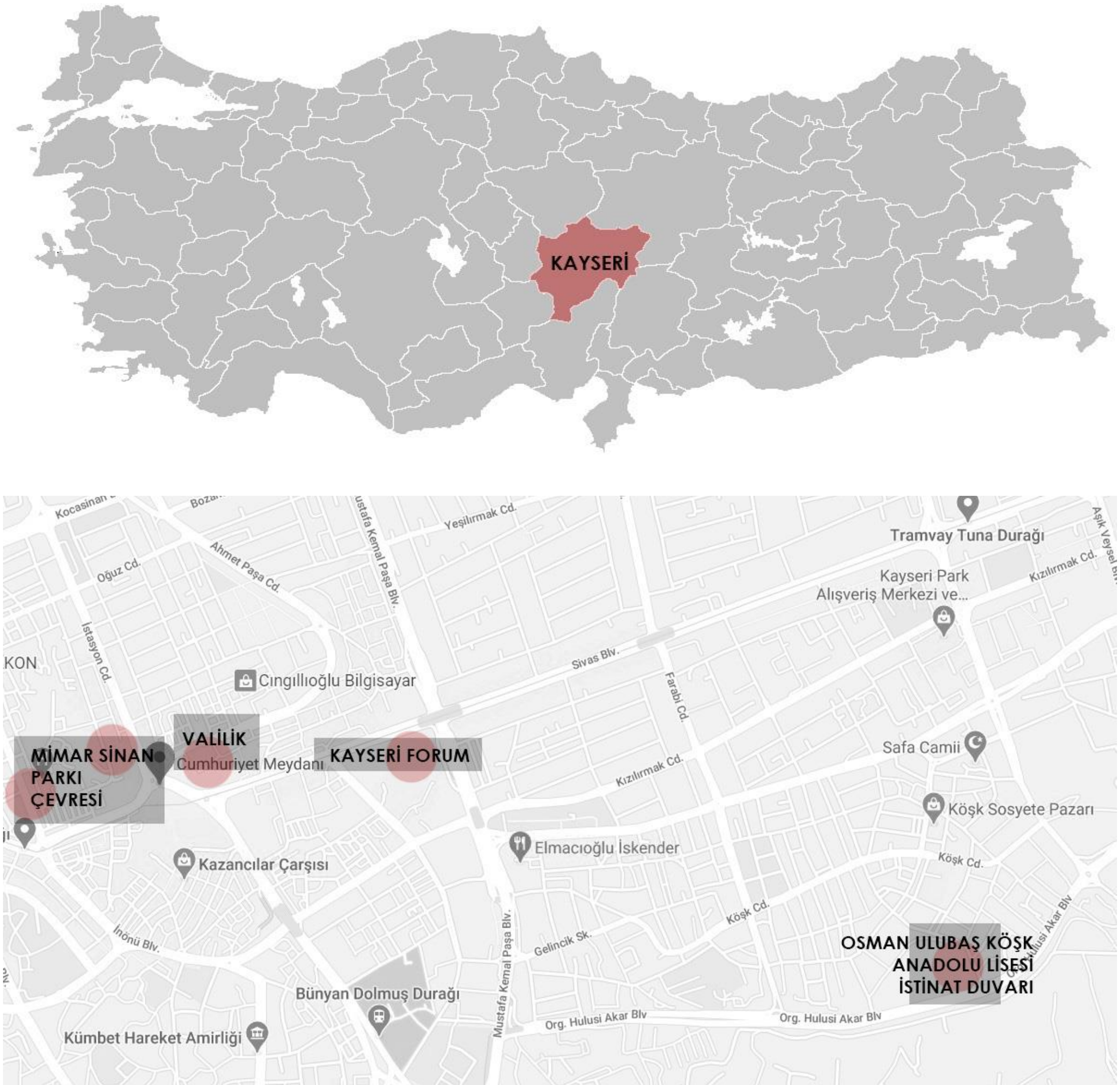


Figure 22. Potential areas for vertical garden applications in Kayseri province
Findings and Discussion

4. Mimar Sinan Park and Its Surroundings

In Figure 23, satellite images of Mimar Sinan Park and its surroundings are given and the facades of the buildings that are considered to have potential for vertical garden applications are marked. The most important factor playing a role in the selection of this area is Mimar Sinan Park. Mimar Sinan Park has become indistinguishable by being in the middle of the constructions in the city, which has been in development and concretion for years. In order to strengthen the effect of green spaces, to draw attention to their existence and to emphasize the park on the vertical plane, potential ones from the surfaces facing the focal point were selected and marked.

Figure 23. Potential facades for vertical garden applications of buildings around Mimar Sinan Park

5. Governor’s Office

Considering the inadequacy of the Republic Square in terms of green texture, the Governor's Office, which has one of the largest surfaces facing the square and has not been renovated for years, was chosen as a potential area for vertical gardening. Satellite images of the Governor's Office are given in Figure 24 and the facades that are considered to be potential for vertical garden applications are marked.

Figure 24. Potential facades for Governor’s Office and vertical garden applications

6. Osman Ulubaş Mansion Anatolian High School Retaining Wall

In Figure 25, satellite images of Osman Ulubaş Mansion Anatolian High School are given and the retaining wall, which is considered to be potential for vertical garden applications, is shown.

In the area chosen for the construction of the school, the elevation differences are significantly higher. For this reason, the lower floors of the neighboring buildings were blocked due to the retaining wall formed as a result of the excavation applications made during the construction works. This situation creates negative effects both in terms of urban life and the quality of life of the residents. In order to eliminate these problems and create a more aesthetic appearance, Osman Ulubaş Mansion Anatolian High School retaining wall was chosen as a potential area for vertical garden applications.

Figure 25. Retaining wall of Osman Ulubaş Mansion Anatolian High School, which is thought to have potential for vertical garden applications.

7. Kayseri Forum Shopping Center

Satellite images of Kayseri Forum Shopping Center are given in Figure 26 and the facade facing the tram stop, which is considered to have potential for vertical garden applications, is shown.

One of the most important factors in choosing this area is the Pool Park. This park is a place where the green texture can be felt and offers an important recreation area. However, this place has lost its visibility as it is in the middle of dense construction, as in the example of Mimar Sinan Park. For this reason, in order to make the area more visible and to direct people to the green texture and to give the area maximum usage capacity, the front of the entrance of Kayseri Forum Tram Stop, which is frequently used by the citizens, has been determined as one of the potential points for vertical garden applications and it has been suggested to give a meaning to the facade design, which cannot be considered as high quality at present.

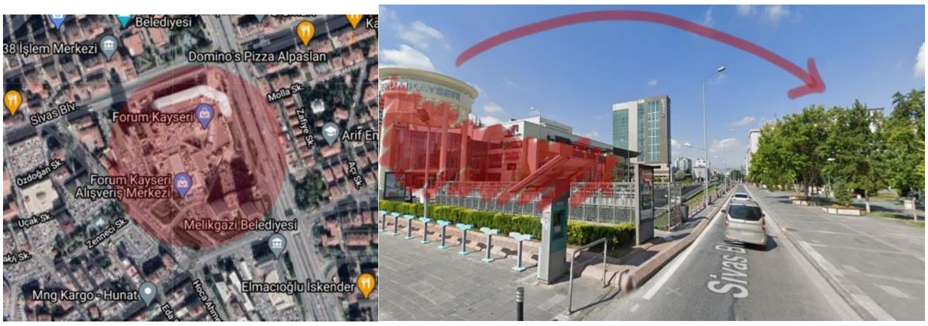


Figure 26. Retaining wall thought to be potential for vertical garden applications in Kayseri Forum Shopping Center

Table 2 shows the system and alternative plant suggestions that can be used for the units selected as vertical landscape application areas in the city center of Kayseri.

While making plant suggestions, attention was paid to the selection of plant species with different colors that could adapt to the terrestrial climate and create a visual aesthetic perception (Timur et al., 2018). While creating the system proposals, the previous applications in the literature were examined (URL-14, URL-21) and criteria such as the size of the structures, their locations, functions, and the applicability of the selected plants to the system were taken into account within the available information.

Table 2. System and plant suggestions for units selected as vertical landscape application areas in Kayseri province.

AREA	SYSTEM AND PLANT SELECTIONS	RECOMMENDATIONS
Mimar Sinan Park and Its Surroundings  	**- Plant species:** *Hedera helix 'Contraindicaciones'* (forest wall creeper)  (URL-23) -*Parthenocissus quinquefolia* (Virginia creeper)  (URL-24) -*Euonymus fortunei* (Fortune's spindle)  (URL-25) **-System:** Panel System	It is aimed to ensure the continuity of the green texture proposed in the area by applying them together or alone, such as Hedera helix 'Contraindicaciones' (Forest wall creeper), Parthenocissus quinquefolia (Virginia creeper), Euonymus fortunei (Fortune's spindle), and these selected plants are suitable for the purpose. It can be said that the panel system is a suitable system both for the selected plant species and for the area to be applied.
Governor's Office 	**-Plant species:** *Festuca glauca* (blue fescue) (URL-26)	The design, which is created by bringing together Festuca glauca (blue fescue), Genista Lydia (Lydian broom), Ophiopogon japonicus 'Nigrescens' (dwarf lilyturf), Delosperma cooperi (trailing iceplant) plants, is recommended to be applied to the area in order to meet both visual and green texture needs of the area. It is an example of vertical landscaping.

It can be said that the felt system is a suitable system both for the selected plant species and for the area to be applied.

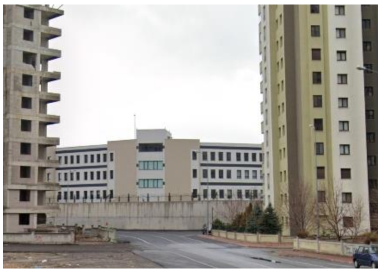
Genista Lydia (Lydian broom) (URL-27)

-*Ophiopogon japonicus 'Nigrescens'* (dwarf lilyturf)

-*Delosperma cooperi* (trailing iceplant) (URL-28)

-System: Felt System

Osman Ulubaş Mansion Anatolian High School Retaining Wall



-Plant species:

-*Lonicera japonica* (Japanese honeysuckle) (URL-29)

-System: Hanging System

Lonicera japonica (Japanese honeysuckle) is a plant species that can offer positive effects for both school and residential areas with its pleasant smell and various color options. It is a perennial plant that is resistant to harsh climatic conditions and can grow between 3-7 meters.

It can be said that the hanging system is a suitable system both for the selected plant species and for the area to be applied.

Kayseri Forum Shopping Center

-Plant species: *Jasminum nudiflorum* (winter jasmine) (URL-30)

-*Acorus gramineus* (Japanese sweet flag) (URL-31)

-*Campanula carpatica* (tussock bellflower)

Adiantum venustum (Himalayan maidenhair fern) (URL-32)

-System: Panel System

By placing the design created with the combination of plants such as Jasminum nudiflorum (winter jasmine), Acorus gramineus (Japanese sweet flag), Campanula carpatica (tussock bellflower), Adiantum venustum (Himalayan maidenhair fern) on the facade, it is a type of vegetation that is recommended both to create a visual feast and to make the area special and attract attention.

It can be said that the panel system is a suitable system both for the selected plant species and for the area to be applied.

Conclusion and Recommendations

In this study, in which the potential areas for vertical landscaping applications throughout the city of Kayseri are determined and what kinds of plants and systems can be used in these areas, while making site selections, vertical landscaping system and plant suggestions were made for these areas, taking into account the regions where there is insufficient green space in the area, which is the heart of the city, surfaces that can support the development of urban identity, and regions where deaf surfaces are used inefficiently. As a result of the findings obtained from field trips and satellite images in the city center of Kayseri, Mimar Sinan Park and its surroundings, the facade of the Governor's Office facing the square, the Kayseri Forum tram entrance stop and the Osman Ulubaş Mansion Anatolian High School retaining wall were determined as potential regions for vertical landscape applications. Considering the problems and potentials of the areas, the application of Hedera helix 'Contraindicaciones' (forest wall creeper), Parthenocissus quinquefolia (Virginia creeper), Euonymus fortunei (Fortune's spindle) plants with a panel system has been suggested for the structures around Mimar Sinan Park. Festuca glauca (blue fescue), Genista Lydia (Lydian broom), Ophiopogon japonicus 'Nigrescens' (dwarf lilyturf), Delosperma cooperi (trailing iceplant) plants were preferred on the surface of the Governor's Office. On the retaining wall of Osman Ulubaş Mansion Anatolian High School, another potential area, a hanging system and Lonicera japonica (Japanese honeysuckle) plant are recommended, while on the Kayseri Forum tram entrance facade, panel system and Jasminum nudiflorum (winter jasmine), Acorus gramineus (Japanese sweet flag), Campanula carpatica (tussock bellflower), Adiantum venustum (Himalayan maidenhair fern) plants have been proposed.

Vertical landscape applications, which are among the methods recommended as an alternative in cases where it is not possible to place green areas horizontally in the city plans, can contribute to increasing the quality of life with their nature-friendly approaches by creating qualified urban environments if planned and implemented correctly.

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RELATIONS BETWEEN ECOSYSTEM SERVICES AND URBAN LIFE

EKOSİSTEM HİZMETLERİ İLE KENTSEL YAŞAM ARASINDAKİ İLİŞKİLER

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Abstract

Ecosystem services include products such as food, fuel and fibre; regulating services such as climate regulation and disease control; and nonmaterial benefits such as spiritual or aesthetic values. Changes in these services affect urban life in many ways. These impacts have direct and indirect consequences. In most cases, greater biodiversity that is a necessary condition for the delivery of all ecosystem services is associated with a larger or more dependable supply of ecosystem services. Diversity of genes and populations is currently declining in most places in the world, along with the area of near-natural ecosystems. Humanity depends directly on ecosystem services such as food, oxygen and water supplied by both by ‘‘near-natural’’ ecosystems, such as rangelands, oceans, and forests, and by highly managed ecosystems such as cultivated or urban landscapes. The human population in general is becoming better nourished, people live longer, and incomes of the people have been risen through positive relations/interactions among ecosystems each other and living creatures. Political institutions have become more participatory. In part these gains in well-being have been made possible by exploiting certain ecosystem services (the provisioning services, such as timber, grazing, and crop production), sometimes to the detriment of the ecosystem and its underlying capacity to continue to provide these and other services. Some gains have been made possible by the unsustainable use of other resources. These relations/interactions between ecosystem services and urban life are approached and studied in the scope of this paper.

Key Words: Ecosystem services, urban life, relation, interaction

Özet

Ekosistem hizmetleri arasında gıda, yakıt ve lif gibi ürünler; iklim düzenlemesi ve hastalık kontrolü gibi hizmetlerin düzenlenmesi; manevi veya estetik değerler gibi maddi olmayan faydalar sayılabilir. Bu hizmetlerdeki değişimler kentsel yaşamı birçok yönden etkilemektedir. Bu etkilerin doğrudan ve dolaylı sonuçları vardır. Çoğu durumda, tüm ekosistem hizmetlerinin sunulması için gerekli bir koşul olan daha fazla biyolojik çeşitlilik, daha büyük veya daha güvenilir ekosistem hizmetleri arzı ile ilişkilidir. Genlerin ve popülasyonların çeşitliliği şu anda dünyanın birçok yerinde, doğal ekosistemlerin yanı sıra azalmaktadır. İnsanlık, hem araziler, okyanuslar hem de ormanlar gibi ‘doğaya yakın’ ekosistemler tarafından sağlanan gıda, oksijen ve su gibi ekosistem hizmetlerine ve ekili veya kentsel manzaralar gibi yüksek düzeyde yönetilen ekosistemlere doğrudan bağlıdır. Genel olarak insan nüfusu daha iyi besleniyor, insanlar daha uzun yaşıyor ve ekosistemler ve canlılar arasındaki olumlu ilişkiler / etkileşimler yoluyla insanların gelirleri artıyor. Siyasi kurumlar daha katılımcı hale geldi. Kısmen refahtaki bu kazanımlar, bazı ekosistem hizmetlerinden (kereste, otlatma ve bitkisel üretim gibi tedarik hizmetleri), bazen ekosistemin zararına ve bu ve diğer hizmetleri sağlamaya devam etme temel kapasitesinden yararlanılarak mümkün kılınmıştır. Bazı kazanımlar, diğer kaynakların sürdürülemez kullanımı ile mümkün olmuştur. Bu çalışma kapsamında ekosistem hizmetleri ile kent yaşamı arasındaki bu ilişkiler/etkileşimler ele alınmakta ve incelenmektedir.

Anahtar sözcükler : Ekosistem hizmetleri, kentsel yaşam, ilişkiler ve etkileşimler

1. INTRODUCTION

Ecosystems are a dynamic mixture of inanimate environment that functionally interacts with plant, animal and microorganism communities. At the same time, ecosystems are natural systems in which living and inanimate beings and are influenced by each other, consisting of a large number of subunits and having a meaningful relationship and interaction between these units (Çağlar, 1999; Çağlar, 2002; Bobat, 2018). Ecosystems are not uniform but vary, and this diversity can range from a very large system such as the earth or the entire universe to a fairly small system such as a puddle or a handful of soil. In this context, it is possible to characterize ecosystems by the defined names given to them, such as mountain ecosystem, marine ecosystem, agricultural ecosystem, desert ecosystem. These different definitions or attributes of ecosystems are accepted as ecosystem diversity (Kışlalıoğlu ve Berkes, 1991).

Ecosystems provide abstract and tangible outputs/benefits for the service of humanity. The tangible benefits supplied by ecosystems can be the main products obtained from the forest such as raw wood and resin, by-products such as chestnut and linden, some fossil fuels such as oil, gas and coal extracted from underground and the basic elements of the main source of life and production, such as soil and water. Since such assets are visible and tangible and require production inputs such as labour, capital and management to be produced, they have a "price" in human life (Bobat, 2002; Bobat, 2015). People have to pay a price when they get these assets/benefits. However, almost no one is aware of some of the services offered by ecosystems because they are "abstract" and no price is paid for these services (MEA, 2005a). For example, a tree has a tangible value as wood or in terms of the fruit it gives. However, when the value of the services offered by this tree such as preventing air pollution, balancing humidity, producing oxygen, improving soil, preventing erosion and producing protein that are not visible, not tangible and only have very important functions in the ecosystem is calculated, it can be understood that it is much more important than its tangible values. It has been calculated that the abstract or ecosystem value of a tree is one million USD for an economy (Wilson and Howarth, 2002). The value of ecosystem services offered by a forest is also immeasurably high. Because benefits of a forest, as an ecosystem service, provides the economy, man and nature with much more than a tree within fifty years. When this approach is generalized to other ecosystem services; that the value of the "unrequited" services offered by natural assets/systems to nature and thereby to the economy and people from, are "invaluable" can be more easily understood. Carbon, nitrogen and phosphorus cycles, biodiversity, pollination (pollination), softening and protective functions against severe climatic events, feeding groundwater, reintroducing waste and waste into nature by dissolving/separating them are just a few of the valuable but incalculable services offered by ecosystem services (Bobat, 2018; MEA, 2005b).

These services have been more or less used/consumed by people from the very existence of mankind to the present day for the purposes of rural/urban life, and especially in the 20th century after the second half of the century, many ecosystem services were irreversibly exploited. This exploitation has existed in some ecosystem services until their complete extinction. However, in general, it has been found that ecosystems and their services provide great benefits in both rural and urban life, and these benefits cause great deterioration when used in favour of humanity.

In the scope of this study, ecosystem services and their benefits are discussed first, and then the effects of people on ecosystems and services are examined with a holistic approach in the context of cause-effect relationships.

2. ECOSYSTEM SERVICES AS A BASIC COMPONENT OF LIFE

The ecosystem, as already expressed, is a dynamic complex of plant, animal and microorganism communities and the non-living environment that interact as a functional unit. Humans are an integral part of ecosystems. Ecosystem services are the benefits natural ecosystems provide to people. That broad definition covers a vast array-from the tangible fish sold in a market or served in a family home, to the invisible influence of a seagrass meadow removing some of the world's excess carbon dioxide, subtly shifting the chemical balance of both the water and the air. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth. People seek many services from ecosystems and thus perceive the condition of an ecosystem in relation to its ability to provide desired services. The ability of ecosystems to deliver services can be assessed by a variety of qualitative and quantitative methods. An assessment of the condition of ecosystems, the provision of services, and their relation to urban life requires an integrated approach. This enables a decision process to determine which service or set of services is valued most highly and how to develop approaches to maintain services by managing the system sustainably (MEA, 2003).

The benefits nature provides are classed in three broad groups:

- **Provisioning services** are those that provide tangible, harvestable goods-fish, shellfish and seaweed for food, but also mangroves timber, algae, minerals and health products.
- **Regulating services** are the benefits ecosystems play in regulating our environment-coastal protection, prevention of erosion, water purification and carbon storage.
- Finally, **cultural services** are the many non-material benefits derived from nature-recreation, beauty, as well as spiritual, intellectual and cultural benefits.

Underpinning these different benefits are the ecosystems themselves-complex matrixes of plants and animals that both respond to and directly modify their surrounding physical and chemical environment through a constant dynamic series of interactions. Many of these processes and interactions are described as **supporting services**, or services that are necessary for all of the other ecosystem services to occur.

These services make the planet inhabitable by supplying and purifying the air we breathe and the water we drink. Water, carbon, nitrogen, phosphorus, and sulphur are the major global biogeochemical cycles. Disruptions of these cycles can lead to floods, droughts, climate change, pollution, acid rain, and many other environmental problems. Soils provide critical ecosystem services, especially for sustaining ecosystems and growing food crops, but soil erosion and degradation are serious problems worldwide. Higher biodiversity usually increases ecosystem efficiency and productivity, stabilizes overall ecosystem functioning, and makes ecosystems more resistant to perturbations. Mobile linked animal species provide critical ecosystem functions and increase ecosystem resilience by connecting habitats and ecosystems through their movements. Their services include pollination, seed dispersal, nutrient deposition, pest control, and scavenging. Thousands of species that are the components of ecosystems harbour unique chemicals and pharmaceuticals that can save people's lives, but traditional knowledge of medicinal plants is disappearing and many potentially valuable species are threatened with extinction. Increasing habitat loss, climate change, settlement of wild areas, and wildlife consumption facilitate the transition of diseases of animals to humans, and other ecosystem alterations are increasing the prevalence of other diseases. Valuation of ecosystem services and trade-offs helps integrate these services into public decision-making and can ensure the continuity of ecosystems that provide the services (Şekercioğlu, 2010).

As already used in existing international documents), the term and concept of **'ecosystem services'** in no way implies an automatic requirement or obligation on the part of the consumer to pay directly for the supply of the service. The term does, however, imply that the service is of value to people (in terms of economic, health, cultural or other benefits), and that the degradation or loss of the service represents a harmful impact on human wellbeing. Ecosystems provide multiple benefits, and are vital to urban life. Many of these benefits have historically been free to all humans as the result of the working of nature, such as clean air to breathe, fresh water to drink, fuel for warmth and cooking, and food to eat. However, many of these ecosystem services (some 60 per cent of the 24 services) are over-used, mismanaged or degraded.

If each ecosystem service is described in detail, it is necessary to mention four main ecosystem services (Costanza and Folke, 1996; Costanza, 2000):

Provisioning, regulating, cultural and supporting ecosystem services (Figure 1).

2.1. Provisioning Services

These are the products obtained from ecosystems, including:
Food and fibre: This includes the vast range of food products derived from plants, animals, and microbes, as well as materials such as wood, jute, hemp, silk, and many other products derived from ecosystems.
Fuel: Wood, dung, and other biological materials serve as sources of energy.

Genetic resources: This includes the genes and genetic information used for animal and plant breeding and biotechnology.

Biochemical, natural medicines, and pharmaceuticals: Many medicines, biocides, food additives such as alginates, and biological materials are derived from ecosystems.

Ornamental resources: Animal products, such as skins and shells, and flowers are used as ornaments, although the value of these resources is often culturally determined. This is an example of linkages between the categories of ecosystem services.

Fresh water: Fresh water is another example of linkages between categories-in this case, between provisioning and regulating services.

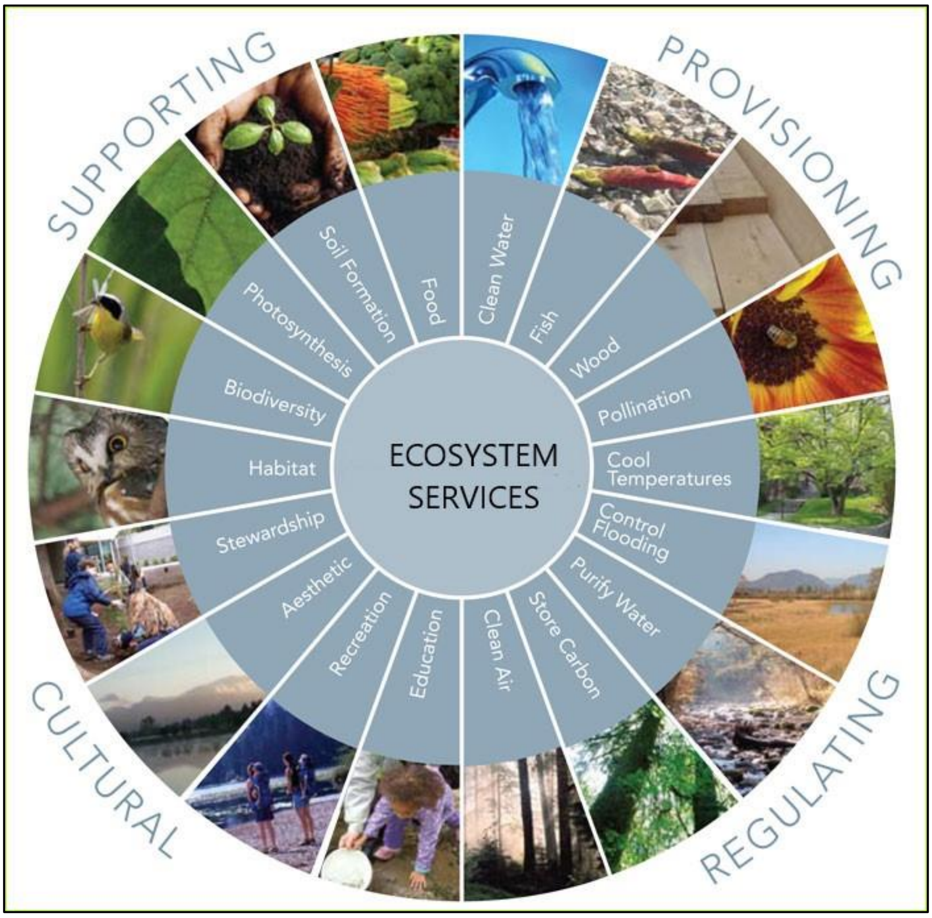

Figure 1. Ecosystem Services

2.2. Regulating Services

These are the benefits obtained from the regulation of ecosystem processes, including:

Air quality maintenance: Ecosystems both contribute chemicals to and extract chemicals from the atmosphere, influencing many aspects of air quality.

Climate regulation: Ecosystems influence climate both locally and globally. For example, at a local scale, changes in land cover can affect both temperature and precipitation. At the global scale, ecosystems play an important role in climate by either sequestering or emitting greenhouse gases.

Water regulation: The timing and magnitude of runoff, flooding, and aquifer recharge can be strongly influenced by changes in land cover, including, in particular, alterations that change the water storage potential of the system, such as the conversion of wetlands or the replacement of forests with croplands or croplands with urban areas.

Erosion control: Vegetative cover plays an important role in soil retention and the prevention of landslides.

Water purification and waste treatment: Ecosystems can be a source of impurities in fresh water but also can help to filter out and decompose organic wastes introduced into inland waters and coastal and marine ecosystems.

Regulation of human diseases: Changes in ecosystems can directly change the abundance of human pathogens, such as cholera, and can alter the abundance of disease vectors, such as mosquitoes.

Biological control: Ecosystem changes affect the prevalence of crop and livestock pests and diseases.

Pollination: Ecosystem changes affect the distribution, abundance, and effectiveness of pollinators.

Storm protection: The presence of coastal ecosystems such as mangroves and coral reefs can dramatically reduce the damage caused by hurricanes or large waves.

2.3. Cultural Services

These are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including:

Cultural diversity: The diversity of ecosystems is one factor influencing the diversity of cultures.

Spiritual and religious values: Many religions attach spiritual and religious values to ecosystems or their components.

Knowledge systems (traditional and formal): Ecosystems influence the types of knowledge systems developed by different cultures.

Educational values: Ecosystems and their components and processes provide the basis for both formal and informal education in many societies.

Inspiration: Ecosystems provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising.

Aesthetic values: Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, "scenic drives," and the selection of housing locations.

Social relations: Ecosystems influence the types of social relations that are established in particular cultures. Fishing societies, for example, differ in many respects in their social relations from nomadic herding or agricultural societies.

Sense of place: Many people value the "sense of place" that is associated with recognized features of their environment, including aspects of the ecosystem.

Cultural heritage values: Many societies place high value on the maintenance of either historically important landscapes (cultural landscapes) or culturally significant species.

Recreation and ecotourism: People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area. Cultural services are tightly bound to human values and behaviour, as well as to human institutions and patterns of social, economic, and political organization. Thus perceptions of cultural services are more likely to differ among individuals and communities than, say, perceptions of the importance of food production.

2.4. Supporting Services

Supporting services are those that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are either indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people. Some services, like erosion control, can be categorized as both a supporting and a regulating service, depending on the time scale and immediacy of their impact on people. For example, humans do not directly use soil formation services, although changes in this would indirectly affect people through the impact on the provisioning service of food production. Similarly, climate regulation is categorized as a regulating service since ecosystem changes can have an impact on local or global climate over time scales relevant to human decision-making (decades or centuries), whereas the production of oxygen gas (through photosynthesis) is categorized as a supporting service since any impacts on the concentration of oxygen in the atmosphere would only occur over an extremely long time. Some other examples of supporting services are primary production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.

3. RELATIONS AMONG ECOSYSTEM SERVICES, HUMANITY AND URBAN LIFE

All ecosystems serve to increase human well-being and enable people to live better, and in this context, from personal/social security to meeting basic needs, from health to establishing good social relations and freedom, ecosystems contribute to human well-being and thus to rural and urban life (Figure 2) (MEA, 2005b).

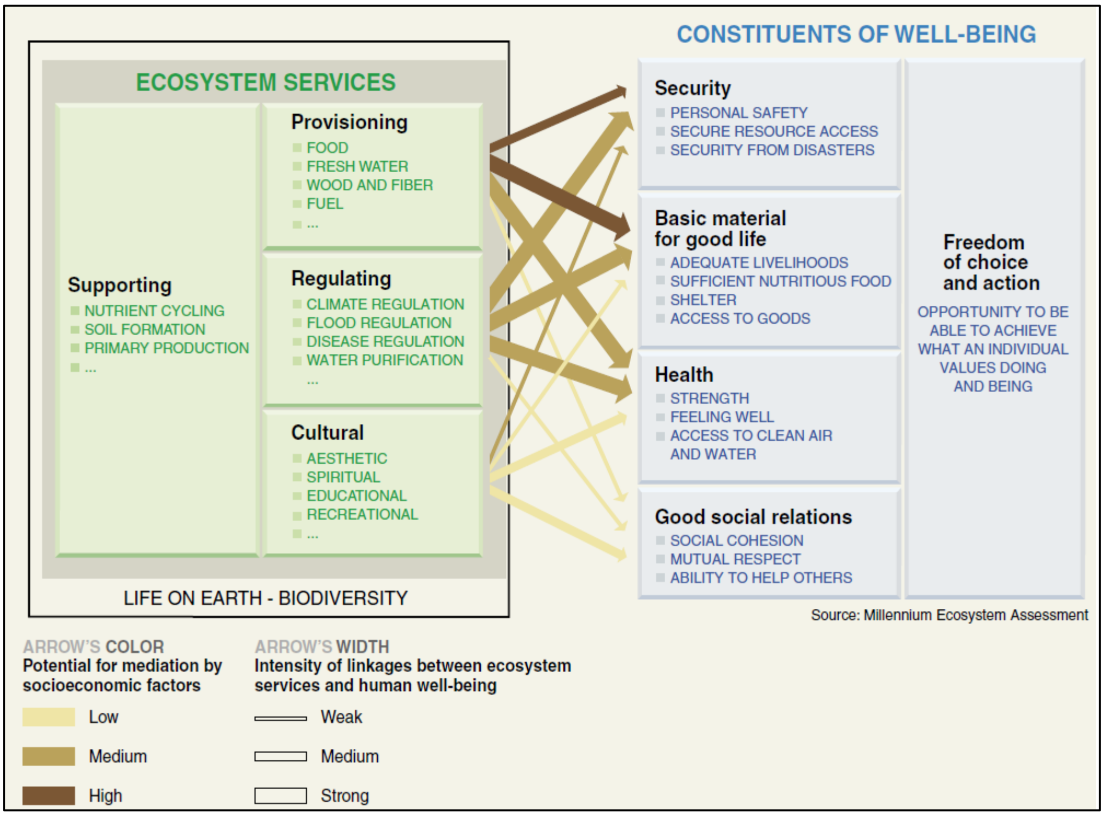

Figure 2. Linkages among Ecosystem Services, Humanity and Urban Life

As shown in Figure 2, there are five main components between ecosystem services and urban life : Basic requirements/materials for a good life, health, good social relations, security and choice-freedom of choice/action.

3.1. Basic Requirements

The basic requirements define income and adequate livelihoods, access to adequate food and water at all times, housing, energy for heating/cooling, and access to goods/services. Changes in water supply, pollination and food production, as well as regulatory services affecting the climate, have a very strong impact on this element of human well-being. They are less dependent on socioeconomic conditions. However, changes in cultural services have relatively weaker links to the material elements of urban life.

Changes in the use and management of these services can either increase employment such as agriculture spreads to new territories), or reduce it with the help of gains in labour productivity. In areas where productivity is declining due to land degradation or overfishing, the effects on local economies and employment may be more damaging to the poor or those who rely on income from these services. Food production is keeping pace with the global population growth with the increase in agricultural productivity and the prices of foodstuffs are gradually falling (Alkire, 2002). Looking at the last 40 years, it can be seen that food prices have decreased by 40% in real terms due to productivity growth. Food production at an increasingly low unit cost has improved the health and well-being of billions of people who spend the bulk of their income on food, especially those in need. However, this problem has led to the fact that in some developed countries and developing countries, more than 1 billion adults are overweight and at least 300 million people are clinically overweight(obese). The use of rivers and lakes with the construction of dams and the replacement of stream beds has increased the water available for human use in many regions of the world. However, the decrease in the amount of water used per capita is an important and growing problem globally for about 1.5-2 billion people worldwide, which has also led to problems related to food production, human health and economic development (WHO, 2003a; OECD, 2017).

3.2. Health

Health is that an individual feels good and strong. Human health is both a cause and a consequence. Provider services such as food, water, medicinal plants, access to new medicines, as well as changes affecting air/water quality, disease regulation and waste treatment also have very strong effects on health. Changes in cultural services affect spiritual, inspirational, aesthetic and recreational opportunities and these in turn change both physical and emotional states. Changes in supporting services have a strong impact on all other categories of services. These benefits depend on moderate socioeconomic conditions. There are quite a lot of examples of the health components of well-being affected by ecosystem change. For example, among the poorest countries, about a quarter of the burden of the disease on childhood and the malnourished mother. Malnutrition accounts for about 10% of the global disease burden. Disease loads caused by insufficient water and sanitation services and inadequate hygiene cause a total of 1.7 million deaths and at least 54 million people die annually. About 1.1 billion people lack access to clean drinking water and more than 2.6 billion to health care. Globally, the economic cost of coastal water pollution is $ 16 billion due to its effects on human health. Numerous increasing prevalence of infectious disease and deforestation, dam construction, road construction, agricultural conversion, and environmental changes such as urbanization in many cases contribute to it. Natural products are still actively used in pharmaceutical research. Medicinal plants continue to play an important role in health care systems in many regions of the world (Rapport et al., 1995; Rapport et al., 1999).

3.3. Good Social Relations

Good social relations describes elements such as social harmony, mutual respect/love, and helping others/children. Changes in the provision and regulation of ecosystem services can affect social relations, mainly with their direct impact on fiscal well-being, health and safety. Changes in cultural services can have a strong impact on social relations, especially in cultures that have strong connections with local circles. Changes in ecosystems tend to increase the accessibility that people have for recreation and ecotourism. Local societies, whose cultural identities are closely tied to specific habitats or wildlife, are damaged when habitats are destroyed or when the wildlife population decreases. Such effects have been observed in coastal fisheries societies, polar region communities, traditional forest communities and rural nomadic societies (Dasgupta, 2001).

3.4. Safety

Safety defines the safety of persons and property, the safety of safe access to necessary resources and the safety of natural/man-made disasters. Changes in regulatory services such as disease/climate and flood regulation have very strong effects on security. Changes in provider services such as food and water also have a strong impact on security, as their deterioration can lead to a loss of access to these basic resources. Changes in cultural services that contribute to the disruption or strengthening of social networks in society can positively/negatively affect security. Ecosystems and changes in their management contribute to this safe rural/urban life. For example, diverting rivers tends to reduce the incidence and impact of small flood events and increase the frequency and severity of large ones. On average, 140 million people are affected by floods every year (more than all other natural or technological disasters combined). For example, between 1990 and 1999, more than 100.000 people died due to floods, resulting in a total of $243 billion in damage (Sen, 1999; Alkire, 2002).

3.5. Freedom of Choice and Action

Freedom of choice and action allows individuals to control what is happening to them and be able to value what they do or have. Freedom and choice cannot be preserved without the presence of other components of the will. Therefore, changes in all units of ecosystem services have an indirect impact on the creation of this component. The impact of ecosystem change on freedom and choice is heavily determined by socioeconomic conditions. Wealthy people living in countries with effective governance and a strong civil society can maintain freedom and choice/choice even in the face of important ecosystems. However, this results in a loss of livelihood for the poor. In total, information on the impact of changing ecosystem conditions on freedom and choice is relatively limited. It has been shown that the reduced availability of fuel oil and drinking water increases the time required for the collection of such basic needs, which, in turn, reduces the amount of time available for training, employment and caring for family members. It is thought that such effects are typically experienced disproportionately by women (Duraiappah, 2002).

4. EFFECTS OF URBAN LIFE ON ECOSYSTEM SERVICES AND PROBLEMS

Urban life with human well-being has improved significantly over the past two centuries for many communities and continues to improve. In general, people are now eating better, living longer, and their incomes are increasing. Political/social institutions are looking for ways and methods to be more participatory. These gains in human well-being have been achieved by taking advantage of some ecosystem services and at the expense of their degradation. Even the ecosystem and its basic capacity have been destroyed for the sake of achieving these gains. Some of the gains have been achieved through the unsustainable use of other assets. For example, increases in food production have been achieved in part by taking advantage of the finite delivery of fossil fuels, an ecosystem service, millions of years ago.

Gains in human well-being are not evenly decoupled between individuals or social groups, or the countries in which they live, or the ecosystems of the world. For example, a child born in sub-Saharan Africa is 20 times more likely to die than a child born before the age of five in an industrialized country, and this rate is higher than a decade ago. People living in urban areas, near the coast and in systems of high ecosystem productivity in general have an above-average level of well-being. People living in dry and mountainous areas, which are characterized by lower ecosystem productivity, tend to have below-average and more variable well-being. In ecosystems characterized by low ecosystem productivity, the population increases faster than in high-risk ecosystems in high-yield regions, and the infant mortality rate shows similar characteristics (MEA, 2005b).

The use of all ecosystem services for urban life is growing rapidly. Today, about 60% of ecosystem services have been destroyed or used in inappropriate forms and intensity. The use of 20 out of 24 of the provider, cultural and regulatory ecosystem services, of which there is sufficient information available, continues to increase. Fishing, which is only an ecosystem service, has been declining due to overfishing in recent years. The other two ecosystem services, fuel and fibre plants, show a mixed situation. While the use of some types of fibres is increasing, that of others is decreasing. Although previously the destruction of forests was a clear source of carbon emissions, in recent years, carbon sequestration has increased globally, in part due to reforestation in temperate regions. Almost half of the provider services and 70% of the regulatory/cultural services have been destroyed or used in an unsustainable manner (MEA, 2005a).

Over the past 50 years, the world's population has more than doubled from 3 billion to 8 billion, while the global economy has grown more than 6 times. During this time, food production increased by roughly 2.5-3 times (an increase of 160% between 1961 and 2003), water use has doubled, and raw wood/firewood production has increased by almost 60%. Between 5% and 25% of global freshwater has exceeded its long-term accessible position. The use of water, especially for irrigation purposes, has made the existence of groundwater no longer sustainable. In addition, excessive nutrient or pesticide use, salinization, nutrient loss and soil loss exceeding soil formation rates have negatively affected the sustainable use of both soil and water (Grizetti et al., 2016).

Urban life are significantly has been changing regulatory services such as disease and climate balancing by transforming service-providing ecosystems. At the same time, the same situation is observed even in waste processing services, exceeding the capabilities of ecosystems to provide services. These undesirable consequences in ecosystem services are, in a way, due to the release of greenhouse gases triggered by humans. Ecosystem changes have caused a significant increase in the number of floods and major fires on all continents since 1940; although they play an important role in the purification of waste entering the environment, they are also based on the limits of the ability to process waste. For example, aquatic ecosystems clean up an average of 80% of the nitrogen load on a global scale. However, this self-cleaning capacity has decreased with excessive use and loss of wetlands (Guerry et al., 2015).

Culture of urban life have significantly influenced ecosystems, which has led to significant changes in cultural identity and social balance. The rapid loss of culturally valuable ecosystems and landscapes leads to social degradation or social othering. And there has been a decrease in the quantity and quality of aesthetically pleasing natural landscapes (Costanza and Maxwell, 1994).

Global profits from food, water, firewood and other provider services were generated and transported from colonial areas and sometimes very remote places in the last century. These options are almost out of date. Although the total demand for ecosystem services continues to increase, as by-products have improved, the demand for special services in certain regions has decreased. About 2.6 billion people use wood as the main energy source for heating and cooking, but wood instead of other materials (vinyl, plastic, and metal) to pass relatively slowed in recent years the global timber consumption. The use of substitute products has reduced the pressure on certain ecosystem services.

Apart from these problems, both the delivery and flexibility of ecosystem services are affected by biodiversity

4.1. Issues between urban life and biological diversity

Biological diversity refers to the differences in the habitat of species in terms of various living and inanimate factors. Ecosystem at the same time among organisms, between the living and non-living things, with differences varying according to time and place; the full range of functions of genes, species and ecosystems define. Both the delivery and elasticity of ecosystem services are affected by biodiversity (Kışlalıoğlu ve Berkes, 1991; Sala et al, 2000).

Biodiversity has an indispensable place in meeting the basic needs of people such as food especially. Considering the world's dwindling living assets and increasingly polluted land and water assets, the biodiversity possessed by countries has been becoming a strategic force. Many substances used in the food and beverage, clothing and pharmaceutical industries are obtained from living beings. The genetic material of each living species, which is unique, is the main raw material for the breeding of plants and animals. According to today's information, it may be discovered that a living species known as “useless or harmful” may become a “panacea” in the coming years. The biosphere, which provides the nutrients we eat, the oxygen we breathe, and many other requirements, makes great efforts to make our daily waste harmless, and biodiversity has an important task in this endeavour. For example, if there are no organic substances decomposed by microorganisms, the soil cannot support agriculture; cereals cannot give seeds if bees do not carry pollen; plants in the terrestrial ecosystem and plant plankton in the aquatic ecosystem cannot be breathable if they do not photosynthesize; water cannot be provided with a drinkable cleanliness if it does not have a cleansing effect on forests and wetlands. And all these are the basic requirements that directly affect both urban and rural life (Moberg and Folke, 1999; Bobat, 2018).

From an ecological point of view, the loss of a species means the rapid disappearance of species that are directly or indirectly dependent on that species in that ecosystem. The disappearance of particularly important species increases the speed at which other species disappear and can lead to the collapse of ecosystems. Many ecosystem services such as that ensures the continuity of food chain and the oxygen and carbon dioxide cycle, controlling pests biologically, pollinizing and fruiting of flowering plants, water and soil protection in nature, ensuring the water and mineral cycle in ecosystems and the realization of natural recycling and the decomposition of wastes has been contributing to the healthy maintenance of urban life. The monetary value of these services is estimated at about USD 33 trillion per year (Costanza et al., 1997).

Aesthetically, the diversity in nature adds colour and flavour to human culture. The creative powers of people are increasing in proportion to the diversity of living and inanimate beings around them. For example, the creativity of a person living in a region rich in biological diversity (for example, in the forest) is greater than that of a person living in a poor place (for example, in a desert environment) from the same point of view. In addition, aesthetic wealth triggers tourism activities (Reid, Watson, Mooney; 2005).

From the ethical and moral point of view, every living species has the right to live and continue its generation. Changes in biodiversity can indirectly affect ecosystem services over a long period of time. These effects can cause extensive and sometimes irreversible disproportionate changes in ecosystem processes, ranging from environmental change to negative ecosystem capacity effects. In addition, these effects range from the spread of infectious diseases and potential impacts on agricultural systems, from changing the potential effects of pests and pathogens to the risks of crop reduction in a different environment. For example, operations implemented to increase food production lead to increased water use, deteriorating water quality, falling biodiversity, reduced forest areas, forest product losses or greenhouse gas emissions. About 70% of human-caused nitrous oxide gas emissions are caused by agriculture, mostly for soil conversion and the use of nitrogen fertilizers. Similarly, the conversion of forested areas into agricultural areas can significantly change the frequency and magnitude of floods, although the amount and direction of their impact depends heavily on local ecosystem characteristics and the nature of soil cover change. The transformation of forests into agricultural areas can trigger water quality and the frequency of floods in places of ecosystem change. And the increased use of nitrogen fertilizers in the soil negatively affects the coastal water quality (Costanza, Norton and Haskell, 1992).

4.2. Issues between urban life and species or genetic diversity

Ecosystem processes involving the cycles of water, nitrogen, carbon and phosphorus have changed much faster in the second half of the twentieth century than at any time in human history. The transformation of ecosystems by human hands has not only changed the structure of systems, but also their processes and functions. The capacity of the ecosystems providing the services was directly affected by the operation of natural biogeochemical cycles, which in some cases were highly modified. The clearest evidence of this was seen in vital ecosystem processes such as the water, carbon, nitrogen and phosphorus cycles (White et al., 2000).

The amount of water withdrawn from rivers and lakes for irrigation or industrial water use doubled between 1960 and 2000. The construction of large reservoirs has doubled or tripled the average time it takes for a drop of water to reach the sea. Globally, since 1750, the amount of carbon dioxide in the atmosphere has increased by about 34%. About 60% (60 ppm) of this increase occurred in the period from 1959 to the present (Forget and Sanchez-Bain, 1999). The effect of changes in terrestrial ecosystems on the carbon cycle has been reversed over the past 50 years. These ecosystems are the 19^{th} century and 20^{th} at the beginning of the century, it was an average net source of carbon dioxide, and although carbon losses from soil/land use change continued at high levels, there was a net decrease in the middle of the last century (WHO, 2003a, 2003b; WWC, 1999).

The total amount of reactive (taken by plants) and biologically available nitrogen created by human activities has increased nine-fold with the increase in the second half of the century with the increasing use of fertilizers. More than half of all synthetic nitrogen fertilizer consumed on the planet and first produced in 1913 has been used since 1985. Human activities have roughly doubled the rate of formation of reactive nitrogen on the terrestrial surfaces of the earth. The flow of reactive nitrogen into the oceans increased by almost 80% from 1860 to 1990 (Butler, 2000; Dasgupta, 2001).

Between 1960 and 1990, the use of phosphorus fertilizers and the accumulation of phosphorus in agricultural soils almost tripled, although it has decelerated to some extent since then. The current flow of phosphorus into the oceans has tripled compared to past rates.

These changes and transformations in the basic functions of the ecosystem negatively affect both ecosystem services and human life and urban life. The distribution of species on earth is becoming more and more homogeneous. The natural process of evolution and the composition of the natural barriers of species to migration and local adaptation cause significant differences in species types in ecosystems in different regions. But these regional differences in living things on the planet are also gradually decreasing. Two factors are responsible for this decrease: firstly, the extinction of the species, and secondly, the increase in the invasion rate (Yachi and Loreau, 1999; TEEB, 2010). Meanwhile, the rates of taxonomic groups are gradually decreasing. Studies conducted globally show that most species are declining in proportion or number. Between 10% and 30% of mammalian, avian and amphibian species are in danger of extinction. 12% of bird species, 23% of mammals and 25% of conifers are currently endangered; 32% of amphibians are threatened with extinction. In general, freshwater habitats tend to have the most threatened species. About 100 of the birds, mammals and amphibians have become extinct in the last 100 years, which is 50-500 times higher than in the past. When possibly extinct species are included, this ratio is 1000 times higher than in the past (TEEB, 2010).

Genetic diversity describes the diversity within a species. Each species needs a rich genetic diversity in order to reproduce successfully, to be resistant to diseases and to adapt to changing living conditions. The loss or extinction of species and genes negatively affects the entire ecosystem, ecosystem services, biodiversity, and therefore humanity and urban life (Naeem, 1998).

5. CONCLUSION AND RECOMMENDATIONS

Human well-being and urban life depend on the constant provision of goods and services produced, as well as services derived from ecosystems. Over the past 50 years, human actions and interventions have changed/transformed ecosystems to an unprecedented extent and degree in human history. In fact, health and well-being improved on an average basis. However, the benefits provided were distributed unevenly. Further progress has limited by the fact that key ecosystem services are insufficient and cannot fully meet the demands/needs of urban life. In this regard, biodiversity was also negatively affected. However, biological diversity is a necessary condition for the provision of all ecosystem services. In most cases, as biodiversity increases, the provision of ecosystem services also increases and becomes more reliable. One of the most important reasons for this negative process is the rapidly increasing and uninhibited activities of humanity after the industrial revolution. Human activities trigger climate change, while climate change causes disruption of the carbon, nitrogen and water cycles.

In the twentieth century, the world's population grew rapidly, reaching 8 billion. The measures taken to feed this population (interfering unconscious watering/overfeeding/using too many pesticides, etc.) in addition, industrialization/urbanization, which covers all the issues necessary to meet other human needs, also brings important environmental problems together.

Nature and natural systems which meet ecological, economic, social and cultural requirements with varying weights depending on the conditions, economic (commercial/industrial), social, cultural, political, ecological, and aesthetic purposes is used and consumed. The consequences of this consuming frenzy negatively affect the environment and the diversity of living things, and as a result of ecological events within geological periods, living species are decreasing every day.

All natural or artificial systems and all entities included in this system are a whole. A holistic approach means calculating the totality of relationships when looking at events. In ecology, the holistic approach also means examining the parts of nature as a whole, not as singular, and considering the relationships/interactions between the parts. Instead of thinking of nature as an asset to be consumed/used, looking at it as an asset to be managed and a potential to be used by ensuring its continuity is the solution to the problem. Because the understanding of management, unlike the act of consuming /using, requires serious planning, organization, orientation, coordination and supervision. The basic principles of this understanding are sustainability, efficiency, continuity, spatial and social balance and publicity.

On the other hand, all systems, whether natural or artificial, open or closed, tend to deteriorate. All systems that have a tendency to deteriorate, when they are interfered with from the outside, enter the tendency to deteriorate more quickly and at an increased rate, and after a while they become unable to regenerate themselves. If the system in question shows an ecosystem feature, an intervention that will be made without understanding the system can cause irreparable problems in the entire system. As a result, the system becomes unable to carry this load. These deteriorations can lead to individual or systemic disruptions, and in this case, all ecosystem services are more or less negatively affected. In this context, all ecosystem services are subjected to constant entropy conditions with a tendency to overuse or consumption.

As a result, efforts to consciously and unconsciously consume only nature and ecosystem services in general will disrupt the production-consumption balance and therefore urban life, as well as threaten our common future.

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CITIZEN PARTICIPATION IN REPORTING ENVIRONMENTAL NUISANCE; INTRODUCING THE ENVIRONMENTAL REPORT TRACKING AND MANAGEMENT SYSTEM (ERTMS)

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Abstract
Environmental information is essential for governments and decision-makers to set and follow environmental policies and management of environmental issues. One of the most prominent environmental information is about environmental pollution and its direct/indirect effects on ecosystem and society. Odour pollution is reported to be the prominent cause of environmental nuisance and complaints to local authorities after noise pollution. There is no universally accepted environmental odour management method reported so far.
A geographic information system (GIS) integrated complaint platform would fill the gaps of conventional tools (line-desks-forms) that are mostly not displayed and managed through a common and integrated platform, thereby bring along confusion and conflicts regarding the jurisdiction of authorities.
The Environmental Report Tracking and Management System (ERTMS) is structured on the idea of developing a centralized environmental complaint management system built on a hierarchical delegation structure that would enable separation of responsibilities.
The ERTMS comprises a mobile app and a management panel. Any citizen can report odour complaints at immission source via mobile app and the latter is used for redirecting collected geolocalized sensorial to the responsible municipality agency. The ERTMS panel is equipped with the basic tools for filtering, monitoring, tracking, simply reporting odour complaints and interacting with users by way of a feedback mechanism on the progress of reported issues. The panel will be enriched by development and integration of odour alert and odour source estimation algorithms.
The proposed ERTMS system offers the following benefits for municipalities; the prioritization of complaints and efficient use of time and resources of decision-makers; the monitoring and management of environmental issues with high spatiotemporal resolution, planning and prioritization of remediation and control and monitoring techniques and infrastructures (location and number of air pollution monitoring stations, odour sensors etc). From the perspective of the scientific community; the generated big sensorial data (odour measurement by citizen science) can be used in calibration and verification steps of varying applications; be it odour sensor networks, electronic noses, field olfactometry measurements, air pollutants reverse dispersion model studies.
The ERTMS pilot application within the proposed innovation framework is carried out in a city with population of >200.000 and with >1400 active and verified mobile app users which have reported over 2750 odour issues between November 2020 – December 2021 period, with spatial representation over %70

surface area of the region. The ERTMS has a national patent pending status with the TPTO application no: 2020/20098
Keywords: *Environmental Complaint management, Environmental nuisance, odour pollution, citizen science, GIS, smart city, mobile app.,*

Introduction

Digitization has not only made co-production more effective and efficient but has also allowed public services to be shaped by citizens and service users and fundamentally changed the way they provide input by creating content [1,2]. Data can be considered one of such inputs. Geographic information technologies (GIT), include all types of computer systems (hardware and software) and tools used in processing georeferenced information

According to the inclusive review, the type of GIT application and area of usage on different domains have been emphasized with an informative subclassification. Numerous applications of GIT on decision support, monitoring, risk management, and research on environmental and natural resources have been carried out in the last decades (Amade d., 2018). There is a growing interest in public participation GIS generated information in the field of urban planning and environmental planning [1,4,5].

According to European Technical Report on "Citizen-generated data for public policy", the number of citizen-generated data (CGD) projects in Europe is very likely to grow. This trend is expected to continue along with more influence on decision-making at the local government level. National/regional legal and policy frameworks could be useful to guide the public sector to use unofficial data together with official data and private repositories. The report has sampled over 20 recent projects which have put their focus on collecting data with the purpose of environmental, urban, and health issues (examples including examining effects of climate change, measuring air quality, mapping quiet areas, measuring noise pollution, reporting street problems, improve local infrastructure, use renewable energies) [1].

Type of data collected mainly comprises of; sensor data, audio-visual recordings, geolocated data, textual descriptions via varying methods/tools sensors, online platforms, mobile phones and maps Accordingly, citizen participation come true by taking role as a sensor, reporter, monitor, observer, co-creator of sensors, platform users or a multiple combination of those [1,6].

Projects with varying objectives and methodologies have been applied with intent to collect environmental information and propose a better management system alternative [7–10]. Development and use of proper monitoring and tracking tools and methodologies are essential for building an efficient management system [3,5].

Environmental information is necessary for governments to follow environmental policies and manage and protect the environments. The collected information also may serve in identification of regional and temporal citizen complaints and disorders. The subcategories of environmental data can be listed as; data related to pollution, ecosystem and landscape data, epidemiological and psychological data which are indicative of health, a healthy environment and life style). One of the most prominent environmental information is about environmental pollution and its direct/indirect effects on ecosystem [7].

Techniques and methods for monitoring environmental pollution and data collection include but not limited to; automatic observation stations, analysis of environmental samples, study of indicators, illness symptoms, remote sensing and complaint records which involve citizen generated GIS integrated information and has exhibited a popularity peak in the last decade. With the use of GIS, different kinds and forms of data can be integrated in a joint spatial database.

What is Wisdom of Crowd and Public Participation GIS?

According to theory of wisdom of crowds; collective opinion of a group of individuals is superior over a single expert. It is widely used in the field of decision making, innovating, problem solving. On the other hand, PPGIS have been invented in 1996 and academic studies were carried out mostly in the field of environmental and urban planning [4]. By PPGIS, the field of mapping became not only an experts domain but also a public one [6].

Creating and keeping up to date the geospatial information by disseminating use of mapping tools evolved and contributed to the development of wisdom of crowd and crowdsourcing methodologies [6]**.** In PPGIS applications, the potentially affected public is randomly recruited as a result the crowd is engaged. All citizens must be set free to use the proposed feedback tools and exhibit a volunteered participation within context of the methodology. In this context the below listed criteria must be achieved in order to make WO Crowd functional in PPGIS; The proposed tool/method must support diversity in opinion, provide independence, to be decentralized and to be considering data aggregation (basically grouping multiple objects with similar characteristics into a single object by using principal component analysis or other tools)

Measurement of Odour, Tracking and Monitoring Odour Nuisance

Odour complaints are amongst the most widely encountered environmental complaint issues worldwide [8,11]. Frequent exposure to odourous compounds and/or odour nuisance are increasingly associated with health problems (headache, stress, respiratory tract diseases and environmental issues. Odour pollution is highly related with improper waste management, polluted water bodies and sources, air pollution related emission sources. Besides, odour pollution is mostly overseen and/or not efficiently tracked or monitored and managed with proper methods and tools. Due to lack of regulations and incapacity in infrastructure, undermanned planning of environmental agencies, collection and access to odour pollution data become limited. Odour pollution is one of the major environmental issues and specific regulations (becoming widespread worldwide in the last decade) and a management approach is a prerequisite to take it under control. There is not any universally accepted and applied method on management of environmental odour. But research on making the optimum selection of the odour nuisance assessment method in urbanized areas is on progress [9,12].

Analysis, monitoring programs, survey and modeling studies are applied with intent to reveal and investigate environmental hazards and related health effect. Numerous researches put their efforts to provide management alternatives that are applicable to large scale problems as much as local ones.

The odour emitting source including process, activity, plant, basic municipal/civil infrastructure, point or linear air pollution sources and odour pollution sources have to be determined carefully. Research in the field is overemphasized have potential to give direction to regulations and applications. As the spatiotemporal representation of the proposed approaches increase, the developed management models and tools become more adaptive. Monitoring studies on air and odour pollutions are mostly carried out in emission sources which exhibit limited representation of the level of odour nuisance and related complaint levels at ambient emission site also called the immission site.

Table 1. Odour Impact Assessment Methodologies

	Emission site	Immission site	
Sensorial	Dynamic Olfactometry (EN13735:2003)	Field olfactometry (EN16481:2016), field inspection, Citizen science *	
Instrumental	Chemical analysis Electronic noses	Chemical analysis, Gas chromatography, e-noses	[13]
Mathematical	Odour emission based factor assessment, emission databases	Dispersion model	

*VDI 3883 (2015) Part 1: "Effects and Assessment of Odours - Assessment of Odour Annoyance Questionnaires,

*Repeated questioning of neighbour panellists: VDI 3883:1993 Part 2,
*Conflict management in odour pollution: VDI 3883:2014 Part 3,

*Processing odour complaints: VDI 3883:2017 Part 4

Odour pollution is mostly tackled by traditional methods such as dynamic olfactometry (EN Standard 12725:2003) and modeling impact, and by scheduled field observations according to European standard EN 16841:2016. Since those methods are ineligible for collecting real time data (descriptive of the full odour episode), or due to limitations of sampling validity and prevalence and degradation of samples by time elapsed till analysis, they become non representative of the situation in the field, described as the level of annoyance/level of complaint at the ambient emission site [14,15].

Use of PPGIS and WOC in Environmental Complaint Management

Data collected via notification collection with the help of mobile cross platform instant messaging tools, notification lines, institutional complaint desks and complaint forms via some mobile applications are mostly not displayed nor managed through a common GIS integrated platform. This brings along lack of integrity and compatibility with GIS and results with confusion and conflicts regarding the spatial boundary and scope of authorities (between metropolitan, municipal administration, environmental departments and agencies etc.) and result with nonproductive use of labor, time, energy and finance in the management of environmental complaints.

The data collected by PPGIS have potential to be used with intent to enhance local authorities and policy makers decision making and planning processes on environmental complaints and environmental pollution management. On the other hand, the collected sensorial data have potential area of usage for planning, calibration and verification steps of varying application; be it odour sensor networks, electronic noses, field olfactometry measurements, air pollutants reverse dispersion modelling studies.

Field survey studies with civil participation are highly encouraged in United Kingdom and also in number of EU countries including Germany, Spain and Italy. Number of national standards relying on odour annoyance at immission site pave the way for eliciting an unified measurement method and an inclusive consensus as they are built on collecting comparable information based on FIDOL factors [14,16,17]**.**

In some countries, citizen surveys have been used extensively to gather data on odour nuisance. According to UK Odour Management Guide, level of odour annoyance is collected by community surveys and odour problem patters(patterns?) are built over time and be associated with meteorological factors and site activities. Similar applications were carried out in accordance with the VDI 3883:2015 and different regional guidelines applied in Europe (Germany and Italy) [10]. A recent research have proposed a novel bottom up approach based on real-time field observation by citizens and integrating with a quadruple helix model to provide all stakeholders participation including industry, public authorities and Academia [10]**.**

Specific guidelines (VDI 3883 part 1, Effects and assessment of odours, 2015) emphasizes the importance of annoyance assessment. The lack of exposure assessment and questionnaire surveys are apparent and the gaps have to filled by joint policy and regulations [18]. Research in its early stages have hypothesized that environmental conditions are determining parameters on level of annoyance. It has been proposed to weight odour episodes by the time of the day and the year regarding their annoyance potential (at specific time of the day and year) [18,19]. Combination of calculated frequency of day time odour-hours and type of odour was reported to explain complaint rates best. For decision makers and environmental agencies and/or local authorities, it is recommended to keep odour emissions as low possible, especially for highly annoying odour types.

D-noses project, collected odour complaints at over 10 pilot cities worldwide and have collaboratively integrated its findings with PROLOR reverse dispersion model and algorithms to predict odour complaints on population/receptors and propose process modifications for responsible plants based on odour nuisance forecasting results [10]. Same approach have also been applied on planning of public infrastructure scheduling its services such as local solid waste operations [20]. With CanarIT is designed to be used as part of a network of environmental sensors (in Smart City projects) people and authorities can receive real time information through the web and be alerted just as things happen. The SNIFFDRONE system provides 3D intensity odour maps that allow managers to take appropriate control actions [21].

In this study, we are introducing the Environmental Report Tracking and Management System (ERT&MS) and propose the idea of building a centralized environmental complaint management system that is built on a hierarchical delegation structure that gather all necessary information under a single roof and transfer the data-information to the related authority. With ERTMS approach, the main goal is to minimize the local authorities problems encountered in Environmental complaints collection, monitoring and management. It is aimed to follow up development and continuous improvement of ERTMS as a smart city tool for municipalities, urban planners and environmental agencies.

With this approach, citizens may report environmental issues anytime, anywhere through own tools of ERTMS (the mobile app). The GIS integrated data is collected with high location sensitivity. The ERTMS proposes a centralized and GIS integrated environmental complaint management system. From the perspective of municipalities; management of complaints under the roof of regional and hierarchical separation of responsibilities, from the perspective of decision makers and/or urban city planners; help to prioritize remediation plans and to build management strategies concerning environmental issues. With the engagement of local authorities and/or environmental agencies in ERTMS, what expected is the increase in number of users and reported issues. Which would reflect to the level of spatiotemporal representation of the collected data. The collected data with high spatiotemporal representation would help decision makers on choosing location, number and ideal field distribution of innovative pollution monitoring systems; like odour sensor and e-noses network [5,22,23].

From the perspective of scientific community; the collected data (upon verification and integrated with meteorological information, trajectory model and forecast models) can be used in development of supervised/unsupervised odour pollution alert algorithms, complaint prioritization and management algorithms, early warning systems, odour abatement and mitigation methods and strategies [10,11].

In this paper, the ERTMS as a GIS integrated public participated environmental data collection platform was briefly described and introduced from the perspective of pilot scale application on odour pollution and odour complaint management. The ERTMS pilot application has been carried out in a city with a population over 200k under project collaboration of the Tekirdag Namık Kemal University, Çorlu Faculty of Engineering and the Municipality of Çorlu between 2020 October to 2021 November. The ERTMS services including; the management panel and mobile application for collecting odour complaints have been disseminated with collaborative work of project partners. The developed tools and applied methodology and the basis of the PPGIS data collection approach were briefly described and basic findings of the ERTMS pilot application was introduced.

Material Method

Collecting odour and noise complaints, nuisance:

The GIS based odour complaint data collection is carried out through a mobile application that is provided and introduced to citizens on IOS and Android marketplaces as a free service. The mobile app involves a smart user interface addressing odour nuisance related survey questions in different steps. The annoyance of an odour is a factor of FIDOL factors and listed as frequency, intensity, duration, offensiveness and location of odour (Figure 1). User odour reports involving FIDOL factor information are collected from mobile app users and directed to local authority/environmental agency that is registered on ERTMS.

The theory of odour nuisance complaint collection was based on literature and national and international policies and legislations. As the ability to smell a certain odour in the populations follows a log normal distribution and >96% of the population theoretically have a normal sense [24]. The collected sensorial have potential to be used in environmental odour characterization of the study area from a nuisance perspective [8,10].

The ERTMS mobile app will serve in spatiotemporal archiving of odour complaints based on FIDOL parameters and make it available for local authorities and environmental agencies access through the management panel.

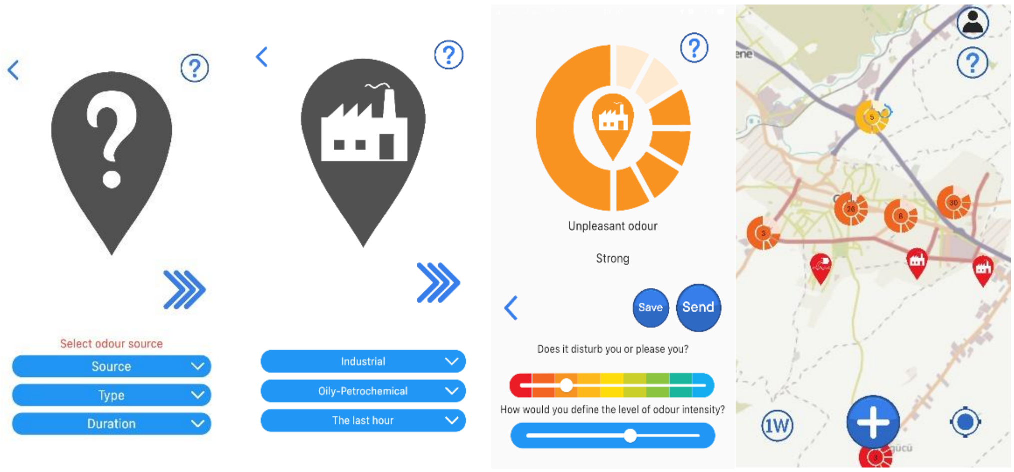

Figure 1. The user interface of mobile app for odour reporting

Technical background of the Mobile app and the ERTMS Panel

The designed Environmental Report Tracking and Management System consists of four main parts namely, a mobile application interface (2) that collects odor complaints from the user, informs the user about the odor and allows the user to monitor the air quality in the environment where they live; a web interface (1) where authorized municipalities can follow up, visualize and report the data that users complained and provide feedback to users who have complained when necessary; A server (3) hosting web services that provides communication between database (4) and components. The designed model for ERTMS is shown in Figure 2.

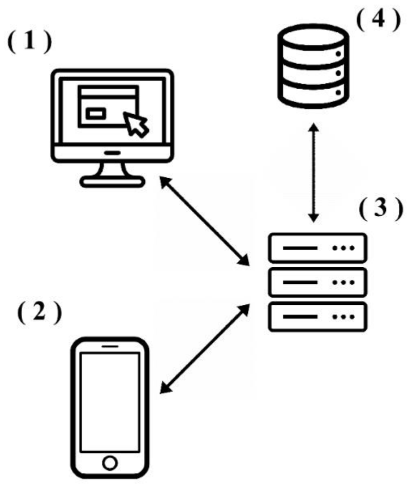

Figure 2. The model for app and web server-based Environmental Report Tracking and Management System

Dissemination of service

Basically, management of environmental complaint/issues require practical and widespread collection of reliable data and a prioritization algorithm. The stakeholder municipalities, environmental agencies and Universities, schools, non-governmental organizations and the ERTMS project group (including the volunteered social responsibility participation) have taken role in the dissemination studies. This way, the number of system users with random distributed geographical, demographic information have been increased and biased participation and reporting were avoided.

Within context of the dissemination studies; Kick-off meetings, launching meetings, press statements (local and national press) introductory surveys and demonstration desks, introductory and demonstrative joint activities with (webinars and meetings) and organizations were carried out with organized industrial site directorates, schools, non-governmental organizations, including professionals and student participants from different sectors and disciplines. All registered educators of the district national educational directorate (Ministry of national education MEB) were officially invited for voluntary participation as test users at the mobile app development stages.

The odour complaint information representative of the odour issues at immission source is based on the theory of wisdom of crowds [1,25]. From this point of view, as the number of mobile app users increase, the objectivity of the collected data will increase.

Common features of the mobile and data reliability

Only validated users, upon their registration and e-mail verification are free to report odour issues, display and remember personal odour records by time/location info and monitor neighboring complaints. Users are subjected to below listed constraints and limitations for the purpose of collecting reliable, unbiased and nonmanipulated data representative of odour episodes experienced at immission site;

- Users can report a limited number of odour (regardless of location) within 24 hours,
- The number of odour reports of same source/type within a unit distance and time is limited;
- Users can report a limited number of odours of a certain source (within 500 m diameter) in one hour,
- Users can report a limited number of odours of any source (within 500 m diameter) in one hour,
- Multiple registration with e-mail addresses is prevented,
- Multiple registration (and/or use of the mobile app) through a mobile device is prevented,
- Users can use back-wards reporting service any time but with a limited number of times in 24h.

The mobile app users unavailability to use their devices or report odour issues in certain situations have been considered. In this case, the mobile app users are free to make back-wards odour reporting by describing and saving the odour issue and marking its precise or approximate location on the map by choosing time.

Common Features of the ERTMS Panel

The registered panel users can be given a varying level of authorization valid for specific locations like a city, district or region (for administrator, municipality, academic, environmental agency etc.).

From the management panel, authorized users may display, filter, save, send feedback to mobile app users with complaint records, define the level of progress on the action taken for each (or group of complaintcomplaints at a specific location/time/type of odour complaint by source, tone, intensity) complaints records.

Location based authorization is derived by using reverse geolocation algorithms. In this way, region, sub-regions, city and district-based authorization/multiple authorization is defined. As a result, the odour reported from a specific location is associated with the right respondent that is authorized in the ERTMS.

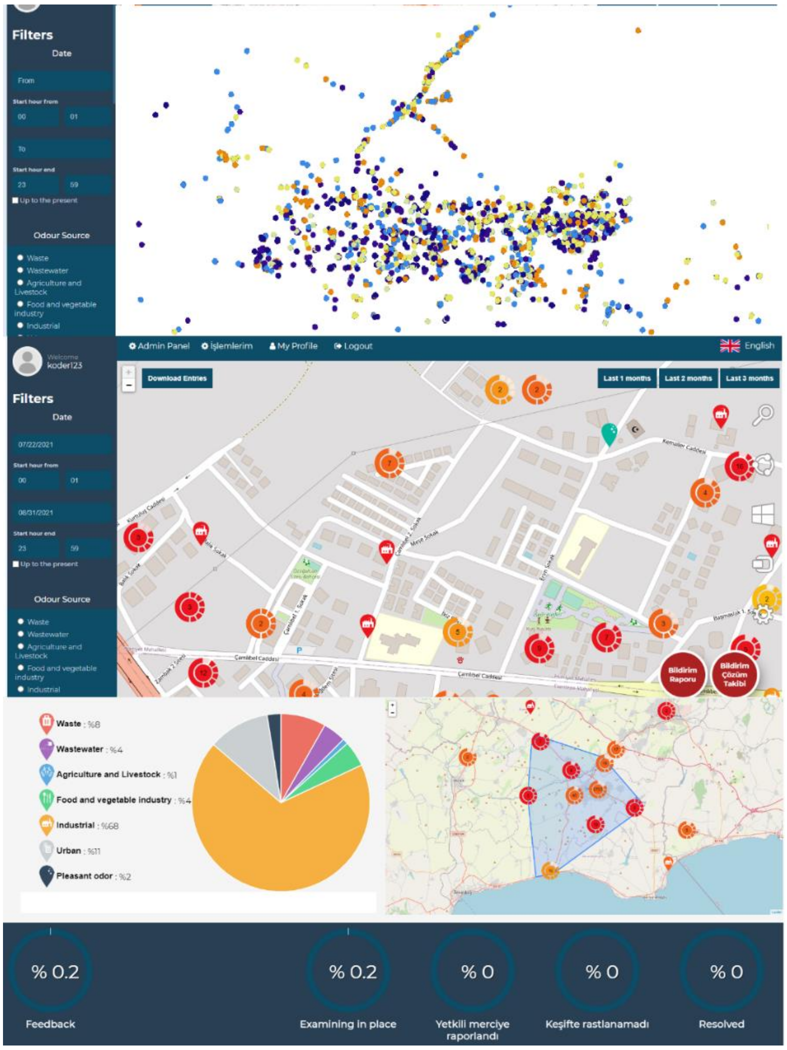

Figure 3. The ERTMS Panel for authorized* users (as the municipality in the ERTMS pilot scale application)

Within their area of jurisdiction, an authorized ERTMS user can display, download the data in CSV format, get reports of specific time and location, record the progress state of actions taken in the field about the complaints and display/get progress reports anytime.

Within their area of jurisdiction, the ERTMS authorized user is entitled to send feedback (in the form of templates or custom texts) to multiple mobile app users that have complaint records and/or notify them about the recent progress state of their complaints.

Results

The ERTMS was the first GIS integrated and public participated odour pollution/odour complaint reporting/notification platform developed and found pilot scale application in a city of Turkey.

The ERTMS was applied at pilot scale with intent to collect and manage odour complaints in Çorlu/Tekirdağ. The mobile app have >1400 verified users that have reported over 2750 odour issues between October 2020 – November 2021. The collected data provided the municipality with prioritization and planning options for on-site inspection and surveys. The collected data (representative of a specific odour episode and/or time and location), provide the opportunity for municipality and implicitly the provincial environmental directorate to track citizen odour complaints in a GIS integrated platform with relatively higher resolution of representation. The municipality were able to track and report definite time periods of regional and/or city wide complaint that have exceeded certain thresholds. According to the pilot scale application results; the number of days with at least one odour complaint is 326, while for the remaining 86 days no complaints were recorded through the system. 8.5±7 is the average number of complaints (+ standard deviation) for the days with at least 1 complaint recorded. As a result, there were 45 days with equal or more than 16 (>average number of complaints) complaints. The above mentioned and briefly introduced results point out the potential use of collected data with intent to develop an alert system that would be triggered when number of complaints in unit time and area exceeds certain thresholds.

Conclusion

In accordance with the quadruple helix model success and productivity, the collaboration will grow and the below listed issues will become common ground for all stakeholders.

The collected sensorial data have the potential use in varying application; creating odour nuisance maps, planning urban odour sensor networks, integrated (also validated with) with field olfactometry measurements and used in odourous compounds reverse dispersion model studies [8,9,16].

Development and enhancement of odour alert algorithms and odour episode forecasting models will be feasible. Evaluation of data in combination with electronic noses and other odour sensor data have wide range of application field. The ERTMS system will provide an odour alert system as the most viable product in every possible stage of system development and dissemination. The ERTMS as a smart city tool is beneficiary,

For municipalities on;

- Prioritization of odour complaints and intervention in the field
- Optimizing and providing efficient use of resources, time and labor force

- Increasing public satisfaction by the level of awareness and democracy on environmental issues.
- Reports with high spatiotemporal representation of environmental issue – nuisance complaints
- Auto GIS integration of citizen complaintcomplaints
- Upon validation by odour measurement at specific sites in the right periods; Authorities; (ministry and agencies of environment and urban planning), may benefit in their decision-making processes.
- Take role in the dissemination of service and collection of data. As a result, will benefit from using developed alert tools, forecasting models for short to long term planning of basic services, maintenance & repair or installation of a new infrastructure.

Environmental control and management & Urban Planning

For decision makers in the field of urban planning and environmental control and management the collected data will be informative and instructive on;

- Planning environmental pollution monitoring and remediation programs and investments,
- Planning mitigation strategies,
- Planning new settlements and transportation and transit lines,
- Assist in decision making progress of air pollution monitoring stations and odour sensors location,
- Planning and time optimization regarding basic municipal services, maintenance and repair services.

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TÜRKİYE'DE HASTANE BAHÇELERİNİN ÖNEMİ VE TASARIM ÖZELLİKLERİNİN AÇIKLANMASI

The importance of hospital gardens in Turkey and description of desing features

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Özet

Son zamanlarda hasta merkezli tasarımlar özelikle sağlık yapılarında, tasarımcıların dikkatini çekmiştir. Hastalar, günlerce veya aylarca kalmak ve yatmak zorunda kaldıkları sağlık yapıların güneş almadıklarından, temiz havası olmamasından, dar koridorları ve kalabalık olmalarından dolayı şikâyet etmektedirler. Öte yandan doğanın iyileşici etkisinin ortaya koyulması sonucunda iyileştirme bahçelerinin önemi her geçen gün artmıştır. Bu bağlamda hastane ortamlarında veya bahçesinde doğal ve kullanışlı bahçelerin tasarımı çok önemlidir. Ancak bir bahçeye, iyileştirme bahçesi olarak adlandırmak için bazı tasarım özelliklerin olması şarttır. Batı ülkelerinde iyileştirme bahçelerine verilen önem hızla büyümesine rağmen, Türkiye'de henüz yeterli seviyeye ulaşamamıştır. Oysa Türkiye'de özel gereksinime ihtiyaç duyan insanların sayısı azımsanmayacak ölçülerdedir. Bu çalışmanın amacı dünyada yapılan ilgili araştırmaları göz önüne alınarak hastane bahçelerin tasarım özelliklerin açıklanması olmuştur. Açık şekilde tanımlanan tasarım özellikler ve bahçe elemanları, tasarımcıların kafa karıştırmalarına engel olup ve her zaman daha uygun çözümlerdir. Bu tarz bahçelerde alan çeşitliliği sağlarken alanda olumlu açıdan dikkat dağıtıcı, duyulara hitap eden elemanların kullanımına özen göstermek gerekir. Bunları yaparken yapaylığı minimuma indirgeyerek doğal elemanların kullanılması, bahçenin tedavi edici etkisi üzerine olumlu katkı sağlanacaktır. Hastane bahçeleri doğayla iç içle olduğu zaman hastaların stres azalmasında ve tedavi süreçlerin kısalmasında etkili olacaktır. Araştırmanın sonucu yeni planlanmakta olan sağlık yapıları için bir kılavuz teşkil etmesi beklemekte ve özellikle Türkiye'de hastane yapılarında iyileştirme bahçelerin yapılmasını önermektedir.

Anahtar Kelime: Hastane bahçeleri, İyileşme, Tasarım, Türkiye

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Abstract

Recently, patient-centered designs have attracted the attention of designers, especially in healthcare structures. Patients complain that the health facilities where they have to stay for days or months do not receive sunlight, do not have fresh air, narrow corridors and are crowded. On the other hand, as a result of revealing the healing effect of nature, the importance of healing gardens has increased day by day. In this context, the design of natural and useful gardens in hospital environments or gardens is very important. However, in order to call a garden as a healing garden, it is necessary to have some design features. Although the importance given to healing gardens has grown rapidly in Western countries, it has not reached a sufficient level in Turkey yet. However, the number of people with special needs in Turkey is substantial. The aim of this study was to explain the design features of hospital gardens, taking into account the relevant researches done in the world. Clearly defined design features and garden elements prevent designers from getting confused and are always more suitable solutions. While providing diversity of space in such gardens, it is necessary to pay attention to the use of elements that are positively distracting and appealing to the senses. While doing these, the use of natural elements by minimizing artificiality will contribute positively to the therapeutic effect of the garden. When hospital gardens are intertwined with

nature, it will be effective in reducing the stress of the patients and shortening the treatment processes. The result of the research is expected to constitute a guideline for the newly planned health buildings and recommends the improvement of gardens, especially in hospital buildings in Turkey.
Keywords – Hospital gardens, Healing, Patient-centered Design, healthcare buildings, Turkey

I.GİRİŞ

Şifa bahçesi belirli bir nüfus, yer ve amaca göre hazırlanmış olumlu sağlık sonuçlar elde edebilmek için tasarlanmış bir bahçe veya peyzajdır [1]. Restoratif bahçeler ve sağlık bahçeleri olarak da tanımlanan şifa bahçelerinin çoğunluğu, genel akut bakım hastaneleri, ayakta tedavi klinikleri, yardımcı bakım ve rehabilitasyon tesisleri, zihinsel ve davranışsal hastalıkların sağlık tesisleri ve özel tesisler dahil olmak üzere sağlık tesisleri çevresinde yer almaktadır. Bahçe kullanıcılarını hastalar veya yakınları, ziyaretçiler ve personel ya da özel durumlarda öğrenciler oluşturmaktadır. Stres azaltma ile birlikte birçok fiziksel, biyolojik ve ruhsal hastalıkların tedavisinde hem pasif hem de aktif olarak doğa ile birlikte bir bağ kurarak pozitif sonuç alma imkanını arttıran bahçelerdir. Büyük bir bahçe ya da pencereden görünebilecek küçük bir peyzaj bile eğer birey üzerinde olumlu bir etki ve güç yaratıyorsa şifa bahçesi olarak tanımlanabilir [2].

Şifa bahçesi olgusu içerisinde, doğanın özellikleri ve yansımalarının yanında insana ve sağlığına olan olumlu etkileri üzerinde durulmaktadır. İnsan doğanın bir parçasıdır ve şifa bahçeleri de bireyler ve doğa arasındaki alış-verişi sürdürebilmek için tasarlanmış alanlardır [3]. Doğa olgusu birçok bilim insanı tarafından çeşitli şekillerde aktarılmıştır. Doğa olgusu; tüm canlı ve cansız varlıkların bir arada bulunduğu ortamı içerisine alan ve karşılıklı ilişki halinde bulundukları özel mekanlar olarak tanımlanmaktadır [4]. Spinoza, doğayı aktif ve pasif doğa olmak üzere iki başlıkta incelemektedir. "natura naturans" yani yaratıcı doğayı içerirken; pasif doğa ise "natura naturata"yı yaratılmış olan doğayı içermektedir [5].

Şifa-terapi temalı bahçeler, genellikle doğal peyzaj elemanlarından (bitki, su, toprak, taş v.b.) oluşturulan alanlardır. Burada doğal pezyaj elemanları insanların beş duyu organına (görme, tatma, işitme, dokunma, koklama) hitap etmeyi amaçlayarak biyolojik, fiziksel, psikolojik sağlık sorunların tedavisinde yardımcı olacaktır. Örneğin; rezene, yasemin, lavanta gibi aromatik bitkiler, stres/ depresyon gibi sağlık problemlerinde olumlu etki oluşturduğu için insanlık tarihi boyunca kullanılmıştır. Bitkilerin mikrop öldürücü özellikleri de bulunmaktadır. Özellikle salgın hastalıkların yaygın olduğunu Ortaçağ'da hekimlerin ellerini fesleğen yağı ile odalarını ise biberiye tütsüleri ile temizledikleri bilinmektedir (Anonim 2020ı). Günümüzde de şifa temalı bahçeler genellikle şifalı olduğu kabul edilen tıbbi ve aromatik özellikli bitkilerle tasarlanmaktadır. Bitkilerin yanı sıra doğal taşlar da şifa bahçelerinde kullanılan diğer yardımcı elemanlarıdır. Günümüzde eski popülerliğini kaybetmiş olsa da insanlık tarihinde doğal taşlar ile tedavilerin yapıldığı kanıtına rastlanmaktadır. Örneğin yılancık taşı ismi verilen doğal taşların uygun kullanımı ile, migren, romatizmal ağrılar, sindirim sıkıntıları gibi birçok sağlık sorununa olumlu etki gösterdiği birçok araştırma ve deney ile görülmüştür [2].

Doğanın insan hayatında meydana getirdiği yansımalar arasında; sıcaklık, yağmur, kar, rüzgar, toprak, kayaçlar, bitkiler, hayvanlar, dağlar, akarsular ile ilişki kurulabilir. İnsanların yaşadıkları coğrafik konum, iklim çeşitleri ve yaşadıkları bölge onların giyinme, beslenme ve bağışıklık sistemleri üzerinde farklı etkiler ortaya çıkarmakta ve hayatlarını yönlendirmektedir (Aydoğan 2016). Doğanın birey sağlığı üzerinde hem fizyolojik hem de psikolojik açıdan farklı etkileri vardır. Doğanın insanlar üzerindeki psikolojik etkisinin kanıtlanması fiziksel etkilerinin kanıtlanmasından daha uzun bir zaman almıştır. Uygulama olarak da bahçeyle ve bitkilerle uğraşmanın tedavi edici özelliği, hastanelerde, ilaç bağımlılarının ve engelli hastaların tedavilerinde kullanılmaya başlanmıştır [6]. Bu çalışmanın amacı dünyada yapılan ilgili araştırmaları göz önüne alınarak hastane bahçelerin tasarım özelliklerin açıklanması olmuştur. Açık şekilde tanımlanan tasarım özellikler ve bahçe elemanları, tasarımcıların kafa karıştırmalarına engel olup ve her zaman daha uygun çözümlerdir.

II. MATERYAL VE YÖNTEM

Bu çalışmada, şifa bahçeleri/ iyileştirme bahçeleri ile ilgili literatür çalışması yaparak şifa bahçesinin tanımı açıklanmıştır. Ayrıca hastane bahçelerinin planlama ve tasarım özelliklerini açıklamak amacıyla Dünyada başta olmak üzere Türkiye'de de uygulanan örnekler incelenmiş ve sonuç olarak da sağlık kurumların ve hastanelerin bahçe tasarımlarıyla ilgili birtakım konular açıklanmıştır.

III. BULGULAR

A. *İyileştirme Bahçelerin Tarihçesi*

Şifa bahçeleri insanlık tarihi boyunca karşımıza çıkan hem eski hem de modern bir kavramdır. İlk zamanlarda insanlar, evler yaptıkları gibi ilk iş olarak lokal iyileştirme alanları (kutsal bahçeler, kayalar, mağaralar v.b.) oluşturmaya başlamışlardır. Batı dünyasında karşımıza çıkan ilk hastaneler, şifalı bitkilerle iyileştirme sağlayan manastır bahçeleridir [7].

Tarih boyunca insanlar şifa bulmak için doğayı bir yol olarak görmüşlerdir. Tarihte iyileşme amacıyla kullanılan bu alanlara kesin bir isim verilmemiş olsa da günümüz tanımı ile bu alanlara şifa bahçeleri olarak adlandıra bilinir. Bu bahçelerin tarihi, açık mekanların kullanımı ile beraber başlamıştır. Literatürde ilk açık alanlar M.Ö 10.000 yılında kullanılmaya başlanmıştır [8]. Şifa bahçeleri antik dönemde de var olmuş ve bugün de devamlılığını sürdürmektedir. İnsanların yerleşik hayata geçmeleriyle birlikte şifa bahçeleri de bu yaşam alanlarına yakınlaşmıştır [7]. Özellikle orta çağda bu bahçeleri hastanelerde, rehabilitasyon merkezlerinde, yaşlı bakım evlerinde ve engellilerin tedavilerini sürdürmede önemli bir yeri vardır [9].

Asya ve Batı kültürlerinde, bitkilerin ve bahçelerin hasta bireyler için şifa bulma amaçlı kullanımın tarihçesi bin yılı geçmiştir. Örneğin Avrupa'da Orta Çağ boyunca, manastırların bahçeleri hastaların üzerinde sakinleştirici etkisi olması nedeniyle bahçelerle donatılmıştır. 180lü yıllarda ise Avrupa ve Amerikan hastanelerinde huzur yaratmak amacıyla bahçelere yaygın olarak yer verilmiştir [10].

Japon Bahçeleri Doğu'daki ilk şifa bahçelerini temsil etmektedir. 14. ve 15. yüzyıllarda kiliselerin yönetimlerde ve halkın sosyal ilişkilerinde önemli yere sahip olması sebebiyle Batı'da ilk sağlık bahçeleri, manastır bahçelerinde rastlanılmıştır [8]. Manastır bahçeleri bu dönemlerde, ruhsal ve fiziksel hastalığı bulunanların tedavi edilmesi amacıyla şifa bahçesi olarak kullanılmıştır. 17. ve 18. yüzyıllarda bilimsel tıp alanındaki elde edilen veriler ile şifa bahçeleri ve açık alanlar tekrar eski değerini kazanmıştır [7]. 19. yüzyılda hastaneler tasarlanırken aralarında açık alan bırakılacak şekilde planlanmıştır. Bu açık alanlar hastaların güneş ışığından faydalanabilmesi ve içerisinde gezinti yollarının bulunduğu şifa bahçeleri olarak planlanmıştır [8]. Orta Çağ manastır hastaneleri başta olmak üzere 17. ve 18. yüzyıldaki büyük kent (belediye) hastaneleri, akıl hastaneleri ve 19 ile 20. yüzyıllardaki senatoryumlara kadar birçok sağlık kuruluşunda bitkiler, güneş ışığı ve temiz hava iyileşme sürecinin kaynağı olarak kabul edilmiştir. Buna karşın teknolojinin insan hayatına girmesi ile birlikte 1950- 1990 yılları arasında özellikle batıda, şifa bahçeleri, eski değerini kaybetmiştir [11].

20. ve 21. yüzyıl insanlık tarihinde büyük değişikliklerin meydana geldiği bir dönem olmuştur. Gelişen teknoloji ile birlikte sağlık sektöründe de çeşitli teknikler kullanılmaya başlanmıştır. Geniş bahçeler yerini karmaşık hastanelere ve büyük binalara bırakmıştır. 20.yy. başlarında insanlar şifayı doğadan bulabileceklerine tüm güvenlerini kaybetmişlerdir. Teknolojinin meydana getirdiği yenilikler ile birlikte insanlar doğaya bir ihtiyaçlarının kalmadığını düşünmeye başlamış fakat uygulanan tedavi metodlarının eksiklikleri, kimyasal kullanımının artması gibi durumlarla karşı karşıya kalınmıştır. Bu durum doğanın bir parçası olan insanın, doğaya olan özlem ve ihtiyacını arttırmıştır [8]. Günümüzde ise kentleşmenin artması ile doğaya dönüş hızlanmış, insanlar faaliyetlerini doğal alanlarda yapmaya başlamış ve doğadan şifa bulma güveni tekrar artmaya başlamıştır.

Yüksek katlı hastane binalarının yapılması, klima kullanımı, dış mekan terasları ve balkonların kaybolması, açık alanların arabalar ve otoparklar için kullanılması, iç mekanların tamamıyla kullanılabilirlik esasına göre planlanması, hastalar, ziyaretçiler ve personelin daha fazla stres altında kalmasına neden olmuştur. 1990 yılından itibaren bu yönelimin tersine Amerika'da 'Hasta Merkezli Tedavi' adı altında yeni bir uygulama başlamıştır. Hastanelerde bu uygulamanın ardından artan rekabet ortamı, yüksek katlı hastane binalarından uzaklaşmayı sağlamıştır. Tüm bunların üzerine bilim insanlarının yaptığı çalışmalar doğrultusunda doğanın insan üzerindeki iyileştirici etkisini önemli ölçüde kanıtlanmıştır [12].

B. *Şifa/İyileştirme Bahçelerinin Faydaları ve Özellikleri*

Şifa bahçeleri kendine ait özellikleri sayesinde birçok fayda sağlamaktadır. Bunlar arasında İyileştirme etkilerin bulunması, stresli ortamlardan uzak durmayı sağlaması, fiziksel hareketler aracılığı ile kendini iyi hissettirmesi, psikolojik ve fizyolojik açıdan iyileştirmesi ve motivasyon arttırıcı etkiler oluşturması gibi faydalar sağlanır [13].

Şifa bahçeleri bireylerin fiziksel ve psikolojik anlamda kendilerini daha iyi hissetmelerine olanak sağlamak amacıyla ve hastaların tedavilerine destek olması için tasarlanan alanlardır. Şifa bahçeleri, sağlıklı bireylerde yeni hastalıklara sebep olabilecek, herhangi bir hastalığa sahip bireylerde ise sağlık durumunun çok daha kötü bir hale dönüşmesine engel olmayı ve stresin olumsuz etkilerini en aza indirgemeyi amaçlamaktadır. Son yıllarda yapılan sosyolojik çalışmalarda da çevre kirliliğinin ve şehirleşmenin hızla artması sebebiyle kişilerde stresin arttığı gözlemlenmiştir. Stres, kişilerin hastalığa yatkınlığını arttırır, savunmasız hale getirerek, bağışıklık sistemini düşürür [14].

Yapılan çalışmalara göre; duyguların bastırılması stres ve depresyona neden olmakta ve bu da bağışıklık sisteminin zayıflamasına sebep olur [14]. Zayıflayan bağışıklık sistemi kanser hücresi proliferasyonuna (çoğalmasına) karşı direncin azalmasına neden olabilir [15].

Tüm bu nedenler dikkate alındığında şifa bahçelerinin varlığı ile özellikle büyük kentlerde yaşayan insanların doğa ile buluşması kaçınılmazdır. Doğanın insan sağlığı üzerindeki pozitif etkileri ile bağışıklık sistemi koruma altına alınarak, kalıcı hasarlar oluşturan hastalıklara karşı önlem alınmış olacaktır. Gelişen kentsel yerleşim alanları insanlar için hem pozitif etkiler oluşturmakta hem de ruhsal ve bedensel sağlığı olumsuz yönde etkileyebilmektedir. Son yıllarda sağlık sorunlarının artması sebebiyle, bu konular dünya kamuoyunda gündeme gelmiş ve sonucunda yeni düzenlemeler oluşturulmuştur. Gerek mimaride gerekse diğer alanlarda alınan yenilenme kararları doğa ve insanı birbiriyle birleştiren yaklaşımları içermiştir. Peyzaj kapsamında bu yenilenmeler sonucu şifa bahçeleri kavramı ortaya çıkmıştır [16].

Örneğin ABD'de yapılan çalışmalara göre turistlerin daha çok doğal alanları tercih etmeleri [16], yeşil alana yakın evlerin daha çok tercih edilir olması, şehir içindeki doğal alanların önemini açıklamaktadır. Şifa-terapi temalı bahçeler, doğal bitki, su, toprak, taş, hayvan gibi peyzaj elemanlarından oluşturulan alanlardır ve hedefleri doğanın sunduğu bu imkanları beş duyu organına (görme, tatma, işitme, dokunma, koklama) seslenecek şekilde tasarlamak ve biyolojik, fiziksel, psikolojik sağlık problemlerine şifa vermektedir. Şifa bahçelerinde kullanıcıların iyileşmelerine ve şifa bulmalarına yönelik bazı özel terapi yöntemleri kullanılmıştır bunların en önemlileri; su terapisi, müzik terapi, hayvan terapisi ve bitkisel terapi olmuştur.

Su ile terapi, duyusal terapinin bir çeşidi olarak açıklanabilir. Su ile tedavi çok eskilerden beri yapılan bir tedavi şeklidir. Birçok bilim insanına göre suyun hafızası vardır. Su, görme ve dokunma duyuları ile hissedildiğinde insanlarda rahatlama ve stresi azaltma gibi olumlu etkiler gösterir. Su yaşamın kaynağıdır, bundan dolayı hastalıkların tedavisinde de su vazgeçilmez bir peyzaj elemanı olmuştur. Marmara Üniversitesi İlahiyat Fakültesi Türk Din Musikisi Ana Bilim Dalı Başkanı Prof. Dr. Ahmet Hakkı Türabi, Kocaeli'nin Derince ilçesinde açılan Toplum ve Ruh Sağlığı Merkezi'nde gerçekleştirilen su ve müzik sesi ile rehabilitasyon uygulaması için, su sesinin hastaları dinlendirdiğini, nabız atışlarını düzenlediğini ve streslerini azalttığını gözlemlediklerini söylemiştir [17]. 15. yüzyılda Osmanlı'da akıl ve ruhsal hastalıkları olan hastalar 1488'de yapılan Edirne Sultan Bayezid Darüşşifası'nda birden çok müzik aletleri ve su ile tedavi edildiği literatürde yer almıştır. 1154 yılında Şam'da açılan Nureddin Hastanesi'nde de hastalara su ve müzik ile tedavi uygulandığı bilinmektedir. Türk tarihinde bu yöntemin birçok şifahanede uygulandığı kabul görülmüştür [17].

Uzakdoğu kültüründe ise yoga ve meditasyonların su kenarında yapılması suyun insanlar üzerindeki olumlu etkilerine dayanmaktadır.

1990 yılında yapılan bir çalışma ile koku duyularının sadece burunda değil deride ve diğer vücut organlarında da bulunduğu kanıtlanmıştır. Almanya'daki Bochum Üniversitesi'nden bir grup bilim insanı, insan derisinde bulunan koku alıcı hücrelerin, burundaki hücrelere benzediğini, cildimizin de aynı burnumuz gibi kokuyu algıladığını kanıtlamışlardır. Hasarlı derinin sandal ağacı kokusu olarak bilinen 'sandolare' molekülüne maruz bırakıldığında kendini %50 daha hızlı iyileştirdiği gözlemlenmiştir [17].

Dünyada hayvan destekli tedaviler hem fiziksel hem de psikolojik sorunların çözümünde etkin bir role sahiptir. Hayvanlarla iletişim kuran çocuklarda sinirlilikte ve öfke nöbetlerinde gerileme olduğu gözlemlenmiştir. Yine davranış bozukluğu olan çocuklar için hayvanlarla temas kurmak davranışsal problemleri azalttığı savunulmaktadır.

Günümüzde alternatif tıp ve şifalı bitkiler ile tedavilerin desteklenmesi konuları çalışmalarda önemli bir yere sahiptir. Özellikle kardiyovasküler hastalıklar ve bu hastalıklardan sonra dünyada ikinci ölüm sebebi olan kanser, depresyon ve strese dayalı tüm çağ hastalıklarının doğadan uzaklaştıkça meydana geldiği bilinmektedir [18].

Bitkilerin kanser tedavisindeki pozitif etkileri detaylı olarak incelenmiş ve tedavi sürecine desteği kanıtlanmıştır. Çeşitli araştırmalarda diyabet, kadınsal hastalıklar, üreme sorunları, tiroit bozuklukları, anemi ve psikolojik rahatsızlıklar gibi diğer hastalıkların iyileştirilmesi konusunda da bitkilerin etkisi araştırılmış ve pozitif sonuçlar ede edilmiştir [18].

Örneğin, Manisa Spil Dağı zirvesinde yer alan Ayvacık köyü, şifalı bitkileri, yüksek oksijen oranı, doğal su varlığı ile kanser hastalarının tercih ettiği bir alan olmuştur. Yapılan araştırmalara göre açık alan aktivitelerinin, iç mekânda yapılan aktivitelere oranla strese, kalp rahatsızlıklarına ve fiziksel rahatsızlıklara karşı daha pozitif etkiler meydana getirdiği bilinmektedir. Texas Üniversitesi'nin yaptığı bir araştırmaya göre, gün içerisinde bahçede geçirilen 30- 45 dakikanın kanser hastalığından korunmaya karşı çok etkin olduğunu belirtilmiştir [17].

Aynı çalışmada; bahçede fiziksel aktivitede bulunulmasa bile sadece izleyerek doğal ortamların hastalar üzerinde rahatlatıcı ve tedavi edici bir etkisi olduğu sonucuna varılmıştır. Texas'da bulunan Mc Anderson kanser tedavi merkezinde, kanser hastalarının tedavi süreçlerinin desteklenmesi için doğal peyzaj alanları oluşturulmuştur. Müzikle, bitkilerle ve doğal yaşam alanları ile hastaların tedavilerine devam edilmiştir. Alınan sonuçlar doğrultusunda, normal hastanede uygulanan tedavilere oranla, doğal ortamlarda tedavileri sürdürülen hastaların daha kolay ve çabuk iyileştiği ve sağlıklı hallerinin daha uzun sürdüğü görülmüştür [17].

Doğa insanlara duyularını kullanarak şifa bulma olanağı sağlar. Dokunarak, tadarak, görerek, işiterek ve koklayarak şifa bulmak olasıdır. Bir araştırmaya göre; ağaçların ve bitkilerin insanlar üzerine iyileştirme güçleri vardır. Ağaçların titreşimini hissederek yani onlara sarılarak ya da dokunarak rahatlama ve kalp atışlarının dengelendiği ispat edilmiştir. Şifa bahçeleri hususunda yapılacak olan peyzaj mimarlığı çalışmalarında; şifa bahçesinin yerleşim planlaması, konumu, fiziksel ve görsel ulaşılabilirlik, fiziksel ve duygusal olarak güvenilirlik uygun bitkilendirme ve bahçe donatı elemanları, tasarımda çeşitlilik ve özellikleri üzerinde durulması gerekmektedir. Terapi-şifa bahçelerinin planlamaları ve tasarım elemanları, ele aldıkları yaş gruplarına ve hastalık durumlarına göre çeşitlilik göstermektedirler. Örneğin; yaşlılar için tasarlanmış bir şifa bahçesinde sessizlik ve sakinlik hakimken, çocuklar için tasarlanmış bir şifa bahçesi oyun alanı ve keşfetmeye dayalı alanlar ön plandadır [17].

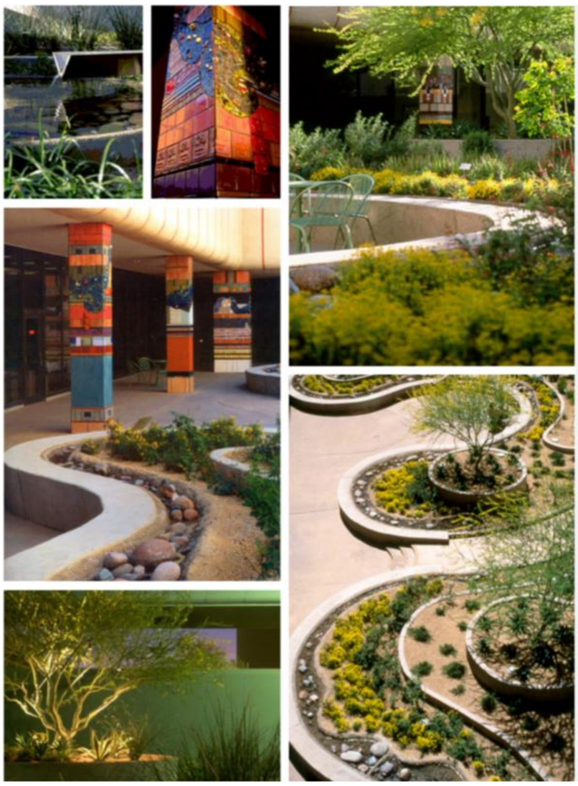
C. *Dünya'da ve Türkiye'de Şifa Bahçesi Örnekleri*

Good Samaritan Hospital Şifa Bahçesi

Bu bahçe 1996 yılında Phoenix, Arizona eyaletinde yapılmıştır. Bu iyileştirme bahçesi üç yönden sınırlandırılmış ve bir merkezi avlu sayılmaktadır. Özel olarak suyun kullanımı, bu bahçenin en önemli özelliğidir. Bahçede kullanılan su, yaşam döngüsünün göstergesidir ve doğumdan ölüme kadar yaşamın tüm evrelerini suyun akan ve durağan çeşitli kullanımıyla temsil etmektedir. Kullanılan su sadece görsel ve duyusal değil belki bahçe boyunca his edilebilir şekilde tasarlanmıştır.

Kullanılan oturma bankları hem sabit ve hem hareketli olarak tasarlanmıştır ve bu da kişilerin oturma yerlerinin (gölgeli veya güneşli yerler) seçmelerine imkan sağlıyor. Sanata önem verilmesi ve renkli seramiklerin kullanımı bu bahçenin diğer özelliğidir. Ulaşım yolları tekerlekli sandalye kullanıcılara veya hasta yatakların ulaşımı için uygun bir şekilde tasarlanmıştır. Sosyal etkinlik için ayrılan alan kahve rengi bir bantla belirlenmiştir. Hastane bahçesi birçok farklı gurup kullanıcı tarafından kullanılmaktadır. Hastalar ve hasta yakınları kahve keyfi için veya yürümek amacıyla alanı kullanmaktadırlar. Ayakta tedavi göre hastalar bahçeyi bekleme alanı olarak ve Hastane çalışanları dinlenme, yemek yeme veya grup toplantıları için alanı kullanmaktadırlar. Alanda büyük bir beton alanın olması hastaları alana yataklarıyla birlikte girmelerine izin vermekte ve hasta odaların pencereleri bahçeye doğru planlaması hastanın iyileşme sürecini olumlu şekilde etkilemektedir [19].

Bu bahçenin tasarımında, suyun sakinleştirici sesi ve dokunulabilir olması, tıbbı özelliği olan birçok yerel bitkilerin kullanılması ve ayrıca mevsim değişikliğini yansıtan bitki seçimi ve yaban hayatına zemin sağlayan bir bahçe olmasından dolayı başarılı olmuştur. Oturma bankları farklı malzemeden olması ve farklı konumlarda yerleşmesi diğer dikkati çeken konulardandır. Beton zeminlerin güneş ışığını çok fazla yansımasına neden olmasından dolayı, bu zeminler boyanmıştır. Bu bahçe 24 saat açık olmasına rağmen Arizona'nın sıcak ikliminden dolayı daha çok sabah ve akşam sakatları kullanılmaktadır [19].



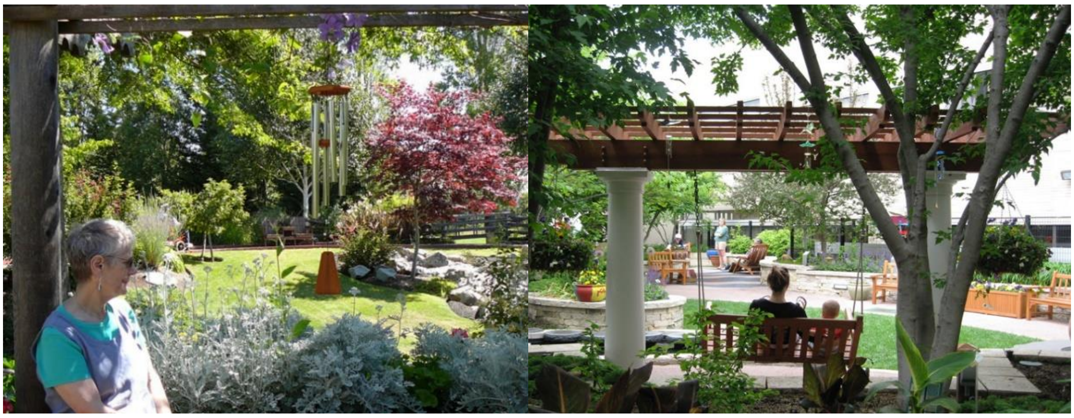
Şekil 1. Good Samaritan Hospital Şifa Bahçesi [20].

Bahçenin olumlu yönlerini: suyun sesi bahçenin birçok yerinden duyulması, suyun erişebilir olması, yerel ve uygun bitkilerin seçilmesi, yerel kültürüne uygun olan tıbbı bitkilerin kullanımı, yaban hayatına müsaide eden bitkilerin kullanması, mevsim değişiklerini gösterin bitkilerin kullanımı, bütün bitkilerin isimlendirilmesi, sabit ve seyyar banklara sahip olan farklı ve değişik oturma alanları, kullanıcımın gölge veya güneşli alanlarda oturabilmeleri, tek başına veya grupça oturma şansı veren küçük ve farklı alanların planlanması, bahçenin bütün kullanıcılara hitap etmesi, 24 saat açık olması, açık renkli seramikler ile süslenmiş renkli ve cazip sutunlerin olması, bahçenin hastanenin giriş kısmından anlaşılır ve ulaşılabilir olması, hasta odalarından bahçenin görünmesi ve doğa manzaranın olması ve iyi bir yönetimin ve sistematik değerlendirmenin olmasını sayabiliriz. Sıkıntı yönü olarak görünen konular betonun fazla kullanımı bahçedeki duygunun azalmasına neden olmuştur [19].

Graham Garden, Saanich Peninsula Hospital, Vistoria, British Columbia, Canada

Bu alanın bahçesi daha öncelerden tasarlanmıştı ancak 1990 yılına kadara yapımı bitmemişti. Bu bahçe hastanenin iki bakım bölümü arasında yerleşmektedir. Kullanıcıların %90'nı tekerlekli sandalye kullanmakta ve kullanıcıların yarısı yürüme sıkıntıları, sınır ve beyin hasarı olan kişiler olmuştur. Bahçenin tasarım amacı hastanedekilere bir duraklama alanı, bahçecilik ve egzersiz alanı olarak tanımlanmıştır [19].

Bahçedeki en önemli unsurlardan ahşap köprülü olan bir toprak yolu ki uygun görsel derinliğe sahip ve ulaşım yollarının görülmesine olanak sağlamaktadır. Alanda ateş yakma yeri ve bitkilerin dikim çukurları mevcut ayrıca bu alanlara tekerlekli sandalye kullanıcıların girilmesi rahatlıkla mümkün olmuştur. Alzheimer hastaları için yollarını rahatlıkla bulabilmeleri için aralarda heykeller tasarlanmış ve pergolaları barındıran bir yol ve ahşap köy kulübeleri gibi yapılan bir gazaba görünmektedir. Mevsimsel çiçeklerin bulunması kullanıcılara uygun ikim şartlarında kullanmalarına izin vermektedir. Bu bahçenin tasarımı tepecikleriyle bir köy manzarası yansımakta ve bir küçük gölet ile desteklenmektedir. Bu bahçenin en önemli avantajı herkes için ulaşılabilir olması olmuştur [19].



Şekil 2. Graham Garden, Saanich Peninsula Hospital şifa bahçesi [19].

San Ferancisco Genel Hastane bahçesi

Bu bahçenin yapımı 1872 yılında başlanmıştır. 1500 metrekareye sahip olan bu bahçe 1990 yılında çalışan bir memurun ailesi tarafından hastaneye hibe edilmiştir. Bahçede doğanın güzelliği kullanıcılara sakinlik ve rahatlık hissini vermektedir.

Bu bahçe çocuk poliplini, HIV polikliniği, sel hastalığı polikliniği ve aile polikliniğin yanında konumlandırmaktadır. Hastanede yatan hastalar ara sıra bu bahçeyi geçiş yolu olarak kullanmaktadırlar. Yerel kalk bahçeyi yem yeşil bir alan olarak bilmektedirler. Alanda iki tane çam ağacı ve bir sedir ağacı bahçenin en yüksek ağaçlıları olarak uzaklardan görülmektedir. Betonlu yollar, çiçekler ve çalılar ile sınırlandırılmıştır ve yollar daha çok yayalar için tasarlanmış ve bazı yollar granit döşemeler bazı ise ahşap parçalarından yapılmıştır. Sınırlar ise mevsimsel çiçekler ile belirlenmiştir. Bu kompozisyon ağaç ve çalılar ile birlikte rengârenk bir alan yaratmışlardır. Bahçede yabani otlar veya çöpler bulunmamaktadır ve 1994 yılında bir heykel bahçeye eklenmiş ve o alana bilirlik alanı olarak adlandırılmıştır. Bu alanda eğri tasarlanmış yollar, sıralı sandalyeler, çiçek yatakları ve bide heykel bulunmaktadır.

Çeşitli bitkilerin yardımıyla alanda iki kişinin oturması ve keyifli sohbet etmeleri için güzel alanlar oluşturulmuştur. Kullanılan banklar sırt ve kol dayama kısımlara sahipler. Büyük ağaçlardan bir tanesinin altında ahşap platform yapısı mevcut ve bu alan grupça oturma ve sohbet etme imkanını yaratmaktadır. Yazın sıcak günlerinde bahçeyi en çok kullanılan saatler 11-2 olmuştur ve bu mevsimde hava rüzgarlı olmasına rağmen yaklaşık 85 kişi genelde bahçeyi kullanmaktadırlar. Kullanıcılar genelde hastane personeli, yalnız veya ikili gelenler ve hasta yakınları, hasta ziyaretçileri veya kısa bir süre bahçede dinlenmek, sigara içmek veya bir şeyler atıştırmak isteyen hastalar olmuştur. Yemek sakatlarında hastane personelinin oturmak için yer bulamadıkları anormal bir durum değildir [19].

Şekil 3. San Ferancisco Genel Hastane bahçesi [21].

Mclaren Clarkson Şifa Bahçesi/ Michigan

Şifa ve yenilenme bahçesi olarak Michigan'da planlanan bahçede, labirent yürüyüş yolları, dinlenme alanları bulunmaktadır. Özellikle kanser hastalıklarının tedavisinin yapılması amaçlı kurulan yenilenme bahçesinin pozitif sonuçlar alması ile gördüğü ilgide bir artış söz konusudur.

Şekil 3. San Ferancisco Genel Hastane bahçesi [22].

Mount Zion Üniversitesi/ Kaliforniya/ ABD

Kaliforniya Eyaleti'nde kanser hastaları için tasarlanmış olan iyileştirme bahçesi örneğidir. İyileştirme bahçesi bir devlet hastanesinin bahçesine planlanmış ve hem hastane personeli için, hem de hastalar için olumlu etkiler meydana getirdiği gözlemlenmiştir [19].

Şekil 3. Mount Zion Üniversitesi/ Kaliforniya/ ABD [19].

Zeytinburnu Tıbbi ve Aromatik Bitkiler Bahçesi / İstanbul Türkiye

Zeytinburnu Tıbbi ve Aromatik Bitkiler Bahçesi; sürekli tıbbi ve aromatik bitkiler hakkında, bahçe düzenlemeleri, peyzaj tasarımları hakkında ve sağlık alanında bilgilendirme eğitimlerinin, konferanslarının yapıldığı bir yapı olarak tasarlanmıştır. Alanda eksikler olmasına rağmen Türkiye'de şifa bahçesi karşılığını veren yerlerdendir [17].

Kütahya Hekim Sinan Tıbbi ve Aromatik Bitkiler Bahçesi/ Kütahya/ Türkiye

Kütahya Belediyesi Hekim Sinan Tıbbi Bitkiler Araştırma Merkezi, 2011 yılı başında çalışmalarına başlamıştır. Kütahya Belediyesi'ne bağlı bir kuruluştur. Adını XV. Yüzyılda yaşayan ve Osmanl Devleti'nin ilk Hekim Başı'sı (Reisül-Etibba) olan ve edebiyatımızda Şairler Şeyhi unvanını alan Kütahyalı Şeyhi Hekim Yusuf Sinan'dan almıştır. Alanda 89 parselde 66 familyadan 210 çeşit tıbbi bitki yetiştirilmiş, 110 çeşit tohumluk elde edilmiştir. 2012 yılında da tür sayısı 300'ü aşmıştır. 2013 yılında ise tür sayısı 400'ü bulmuştur [17].

Konya Şifa Bahçesi / Konya/ Türkiye

Konya Şifa Bahçesi de 2018 yılında Konya Büyükşehir Belediyesi tarafından 38.600 m2 alan içerisinde yapılması planlanan halka açık bir şifa bahçesidir. Alanda şifalı bitki tarhları, dinlenme alanları ve yürüyüş yolları yapılması uygun görülmüştür [17].

V. SONUÇLAR

Son zamanlarda hasta merkezli tasarımlar özelikle sağlık yapılarında, tasarımcıların dikkatini çekmiştir. Hastalar, günlerce veya aylarca kalmak zorunda kaldıkları sağlık yapıların güneş almadıklarından, temiz havası olmamasından, dar koridorları ve kalabalık olmalarından dolayı şikâyet etmektedirler. Öte yandan doğanın iyileşici etkisinin ortaya koyulması sonucunda iyileştirme bahçelerinin önemi her geçen gün artmıştır. Bu bağlamda hastane ortamlarında veya bahçesinde doğal ve kullanışlı bahçelerin tasarımı çok önemlidir. Ancak bir bahçelerde iyileştirme bahçesi olarak adlandırmak için bazı tasarım özelliklerin olması şarttır. Batı ülkelerinde iyileştirme bahçelerine verilen önem hızla büyümesine rağmen, Türkiye'de henüz yeterli seviyeye ulaşamamıştır. Oysa Türkiye'de özel gereksinime ihtiyaç duyan insanların sayısı azımsanmayacak ölçülerdedir. Bu çalışmada Dünya'da ve Türkiye'de yapılan şifa bahçelerinin örnekleri incelenmiştir ve bu bahçelerin tasarım ve uygulamasına yönelik bazı tasarım özellikleri aşağıda açıklanmıştır.

Hastanelerindeki Şifa Bahçelerin Tasarımında Dikkat Edilecek Hususlar

- Şifa bahçelerinde tasarım yapılırken ilk olarak ziyaretçilerin fiziksel rahatlıklarına dikkat edilmeli, tasarımcı estetik kaygıdan önce kullanıcıların ergonomisini, alanın kullanılabilirliğini düşünmelidir.

- Halkın her kesiminden ve her meslek grubundan bireylerin ulaşabileceği iletişim araçları kullanılarak iyileştirme bahçelerinin herkese ulaşması sağlanmalıdır.
- Yaşlı ziyaretçilerin fiziksel güçleri, alana ulaşımları göz önünde bulundurularak alanla ilgili ön çalışmalar yapılmalıdır. Yaşlılar için tasarlanan şifa bahçelerine toplu ulaşım araçları ile ulaşım kolay olmalıdır. Örneğin işitme ve koku duyuları bu yaşlarda yitirilmeye başladığı için daha çok temas ederek alanı tanımalarına fırsat verecek alanlar oluşturulmalıdır. Koku ve işitme duyularını kullanabilecekleri alanda ise daha keskin kokusu (lavanta, nane, biberiye v.b.) olan ve ayırt edilebilecek bitkiler kullanılmalıdır.
- Yaşlı ziyaretçilerin ekim- dikim yapabilecekleri, doğal taşlara basabilecekleri ya da dokunabilecekleri, su öğesi ile dokunarak etkileşim oluşturabilecekleri peyzaj alanları oluşturulmalıdır. 65 yaş üzeri ziyaretçiler için bilgilendirme ve eğitim bölümleri tasarlanarak, bu yaş grubundaki hastaların şifa bahçelerinden beklentileri olan huzur ve rahatlığı bulabilecekleri dinlenme alanları tasarlanmalıdır.
- Çocuklar için tasarlanan şifa bahçelerinde; çocuklara oyun oynayabilecekleri ve enerjilerini atmalarını sağlayabilecekleri çocuk oyun alanları tasarlanmalıdır. Bu bahçelerde de zehirli, alerjik ve dikenli bitkiler kullanılmamalı, gerekli durumlarda kullanılsa dahi ulaşımı engellenmelidir. Çocukların oyun ve rekreasyon alanlarında iklimsel etkilerden korunabilecekleri uygun peyzaj donatı elemanları kullanılmalıdır. Dikkat çekici bitkiler kullanılmalı ve çocukların toprak ve bitki ile kontrollü ilişki kurabilecekleri alanlar oluşturulmalıdır. Özellikle fiziksel rahatsızlığı olan çocuklar için motor becerilerini geliştirmeyi amaçlayan bahçe aktiviteleri yapılmalıdır. Oyun alanları fiziksel engeli olan çocuk hastaların da rahatlıkla kullanabilecekleri özellikte tasarlanmalıdır. Çocukların güven duygularının gelişimini sağlayabilmek için oyun alanları, yürüyüş yolları, dinlenme alanlarında mekân olgusu oluşturulmalıdır.
- Zihinsel engelli ve ruhsal bozukluğu olan ziyaretçiler için tasarlanacak şifa bahçelerinde, mekânda güneşten ve diğer iklimsel etkilerden koruyucu özelliğe sahip, dinlenme alanları oluşturularak, bahçe toz, gürültü, rüzgâr gibi etkilere karşı korunması amacıyla uygun bitkiler kullanılmalıdır. Farklı formlar, tektürler, mevsimsel olarak dikkat çekici renkler gibi elemanlar kullanarak, bahçe tasarımı içinde farklılık sağlanmalıdır.
- Bahçede, su elemanı yeterli miktarda kullanılmalıdır. Bahçede yapılacak aktiviteler ve peyzaj ögeleri hastalar üzerinde hatırlatıcı özellikte olmasına dikkat edilmelidir.
- Şifa bahçelerinde mental ve ruhsal sağlık sorunları olan ziyaretçiler ve Alzheimer hastaları için sanatsal elemanların olduğu alanlar oluşturarak hastalarda mekan kimliği ve hafızası oluşturulmalıdır. Bu durumda hastaların yön algıları ve güven duygusu ön planda olacaktır. Planlamada karmaşık hatlardan uzak durulmalı ve alanın algılanması daha kolaylaştırılmalıdır.
- Dinlenme alanlarının tamamen sesten uzaklaştırılması ziyaretçilerde karmaşık duygulara sebep olacağından; sessiz ortamlar yerine doğa seslerinin (kuş sesleri, rüzgar sesi, bitkilerin rüzgarla oluşturduğu ses, su sesi, v.b.) bulunduğu alanlar oluşturulmalıdır.
- Oturma ve dinlenme alanları ile ziyaretçilerin sosyal iletişimini artırabilecekleri alanlar olmalıdır.

- Bireylerin bu bahçelere yalnızca ziyaret amaçlı değil, tedavi amaçlı da gelmelerini sağlamak için şifa bahçelerinde sadece bitkisel alanların yapılmasını engellemek gerekmektedir. Şifa bahçelerinde ziyaretçilerin belirttiği nitelikler en çok tercih edilen donatı elemanları ile tasarlanmalıdır.
- Şifa bahçelerinde 5 duyu organımızı da kullanabileceğimiz alanlar oluşturulmalıdır.
- Şifa bahçelerinden şifa bulma amacıyla gelen ziyaretçiler için, şifa bahçelerinin her açıdan düşünülüp tasarlanması, hastalıkların tedavisi için bitki dışındaki donatı elemanlarına da bahçelerde yer verilmesi gerekmektedir.
- Şifa bahçelerinin her mevsimde kullanımını sağlayabilmek için, sonbahar ve kış aylarında da burada canlılık olduğunu gösteren bitkisel tasarım yapılmalıdır. Herdem yeşil (taflan, şimşir, ibreliler v.b.), bitkiler kullanılarak doğanın canlılık hissi insanlara aktarılmalıdır. Sadece bitkiler ile değil, bu aylarda hastaların soğuktan ve yağıştan korunmalarını sağlayacak örtü ekipmanları da bahçede kullanılmalıdır.
- Şifa bahçelerinde bitkilendirme tasarımı yapılırken ziyaretçilerin de tercihi olan ağaç ve çalılar kullanılan alanlar oluşturulmalı ancak alanda karışıklığa sebep olmaması nedeniyle bitkilerin kullanımında bitki sosyolojisi, bitkilendirme tasarımı temel kurallarına dikkat edilmelidir.
- Şifa bahçelerinin uzun süreli tedavi gerektiren hastalıklar için kullanım koşullarının iyileştirilmesi ile hastaların daha sık buraya gelmeleri ve fayda görmeleri sağlanabilir. Ziyaretçiler için konforlu ortamlar sağlanması, yatılı hastalar için ortam hazırlanması, refakatçi ve ziyaretçiler için mekanlar oluşturulması kullanıcıların şifa bahçelerinden uzun dönem fayda sağlamasını önemli derecede etkileyecektir.
- Ziyaretçilerin bir arada sosyalleşebilmeleri, zihinsel ve bedensel aktivite yapabilecekleri alanlar oluşturulmalıdır. (satranç, koşu, kültür-fizik alanları gibi).
- Oluşturulan aktivite alanlarının tamamı her açıdan görülebilir olmalı, böylelikle alanda meydana gelebilecek olumsuz durumları kontrol altına alma imkanı artacaktır.
- Hastaların güneşten korunabilmeleri için toplanma ve dinlenme alanlarında uygun donatı elemanları tasarlanmalıdır.
- Kullanıcılara rahatsızlık veren ve görüntü kirliliği oluşturan aydınlatma elamanlarını genelde su ve yol kenarlarına kullanarak bu olumsuz etki azaltılmalıdır.
- Su öğeleri hastalığın türüne ve kullanıcı yaş uygunluğuna bakılarak peyzaj elemanı olarak şifa bahçelerinde kullanılmalıdır.
- Şifa bahçelerinde evcil hayvanlarda iletişim kurulabilecek alanlar oluşturulabiliniz.
- Meditasyon, bitki ekim-dikim, müzik dinleme alanları gibi psikolojik güçlenmeyi sağlayacak farklı mekanlar oluşturarak şifa bahçelerinin etki alanı artırılmalıdır.
- Terapi bahçelerinde yapılan aktiviteler ziyaretçilere yeni yetenekler kazandırabilmelidir. (Açıkgöz ve ark. 2016).
- Şifa bahçelerinde ziyaretçilerinde aktivite yapacağı alanlar oluşturulmalı toprağa ve bitkilere dokunabileceği, bitki yetiştirip, sulayabileceği terapi mekanları oluşturulmalıdır.

- Özellikle orta yaş hastalar için tasarlanan şifa bahçelerinde hastaların doğanın sesini dinleyebilecekleri terapi alanları oluşturulmalıdır. Bu alanlarda huş gibi ince yapılı ağaçlardan, süs havuzlarından ya da kelebek bahçesi gibi peyzaj alanlarından yararlanılabilir.
- Şifa bahçelerinde ziyaretçilerin, refakatçi ve çalışan personelin de rahatlıkla kullanabileceği uygun alanlar tasarlanmalıdır. Bu alanlarda kullanılacak peyzaj donatı elamanları, kullanıcıları güneş, yağış gibi olumsuz hava şartlarından koruyacak peyzaj donatı elemanlarına yer verilmelidir.
- Kullanılacak oturma donatıları de hem engelli bireylerin hem de diğer kullanıcıların ortak kullanımlarına uygun olarak tasarlanmalıdır.

Uygun altyapı oluşturulduğu durumda diğer mevsim ve günlerde de ziyaretin arttırılması sağlanabilir, ziyaretçiler her dönemde şifa bulabilecekleri alanları kullanabilirler.

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KENT MORFOLOJİSİ ÜZERİNE BİR DEĞERLENDİRME: YENİ BİR PROJENİN GALATA KENT FORMUNA ETKİSİ

An Evaluation on Urban Morphology: The Effect of a New Project on Galata City Form

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Öz

Kentler farklı dönemleri içerisinde barındıran mekanizmalardır. Kenter gelişirken mevcut morfolojisini etkileyecek yeni projeler planlanmaktadır. Bu çalışmada, yeni kentsel tasarım projelerinin şehir ile etkileşim içinde planlanması ve kent bütünü ile bütünleşmiş bir politika içermesi gerektiğine vurgu yapılmaktadır.

Bu çerçevede çalışma alanı olarak Galata bölgesi seçilmiştir. Çalışma alanı seçimindeki en önemli sebeplerden biri çalışma alanında planlanan Galataport projesinin, bölgenin özelliklerinin ve etkisinin sorgulanması gerektiren bir durum olduğu düşünülmektedir. Bu nedenle, çalışmanın amacı olarak Galataport projesinin hem Galata bölgesi üzerindeki etkisini hem de kıyı şeridi kullanımına etkisini ortaya koymak amaçlanmaktadır. Bu noktada "yeni proje alanının mekânsal yapı içinde etkili olup olmadığını" sorgulanmaktır.

Çalışmanın yöntemi olarak çalışma alanını iki farklı morfolojik yaklaşım ile analiz etmek amaçlanmıştır. Bunlardan biri Conzen yaklaşımıdır; 1) Bu yöntem ile, kentin mekânsal gelişimi tarihi haritalar ile incelenecek ve değişimler tespit edilecektir. 2) Kenti anlamak için bir diğer önemli araç ise, mekân dizimi yöntemidir. Bu yöntem ile, odaklanılan alanın, 1980 ve günümüz (2020) haritaları aracılığıyla aksiyalite, dışbükeylik, entegrasyon, kavranabilirlik ve sinerji kavramı ile karşılaştırmalı olarak açıklanacaktır. Bu nedenle, alanın gelişim ve değişim süreçlerini etkileyen karar ve süreçlerin morfolojik olarak belirtilen iki ölçekte değerlendirilmesi yapılması amaçlanmıştır.

Sonuç olarak, Galata bölgesi olarak ele aldığımızda çalışma alanının kendine özgü mekânsal özellikleri ve tarihsel süreci olduğu görülmektedir. Morfolojik yapı ile birlikte tamamlanan Galataport projesinin çalışma alanında fonksiyonel değişikliklere yol açtığı ve mekânın hem kullanım özelliklerinde hem de morfolojik yapısında farklılıklara neden olduğu görülmektedir. Son olarak, elde edilen sonuçlara göre öneriler verilmiştir.

Anahtar Kelimeler: kent morfolojisi, mekân dizimi yöntemi, Conzen yaklaşımı, Galata bölgesi, Galataport projesi.

Abstract

Cities are in a continuous process with the change and re-adaptation of different parts. Cities are deliberately planned under different socio-economic, natural, religious, and political conditions in different historical periods. While cities are growing new urban projects are planned that will affect the urban morphology of the cities. Thus the emphasis on the research problem is that new urban design projects require planning and integrated policy in interaction with the city. One of the aspects of ensuring this is to examine the city from the historical point of view and to comprehend urban morphology analysis.

In this context, Galata region is chosen as the study area. It is thought that one of the most important reasons for the selection is that Galataport Project in the study area is a situation where the characteristics and impact of the district should be questioned. Therefore, as the aim of the study, the author aims to reveal the effect of the Galataport project on both the Galata region and the use of the coastline. At this point, it is questioned whether the new project area is effective in the spatial structure.

As a result, it is seen that the study area has its own unique spatial characteristics and historical process. It is seen that the Galataport project, which is completed with the morphological structure, caused functional changes in the study area and caused differences in the usage characteristics of the space. Finally, recommendations are given according to the results obtained.

Keywords: urban morphology, space syntax methodology, Conzenian approach, Galata region, Galataport project.

1. Giriş

Kentler sürekli bir değişim içerisinde olan mekanizmalardır. Geçmişten günümüze kentsel form ve yapı, kent araştırmalarının önemli kavramlarından biri olmuştur. Aynı şekilde kent morfolojisini oluşturan temel öğelerin kent formu ve kent yapıs olduğu bilinmektedir. Kent formunun ve yapısının incelenmesinde etkili olan temel yöntemin morfolojik analiz olduğu anlaşılmaktadır. Kentsel morfoloji kavramını kentsel form ve yapının analizi olarak tanımlamak mümkündür. Kentler için planlama ve tasarım kararları geliştirirken kent tarihini anlamak, kentin mevcut durumunu analiz etmek ve geleceği kurgulamak stratejik öneme sahip konular olmuştur. Bu kararlar sonucunda kentlerin zaman içinde tanık olduğu değişimler kentsel formu birçok ölçekte etkilemektedir. Bu açıklamaya göre kent morfolojisi, kentlerin tarihsel karakterlerini anlamak ve bu etkilerinin kentsel ölçekteki yansımalarını inceleyerek gelecek planlama yaklaşımlarını yorumlamak açısından çok yönlü bir araştırma alanı sunduğu görülmektedir.

Bir şehir plancısı/şehir tasarımcısının kabul etmesi gereken temel hususlardan biri morfolojik analizdir. Larkham' a (2005) göre, "binalardan, parsellerden, sokak bloklarından ve şehirlerin yapısını oluşturan sokak modellerinden çeşitli ölçeklerdeki fiziksel karmaşıklıkları anlamak, şehirlerin nasıl büyüdüğünü ve geliştiğini anlamamıza yardımcı olur".

Kentler gelişirken yeni kentsel tasarım projeleri planlanmaktadır. Her plan kararı ve proje kent bütünü ile uyumlu ve entegre olması gerekmektedir. Bu doğrultuda bakıldığında kentler ve limanlar her zaman etkileşim halinde olmuştur. İstanbul bir liman kenti olarak birçok liman projesini içinde barındırmaktadır. Kentin gelişme evresinde, artan trafik ve şehirleşme nedeniyle kentle bütünleşen limanların genişlemesi/büyümesi ve artan talebi karşılamaları gerekmektedir. Fakat bu talebi karşılarken ; kentin büyümesine paralel olarak büyüyen limanlar liman kenti görünümünü korurken, kentte sıkışıp kalan ve kentle bütünleşemeyen limanlar küçülerek işlevsiz hale gelmektedir.

Çalışma alanı olarak seçilen Galata bölgesi, İstanbul'un tarihi merkezi olarak kabul edilmektedir. Tarihten bu yana birçok planlama ve tasarım kararından etkilenmiştir. Tarihi bir merkez olan bu bölgede Galataport limanı gibi yeni liman projeleri planlanmaktadır. Bu tür planlama kararları bölgenin morfolojik çerçevesinde değişikliklere yol açabilmektedir. Galataport Projesi'nin planlaması da ilçenin özelliklerinin ve etkisinin sorgulanması gereken bir durum olduğu düşünülmektedir. Bu noktada araştırma problemine yapılan vurgu, yeni kentsel tasarım projelerinin şehirle etkileşim içinde planlama ve entegre politika içermesi gerektirdiğidir. Bunu sağlamanın ve analiz etmenin yönlerinden biri de kenti tarihsel açıdan incelemek, kentsel morfoloji analizini kavramak, kenti ve işlevini mekansal ve sözdizimsel analizlerle anlamaktır.

Bu çalışmanın amacı, Galata bölgesinin mekansal yapısını tarihi dönemler boyunca analiz ederek zaman içindeki değişimini ve gelişimini analiz etmek ve Galataport projesinin kıyı şeridi kullanımına ve Galata bölgesine etkisini ortaya koymaktır. Fakat kullanılan yöntemin de önemine vurgu yapılmak istenmiştir. Bu çalışma aynı zamanda Conzen yaklaşımını ve mekan dizimi yaklaşımını sentezlemeyi hedeflemektedir. Larkham (2006), bu yöntemlerin önemini, "mekan dizimi ve Conzenian morfolojisinin potansiyel tamamlayıcılıklarını keşfetmek için büyük fırsat" olarak özetlemiştir.

Çalışmanın amaçlarına bakıldığında iki araştırma sorusu ortaya çıkmaktadır; (1) Galataport Projesi (yeni liman projesi) mekansal yapı içinde etkili midir? (2) Kentteki değişim ve gelişimi tespit etmek için iki yöntem (Conzenian morfolojisi ve mekan dizimi yöntemi) arasında bir bağlantı kurulabilir mi? Bu çalışmada yukarıda belirtilen sorular cevaplanmaya çalışılacaktır.

2. Kent Çalışmalarında Bir Disiplin Olarak Kent Morfolojisi

Yunanca 'form' anlamına gelen 'morphe' kelimesinden türetilen 'morfoloji' terimi, "biçim bilimi" anlamına gelmektedir (Shorter Oxford Dictionary, 1937), Şehircilik Sözlüğü'nde ise morfoloji kavramı "kentsel biçimin incelenmesi" şekilde tanımlanmaktadır (Cowan, 2006, s.250). Moudon, kent morfolojisinin, "kentin bir insan yaşam alanı olarak incelenmesi" olduğunu belirtmektedir (Moudon, 1997). Moudon gibi diğer bilim adamları da tarih boyunca kent morfolojisinin tanımını ortaya koymuşlardır. Literatürdeki diğer kentsel morfoloji kavramları Tablo 1'de sunulmuştur. Bu tanımların bakıldığında tarihten bu yana temel olarak kent morfolojisi kavramı kentin yapısı olarak özetlenmiştir. Bu tanımlardan yola çıkarak kent morfoloji fikrinin; kentin doğasını anlamak, kent mekânlarındaki yapısal değişimlerin etkisini ve kentleşmenin tarihsel sürecini keşfetmek için yıllardır araştırma yöntemi olarak kullanıldığı görülmektedir.

Kentler gelişirken kent formları hakkındaki bilgimizin, planlama, mimari, coğrafya, tarih ve arkeoloji dâhil olmak üzere çok sayıda disiplin tarafından sağlandığı görülmektedir. Her disiplin, form ve gelişiminin birleştirici ilkeleri için örneklerle katkıda bulunmuştur. Fikirler, kentsel morfoloji terimini şekillendirmek için bir disiplinden diğerine ve eyalet sınırlarının ötesine geçmiştir (Gauthiez, 2004).

Kent morfoloji kavramının gelişim sürecine baktığımızda bir kentin evriminin incelendiğini ve tarih ile kent arasındaki ilişkinin kurulduğunu söyleyebiliriz. Binalar, bahçeler, caddeler, parklar ve simgesel yapılar birincil bileşeni oluşturmaktadır. Bu bileşenler, sürekli kullanılan ve zamanla değişen yaşam formları olarak bilinir.

Ek olarak, morfolojik araştırmanın üç kavrama dayandığı konusunda genel bir fikir birliği vardır (Moudon, 1997):

1. Kent tipi, üç temel fiziksel unsurla karakterize edilir: binalar ve bunlarla ilişkili açık alanlar, parseller veya sokaklar;

2. Kent tipini anlamak için genellikle dört çözüm düzeyi vardır: bina/arsa, sokak/blok, şehir ve bölge;

3. Kent formu kompozisyon unsurları tarafından sürekli dönüşüm ve yer değiştirmeye uğrar, bu nedenle ancak tarihsel olarak anlaşılabilirler.

Bu üç öğe şu şekilde özetlenebilir. Kent morfolojisi üzerine ister coğrafyacılar isterse mimarlar tarafından veya ortaçağ, barok, çağdaş dönemde çalışılmış olsun biçim, çözünürlük ve zaman kentsel morfolojik çalışmanın üç temel bileşenidir (Moudon, 1997).

Kent morfoloji çalışmalarından da anlaşılacağı gibi, bu alanda çalışan bilim insanları bugüne kadar kentin tarihten günümüze gelişimini incelemişlerdir. Yapılan çalışmalar arttıkça kent morfolojisi, kentlerin sadece tarihsel sürecinin incelenmesini değil, aynı zamanda toplumsal boyutunun da incelenmesini içeren en geniş perspektiften bir yaklaşım olduğu görülmüştür. Böylece kentlerin oluşumu, dönüşüm süreci ve kentlerin karakterleri ortaya çıkarmak için kullanılan bir yöntem olmuştur.

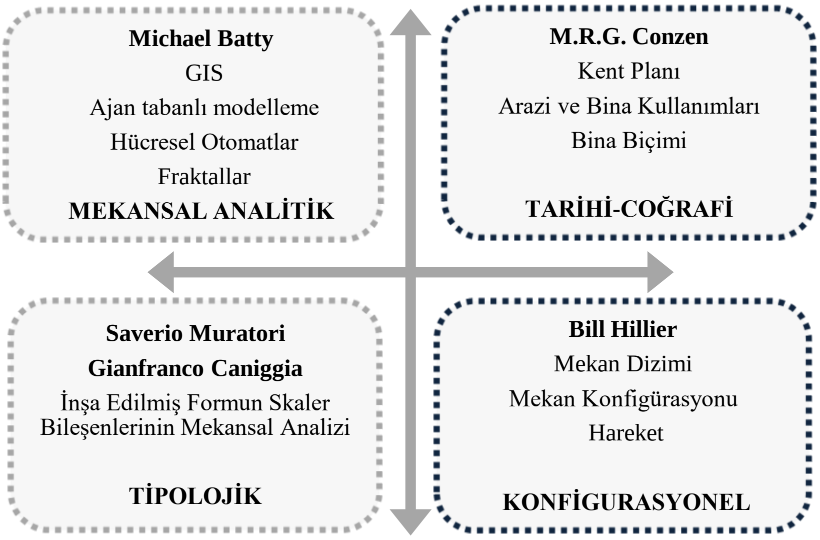
Tablo 1. Bilim insanları tarafından kent morfolojisi tanımları.

Kent Morfolojisinin Tanımı	Bilim İnsanı
"Kökenlerinin, büyümelerinin ve işlevlerinin ifadesi olarak görülen kasabaların yerleşimi ve inşasının incelenmesi"	(Dickinson, 1948, p.232)
"Kentsel tasarımın ilkelerini veya kurallarını bulmak için temel olan bir analiz yöntemi"	(Marshall & Çalişkan, 2011)
"Kentsel tasarımın ilkelerini veya kurallarını bulmak için temel olan bir analiz yöntemi" veya "kentsel tasarımın fiziksel ve mekânsal incelenmesi"	Gebauer & Samuels (1981, cited in Oliveira 2016, p.3)
"Kentsel formun fiziksel (veya inşa edilmiş) dokusunun ve onu şekillendiren insanlar ve süreçlerin incelenmesi"	(Urban Morphology Research Group, 1990)
"Formun bilimi veya formu yöneten ve etkileyen çeşitli faktörlerin bilimi"	(Lozano, 1990)
"Kentsel formun fiziksel (veya inşa edilmiş) dokusunun ve onu şekillendiren insanlar ve süreçlerin incelenmesi"	(Larkham & Jones, 1990)
"Kentin insan yaşam alanı olarak incelenmesi".	(Moudon, 1997, p.3)
"Belirli bir yerin zaman içindeki evrim sürecinin incelenmesi"	(B. Scheer & Scheer, 2002)
"Kentsel form çalışması"	(Cowan, 2005)
"Kentsel oluşumların temel ilkelerini ortaya çıkarmak için kullanılan ve belirli bir zaman diliminde kentsel oluşum sürecini hiyerarşik bir düzen içinde tanımlamayı amaçlayan bir kentsel analiz yöntemi"	(Mıhçıoğlu Bilgi, 2010)
"Morfoloji, organik olarak sürdürülebilir teknolojileri ve resmi ihtiyaçları birbirine bağlayan araç olduğunu iddia ediyor."	(Maretto, 2013)
"Öğelerin birlikte nasıl çalıştığını, özellikle insan ihtiyaçlarını karşılamak ve insan kültürünü barındırmak için nasıl çalıştığını anlamaya yardımcı olmak için yapılı çevrenin yapısındaki, oluşumundaki ve dönüşümündeki yinelenen kalıpları" tanımlayan bir çalışma	(Kropf, 2014, p.41)

Kaynak: Yazar tarafından derlenmiştir.

2.1. Kent morfolojiye farklı yaklaşımlar

Kropf (2009), kent morfolojisinin yöntem ve unsurlarını dört başlık altında netleştirmei hedeflemiştir. Burgess, Hoyt ve Lynch gibi kent formu üzerine çalışan bazı bilim insanlarının çalışmalarını incelemesi sonucu kent formu çalışması için ilke ve teknikler geliştirilmiştir. Kropf (2009), kent morfolojını/yöntemini "mekânsal analitik yöntem", "konfigürasyonel yöntem", "tipolojik yöntem" ve "tarihi-coğrafi yöntem" olmak üzere dört temel tekniğe ayırmıştır. Bu teknikler hem kendi içinde hem de birlikte analiz edildiğinde yapılı çevrenin kapsamlı bir şekilde anlaşılmasını sağlamaktadır (Gökçe, 2018).



Resim 1: Kentsel morfolojiye yaklaşımlar (Kropf, 2009'dan derlenmiştir).

Mekansal analitik yaklaşımda, şehirler düzenli yapılar olarak kabul edilir fakat aynı zamanda karmaşık yapıdadırlar ve bu karmaşıklık sorunu, ortaya çıkışları ve evrim yöntemlerini anlayarak mekansal yapıları ve dinamikleri inceleyerek çözülebilir (K. Kropf, 2009).

Konfigurasyonel yaklaşımda, kent morfolojisinde biçim, işlev ve algı arasındaki bağlantıları çözümlemek için kullanılan temel yöntem mekân dizimi analizidir (K. Kropf, 2009). Temel fikir, uzamsal konfigürasyon ve hareketin birbirleri üzerinde belirleyici bir etkiye sahip olduğudur ve bu yaklaşım öncelikle insan ile uzamsal konfigürasyon arasındaki ilişkiyi vurgulayan mekansal dizi kavramını geliştiren Bill Hillier'in çalışmalarında bulunabilir (Hillier & Hanson, 1984).

Tipolojik yaklaşımın kökleri, öncelikle Giuseppe Pagano'dan ilham alan Saverio Muratori'nin çalışmasına dayanmaktadır (Marzot, 2002). Bu bakış açısı, yapılı çevrenin nasıl geliştiğini ve fiziksel yapısının zaman içindeki evriminden gelecekteki hangi gelişmelerin yararlanabileceğini inceler (K. Kropf, 2009). Esas olarak iki boyuta odaklanır: "uzaysal" ve "zamansal" (Caniggia & Maffei, 2001, s.60).

Tarihi-coğrafi yaklaşım, kentin mekansal yapısını ve karakterini değerlendirmek için kentin özelliklerini ve dönemler boyunca gelişmesini sistematik olarak analiz eden Conzen'in şehir planının analizi olarak görülmektedir (K. Kropf, 2009). Bu yöntemde şehir manzarası üç kompleks temelinde incelenir: şehir planı, arazi kullanım şekli ve yapı dokusu (Whitehand, 2001; Kropf, 1993; 2009).

Yukarıda bahsedilen dört farklı morfolojik yaklaşımın köklerini kültürel, coğrafi, politik ve ekonomik etkilerin fiziksel çevreye bölgesel değişim ve dönüşüm süreçleriyle birlikte araştıran İtalyan, Fransız ve İngiliz okullarının çalışmalarından almaktadır. Bu çalışmanın temelinde kullanılan tarihsel-coğrafi ve konfigürasyonel yaklaşım olarak adlandırılan iki yaklaşım method olarak seçilmiştir.

2.2. Dört morfolojik yaklaşım arasındaki benzerlikler ve farklılıklar

Üç farklı okul yaklaşımı, çeşitli mesleki eğilimler, sosyo-kültürel arka planlar, tarihi süreçler ve araştırma amaçları nedeniyle benzerlik ve farklılıklara sahiptir. Tamamı kent formunu ve tasarlanmış yapının incelenmesi için değerli bir bağlam oluşturmaktadır. Bu üç yaklaşım, farklılık ve benzerliklerinin yanı sıra kentsel tasarım pratiğini destekleyebilecek bilgiler oluşturmaktadır. Dört yaklaşımın benzerlikleri ve farklılıkları Tablo 2 de özetlenmiştir.

Tablo 2. Dört morfolojik yaklaşım arasındaki benzerlikler ve farklılıklar.

	İngiliz Okulu	**İtalyan Okulu**	**Fransız Okulu**	**Konfigürasyonel**
Yıl	1950	1950	1970	1970
Kurucu	Coğrafyacılar	Mimarlar	Farklı Disiplinler	Farklı Disiplinler
Taraftarlar	Conzen Whitehand	Saverio Muratori Giafranco Caniggia Aldo Rossi	Lefebre Paneria Caste Depauri	Bill Hillier, Julienne Hanson ve Bartlet Enstitüsü'ndeki meslektaşları
İlgi odağı	Kent morfogenetik süreci	Kentsel formun tasarımı	Kentsel form ve çeşitli sosyal fenomenler arasındaki ilişki	Binalarda ve kentsel alanlarda mekansal düzenler ve insan faaliyet örüntülerini inceler
Amaç	Şehirler nasıl ve neden inşa edilir?	Şehirler nasıl inşa edilmeli?	Ne inşa edilmelidir ve gerçekte ne inşa edilmiştir?	Mekân dizimi olarak bilinen mekânsal kalıpların analizi
Data	Artzamanlı	Senkronik ve artzamanlı	Senkronik	Senkronik ve artzamanlı
Model	Plan birimleri Morfolojik çerçeve Yapı adaları	Bina türleri Yapı dokuları	Farklı kentsel yapıların sınıflandırılması	Mekân dizimi analizleri
Bağlantılar	Arazi kullanımı, arazi değeri, tarihsel dönemsellik	Kültürel bölge	Sosyal uygulamalar	Hareket, etkileşim; yoğunluk, arazi kullanımı ve arazi değeri; kentsel büyüme ve toplumsal farklılaşma

Kaynak: Yazar tarafından derlenmiştir.

Öncelikle yaklaşımlar arasındaki farklılıkları göz önünde bulundursak; ne tür binaların inşa edileceği ve nasıl tasarlanacağı konusunda büyük bir ilgi gösteren mimarlar, İtalyan Okulu'nu kurmuşlardır ve böylelikle tipolojik bir yaklaşım ortaya çıkmıştır. Daha bilgilendirici ve yorumlayıcı süreci içeren coğrafyacılar İngiliz Okulunu kurmuşlardır. Coğrafyacılar, daha kuralcı teoriler üretme kısmını geliştirmekle ilgilenmemektedikleri gibi daha çok şehirlerin nasıl inşa edileceğini öğrenme yolundadırlar. Fransız Okulu, multidisipliner bilim adamları nedeniyle farklı fenomenleri içerisinde barındıran bir yaklaşım içermektedir.

Bu farklılıkların yanı sıra benzerlikler de bulunmaktadır. Yaklaşımların temel ilkesi, kentin fiziksel formunu kullanılarak okunabilir, analiz edilebilir ve araştırılabilir kılmaktır. Özetleyecek olursak, kent morfolojisi, kentin insan yaşam alanı olarak incelenmesidir (Moudon, 1997). Kent morfolojisi; şehirleri, onların biçimlerini ve özellikle onların gelişimini yöneten sosyo-ekonomik mekanizmayı incelemenin uzun bir geleneğini kapsar (Moudon, 1992). Bir yerleşimin morfolojik evrimi, mekânın niteliklerini ve morfolojiyi etkileyen kilit unsurları tanımlamak amacıyla, tarihsel, fiziksel ve sosyal yönleri temelinde tanımlanabilir ve analiz edilebilir. Kent çalışmaları alanında kent morfolojisi araştırmaları büyük önem taşımaktadır ve kent tipi çeşitli düzeylerde ve farklı yaklaşımlarla incelenmektedir.

3. Method

Bu çalışmada Conzen yaklaşımı ve konfigürasyonel yaklaşım method olarak kullanılacaktır.

3.1. Conzen Yaklaşımı

"Alnwick, Northumberland — Kent planı analizinde bir çalışma", M.R.G. Conzen 1960'da ve ardından tekrar 1969'da tekrar yayınladığı çalışmada görülmektedir ki Conzen'in Berlin'de sürdürdüğü eğitim ve erken araştırmalardan açıkça etkilenmiştir (Wurm, 2017). Kent morfolojisine ilişkin Conzen yaklaşımı üç başlık altında incelenmektedir;

I. Kent planı,

II. Saçak kemer konsepti ve

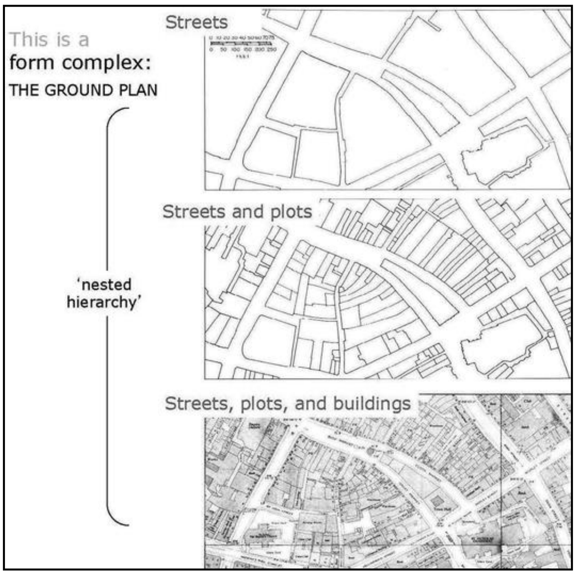
III. Kent manzarası, arazi kullanımı, bina tipi ve plan biriminin bir kombinasyonudur.

Bu çalışma, imar planı analizinin temelini oluşturmaktadır. Kent planı araştırması, kentlerin fiziksel yapısı hakkında geniş bir bakış açısı sağlar ve değişimlere tepki olarak herhangi bir dönemde çoğu şehirde gelişen tarihsel karmaşıklığın doğrudan bir görünümünü sunar.

Kent yapının temel belirleyicileri Conzen tarafından üç bölümde belirtilmektedir: ken planı (veya zemin planı), yapı dokusu (üç boyutlu form) ve arazi kullanımı ve bina kullanımıdır. Kent yapısı belirleyicilerinin kalıcılığının zaman içinde değiştiğini bilinmektedir. Conzen, özellikle kent planı çalışmasına dâhil oldu ve kent planlarının tüm insan yapımı yapıların çerçevesinin ifadesi olduğunu iddia etti. (Moudon, 1994; Whitehand, 2001; Conzen, 1960).

Kent planı, Conzen (1960) tarafından tanımlandığı ve gösterildiği gibi üç unsurdan oluşur (bakınız Resim 2).

1. Sokaklar (ve bunların bir sokak sisteminde düzenlenmesi)
2. Parseller (ve bunların sokak bloklarında toplanması)
3. Binalar (veya blok planları)



Resim 2: Temel kentsel analizin mekansal hiyerarşisi (Oliveira, 2018).

Araştırmanın odak noktası, saha araştırması ve kapsamlı çalışma yoluyla doğrudan gözlem de dahil olmak üzere, yapılı çevrenin mevcut durumu üzerinde olacaktır. Yöntemler, mevcut yapılı çevrenin daha derin bir şekilde anlaşılması ve değerlendirilmesinin yanı sıra eleştirel gözlem ve netleştirmeye katkıda bulunmayı amaçlamaktadır. Bu nedenle, yapılı çevrenin morfolojik analizinin üç aşamayı gerektirmesi muhtemeldir: değerlendirme ve gözlem; analiz ve sonuç.

Kentsel tasarımın en önemli unsurlarından biri, bir şehrin arsa yapısıdır. Bloklar, genel etki alanını ve özel etki alanını birbirinden ayırır. Parseller hem sokakları hem de evlerin barınaklarını tanımlamaya yardımcı olur. Mekansal sınıflandırmada blokları (veya sokak bloklarını) gruplar halinde veya tek parça halinde oluşturan parsellere parsel denir (Conzen, 1960).

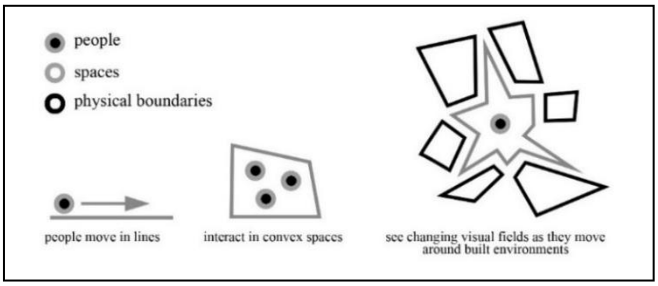
Sokakların ve parsellerin zaman kararlılığı yapılarda mevcut olmasa da kentsel tasarımın en kritik unsurlarından biri kent binalarıdır. Spreiregen'in (1965) tanımladığı gibi "bina, bir şehrin hareketsiz kütleleridir. Binaların düzenlemeleri kütle kalıplarını oluşturur. Binanın düzenlemeleri aynı zamanda kanal ve rezervuar desenleri olarak var olan kentsel alanları da oluşturur".

Morfolojik açıdan sokaklar, kentsel yapının en net bileşenidir. Sokağın tanımı iki ana konu ile bağlantılıdır; şekli ve işlevi. Sokağın işlevi, bu kelimenin en basit tanımından, çeşitli binaları avlularına erişim sağlayarak birbirine bağlayan bir bileşen olarak anlaşılabilir. Bu içerikte; sokak, çeşitli sosyal ve ekonomik amaçlara hizmet eden fiziksel bir unsurdur. Böylece sokak, şehrin üç ana fiziksel bileşeni arasında bir bağlantı görevi görmektedir: sirkülasyon hattı, kamusal alan ve yapılı alan.

3.2. Mekân Dizimi Yaklaşımı

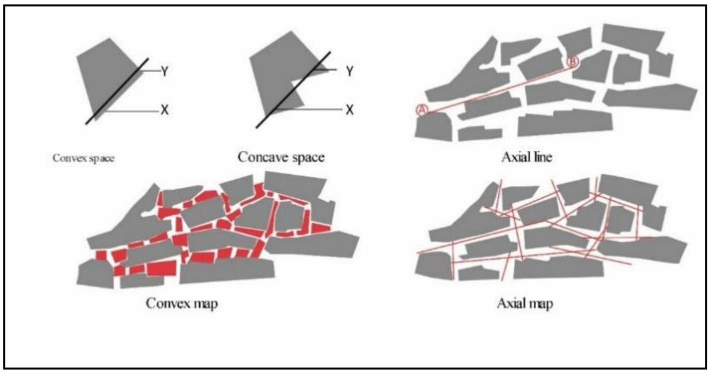
Mekân dizimi 1970'lerin sonu ile 1980'lerin başı arasında Profesör Bill Hillier, Julienne Hanson ve Bartlet Enstitüsü'ndeki meslektaşları tarafından geliştirildi. Bu araştırma grubu, şehrin morfolojisini ve işlev ile ilişkisini analiz etmek için "mekân dizimi" yaklaşımını geliştirdiler.

Tüm insan faaliyetlerinin gerçekleştiği birim mekândır. Mekân, şehrin kültürel ve sosyal yönlerinin bir yansımasıdır. Mekân dizimi, mekânsal bir bağlamdan insan eylemlerini ve sosyal etkinlikleri açıklamaya çalışır. Mekânı, nesnelerin arka planı olarak düşündüğümüz gibi insan faaliyetinin arka planı olarak değil, insanın içsel bir yönü olarak düşünmeliyiz (Hillier ve Vaughan, 2007). Bu açıdan mekân kavramı üç geometrik fikirde tanımlanabilir: insanlar içinde hareket ettikçe doğrusal, içinde etkileşime girdiğinde konvex uzay (her noktanın birbirini görebildiği) ve son olarak, herhangi bir yerden değişken olarak bütün görüş mesafesinde görebildiğimiz alan izovist mekân olarak tanımlanmaktadır. (Benedikt ML, 1979).



Resim 3: Mekan ve aktivite arasındaki ilişki. (Hillier, 2004).

Mekân dizimi harita sonuçlarına ulaşmak için öncelikle bir eksen haritası oluşturulması gerekmektedir. Bu harita kentsel çevre ile yapılı çevrenin mekânsal konfigürasyonunu nesnel olarak değerlendirme fırsatı verir. Oluşturulan eksen haritasının uzamsal konfigürasyonunun dört ana ölçümü vardır. Bağlanabilirlik, bütünleşme (küresel ve yerel) ve anlaşılabilirlik. Bu veriler aynı zamanda bu çalışma için kullanılacak olan girdilerdir. Tablo 3 de bu çalışmanın mekânsal yapısında kullanılan ölçülerin matematiksel tanımını özetlenmiştir.



Resim 4: Mekan dizimi araçları (Hillier, 1983).

Tablo 3. Mekân dizimi ölçülerinin matematiksel tanımları.

Kavramlar	Tanımlar	Formül
Eksenel boğumlanma	Eksenel entegrasyon, eksenel çizgilerin entegrasyonunun bir ölçüsüdür. Düşük değerler, yüksek derecede entegrasyona sahip eksenel bir çizgi anlamına gelir. Eksenel çizgi sayısının bina sayısına bölünmesiyle ölçülür.	L/bina sayısı
Konvex boğumlanma	Bir kent sisteminde açık alanların dışbükey alana bölünme derecesidir.	C/bina sayısı
Eksenel halkalaşma	Eksenel halkalılık, eksen haritasındaki halkaların bir ölçüsüdür.	½L−5
Konvex halkalaşma	Dışbükey sistemin halkalılığı R dışbükey, sistemdeki halkaların sayısı, bu boşluk sayısı için mümkün olan maksimum düzlemsel halkaların oranıdır.	I/2C−5
Izgara eksenelliği	Değer 0 ile 1 arasındadır, yüksek bir değer bir ızgaraya güçlü bir yaklaşımı ve düşük bir değer daha büyük bir eksenel deformasyon derecesini gösterir.	2I1/2 + 2/L
Izgara dışbükeyliği	Bu formül, dışbükey haritayı ortogonal bir ızgarayla karşılaştırır.	(I1/2 + 1)2/c
Dışbükey deformasyon	Izgaranın dışbükey deformasyon derecesi, dışbükey boşlukların sayısı adaların sayısına bölünerek ölçülebilir.	C/I
Eksenel bütünleşme	Eksenel bütünleşme, eksenel çizgilerin entegrasyonunun bir ölçüsüdür. Düşük değerler, yüksek derecede entegrasyona sahip eksenel bir çizgi anlamına gelir.	L/C

Ortalama bağlantı	Bağlantı, belirli bir hatta bağlanan veya kesişen hatların sayısını tanımlayan bir eksen haritasının önemli bir ölçüsüdür.	Düşük veri ortogonal olmayana atfedilir.
Ortalama küresel bütünleşme	En yüksek sayı sistemdeki en bütünleşmiş alandır, en düşük sayı ise sistemdeki en ayrılmış alandır.	Entegrasyon

Kaynak: Hillier,1984; Kubat,1997 tarafından derlenmiştir.

Tabloda görüldüğü üzere dört ana eksenel ölçüm vardır. Bunlar; eksenel boğumlanma, eksenel bütünleşme, ızgara eksenliliği ve eksenel halkalaşmadır.

Eksenel boğumlanma, Hillier ve Hanson'a göre, blok başına düşen eksenel çizgi sayısıdır. Bu mekânsal bir yapının tanecikliliğini gösterir. Düşük bir eksenel boğumlanma değeri daha yüksek bir eksenellik derecesi vermektedir ve daha büyük bir eksenel boğumlanma değeri daha yüksek bir eksenellik kırılma olduğunu göstermektedir.

Eksenel bütünleşme, bir eksen çizgisinin gerçek bağıl asimetri (RRA) değerinin, çizginin ortalama derinlik (MD) değerinin bir fonksiyonudur. Daha yüksek bir RRA değeri, daha büyük bir ayrımı gösterir ve daha düşük bir değer, bir düğümün tüm grafikteki diğer düğümlerle daha yüksek bir entegrasyonunu gösterir. Bu nedenle, bir RRA değerinin tersi olan daha yüksek bir bütünleşme değeri, daha fazla erişilebilirliği, daha düşük bir değer, bir düğümün bir grafiğin diğer düğümlerine göre daha düşük erişilebilirliğini gösterir (Sevtsuk ve Davis, 2019).

Izgara eksenelliği veya ızgaranın eksenel deformasyon derecesi, bir sistemdeki eksenel çizgilerin sayısı ile aynı sayıda ada veya blok içeren düzenli bir ızgarada bulunabilecek sayının karşılaştırılmasıyla ölçülür. (Hillier ve Hanson, 1984)'e göre, genel olarak 0,25 ve üzeri değerler ızgara benzeri bir sistemi gösterirken, 0,15 ve altı değerler daha eksenel olarak deforme olmuş bir sistemi gösterir.

Eksenel halkalaşma, bir sistemin eksen haritasındaki halkaların sayısı, bu sayıda eksen çizgisi için mümkün olan maksimum düzlemsel halkalara oranıdır. Eksen haritası düzlemsel olmadığı için bu değer 1'i geçebilir. Ancak uygulamada 1'den büyük değerler olağandışıdır (Hillier ve Hanson, 1984). Eksenel halkalaşma, kişinin bir alanda ne kadar özgürce hareket edebileceğini gösteren kısıtlamaların bir ölçüsüdür.

Tabloda görüldüğü üzere dört ana eksenel ölçüm vardır. Bunlar; konvex boğumlanma, konvex deformasyon, ızgara dışbükeyliği ve konvex halkalaşma.

Dışbükey boğumlanma, dışbükey boşlukların sayısının bina sayısına bölünmesiyle ölçülebilir. Izgara dışbükeyliği, dışbükey haritayı ortogonal bir ızgarayla karşılaştırır. Yüksek değerler ızgarada az deformasyon olduğunu ve düşük değerler ızgarada daha fazla deformasyon olduğunu gösterir. Bir dışbükey sistemin dışbükey halkalılığı R'dir. Dışbükey, bu boşluk sayısı için mümkün olan maksimum düzlemsel halkaların bir oranı olarak sistemdeki halkaların sayısıdır ve ızgaranın dışbükey deformasyon derecesi, dışbükey sayısına bölünerek ölçülebilir.

4. Metodolojinin Çalışma Alanına Uygulanması

Bu çalışma alanı olarak Galata bölgesi seçilmiştir. Seçilen alan altı parametreye göre seçilmiştir. Öncelikle seçilen çalışma alanında zengin bir tarihi ve kültürel arka plan bulunmaktadır. İkinci olarak, Cumhuriyet döneminden önce kentsel alana ilişkin belgelerin (pervititch haritaları, tarihi fotoğraflar, hava fotoğrafları, CBS yazılımları vb.) bulunabilmesi seçilen alan için önemli bir kriterdir. Üçüncüsü, seçilen çalışma alanının çeşitli derecelerde kentleşmeye sahiptir. Dördüncüsü, seçilen alan kentleşmenin her döneminden bir parça içeren zengin bir kentsel dokuya sahiptir. Beşincisi, bölgenin tarihi gelişimi boyunca planlama ve tasarım kararlarından etkilenmesi ve kentin özgün karakterini oluşturan alanlardaki etkilerin kendini göstermesidir. Son olarak Galataport Projesi'nin planlaması da ilçenin özelliklerinin ve etkisinin sorgulanması gereken bir durum olduğu düşünülmektedir.

4.1. Conzen Yaklaşımı

Conzen yaklaşımı ile kenti bütün olarak tarihsel bir süreklilik içinde sokak sistemi, parsel ve yapı örüntülerinin değişiminden yola çıkarak kentsel mekândaki dönüşüm/değişim incelenecektir.

Galata'da yapılan çeşitli kazılarda bulunan mezar taşlarından bölgenin antik çağda önemli bir yerleşim yeri olduğu anlaşılmaktadır. Akın'a (2002) göre fetih öncesi bir Ceneviz yerleşimi olan Galata, kentsel yerleşim düzeni ve yapıları ile 14. yüzyıl Akdeniz şehirlerinin tipik özelliklerini taşımaktadır. Bölgenin önemli fiziki unsuru etkileyici sur duvarıdır.

16. yüzyılda Galata kozmopolit yapısını korumuştur. Kozmopolit nüfus yapısı ticaret merkezi olma özelliğini de güçlendirmiştir. 16. Yüzyıldan beri var olan tersane ve deniz merkezi Galata bölgesinin denizcilerin ve denizciliğin ana merkezi haline geldiğini göstermektedir (İnalcık, 1996).

17. yüzyılda Galata tüm denizcilik mesleklerini bir arada barındırdığı görülmektedir. Depolar, çarşılar ve gümrükler bu bölgede kümelendiği görülmektedir. Bölgede yelken, denizci feneri, halat ve tel satıcılarının bulunması denizciliğin ve liman bölgesi olma özelliğindendir.

18. yüzyılda İstanbul'un fethinden kısa bir süre sonra Fatih, Osmanlı kontrolündeki Galata'nın yönetimini devraldı. Galata, Osmanlı egemenliğinde kozmopolit bir liman kenti olarak gelişmeye devam etse de dokusu İstanbul'dan oldukça farklıolduğu görülmektedir.

19. yüzyılda; 1887-1891 yılları arasında R. Huber Galata, Taksim, Pangaltı ve Feriköy için bir harita hazırlanmıştır. Galata bölgesinde topoğrafyayı dikkate alan bir sokak ağı olduğu görülmektedir. Bölgenin kıyı kesimi ve iç kesimleri düzensiz bir biçimde birbirine bağlanmıştır. Haritada ana yollar olmamasına rağmen bazı sokakların diğerlerinden daha önemli olduğu görülmektedir. 19. yüzyılın ikinci yarısında Galata bölgesi bir ulaşım düğümü olma özelliğini ve ticari işlevlerini sürdürmüştür. Limanın en önemli konumunda Galata Kulesi'nin altında, Azapkapı'nın doğusunda ve Haliç'in girişinde yer almaktadır. Galata bölgesi bugün olduğu gibi bir yerleşim alanından çok ticaret ve ulaşım alanı olarak limanın getirdiği çeşitli işlevlerle yüklenmiştir.

20. yüzyılda ise oluşan yangından ötürü Yüksek Kaldırım Caddesi de dâhil olmak üzere birçok evi, dükkânı ve cadde kül olmuştur. Pera yangınından sonra Galata bölesinin kent planında grid plan yaygın olarak uygulandı. 20. yüzyılın başlarında 1913 Alman haritasında Yüksek Kaldırım caddesinin yangından sonra genişletildiği ve bazı düzenlemelerin yapıldığı görülmektedir. 20. yüzyılın başlarında Galata bölgesinde özellikle Voyvoda Caddesi, Kemeraltı Caddesi ve çevresinde banka ve hanların tamamen oluştuğu ve Pera bölgesine doğru konut adalarının yer aldığı görülmektedir.

Tarihi haritalar incelendiğinde, Galata bölgesi, başından beri taşıdığı Akdeniz liman kentinin özelliklerini korumaya özen göstermiştir. 1840 haritasında görülen boş araziler 1870'lerde dolduruldu ve 20. yüzyılın başlarında inşa edilen alan kuzey ve kuzeybatıya doğru genişletildiği görülmektedir. 1945 haritasından günümüze kadar gelen Kemeraltı Caddesi ve Bankalar Caddesi ana arteri birbirine bağlayan ana yollar olmuştur. Bu iki aks bölgeyi ikiye ayırmaktadır. Bölgedeki tüm birinci derece yollar Karaköy Meydanı'nda birleşerek bu ana artere bağlanmaktadır. Cumhuriyet dönemi İstanbul'da planlama sorununa yönelik çalışmaların başlangıcı olarak görülebilir. Galata bölgesinin geçmişten günümüze planlama sürecini Şekil 5 özetlemektedir.

1936-1950 Henri Prost çalışmaları bu noktada söz edilmesine fayda vardır. IBB raporuna (2008) göre Henri Prost'un planında; Haliç'in sağ kıyısındaki iki köprü arasındaki gıda satış alanlarının geliştirileceği, balıkçıların Karaköy meydanından Galata Kulesi'ne uzanan yeşil bir alan inşa edeceği belirtilmektedir.

1954 yılında ilk defa Beyoğlu Nazım imar planı yapılmış ve 1980 yılında İstanbul Metropoliten Alan Planı'nda bölge 1/50.000 ölçekli "merkezi iş alanı" olarak belirlenmiştir.

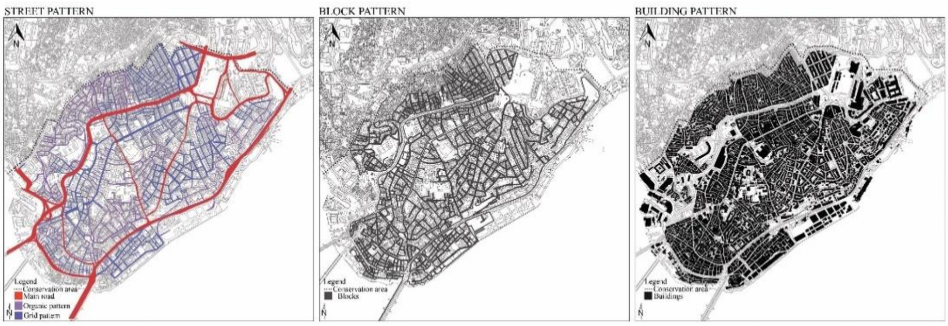
Şu anda 2018 haritasında görülen en önemli gelişmelerden biri de Tarihi Yarımada ile Galata bölgesini birbirine bağlayan metro hattı ve kıyı çalışmasıdır. Karaköy Meydanı ve liman bölgesi tarih boyunca farklı planlama yaklaşımlarıyla düşünülmüştür. Günümüzde yeni projelerle sahil şeridi yaya kullanımına uygun hale getirilmiştir. Meydanın ve limanın bulunduğu iki köprü arasında kalan alan mesire alanı olarak değerlendirilmektedir. 2020 haritasında 2000'li yılların başından itibaren bölgede pazarlama yaklaşımının bölgede morfolojik dönüşümlere neden olan liman fonksiyonlu mega projelere (Galataport ve Haliçport) yol açtığı görülmektedir.

Tarihi haritalar incelendiğinde Galat bölgesinin her dönemin izlerini yansıtmakta ve her döneme ait önemli tarihi yapılarla günümüze ulaştığı görülmektedir. Ana yol üzerinde yapılar, bankalar ve önemli idari merkezler yerleştirildiği ve iç kısım ikinci sınıf ticaret merkezleri haline geldiği görülmektedir. Galata bölgesi banka merkezleri, denizcilik işletmeleri, iş hanları, dükkânları ve tezgâhtarlarıyla İstanbul'un ticaret ve iş merkezlerinden biridir.

Resim 5: İncelenen dönemler için sokak dokusunun gelişimi, önemli değişikliklerle işaretlenmiştir.

Şekil 5'de sokak dokusu üzerinden tarihi haritalara bakıldığında surların 1453'ten sonra yıkıldığı görülmektedir. Daha sonra çıkan yangın ile 1860 yılında Yüksek Kaldırım Caddesi de dâhil olmak üzere birçok ev, dükkân ve caddeyi tahrip etmiştir. Pera yangınından sonra ızgara planın kentsel düzenlemelere yaygın olarak uygulandığı 1887 haritasını görebiliyoruz. Daha sonra 1913 yılında Yangından sonra Yüksek Kaldırım Caddesinin bulunduğu Alman haritası genişletilerek bazı düzenlemeler yapılmıştır. 1945 haritasında Kemeraltı Caddesi ve Bankalar Caddesi, Galata Köprüsü'nden geçen ana arteri birbirine bağlayan ana yollar oldu. 1980 haritasında bölgenin kıyı bölgesinin önemli bir planlama alanı olduğunu görğu görülmektedir. Sonuç olarak araştırma, artan sokak doku ve önemli yapıların yanı sıra bölgenin değişimini ve gelişimini de göstermiş ve analiz etmeyi mümkün kıldığı düşünülmektedir.

Galata bölgesinin fiziksel örüntüleri Şekil 6’da görülmektedir. 1887 yılına kadar var olan ana aksların Yüksek Kaldırım Sokak, Kemeraltı Sokak, Tersane Sokak ve Bankalar Sokak olduğu sokak dokusunda görülmektedir. Bu sokakların önemi uzun yıllardır devam etmektedir. Bu yollar geçmişe kadar ana yol olarak kullanılmaktadır. Bölgenin çekirdeği, birçok tarihi kent merkezinde görülebilen geleneksel organik bir doku olarak planlanmıştır.



Resim 6: Çalışma alanının fiziksel örüntüleri.

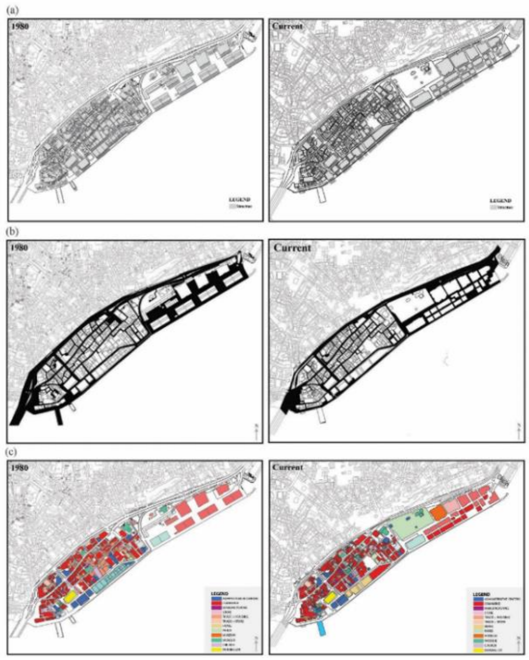
Blok dokusunun, blokların daha küçük ölçekte, yapıyı tanımlama ve çevreleme için deniz alanına yakın olduğu görülmektedir. Panerai, Castex ve Depaule (2004), kentsel bloku, sokaklarla çevrili ve bir kenar ve bir iç kısım tarafından tanımlanan ve kenarın doğrudan cadde ile bağlantılı olduğu ve kamusal alan olarak anlaşıldığı ve iç kısmın özel bir bölge olduğu kentsel eleman olarak tanımlamıştır. Ancak kent merkezinden uzaklaştıkça blok dokusunun ölçek olarak daha büyük olduğu görülmektedir. Bunu yapı örüntüsünde de görebiliriz.

Kenti bütünen analiz etme aşamasından sonra Galataport projesinin değişimleri tespit eedilmiştir.

2000 yılında TDİ tarafından Karaköy Salı Pazarı alanında TDİ'ye ait depo ve binaların yeniden değerlendirilmesi ve alanın şehre kazandırılması için ihale açılmıştır. Geçmişte hem yük hem de yolcu taşımacılığı için kullanılan alan, günümüzde Galataport projesi öncesi sadece yolcu taşımacılığı olarak işlevini sürdürmektedir. Galataport projesi ile bölgenin farklı işlevler kazanarak kültür, turizm ve ticaret merkezi haline geleceği ve böylece İstanbul'a yeni değer katacağı düşünülmektedir. Projenin ana nedeni olarak liman kapasitesinin yetersizliği gösterilmiş ve çözüm olarak kıyıya çıkan gemi sayısını artıracak ve turizm kapsamında otel, restoran, alışveriş merkezi gibi yeni işlevlerin artırılacağı bir model önerilmiştir.

Sahil şeridinin tamamı kruvaziyer limanı kullanımına ayrılmıştır. Proje kapsamında fonksiyonel değişiklikler de planlanaktaıdr. Bölgede tarihi Postane, fuar ve sergi salonları, sahildeki tarihi han binaları ise otel işlevne değiştirilecektir. Tophane tarafında meydan ve tescilli tarihi yapılar ve mekansal unsurlar korunmuştur. Ancak rıhtım hattına oteller, ofis binaları, satış alanları ve marina gibi yeni kullanımlar eklenmiştir. Sahil bandının fonksiyonel dağılımı oteller, terminaller, kongre merkezleri gibi toplu kullanımın dahil edilmediği yarı özel kullanımlar olarak planlanmıştır.

Resim 7 incelendiğinde, Tophane Meydanı dışında alanda halka açık bir açık alanın olmadığı görülmektedir. Binalar arasındaki küçük ölçekli açıklıklarda otel ve restoranların yarı özel kullanımları görülmektedir. Projede silüeti değiştiren ve kamusal bir açık alan oluşturan tek nokta Tophane Meydanıdır. Ancak aslında bir kıyı Meydanı olan ve şehir hafızasında kıyı meydanı olarak bilinen Tophane Meydanı, denizle tam anlamıyla buluşamamaktadır. Meydan yine kıyı şeridinin gerisinde yer almaktadır ve önünde batı yönünde akvaryum olarak planlanmış bir yapı bulunmaktadır. Alanın geri kalanı limanın kullanılması ile meydanın kıyıdaki konumunu kaybetmesine neden olacağı görülmüştür. Karaya yanaşacak yolcu gemileri, meydanı tamamen kapatan ve deniz kıyısını engelleyen boyuttadır.

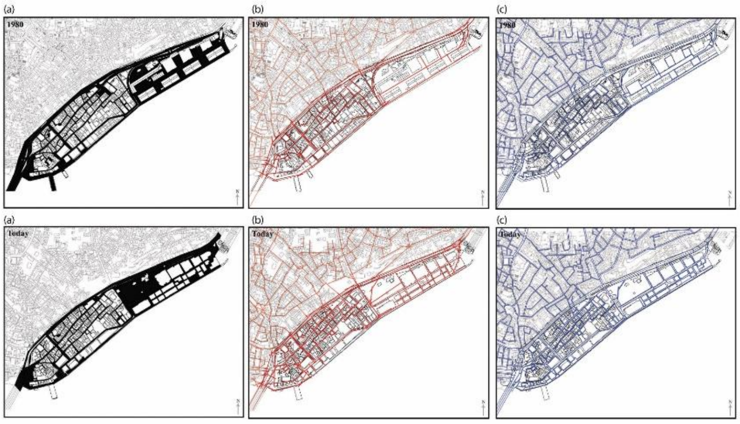


Resim 7: Galataport projesinin 1980 ve günümüz (2020) durumu.

4.2. Mekân Dizimi Yaklaşımı

Çalışmanın bu kısmında, bir önceki bölümde tespit edilen sonuçlar mekân dizimi yöntemi ile vurgulanacaktır. Morfolojik değişimin tanımında bağlantı, bütünleşme ve anlaşılabilirlik parametrelerine dayalı matematiksel analiz süreci gerçekleştirilecektir. Bu analiz, bölgenin tarihsel süreç içinde nasıl değiştiğini ve Galataport proje alanının etkisini görmek için yapılmıştır. 1990 ve 2020 yılı haritaları kullanılarak karşılaştırmalı bir sonuca varmak hedeflemiştir.

Parametrelere ulaşmak için öncelikle mekân dizimi ile morfolojik analiz için gerekli girdiler oluşturulmuş ve analiz edilmiştir. Resim 8 de bölgenin açık alan haritası sonrasında planın konvex haritaya dönüştürülmesi ve haritanın bir eksen haritasına dönüştürülmesi görülmektedir. Bu verilerin gerekli formüller uygulanarak belirlenmesinden sonra, seçilen örnek alanın morfolojik özellikleri, sözdizimsel ölçülerin karşılaştırmalı bir analizi ile tespit edilebilir. Seçilen alanın tarihi ve ticari etkilerden kaynaklanan benzerlikleri ve farklılıkları, limanın konumundan da analiz edilerek, kentsel yerleşimdeki mekânın karşılaştırmalı analizleri ve genellemeleri elde edilmiştir. Çalışma alanlarından elde edilen mekansal ölçüler özetlenmiş ve sunulmuştur.



Resim 8: Bölgenin 1980 (üstte) ve günümüzdeki (altta) haritaları: (a) açık alan haritası (siyah olarak gösterilmiştir); (b) planın konvex haritaya dönüştürülmesi; (c) haritanın bir eksen haritasına dönüştürülmesi.

Tablo 4. Çalışılan dört dönemin matematiksel değerleri dizimi.

Özellikler	1990	2020	Ortalama Değer
L= Eksenel çizgi sayısı	106	116	111
C= Konvex boşluk sayısı	231	257	244
I= Ada sayısı	36	48	42
B= Bina sayısı	316	362	339
Konvex ölçüleri			
Konvex boğumlanma (C/B)	0,7310	0,7099	0,7205
Konvex deformasyon (C/I)	6,4167	5,3542	5,8854
Izgara dışbükeyliği((I1/2+1)2/C)	0,2121	0,2446	0,2283
Dışbükey halkalılık (I/(2*C-5)	0,0788	0,0943	0,0865
Eksenellik ölçüleri			
Eksenel boğumlanma (L/B)	0,3354	0,3204	0,3279
Eksenel bütünleşme (L/C)	0,4589	0,4514	0,4551
Izgara eksenelliği ((I1/2*2)+2)/L)	0,1321	0,1367	0,1344
Eksenel halkalılık (I/(2*L-5)	0,1739	0,2115	0,1927
Entegrasyon ölçüleri			
Entegrasyon	1,1980	1,3970	1,2975
Anlaşılırlık ölçüleri			
Anlaşılırlık	0,4044	0,3344	0,3694
Sinerji ölçüleri			
Sineji	0,4589	0,4787	0,4688

Kaynak: Hillier,1984; Kubat,1997 tarafından derlenmiştir.

1980 haritası ve güncel harita için eksenel boğumlanma değerleri 0,3354, 0,3204 ve ortalama değer 0,3279'dur. 1980 haritasındaki alan, parçalı ve organik kentsel dokusu nedeniyle ortalama değerden daha yüksek bir eksen boğumlanma değerine sahiptir.. Ancak projeden sonra, düşük değerlere sahip alanın daha yüksek derecede eksenellik gösterdiği ve yüksek değerlerin yerleşmede kırılmalar gösterdiği görülmektedir. Ulaşımdaki sapmaların azaldığı ve daha lineer hareketli akslar ile bölgede ulaşımın sağlanacağı sonucunu vermektedir.

Eksenel bütünleşme, eksenel çizgilerin sayısını dışbükey boşlukların sayısıyla karşılaştırmamızı sağlar. Düşük değerler, dışbükey uzayda daha yüksek bir eksenel bütünleşme derecesini gösterir. 1980 haritası ve mevcut harita için eksenel bütünleşme değerleri 0.4589, 0.4514 ve ortalama değer 0.4551'dir. Ortalama değerden daha düşük değerler, dışbükey mekânın yüksek düzeyde entegrasyonunu gösterir. Günümüzde eksenel bütünleşme değeri, dışbükey mekânların eksenel bütünleşme derecesinin daha yüksek olduğunu göstermekte ve geçmişte düşük eksensel bütünleşme gösterilen bölgelerin çeşitli burulma ve açısal birleşmelerden oluştuğu önceki haritalarda görülmektedir.

Izgara eksenelliği, 0 ile 1 arasında bir sonuçtur, ancak daha yüksek değerler, daha iyi bir ızgara yaklaşımı ve düşük değerlerde daha yüksek bir eksenel deformasyon derecesi göstermektedir. Her iki haritada ortalama gridaksiyellik seviyesi 0.1344'tür ve her iki yıl karşılaştırması da yakındır; yine de, kentsel örüntülerin yakından incelenmesi, bu yapıların eksenel olarak deforme olmadığını göstermektedir. Buna karşılık, mevcut haritada ortalama değerden daha yüksek olan grid eksenellik değeri (0.1416), caddelerin kesişimini daha fazla T-kavşak ile değiştirerek basitleştirilmiş bir örüntü izleyen, daha sembolik ve resmi bir mekansal örüntü sağlayan bir ızgara düzeni anlamına gelir.

1980 için ve mevcut harita değeri 0.1739, 0.2115 ve ortalama değer 0.1927'dir. Bu değer, genel değerlendirmede akslar arasındaki bağlantının güçlü olduğunu göstermektedir. Ancak bir tahminde bulunmak gerekirse, bu değerin önceki dönemlere göre daha yüksek olması proje sonrasında akslar arasındaki bağlantının zayıflayacağına işaret ediyor. Bu yüksek değerler aynı zamanda projedeki ızgara düzenini de gösterir.

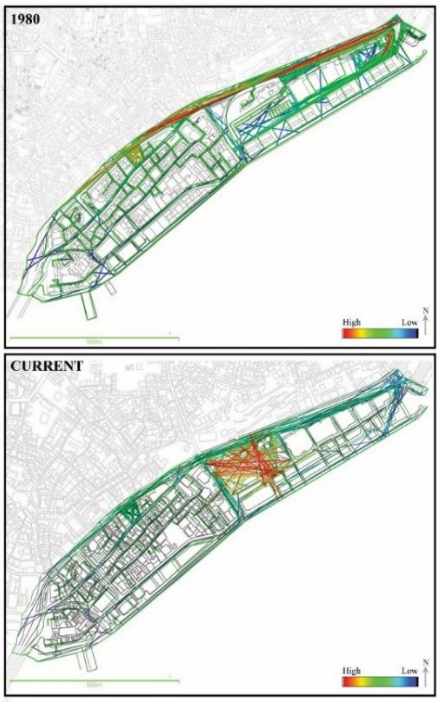
Açık sistemin halkalığını ölçmek için dışbükey uzayda halkalılık değerlerinin hesaplanması gerekir (A.S. Kubat, 1997). 1980 ve güncel harita değeri için eksenel halkalılık değerleri 0.1739, 0.2115 ve ortalama değer 0.1927'dir. Bu değer, genel değerlendirmede akslar arasındaki bağlantının güçlü olduğunu göstermektedir. Ancak bir tahminde bulunmak gerekirse, bu değerin önceki dönemlere göre daha yüksek olması proje sonrasında akslar arasındaki bağlantının zayıflayacağına işaret ediyor. Bu yüksek değerler aynı zamanda projedeki ızgara düzenini de gösterir.

1980 ve mevcut harita değerleri için dışbükey boğumlanma değerleri 0.7310 ve 0.7099 ve ortalama değer 0.7205'tir. Ortalama değerden daha düşük değerler, alanın dışbükey boşluklarında daha az kırılma ve dolayısıyla daha fazla eşleme gösterir. Dışbükey boğumlanma için 1980 harita değeri (0.7310), birçok bükülme, birim uzunluk başına dönüş ve dışbükey boşlukların genişliklerindeki değişiklikler ile asimetrik ve organik deseni doğrular. Bu, açık alan yapısında daha fazla parçalanmaya ve daha az uzamsal senkronizasyona (asenkron) neden olur. Ancak mevcut harita değeri (0.7099), kentsel yapıda daha az parçalanma ve eşzamanlılık ve ayrıca sürekli bir doğrusal ana eksenin varlığını göstermektedir. Bu, çalışma alanının açık alan yapısında daha fazla parçalanmaya ve daha az uzamsal eşzamanlılığa (asenkron) neden olur.

1980 ve güncel harita için dışbükey deformasyon değerleri 6.4167 ve 5.3542 olup, ortalama değer 5.8854'tür. Daha yüksek dışbükey deformasyon değerleri, daha düzensiz bir açık alan ağı önerir. Değerlerin birbirine yakın olduğu söylenebilir ancak geçmişte alan daha düzensiz açık alanlara sahiptir. Ancak daha büyük bir ölçekte bakıldığında Galata bölgesi tarihi merkezi en yüksek değere sahip olduğu görülmektedir.

Izgara dışbükeylik için Hillier & Hanson'a göre, bu formül 0 ile 1 arasında bir değer vermelidir, yüksek değerler daha az grid deformasyonunu, düşük değerler ise çok fazla grid deformasyonunu belirtmektedir. 1980 için grid dışbükeylik değerleri ve mevcut harita değeri 0.2121, 0.2446 ve ortalama değer 0.2283'tür. Çalışma alanının düşük sözdizim değeri, ızgara deformasyonunun yüksek olduğunu gösterir, bu da kentin açık alan düzeninin geometrik olmadığı ve mevcut harita için daha yüksek bir değere sahip yüksek mekânsal değeri, tarihsel zamanda uygulanan geometrik ızgaraların az deformasyonunu gösterir.

Dışbükey halkalılık, bu boşluk sayısı için mümkün olan maksimum düzlemsel halkaların oranı olarak sistemdeki halkaların sayısıdır (Hillier ve Hanson, 1984). 1980 ve mevcut harita dışbükey halkalılık değerleri 0.0788, 0.0943 ve ortalama değer 0.0865'tir. Projeden sonra alanın daha yüksek bir değere sahip olması, açık yapıda hiçbir kıvrım veya eğri göstermediği ve bu alanda gözlemlenen daha ızgara benzeri kentsel yapıyı doğrular.



Resim 9: Bölgenin 1980 (üstte) ve günümüzdeki (altta) haritaları: (a) açık alan haritası (siyah olarak gösterilmiştir); (b) planın konvex haritaya dönüştürülmesi; (c) haritanın bir eksen haritasına dönüştürülmesi.

Galataport projesi sonrası elde edilen entegrasyon değerinden ve ortaya çıkan entegrasyon haritasından, proje sonrası bölgenin, özellikle kıyı şeridinin yoğunluğunun, erişilebilirliğinin ve çevre dokusu ile ilişkisinin artıp artmadığı okunabilmektedir. Küresel ölçekte bir önceki bölümde görüldüğü gibi proje daha entegre bir yerleşime işaret edecektir. Ancak yerel ölçekte bakıldığında değerin bir önceki döneme göre daha düşük olduğu görülmektedir. Bu da projenin kıyı bölgesi ile kentsel doku arasındaki ilişkiyi güçlendirecek bir yapıda olmadığını gösteriyor. Buna karşılık kıyı bandında ise tüm kıyı bölgesinin entegrasyon derecesinin ve bu bölgeye ulaşan bağlantıların düşük olduğu görülmektedir. Galataport projesinin yer aldığı kıyı bölgesinin entegrasyon seviyesinin düşük olması, bu bölgenin çevresiyle bağlantısı zayıf, kapalı alanda çalışacak bir yer olacağını gösteriyor. Kıyıya erişim ve kıyı kullanımı açısından da kıyı şeridine erişim düşük görülmekte ve kullanım yoğunluğunun zayıf olacağı öngörülmektedir. Bu durum, projede hedeflenen deniz-insan ilişkisinin güçlendirildiği, kamu kullanımına açık, kolay erişilebilir bir kentsel kıyı alanı üretiminin gerçekleşmeyeceği sonucunu doğurmaktadır.

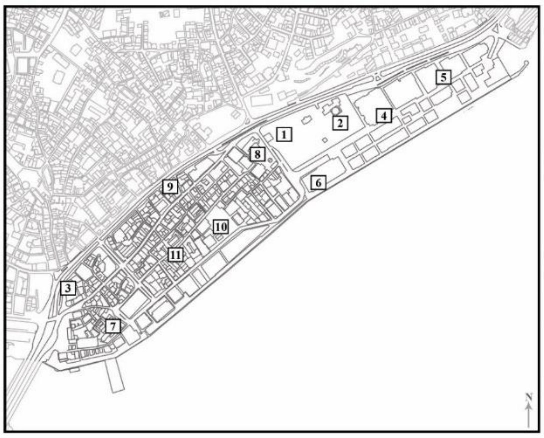
Alanın düşük anlaşılırlığı, şehir kullanıcıları için net bir şekilde anlaşılmadığını ve onu bulmanın ve içinden geçmenin kolay olmadığını gösteriyor. Yüksek anlaşılırlık, aynı zamanda iç bütünleşme ile şehir merkezi olan küresel bütünleşmenin daha yüksek olduğu alanları ortaya çıkarmaktadır. Başka bir deyişle anlaşılır bir sistem, bir kentsel sistemdeki iyi bağlantılı alanlar anlamına gelir. Çoğunlukla, bu alanlardaki ekonomik faaliyetler ve hizmetler uzun vadede yoğunlaşacaktır. Ayrıca metodoloji bölümünde verilen açıklamaya göre, eğer saçılım grafiğindeki noktalar sol alttan sağ üste doğru 45 derece yükselen düz bir çizgi oluşturuyorsa, bu yerel entegrasyon ile küresel entegrasyon arasında iyi bir korelasyon olduğunu gösterir.

Mekansal analiz sonuçlarına göre, mevcut haritanın (0,3344) yapıdan yoksun uzamsal yapısının geçmişe (0,4044) göre daha az anlaşılır olduğu, ortalama değerden (0,364) yüksek değere göre daha anlaşılır olduğu bulunmuştur. . Bu da Galataport projesinin kullanıcılara anlaşılır olmayacağı anlamına geliyor.

Entegrasyon değeri aynı zamanda büyük kentsel alanı veya bölge ile büyük bina etkileşimini tespit etmek için de kullanılacaktır.

Çeşitli kentsel unsurları harita üzerinde konumlandırarak toplum-mekan ilişkileri analiz edilebilir. Bu analiz için, yalnızca kentin tarihinde baskın bir rol oynayan "şehrin ana unsurları" olarak adlandırılan büyük binalar veya büyük kentsel alanlar belgelenmiştir.

Şehrin bu temel unsurları, şehirdeki hareketin ana jeneratörleri veya çekicileridir ve aynı zamanda şehrin kültürel ve sanatsal temsillerinin tezahürleridir (Karimi, 1997). Bu analizde şehrin entegrasyon haritası üzerinden ana mekansal unsurlar konumlandırılmıştır. Değerler ayrıca Tablo 5'te de görülmektedir. Kentsel unsurların küresel entegrasyon sıralaması, çalışma alanının sosyal ve mekânsal önemini vurgulamaktadır. İnşaat sonrası en yüksek değeri Tophane Meydanı'nın aldığı, bunu yeni projeden de etkilenen Nusretiye Camii'nin takip ettiği görülmektedir. Kentsel yapının bir diğer önemli yönü de yeni Proje ile birlikte kente katılan müze ve entegrasyon değeri düşük olan İstanbul Modern binasıdır. Aynı şekilde Galataport Projesi entegrasyon sıralamasının da düşük olduğu görülmektedir.



Resim 10: Bölgenin 1980 (üstte) ve günümüzdeki (altta) haritaları: (a) açık alan haritası (siyah olarak gösterilmiştir); (b) planın konvex haritaya dönüştürülmesi; (c) haritanın bir eksen haritasına dönüştürülmesi.

Tablo 5. Çalışılan dört dönemin matematiksel değerleri dizimi.

Rank	Principal urban elements	Global Integration value
1	Tophane Square	2,0160
2	Nusretiye Mosque	1,9105
3	Karaköy Palas	1,6669
4	Museum	1,4720
5	Galataport Project	1,4439
6	İstanbul Modern	1,4120
7	Yeraltı Mosque	1,3981
8	Kılıç Ali Paşa Mosque	1,3585
9	Surp Krikor Church	1,3421
10	French Gateway	1,1915
11	Aya Nikola Church	0,7098

Kaynak: Hillier,1984; Kubat,1997 tarafından derlenmiştir.

5. Sonuç

Kent bugünkü formunu Bizans, Osmanlı ve Cumhuriyet dönemlerinde almıştır. 19. yüzyılda kentin imarına ilişkin düzenlemeler sebebiyle bölge mekânsal dönüşümler geçirmiştir. Surların yıkılması, yolların genişletilmesi ve yenilenmesi, sokakların aydınlatılması, rıhtımların genişletilmesi, köprülerin yenilenmesi, yeni yapıların yığma olarak yapılması gibi kararlar, Galata'da kentsel gelişim hareketlerine uygun olarak gelişme sürecinin benimsendiğini göstermiştir. Galata bölgesi bu değişimlerle beraber ulaşım odak noktası ve ticari merkez noktası olma özelliğini 19. yüzyılın ikinci yarısına kadar sürdürmüştür. Başka bir deyişle, başından beri taşıdığı Akdeniz liman kentinin özelliklerini korumaya özen göstermiştir. Bölgede topografyaya uygun sokak ağı oluşturulmuştur. Tarihi haritalar incelendiğinde Galata Meydanı ile liman alanı daha önceki yüzyıllarda da görülebilecek yakın bağlantılar içermektedir. Gelişen strateji ile bu liman ilişkisinin süreç içinde ortadan kalktığı görülmektedir. Bölgenin aktivite merkezi ağırlıklı olarak Galata'nın tarihi çekirdeği olarak tespit edilmiştir ancak farklı planlama kararlarıyla çekirdeğin güneyde İstiklal Caddesi ve Karaköy Limanı'na doğru kaydığı haritalardan görülmektedir. Bu olgu planlanan yeni projeyle ilişkilidir. Galataport projesinin raporuna göre planlanan bu projenin şehrin bir görüntüsü olması planlandığı belirtilmiştir.

20. yüzyılda, tarihi haritalardan anayol tespit edilmese de bazı sokakların diğerlerinden daha önemli olduğu görülmektedir. Bu ana aksların Yüksek Kaldırım Sokak, Kemeraltı Sokak, Tersane Sokak ve Bankalar Sokak olduğu görülmektedir. Bu sokakların önemini tarih boyunca tespit edebiliyoruz. Ayrıca 1860'lı yılların sonlarına kadar kıyı ile kent arasındaki sınırı oluşturan tahkimatların yıkılması ve rıhtımların genişletilmesinden sonra surlar ortadan kalkmış, ancak aynı noktalardan denize ulaşılmıştır. Ancak yeni liman binalarının yapılması ve kontrollü bir gümrük bölgesinin oluşturulmasıyla birlikte kıyı sınırı daha aşağı paralele indirgenmiş ve kıyılar halkın kullanımına kapatılmıştır.

Günümüzde ise, özellikle Kemeraltı Caddesi'nin güneyinde kalan kısmında, en eski işlevi olan liman kenti özelliklerini, buluşma, değişim ve kısa süreli varlık alanları olarak sürdürmektedir. 2000'li yılların başından itibaren Salıpazarı ve Haliç tersanelerinin yakınındaki bölgenin liman fonksiyonlu mega projelere (Galataport) pazarlanması yaklaşımı bölgede morfolojik ve tipolojik dönüşümlere yol açmıştır.

Araştırma sorusu olan "Galataport Projesi (yeni liman projesi) mekânsal yapı içerisinde etkili midir ve bir bölgenin karakteristik özelliği midir?" şu şekilde özetleyebiliriz. Galata bölgesi tarihten bu yana farklı liman projelerinin ve yaklaşımlarını geliştirmiştir. Tarihi süreç boyunca liman kullanımı ile kıyı alanı istenilen bütünleşmeyi sağlayamamış ve pasif kalmıştır. İşlev değişikliği ile bölgenin en büyük etkinliği, avantajı olan ve işlev olarak değiştirilmesi gereken kentsel kıyı bölgesidir. Galataport projesi ile bölgenin farklı işlevler kazanarak kültür, turizm ve ticaret merkezi haline geleceği ve böylece İstanbul'a yeni değer katacağı düşünülmektedir. Galataport projesi içerisinde otel, ofis alanları, restoran ve mağazaların yer aldığı bir liman ve kentsel dönüşüm projesidir. Projenin ana hedefleri, Salipazarı kruvaziyer limanının güçlendirilmesi ve bölgenin liman ve yapılarla yenilenmesi olarak tanımlanırken, beklenen kazanımlar arasında proje ile canlandırılacak turizm faaliyetlerinin yakın çevresi ve sağlayacağı olumlu etkiler sayılabilir.

Alanın morfolojik karakterine bakıldığında, projede üretilen yeni mekânların sahilin tarihi dokusunu, meydanın sahil konumunu ve sahilin kamusal kullanımını güçlendirme etkisinin olmadığı öngörüsü ortaya çıkıyor. 1,2 km'lik sahil şeridinde yanaşacak yolcu gemilerinin kıyıda morfolojik bir oluşum duvarı gibi davranacağı gözlemlenmiştir. Mevcut dört antreponun terminal binası olarak yerini alması planlanan yapılar, mevcut olanlardan daha büyük ölçekli ve kıyı şeridini tamamen kaplayacak boyutta olduğu görülmüştür. Bu da kıyıdaki fiziksel dokunun daha büyük ölçekte yeniden üretilmesi ve kentte yeni bir morfolojik karakterin oluşması anlamına gelmektedir. Ek olarak alanda Tophane Meydanı dışında halka açık bir açık alanın olmadığı görülmektedir. Otel ve restoranların yarı özel kullanımları sadece binalar arasındaki küçük ölçekli açıklıklarda görülebilmektedir. Projede silüeti değiştiren ve kamusal bir açık alan oluşturan tek nokta Tophane Meydanı ancak aslında bir sahil meydanı olan Tophane Meydanı denizle tam olarak karşılanmamaktadır. Karaya yanaşacak kruvaziyer gemiler,, meydanı tamamen kapatan ve deniz-kıyı algısını engelleyen boyuttadırlar. Dolayısıyla oluşturulan yeni fiziksel dokunun, projede belirtildiği gibi kent dokusuyla bütünleşik, kolay erişilebilir ve kullanıcıların kullanımına açık bir kıyı bandı olarak çalışmayacağı tespit edilmiştir.

Bu olguları haritalardan ve görsel analizlerden tespit ettikten sonra proje alanı mekan dizimi ile de test edilmiştir.

İki dönemin (1980 -2020) ortalama bütünleşme değerleri birbirine yakındır. Ancak alanın bütünleşme dağılımı kendi içinde mekânsal ve eksenel olarak değişmiştir. Bu dönemde, küresel bütünleşme değeri bir önceki döneme göre artmıştır. Ancak entegrasyondaki küresel artışa rağmen, kıyı bölgesinin bütünleşme seviyesinde önemli bir değişiklik yoktur ve kıyı bölgesinin bütünleşme seviyesi yine düşük çıkmıştır. Bölgesel artışın nedeni olarak 1950'li yıllardaki imar hareketleri kapsamında alandaki ana aks ve bağlantıların genişlemesi, kıyıya erişimi sınırlayan yeni fiziki oluşumlar ise kıyı şeridinde yer almasının olarak gösterilebilir. Alanın hem kendi içindeki mekansal geçişlerinin hem de çevresiyle olan ulaşım bağlantılarının düşük düzeyde entegrasyonu, kıyıdan sonra alanın kentsel doku (çevre) ile olan ilişkisinin ve bağlantısının kopacağını göstermektedir. Anlaşabilirlik ise proje öncesi hesaplanan değer 0.3444 olarak bulunmuştur ki bu da aralığın zayıf bir seviyesini göstermektedir. Galataport için hesaplanan anlaşılırlık seviyesinin de bütünleşme seviyesi kadar düşük olması, Galataport'tan sonra sahilin kullanıcıların anlaması zor olan karmaşık bir mekânsal düzenleme içinde olacağını göstermektedir.

Bu kapsamda öneriler;

I. Projenin raporuna göre bu çalışma şehrin bir imgesi olacağı belirtilmiştir. Ancak mekân dizimi analizlerinden elde edilen nicel bulgular, kentsel kıyı şeridi alanının bir kıyı düzenlemesi gerektirdiğini göstermektedir.

II. Alanın morfolojik karakterine bakıldığında, projede üretilen yeni mekânların sahilin tarihi dokusunu, meydanın sahil konumunu ve sahilin kamusal kullanımını güçlendirme etkisinin olmadığı öngörüsü ortaya çıkıyor. Önceden bahsedildiği gibi, 1,2 km'lik sahil şeridinde kruvaziyer gemilerinin yanaşacağı ve terminal kullanımı için kıyıda duvar görevi gören morfolojik bir oluşuma sebep olacağı tespit edilmiştir. Kıyıda sürdürülen liman fonksiyonunun fiziki dokusunun hem kıyı şeridinin kamusal kullanımına hem de kıyının anlaşılabilirliğine engel olduğu görülmektedir. Limanın başka bir alana taşınmasıyla bölgenin sorunlarına (kıyıya ulaşım, denizin algılanması, kıyının kamusal bir boyut kazanılması gibi) çözümler üretilebilir.

III. Bu nedenle, tarihi haritalardan hareketle Henri Prost'un liman alanının şehir merkezindeki kıyıdan Marmara kıyısına taşınması önerisi sonraki planlama kararlarında dikkate alınmalıdır.

IV. Limanın başka bir alana taşınmasından sonra bu alandaki arazi kullanımının rekreasyonel kullanım için düzenlenmesi önerilmektedir.

Daha sonraki çalışmalar için öneri olarak; öncelikle morfolojik bölge analizleri sonucunda belirli bir alan analiz edilmiştir. Ancak farklı bir çalışma alanı sınırı seçmek de mümkündür. Galata bölgesinin tüm kıyı şeridi odak alanı olarak yeniden işlenebilir. İkinci olarak, Galataport tamamlanmış bir projedir ve Haydarpaşa Limanı veya Haliçport Projelerinin yenilenmesinde bu girdilerin dikkate alınması gerektiğini düşünülmektedir. Küreselleşme bağlamında liman alanlarının yenilenmesi kentsel ileri görüşlülükle, mevcut toplumsal rollerin ihtiyaçları dikkate alınarak planlanmalı ve tarihi, kültürel ve ulusal değerlerle çelişmeden birbirini destekleyen bir formatta ele alınmalıdır.

Notlar:

Bu çalışmaya yorumları ile büyük katkısı olan, bilgi birikimleriyle çalışmama farklı açılardan bakmamı sağlayarak, hem yüksek lisans tezimin hem de bu makalenin gelişmesine katkıda bulunan değerli hocam Prof. Dr. Ayşe Sema Kubat’a sonsuz teşekkür ederim.

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WHAT IS A "NATURE THERAPY" AND HOW IS IT APPLIED?

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Abstract

It has been observed that hospital environments cause negative physical and spiritual effects by increasing the tension on users due to negative effects such as limitation, lack of privacy, light and noise on patients during the treatment process. Health institutions include the natural spaces they have created in order to relieve these negative effects from the situation they are in. It has been the subject of many studies that natural areas have beneficial effects on different types of patients, but the effects of hospital gardens, especially on cancer patients, have not been studied yet. Today, medical centers and hospitals have a major and sensitive role in maintaining and restoring the physical and mental health of individuals in a society and creating physical and mental balance, so it is necessary to apply certain subtleties in the design of such centers. The most effective methods today for the patient's body is the use of nature therapy methods. In this research, the nature therapy method was explained. At the end of the research, the proposed solutions for creating a space with a nature therapy update are explained. By observing these points, we increase the quality of the treatment environment and reduce the patients' stress.

Keywords: Nature Therapy, Health center, Hospital gardens.

Introduction

Despite significant advances in medical science, cancer remains one of the most important diseases of the present century and the second leading cause of death after cardiovascular disease. Despite significant advances in medical science, cancer remains one of the most important diseases of the present century and the second leading cause of death after cardiovascular disease. Cancer with more than one hundred types of malignant tumors can occur in all people in all age groups, sex, race, ethnicity, and socio-economic groups. All human beings have the potential to be infected, and no one is an exception. An estimated 1.6 million new cases of cancer are diagnosed worldwide each year, of which 1.3 million die from cancer (Sherman et al., 2005).

Cancer is a chronic and destructive disease that affects all aspects of a person's life and requires special attention to discuss the quality of life in cancer patients. Over the past two decades, quality of life has been one of the most important topics in clinical research and has been approved as one of the effective aspects in patient care and its evaluation to identify differences between patients, predict disease outcomes and evaluate interventions. Therapeutic has been used.

Access to quality of life information not only paves the way for more effective treatments and future advances but is also very effective in promoting support programs and rehabilitation measures. Today, people want to improve the quality of life, and therefore governments around the world are increasingly paying attention to improving the quality of life of their people and trying to reduce morbidity and death, and provide health services, physical and mental well-being, socialize more people

The World Health Organization defines the quality of life as each individual's understanding of life, values, goals, standards, and interests and states that the ultimate goal of palliative care is to achieve the best quality of life for patients and their families. Therefore, quality of life should be considered as a measure of the main outcome for patients with advanced cancer at the end of life.

Despite addressing various dimensions of quality of life in various studies, according to a significant number of researchers, the concept of quality of life is strongly rooted in thinking about health. A good example of an approach in which health is the result of genetic factors, environment, quality of health care, behavior/lifestyle, is the Blum model. A more accurate model by Evans & Stoddart can be seen in Figure 2.

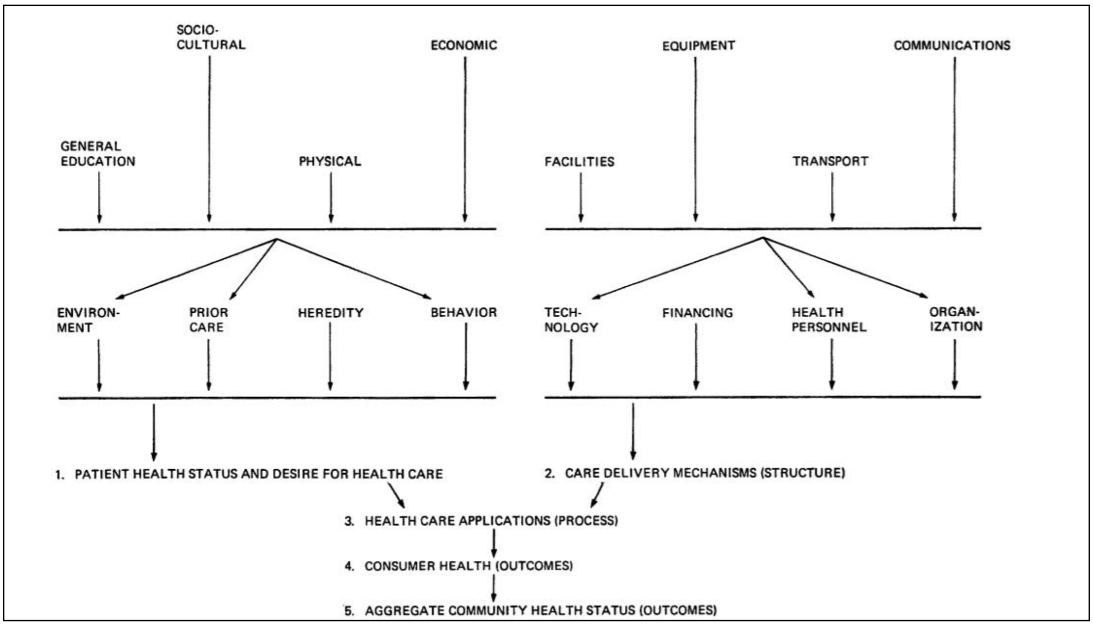

Figure 1. Outline of the health care encounter for purposes of quality improvement

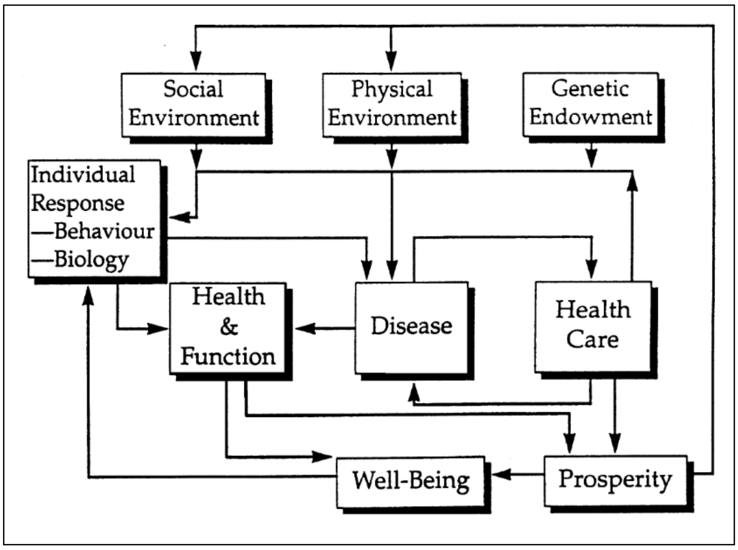

Figure 2. Canadian Institute for Advanced Research model of the determinants of population health (Evans et al., 1994).

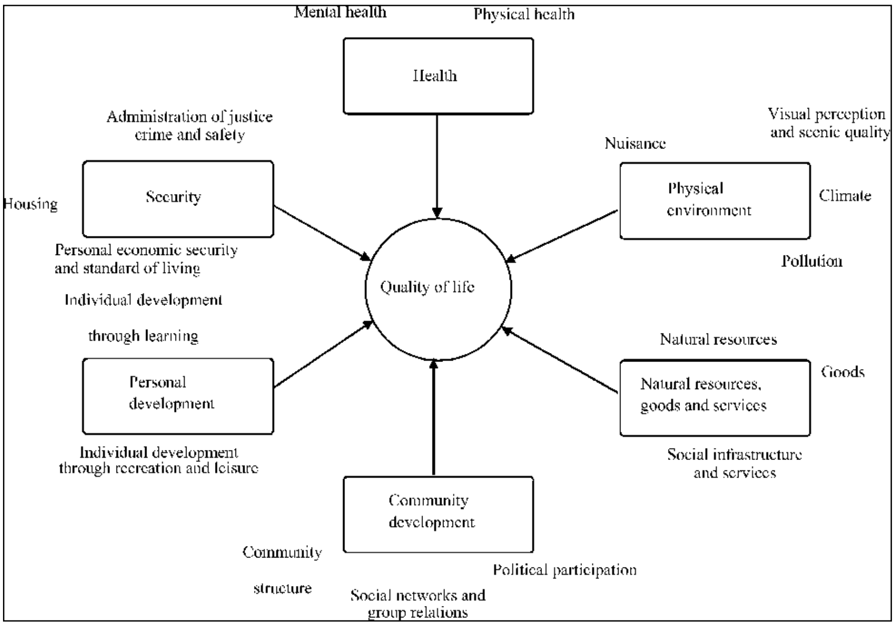

Figure 3. Quality-of-life components (Mitchell, 2000).

Chronic diseases such as cancer are among the disorders that severely affect people's health and thus their quality of life. Diagnosing cancer is a very unpleasant and unbelievable experience for any person, which causes disrupted jobs, economic, social, and family life, leading to the destruction of the patient's life. The American Cancer Society's Behavioral Research Center studied 739 family members of cancer patients and found that high levels of stress were associated with impaired physical, mental, and social functioning.

In cancer patients, as in other chronic diseases, maximizing quality of life is the primary goal of care. Evaluation of quality of life in cancer research is an important variable related to clinical care. It is used to diagnose differences between patients, predict disease outcomes, and evaluate therapeutic interventions. Evaluation of factors related to the quality of life of cancer patients can be an important point in evaluating the effectiveness of treatment and disease process in these patients.

In a broad sense, the effect of nature on human health, psychology and quality of life is an undeniable fact. This view has been supported in different disciplines and scientific studies. Especially in hospitals, some clinical findings have been obtained regarding the effect of natural areas, which we encounter as hospital gardens, on the mental well-being of patients. The healing aspect of the care of the patients under treatment in the hospital with gardens and plants and their contact with nature has been accepted by many professionals (Pouya, S., & Demirel, 2015).

In the literature, the reasons for the positive contributions of being with nature in the daily lives of patients have been investigated and the patients' nature; has been seen that they provide internal, mental, and physical benefits. It has been observed that hospital environments cause negative physical and spiritual effects by increasing the tension on users due to negative effects such as creating obstacles on patients in the treatment process, inability to provide privacy, high light, and noise. Physically, negative effects such as heart rate, difficulty in breathing, and increase in blood pressure, psychological effects such as panic, anxiety, depression, and loneliness, and operational effects such as inability to sleep, irritability, weakness, inactivity, inability to comply with hospital administrative rules appears. Health institutions, to minimize these negative effects on the patients and to save them from the negative situation they are in, the natural areas they create include such areas in the hospitals with the thought that they refresh the patients, cause less anxiety, and increase communication (Marcus, 2007).

Today, medical centers and hospitals have a major and sensitive role in maintaining and restoring the physical and mental health of individuals in a society and creating physical and mental balance, so it is necessary to apply certain subtleties in the design of such centers. The most effective method today for the patient's body is the use of natur therapy methods. In this research, the nature therapy method was explained. At the end of the research, the proposed solutions for creating a space with a nature therapy update are explained.

Nature Therapy

In a study, patients staying in hospitals stated the effects of choosing to stay in open-air rooms and the reason for this is enjoying the fresh air, gaining mood and forgetting about the disease, and becoming more hopeful.

Patients also reported that when they showed in the yard that people experienced faster recovery when exposed to the natural environment than when they observed urban elements. They also studied whether the presence of plants inside the building increases pain tolerance. The results showed that exposure to plants indoors increases pain tolerance and also the rooms with plants compared to Controlled rooms are much happier, quieter, and more pleasant

Another study looked at the recovery of patients in the hospital as a result of paying attention to vegetation outside the building.

In this study, those who were interested in seeing the natural landscape recovered faster. Also, those who participated in horticultural activities showed positive mood changes.

Both studied the effect of having a window on patients' recovery. They found that the patient's proximity to the window and watching the outside scenery is effective in the patient's recovery. Another theoretical framework explicitly refers to the long-term improvement in direct and indirect medical outcomes associated with stress reduction.

For example, faster wound healing by increasing the function of the immune system and reducing pain in hospitalized patients state that an important part of the satisfaction obtained from nature is not due to being in nature, but rather more spectacular.

Various studies show that health benefits are related to experience and observation and not just doing activities. Even short-term visual exposure to real or simulated nature can lead to significant psychological repair in 3 to 5 minutes. Exposure to natural environments reveals a decrease in negative effects, an increase in positive effects, and changes in physiological systems that indicate a decrease in arousal or overall stress.

Hospitalization is generally associated with anxiety and uncertainty. This anxiety disrupts the healing process and heals wounds. Even in a short-term hospitalization, preoperative stress increases postoperative pain (Schweitzer et al., 2004).

Therefore, paying attention to healing environments in treatment spaces while reducing stress, beneficial effects on health and achieving of sustainable development goals. In one study, a questionnaire asked people where they took refuge to escape a stressful environment. 75% of the respondents answered that it was nature or environments designed with natüre. (Petros, Georgi, 2011). Examination of patients before surgery has shown that seeing the scene, hearing the sound of birds singing and splashing water, reduces their pain by 50%.

Researchers have found that when children with Decentralized Disorder work in greener natural spaces, their symptoms are reduced. A study of the mentally ill found that they spoiled abstract images on the wall; While they did not harm the natural landscape. Many nurses cite uniformity in the workplace and mere communication with other staff as the reason for their resignation. Also, the presence of plants in space due to proximity and contact, more than plants outside, has a positive psychological effect on the person; Even if this observation is through seeing the image of nature on the wall, it still has the same effect as the presence of plants in space (Schweitzer et al., 2004; Whitehouse, et al. 2001).

Therefore, the benefits of using nature in medical settings for patients, staff, and companions can be expressed as follows (Yucel, 2013). Physiological: Reducing the patient's physical symptoms, especially after surgery, increasing the immune system and regulating endocrine secretion due to stress reduction, lowering blood pressure, lowering cholesterol, lowering heart rate, lowering muscle tension, improving brain activity, reducing the side effects of painkillers. Psychological: Reducing stress, reducing the feeling of fatigue, increasing the level of comfort, raising the pain tolerance threshold, increasing the level of consciousness, increasing self-confidence.

Social: Increase social relationships, improve a sense of well-being, increase life expectancy, reduce aggressive behavior, increase workplace enjoyment.

Economic: Saving financial resources to use fewer painkillers and reduce hospitalization time (Yucel, 2013).

The effect of plants on indoor air

One of the problems that human beings face today is the sick building syndrome, which is caused by the toxic substance bio fusion. This material is made of artificial compounds inside the building such as computers, carpets, furniture, etc., and is very dangerous to health. This toxin, which causes complications such as asthma, bronchitis, pneumonia, stroke and heart attack, some cancers, as well as loss of concentration, drowsiness, fatigue, headache, nausea, cough, dry eyes, throat, and skin, is easily absorbed by plants and It becomes the food needed by the plant

Plants also capture and produce oxygen through photosynthesis, light, carbon dioxide, carbon monoxide, and nitrous oxide, something that none of today's advanced ventilation systems can do, and by sweating on leaves, in addition to moisturizing and regulating temperature. The environment circulates air in the air and therefore more pollution and dust is absorbed by the leaves and their roots. One of the advantages of many plants is that they do not necessarily need light for photosynthesis; Because this process is also done by bacteria in the soil of the pot. According to NASA research, bacteria and fungi in a bedroom with a plant are 50 to 60 percent less than in a room without a plant. The reason is the secretion of 9 Phytoncid from plants, which in addition to destroying microbes, the balance between the two hemispheres of the brain, creates a sense of calm and ecstasy in humans.

The effect of indoor plant color

In an experiment on 15 female and 15 male students for the effect of plant color on health, it was found that all colors have the same effect on physiological issues such as lowering blood pressure, heart rate, fingertip pulse, and increasing skin reactions.

But psychologically, green and purple reduce irritability, fatigue, and anxiety, and compared to red and yellow, increase energy, vitality, relaxation, and improve mood. Therefore, the use of green and purple plants in therapeutic environments is recommended.

Plants with red and yellow colors are also suitable for children. Pink and white flowers also evoke a feeling of calm, comfort, and confidence. Chrysanthemums with yellow petals also increase appetite and talk of mentally ill patients in the intensive care unit

The use of pink flowers whose blossoms, buds, and flowers 10, which is the universal color of breast cancer, can be effective in improving these patients; It is pink like Idris flower and changes from dark pink to light pink during its growth stages (Li, et al., 2012).

Landscape architecture design tips within therapeutic spaces

To use the effects of nature in humans, various methods can be used, including walking in nature, viewing through a window, watching a movie or landscape photo, and the presence of plants in space (Ulrich, 1984).

For the patient to be able to see the outside view while lying on the bed, a window with dimensions of 22.1 meters wide and 83.1 meters long, which is 74 cm away from the floor of the room, is needed. The presence of plants inside buildings, especially in the cold seasons of the year when there is no plant outside the building is very appropriate. Architectural elements also provide a relatively easy and inexpensive opportunity to change space. The calculated placement of plants, waterfalls, aquariums, greenhouses, vertical gardens, animal and bird enclosures is very effective in creating a sense of distraction in patients (Pouya, S., & Demirel, 2017; Pouya, S., & Demirel, 2018).

Giving patients the opportunity to bring some personal items such as pots or pets to their room creates a sense of control and belonging in them and reduces stress. There is a lot of research going on today because pets are part of the social support of some people, which is why many hospitals are gradually accepting veterinary medicine (Mazer, 2010).

The presence of pots in the space improves the patient's condition and because it is beautiful, flexible and portable, it does not prevent the staff from moving and their performance. Since nature is the universal image of spirituality and presents the life cycle such as birth, death and renewal, designing a green space with a labyrinth design to focus more on spirituality can be useful.

Also, a design that provides a positive confrontation between employees and nature, such as the view from the staff lounge to the natural environment, can create more job satisfaction. It is very important to observe economic savings in designing the green space of medical centers and subsequent maintenance because proper care of plants allows the patient to have a real experience of nature in his room. Attention to the culture of the people and their belief in some plants should not be forgotten.

For plants to have the maximum effect on a person, they must stimulate all five senses; For example, seeing the colorful flowers and green color of the leaves and branches, hearing the sound of the leaves due to the movement of the wind, Smelling the scent of flowers that fills the air with a breeze, tasting the taste of fruits and touching the components of the plant and caressing the breeze on the skin are all closely related to human health.

Results and Discussion

According to research, one of the best ways to avoid the stresses of treating patients in therapeutic environments is to take refuge in nature and use it in the building. Studies show that the presence of plants in space reduces blood pressure, heart rate, muscle tension, stress, fatigue, and aggressive behavior, and factors such as comfort level, pain tolerance, self-confidence, well-being, life expectancy, and enjoyment of Increases the work environment. They also have economic benefits by reducing painkillers and hospitalization times, including air purification, humidification, and oxygen production. The more plants stimulate the human five senses, the more effective they are. The colors of flowers and plants used in therapeutic environments should be chosen carefully because green and purple colors more than red and yellow reduce irritability, fatigue, and anxiety, and pink and white are soothing. Care should also be taken with the location of the plants so that they do not interfere with patient care and hospital operation. Therefore, the benefits of plants in therapeutic spaces should be accepted as a principle and efforts should be made to maintain and develop them.

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MASS HOUSING & ITS SOCIO-ECONOMIC IMPACT: INTEGRATED HOUSING DEVELOPMENT PROGRAM – IHDP IN ADDIS ABABA, ETHIOPIA

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Abstract

Provision of affordable housing is challenging factor of rapid urban developments in the Global South. Addis Ababa, the capital city of Ethiopia, has been trying to address the fast growing housing demand through different schemes of affordable housing. The Integrated Housing Development Program – IHDP, which was initiated in 2003 by the government, is a country wide program designed to address the housing issue.

The IHDP has been set on clearing all slums and contribute for the middle income country target along with providing affordable housing units. Also, it aimed at creating job opportunity for the urban youth through the integration of Micro and Small Enterprises – MSE. The development program has developed a low cost construction system by applying a standardized prefabrication system specially developed for the program along with mass housing design approach.

However, variety of socio-economic problems have started to emerge after the occupation of the newly developed housing neighborhoods. These are mainly caused by the disruption of the socio-economic status caused by the relocation and resettlement of dwellers. These issues include affordability, safety and security, means of income, lost land, societal organization membership and waste disposal systems.

With the data acquired through observation, firsthand experience of the society, technical manuals, newspapers, survey of dwellers of condominium housing by UN-Habitat (2017), Ministry of Construction and Urban Development and Central Statistics Agency of Ethiopia, and literary critiques, this research makes descriptive analysis of the surveys. From the results, it discusses alternative approaches within the framework of policy diversification, relocation strategies and off-grid waste management system that could be integrated in to the housing program in Addis Ababa.

Keywords: *Mass housing, Socio-economy, Diversification, Relocation strategy, Waste management*

1. INTRODUCTION

Addis Ababa, the capital city of Ethiopia, which was established in 1886, has been evolving to be an African City as claimed by a well-known researcher, architect and planner Fasil Giorghis. Ethiopia has cities demonstrating that there have been early settlements in the country with their own character. In a century, where the fate of cities of colonized countries were decided by their colonizers, Addis Ababa has been a city which was able to practice its own way of evolution as opposed to the modern and Utopian planning practices practiced by the colonizers. However, it has also been exposed to modern planning practices through the course of history. These have created an amalgam of local and modern planning which could be read from the current morphology of the city.

The series of planning and their short comings during different periods have demonstrated to reflect the political and economic situation of the respective periods. Of the major issues that shaped the city's evolution, environmental degradation in its early age could be mentioned. This event led to the introduction of Eucalyptus tree that managed to be the prominent source of building material and fire wood source to these days. The other issue that could be mentioned is the land policies. It has never been consistent due to the continuously changing political views or the changing requirements of each time. Significant increase in the rural to urban migration starting from the early establishment specially since the 1930's and 1960's, has been forcing planners to address the issue of affordable housing in the respective master plans prepared.

However, due to constraints such as poor consideration of the socio-economic aspects of planning beside the articulation of spatial planning, weak or no implementation plan and strategies along with financial constraints have been major reasons for the prepared master plans not to be executed in a timely manner. For these major and other factors, the dwellers of the city have been taking the decisions to their hands to satisfy their housing requirement.

Such activities without an integrated monitoring have led to urban sprawling along with the construction of substandard units in all direction of the city. Series of such pattern of development have made 80% of the existing city to be characterized as slum which are lacking basic services such as toilets and kitchen and are constructed from mud mixed with straw locally known as 'Chiqa'[2] plastered on eucalyptus wooden structure covered with corrugated iron sheet roof (Alemayehu & Stark , 2018). These urban fabrics are known to have poor urban management, infrastructure and service which are features of urban poverty.

In order to transform the poor urban situation of the city, the post 1991 government took the initiation by reviewing the previously 1986 prepared master plan in the year 2003. This was further supported by the restructuring of the city's administration. Since then, the city has been witnessing a construction boom. One of these areas has been the provision of affordable housing. In an attempt to bring about a fundamental change, the entire city government of Addis Ababa was dissolved and replaced by a temporary administration. This was followed by a radical restructuring and decentralization of the administrative structure of the city (Alemayehu, 2008). It was then that some city-wide action began to take place on the ground. Among them was the Grand Housing Project which is also known as Integrated Housing Development Program - IHDP which aimed at delivering affordable housing to the city dwellers.

IHDP is a government owned large scale affordable housing program which has been running since 2003. The government in collaboration with German Technical Cooperation - GTZ[3] has launched the Grand Housing Program aiming at providing low cost housing. It started with Bole-Gerji pilot project located at the south west of Addis Ababa. According to the Technical Manual (2005), the objectives of the project have been: (Addis Ababa Housing Development Project Office, 2005)

- Clearing all slums and contribute for the middle income country target in 2025
- Efficient use of urban land
- Mass housing construction
- Job creation through Micro and Small Enterprises – MSE
- Delivery of service land for housing and other investments annually
- Supporting the private sector to produce 125,000 housing units through provision of land and infrastructure and legal and policy framework

[2] Mud mixed with straw plastered on eucalyptus wooden structure
[3] German Technical Cooperation

After setting the objectives, though there is still a significant gap in the housing stock, the IHDP has managed to introduce and deliver affordable housing program in a larger scale in more than thirty locations in the city. It has delivered around 300,000 housing units in the last fifteen years. It has also been successful at creating a significant number of job opportunities for the youth under the organization of Micro and Small Enterprises - MSE. These jobs are mainly created through the manufacturing of building elements for the houses and construction activities.

Figure0.1. Condominium Locations in Addis Ababa

Problem Identification

The mass housing development has caused the displacement of people from the places they have lived for years. This is further exacerbated by the rapid renewal process of the city, specifically the inner part of the city. The phenomenon has caused the disintegration of the long settling neighborhood. This scenario has led to the disruption of the existing social and economic status that have sustained the society to meet its social and economic needs either through formal or informal activities.

This study identifies the disruptions of the lively hood of the people in Addis Ababa caused by mass housing development as the major problem leading to the unintended socio-economic impacts of mass housing. The daily life of the people have given an indigenous structure to the socio-economic aspects of the society such as different social organizations and informal economic activities which served as means of social security and income respectively. Therefore, the socio-economic disruption, which is defined as the disruption of the social organizations and the daily home based economic activities during the rapid transformation of the city via mass housing, is defined as the problem to be studied.

Purpose

Though the IHDP has been serving the housing need, it should also consider the daily socio-economic activities of people that enables them to afford their daily needs and the long term mortgage payment simultaneously. The research aims at implicating alternative strategies within the framework of policy diversification, relocation strategies and off-grid waste management system that could be integrated into the IHDP program in Addis Ababa.

Research limitations/implications

The academic perspective of the research is limited to the exploration of the socio-economic aspects of the society such as different social organizations and informal economic activities which served as means of social security and income respectively. And, it contrasts them with the change that occurred to them after the people are resettled to the new developments in Addis Ababa.

Due to public health risk caused by the Covid-19, the collection of primary data through public survey is limited to referring surveys done by Central Statistical Agency, UN-Habitat & Ministry of Construction and Urban Development. However, surveyed socio-economic issues are further explored through observation and firsthand experience of the society, Technical Manuals, data from newspapers and literary critiques.

Social implications

The research puts forward the major socio-economic impacts caused by transformation of the socio-economic status of the people as they relocate to new neighborhoods. This transformation is analyzed as opposed to the change in the social organizations and daily means of income. Referring back the root cause of the problem that is the socio-economic disruption, it puts major points of discussion through the framework of policy of diversification, relocation strategies and off-grid waste management system that should be considered in the future housing developments in Addis Ababa.

2. METHOD

The research discusses the socio-economic impacts of mass housing that arise from the change in life style of the people while being relocated from slum areas to the sub-urban or other areas of mass housing development. It contrasts the existing socio-economic conditions and the disruption of the societal order caused by the renewal of the inner-city.

The research takes primary data input acquired from the 2017 survey of 1184 dwellers of IHDP[4] housing by UN-Habitat and the city administration, different surveys done by Ministry of Construction and Urban Development, survey results from Central Statistics Agency of Ethiopia, Technical Manuals, data from newspapers, observation and firsthand experience of the society. Data from literary critiques and different reports from the United Nations are also included as supporting resources.

The data are presented in relation to the general socio-economic aspects of the society and the disruptions made by the IHDP mass housing development. These together with descriptive analysis of the data in relation to the socio-economic impact of mass housing in Addis Ababa, would lead to the findings. Finally, they are discussed within the framework of policy diversification, relocation strategies and off-grid waste management system.

3. SOCIO-ECONOMIC ASPECTS

The implication of rapid urbanization on the economy is inevitable. This has led to poor urban management along with consecutive poor urban response, poor infrastructure and service which are features of urban poverty. Addis Ababa being one of the oldest and largest city in Africa, it has been also extremely exposed to this urban poverty characters.

The urban morphology of the city could be considered as low quality or slums that have been the outcomes of series of unplanned and poorly managed urban growth. As per the 2007 CSA[5] survey, more than the 50 percent of the houses are older than 20 years (CSA, 2008). The slums account for majority of the housing stock. The weak economic capacity of the dwellers on its part has had a lot of impact on the houses being substandard. The slums constitute for more than 80 percent of the city (Atlaw, 2014). Here, the socio economic conditions are further discussed in relation to the status of the housings, social organizations and economic activities of the dwellers. Then, it is discussed the socio-economic impacts that occur due to mass housing development program.

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[4] Integrated Housing Development Program

[5] Central Statistics Authority

3.1. Housing Status

These houses in the slums are characterized by little or no services with a densely crowded population in less space. They are built from wooden structure, majority of them from eucalyptus, plastered with mud mixed with straw locally known as 'Chiqa'. According to the 2007 CSA survey result of 628, 986 housing units, 39 percent of them are single room units of which 15 percent with no private or shared toilets and 20 percent with no kitchen.

Figure 2. Housing Condition at Slum Areas

The type of tenure include owner occupied and rented each accounting for 32 and 61 percent respectively. Of the total rented houses close to 40 percent is Kebele[6] houses. Other than these tenure types, they are either rent free or occupied in a different rate.

On another relevant UN-Habitat (2007) report, it indicated that 75 percent of the units are under $40m^2$ while nearly 20 percent are under $20m^2$ referring to the 1988 census. In the same report, the proportion of the single units increased from 26.4 percent to 33 percent in the 1994 census (UN-Habitat, 2007). In the same year, 60 percent of the housing units had two or fewer units. As opposed to the household size of 5.2 individuals, this indicates the worst living condition in overcrowded spaces with no or less facilities. This together with the government not allowing the renovation by the tenants turned them in to a place not convenient for living.

3.2. Social Organizations

Traditional social organizations such as Equb[7], Mahiber[8] and Iddir[9] have been serving the society as a means of social security system. These are organizations that the public have created and developed through time to ensure the wellbeing of the society through traditional community financial saving mechanism, gathering for common purpose and a community that serves the needy in the time of hardship respectively. Membership is determined by the familiarity of the people that arises from living together in a neighborhood for a certain time. To ensure the financial sustainability of this traditional institutions, there would be an entry and monthly membership fee that could be used for the good of the society in time of needs. Some organizations have even extended their services for the development of the society via social contributions by building community libraries, schools, water wells and different community centers.

[6] The least administrative organ in government structure
[7] Traditional saving organization
[8] A community gathered for common social purpose
[9] Traditional organization serving as a social security entity

3.3. Economic Activities

On a countrywide level, Ethiopia has Gini-index of 35 according to World Bank 2015 estimate. According to the World Bank 2015 report on enhancing urban resilience, Addis Ababa is home to 25 percent of the urban population with 14 percent annual economic growth. While there are different empirical data on its contribution to the Gross Domestic Product (GDP) of the country, it accounts for 20 percent of the total GDP with less than five percent of the total population of Ethiopia (World Bank, 2016). The unemployment and poverty level in the city is estimated to be 23.5 and 22 percent respectively while the informal sector employs 30 percent of the active labor (World Bank, 2015).

The economic activities of the society in the slums has been highly attached to the dwellers habit of rearranging the internal spaces to fit for daily activities. These activities included baking 'Injera'[10] (porous thin and rounded Ethiopian bread made from fermented Teff[11] flour), traditional cooking with firewood, charcoal or gasoline, washing and drying clothes, drying and grinding seeds, coffee beans, spices and other food ingredients. These were made both for daily consuming and selling that could be a source of income for the society. Though the houses are not designated for such dense accumulation of activities, it has been an integral part of daily activities of the dwellers.

***Figure 3**. Small scale home based production economic activities*

In general, the economic activities could be classified as informal, semi-formal and formal. Based on the 2015 CSA survey, the nationwide share of urban informal sector had gone down to 27.8% in 2015 from a high of 50.6% in 2003. The share of the informal sector in Addis Ababa has been 13% as opposed to the total employment. The ratio is less while compared to the country total and other urban centers which are 27.8% and 18.2% respectively (CSA, 2018). This could be attributed to the measures taken by the city administration regarding tax rules and enforcement measures while at the same time the incorporation of job creation opportunities through MSE which have been mainly related to the massive government funded housing development program.

3.4.Integrated Housing Development Program and Socio-Economic Impacts

In an effort, to address the housing crisis along with changing the image of the city through upgrading and renewal, the government initiated the nationwide integrated housing development program - IHDP in 2003 aiming at supplying affordable housing units for low and middle income households. Since then, this scheme has been continuing to develop with varied alterations to

[10] Part of staple food which is sour in taste and fermented flat bread with spongy texture
[11] Ancient grain in Ethiopia, size of poppy seed which is used as a basic ingredient to prepare Injera

address the impending challenges such as urban housing and job opportunity creation in the due process.

Figure 4. *Condominium Neighbourhood in Addis Ababa*

Since there is absence of a nationally accepted standard to measure housing affordability, it has been challenging to measure the affordability of the IHDP. For these reason, the program has approached this constraint by developing variety of housing schemes named 10/90, 20/80 and 40/60 in which the dwellers are expected to save an initial amount of 10, 20 and 40 percent of the delivery price. In this regard, the first two have been meant for low income group of the society.

Table 1. *Sale Price of 20/80 Housing Scheme*[12] (Yonas Abiye, 2019)

Housing Scheme	**20/80**			
Year	**Studio**	**One Bedroom Price per m^2 (ETB)**	**Two Bedroom Price per m^2 (ETB)**	**Three Bedroom Price per m^2 (ETB)**
2019	2,483	3,438	4,394	4,776

As per UN-Habitat (2017) the State of Addis Ababa survey report made from 1184 owners of the condominium houses, the sources of finance have been identified to be remittance, loan from informal sources, relative's support and own saving each representing 8.3, 11, 27.6 & 53.2 percent respectively. The same survey has tried to assess the perception of housing affordability. 45 percent of the dwellers said not affordable, 20 percent unaffordable overtime, 15 percent somehow affordable and 20 percent affordable. The defaults of mortgage payment indicate that 48 percent of the participants have fallen short of paying their mortgages.

In addition to the trend of putting people in multistoried buildings as opposed to the way they used to live in ground level buildings and environment, the societal impacts from the IHDP are related to relocation of people to another settlement area. This has created perception of loss and detachment from social organizations such as religious fellowships, Equb[13], Mahiber[14] and Iddir[15]. The UN-Habitat 2017 has surveyed these social impacts and are illustrated in the table below (UN-Habitat, 2017).

[12] One United States Dollar = 47.2453 Ethiopian Birr as of 06/11/2021 (XE.com Inc., 2021)
[13] Traditional saving organization
[14] A community gathered for common social purpose
[15] Traditional organization serving as a social security entity

Table 2. Loss perceptions (Developed from the 2017 State of Addis Ababa Survey)

Loss Perception	Safety and security	Means of livelihood	Strategic location for business	Friendship	Religious Fellowship Group	Equb	Mahiber	Iddir
Due to Relocation (%)	29.4	42.9	82.4	63.9				
Social Organizations (%)					16.1	20.3	25.3	37.5

4. FINDINGS

From the above survey results, the major soci-economic impacts of the mass housing development could be summarized as:

- The complete ownership of the program by the governement undermines the continuity and sustainability of the program in relation to economy of scale. Remodeling the economic activities of the people under the micro and small enterprises that majorly focused on job creation opportunity in the construction sector has diminished the variety of the informal economic activities that the dwelles use as means of income. This has affected the affordability of the houses.
- Though the program has been designed for low income group of the society, the majority have been unable to afford the mortgage overtime. This is due to the lively hood they depend on for income has totally been disintegrated.
- Sense of detachment from relegious fellowship and local community organizations such as 'Equb', 'Mahiber' and 'Idir' exists due to relocation. These organizations have been means of social security in which the community relies on in the time of need.
- There is an increased safety and security risk in the developed neighborhoods. These include theft, homicide, rape and abuse of women and children. The recently developed neighborhoods have an average of 2500 households. This has created a significant load of waste that has reduced the environmental safety and quality.

5. DISCUSSION & CONCLUSION

The socio economic impacts from mass housing could only be addressed through an integrated frame work. These problems have different scale that need to be addressed respectively. The scales could be large scale interventions within policy framework or regulations at management and neighborhood level. Some could also be solved through design and technical interventions.

For a successful socio economic outcomes, there needs to be consideration of the following points during mass housing development (Power, 1997).

- More social and economic diversification should be appreciated to prevent social decline.
- Direct management of urban housing areas should be encouraged.
- Social isolation caused by marginal distance from the rest of the rest of the city should be avoided and residents of mass housing should be integrated to the city as a whole.
- Broad based collective decision and solutions enhance the success of mass housing.

To have a well-functioning socially mixed housing development, more options for a housing career in the district, more social connections and social cohesiveness, developing social capital, giving role models, and reducing the stigma of an area are recommended (Rowlands, Musterd , & Kempen, 2009). Other characteristics that should be addressed in the development process include labor-intensive domestic manufacturing, small business stimulation, and home-based income prospects that place such a high and personal value on housing (PADCO, 2006).

With this regard, the major socio-economic impacts from mass housing in Addis Ababa could be mitigated through the framework of policy of diversification, relocation strategies and off-grid waste management system.

5.1. Policy Framework

At a policy framework, there needs to be a change in the economic model of the IHDP. The ownership should be diversified to make it sound and sustainable economically. The community and the private sectors should be encouraged to participate for the creation of self-driven and smaller units so that the program could be sustainable with ensured continuity.

Understanding the impact of housing in developing economies enables better development of alternative housings. It has a multiplier effect on other sectors and working labor as it is creating other opportunities for every money spent. The development of mass housing should be developed in a way that it is labor intensive, promotes home based income opportunities and small businesses (Duane K. etal, 2006). These could reduce the number of people not able to afford the mortgage over time.

5.2. Relocation strategies

Sense of religious and organizational detachments derived from relocations could be solved either by relocating dwellers from similar neighborhood at once or settling the people in their previous location. The first has been demonstrated in Lideta[16] condominium site in which the dwellers are able to retain their organizations due to relocation of dwellers to similar location at once. This has enabled the continuity of the societal structure and the activities that made sure their livelihood is sustained to some degree. The settling of the people in their previous location is being demonstrated by the transnational developer Eagle-Hills at the heart of the city in which the dwellers are being settled in a vertically dense settlement. However, in both cases, the economic activities of the people should also be well articulated and integrated into the new developments.

5.3. Environmental Dimension and Off-Grid Waste Management

The issue of safety and security could not be solved through housing only. This requires economic and social security along with the stability of the community. The environmental safety that is being threatened by poor infrastructure could be solved either through integrated city or project wide structure development. This could be done with careful planning from the start. Previous experiences from some of the IHDP projects demonstrate that there is a possibility of development of off-grid waste management system that is able to recycle the waste.

5.4. Conclusion

Mass housing could be one of the approaches to address the fast growing housing demand. But, it has also unintended effects in the disruption of the socio-economy build up. It should not be at the expense of disrupting the socio-economic status of the society that took years to build. That is the intangible human cost that would have unpredictable results such as loss of the societal values, organizations and variety of economic activities that could only exist with the continuity of the people living together. Therefore, its application should be reviewed in relation to diversification of housing tenure and supply that could mitigate the risks together with socially inclusive decision making process. On the other hand, the continuity of the IHDP could take lessons learnt from the previous process of relocation of the people that are able to mitigate the socio-economic impacts. The environmental initiations taken in some of the projects regarding off-grid waste disposal and treatment systems should be continuously monitored in relation to

[16] One of IHDP development locations in the inner city

maintenance, technological advancement and the reduction of the discomfort they are causing to the dwellers due to unpleasant smell.

Finally, the briefly explained approaches should be continuously surveyed, studied and reviewed before further alteration and implementation. This ensures the development of better social and economic situations through the development of housing for the dwellers of Addis Ababa.

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THE ROLE OF GREEN INFRASTRUCTURE COMPONENTS IN STORMWATER MANAGEMENT WITH LOW IMPACT DEVELOPMENT ANALYSIS

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Abstract

The increase in urbanization presents several problems. Especially due to intensive construction, the amount of green space decreases and is replaced by concrete that does not allow stormwater to be absorbed, and the infrastructure shortages it brings are the main reasons for these problems. As a result of the destruction of green areas and the replacement of surfaces such as concrete etc., stormwater cannot be absorbed from impermeable concrete surfaces and roofs of structures and transforms into surface runoff, causing some environmental problems and resulting in loss of life and property. This is why there has been a recent trend towards innovative and ecological approaches across the globe to find rational solutions to these problems. At the forefront of these innovative approaches are the green infrastructure/LID components, which are called **L**ow-**I**mpact **D**evelopment **(LID)** and aim to eliminate the negative effects of stormwater at its source. For the research, different areas with hard floors were selected from Malatya city center. In the analysis of the scenarios prepared for the LID, the time period with the most precipitation of the past three years was preferred. To this end, the effectiveness of 3 different components (green roof, permeable pavement, and rain garden) in stormwater management was determined by a process-based simulation study. A validated stormwater management model (SWMM) was implemented for monitoring the water-holding performance of these three determined areas. As a result of the study, it was shown that 3 different LID components integrated into suitable parts of a 90% impermeable basin can be used as an alternative to the traditional gray infrastructure, eliminating the total runoff by 40.44% under 6 hours precipitation of 20.70 mm.

Keywords: Green infrastructure**,** Low-Impact Development **(LID);** Stormwater Management Model **(SWMM),** Surface Runoff

INTRODUCTUIN

Extreme urbanization is causing decreased amounts of green space in urban areas and instead increased surfaces of asphalt, concrete, etc., which do not leak stormwater. As a result of increasing impermeable surfaces and lack of infrastructure, stormwater that comes down to the earth cannot seep deep into the soil, flowing across these surfaces, resulting in a number of environmental problems. In recent years, there has been an orientation towards ecological-based approaches across the globe to create a rational solution to these problems. The most commonly adopted one of these approaches is the green infrastructure/low-impact development approach(CNT, 2010; Qin, Li, & Fu, 2013)

LID approach: It is an approach suggested to create an alternative to traditional stormwater management systems and ensure stormwater problem to be solved at its source. In another saying, they are micro-scale control applications suggested to preserve the natural hydrological structure of a field, or to simulate the hydrological structure of the field before it develops(Ahiablame, Engel, & Chaubey, 2013; Coffman, 2002)

This study aims to create solutions to day-by-day developing cities undergoing increasing concretion with innovative and sustainable approaches such as green infrastructure/DEG components in stormwater management and to eliminate the negatives that stormwater generates through such innovative approaches. Within this scope, a basin located in the city center of Malatya with a 90% impermeability area was determined and the function of the existing stormwater infrastructure under 6 hours of rainfall on 25.05.2020, which is the day that this area received the most rainfall in the last 3 years, was investigated. Then 3 different green infrastructure/LID components (green roof, rain garden and permeable pavement) were integrated into the appropriate parts of the area, and the extent to which stormwater surface runoff would decrease was determined by a simulation study.

1. MATERIAL AND METHOD

1.1. Material (Study Area)

The study area is located within the borders of the city center of Malatya, at the coordinates of 38.349401° 38.295273° (Figure 1.1). The area, located in an urban basin, covers a total area of 119.35 da. The region has a terrestrial climate feature with an average annual rainfall of 383.6 mm, according to Meteorological Directorate data. The month with the most precipitation is April with an average of 55mm, while the month with the least precipitation is August with an average of 3.50 mm precipitation. The study area was divided into 3 basins and examined in the first place. The first area, which is used as a town hall and as a parking lot just behind it, covers 41.94 da; The second, which consists of Malatya Park shopping mall, covers a 49.62 da; The third, which is used as a meeting site located between the town hall and shopping mall, covers a 27.79 da. Then these basins were divided into 21 lower basins within themselves based on the locations of the existing stormwater drainage infrastructure.

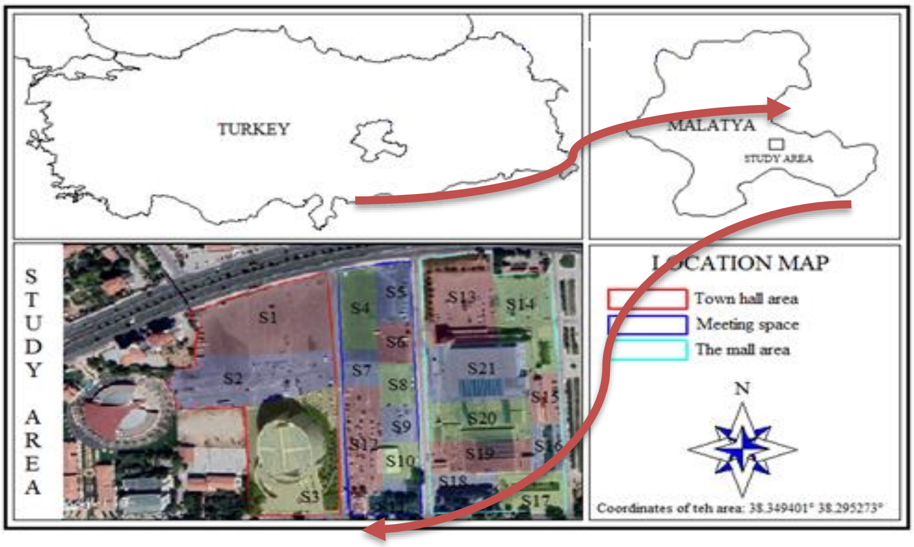

Figure 1. 1: Study Area

1.2. Method

As a method, a stormwater management model developed by USEPA called SWMM (Stormwater Management Model), a dynamic rainfall-flow simulation model, was used. The model simulates surface runoff of the workspace using short and prolonged rainfall data typed into the system. The model also allows for measuring the effectiveness of green infrastructure/low-impact development components incorporated into the system to create an innovative approach and suggest an ecological solution to the overflows occurring in drainage systems. The effectiveness of 3 different DEG components (rain garden, green roof and permeable pavement) under a 6-hour rainfall was determined in this study(Rossman, 2010).

The study area was divided into 21 lower basins, and area data from Google Earth, rainfall data from the Meteorological Directorate, and rainwater drainage infrastructure data from the Water and Sewerage Directorate were obtained and typed into the system. The following figure shows a planned image of the study area created in SWMM software according to existing stormwater drainage canals.

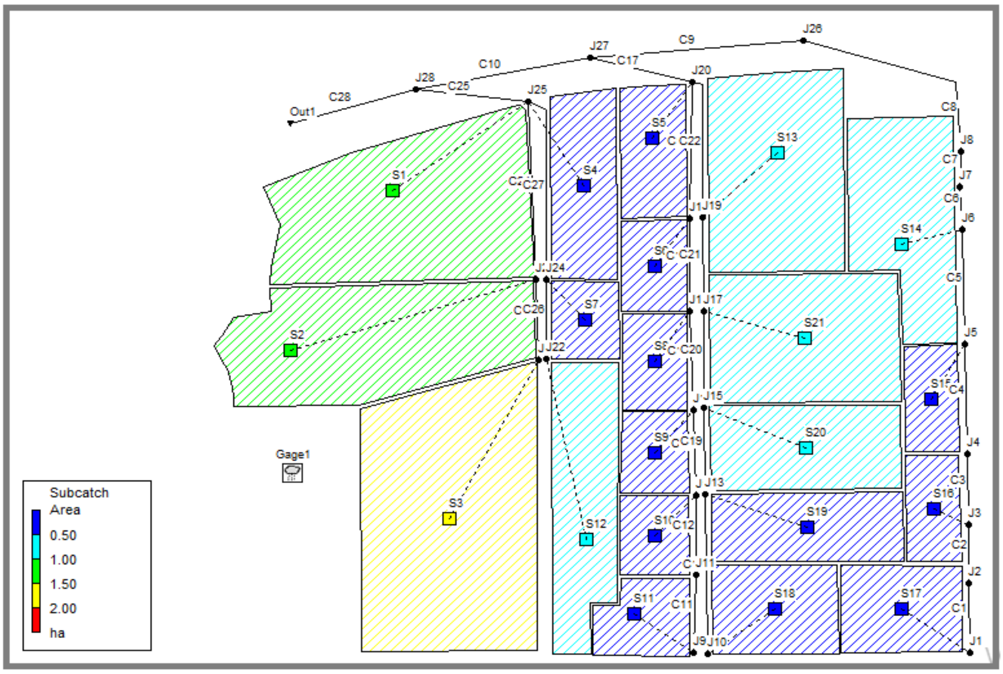

Figure 1. 2: The plotted image of workspace created in the SWMM model. In the figure, S: Subcacthment, J: Junction, C: Conduit, Out: Outfall ve Gage: Rain Gage

To understand the function of the existing stormwater drainage infrastructure, simulation was run without integrating any DEG components into the workspace, and 97.15% of the total 20.70mm precipitation occurring in a 6-hour timeframe resulted in surface runoff. According to the results of the simulation, the exit point value of the surface runoff occurring over the entire area was measured as 0.131 m^3/s. Areas that caused the most surface runoff were identified as S1, S2, S3, S13, and S21 areas

Three different LID components (permeable pavement, rain garden, and green roof) were integrated firstly into the study area, where existing stormwater infrastructure was in short supply, and the simulation results were repeated. According to the current field data, all of the S1 and S2 areas, which had been paved entirely by traditional asphalt pavement, which causes the most surface flow and includes the parking lot of the town hall, were paved with the permeable pavement; Also, 5% and 20% of the S3 area, where the city hall is located, were paved with a rain garden and permeable pavement, respectively; 10% and 25% of S13 area, which is used as the parking lot of the shopping center, was paved with a rain garden and permeable pavement, respectively; and finally, 30% of the S21 area, where the shopping center is located, was paved with the green roof.

The simulation results were repeated by integrating DEG components at indicated rates in the areas that cause the most surface runoff, and it was determined that 67.93% of the total 20.70 mm precipitation occurring in a 6-hour period transformed into the surface runoff.

The S4, S5, S6, and S7 areas of the meeting area, which were largely covered with traditional asphalt, were then covered with the permeable pavement, with the aim of further reducing surface runoff, and the simulation results were repeated once again. The total amount of surface runoff occurring in all basins was measured as 0.078 m^3/s, according to the latest obtained data.

CONCLUSION

- ❖ LID components reduced the surface runoff generated by stormwater from 0.131 m^3/s to 0.078 m^3/s, resulting in a 40.50% decrease.
- ❖ Surface runoff in basins occurred during the time period when the most precipitation intensity rose above 4.00mm.
- ❖ When LID components were planned in integration with existing stormwater infrastructure, they reduced pressure on traditional infrastructure, enabling lower runoff rate.
- ❖ It was established that LID components can be used as alternatives to existing stormwater infrastructure in areas where impermeable surface amount are dense.
- ❖ LID components have partially prevented urbanization by converting impermeable surface amount into slightly less permeable surfaces.
- ❖ LID components allowed for increased green space in urban areas, ensuring improved landscape quality.
- ❖ Thanks to their high water holding capacity, LID components allow stormwater to be stored and used in a number of necessities in areas where annual rainfall amounts are low.

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INTEGRATION OF THE SLUMMED AREAS IN HISTORICAL URBAN ARCHAEOLOGICAL SITES INTO THE CITY THROUGH GENTRIFICATION, RENEWAL, AND PROTECTION: An Example of Tokat Urban Protected Area

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ABSTRACT

Today, slummed and collapsed areas are seen in the regions which were formed first in the historical and urban protected areas with various spatial elements of the cities particularly in developing countries due to the functional changes and structural deterioration caused by the rapid urbanization, during which the changing socio-economic structure causes functional and structural impairments particularly in the historical and urban protected areas in the built-up urban spaces. During this process, the interaction of these urban protected areas with urban development creates an economic pressure. In general, these historical urban protected areas are located on the city center since they are associated with the establishment of the city and include the cultural and architectural characteristics of their period; thus, annuity values are higher in these areas compared to the new development areas. To protect the historical urban protected areas, they should be integrated with the existing built-up areas and the new development areas and slummed historical urban protected areas should be integrated into the city through the urban transformation model. These slummed areas should be revived and necessary measures should be taken regarding their use and the living conditions in these areas.

In this regard, Tokat Urban Protected Area was taken as an example and prevention of the formation of collapsed areas as a result of the interaction between this site and urban development in Tokat through the planning called Reconstruction Plan for Protect between 1992 and 2015. The Reconstruction Plan for Protect stipulated the integration of the construction plan decisions not regarding the urban protected area with those regarding the urban protected area to solve this problem. Thus, a planning model was formed in this study by creating package projects that prioritize registered buildings and preservation of the texture with a new understanding of planning. The typological analysis indicated the number of floors to be three for buildings that should be gentrified or renewed by preserving the development rights of the registered buildings in the urban protected areas. Thus, buildings' level of wear was addressed through restoration and renewal and their structure and texture were preserved, and a planning decision open to functional and technological renewal according to the current needs in the stage of project designing was made through package projects.

It can be said that in this study, the preservation of historical urban protected areas was ensured through the planning model regarding the integration of slummed areas in the historical urban protected areas into the city through gentrification, renewal, and protection processes.

Keywords: *Slumization, Gentrification, Renewal, Protection, Urban Transformation, Historical Urban Protected Area, Package Project*

1- INTRODUCTION

In Turkey, many urban settlements have survived until today with their historical and cultural characteristics in structural and spatial areas. Among them, Tokat city have remained as an urban settlement in Yeşilırmak area, where 14 states and many seigniories have been located or ruled since about 3000 BC, (http://muammer.50megs.com/tarihce.htm, 2013). Since no artifacts or documents were found in Tokat settlement which date back to the periods earlier than about 2000 BC, it can be said that the Tokat's development started in about 2000 BC in terms of settlement and in about 1050 BC in terms of architecture. Thus, Tokat city contain lots of historical artifacts today, as it has been a settlement within many civilizations. With its historical characteristics, Tokat city has survived today as a valuable historical urban protected area within the rapid urbanization process with its registered buildings.

As a result of the above-mentioned development, the historical urban protected areas with various spatial elements have generally deteriorated and become slums particularly in developing countries. The function of these regions in urban areas has changed due to the changing social and economic environments, which causes them to become slum areas (Tekeli, 1991). Meanwhile, the protected parts of urban areas create an economic pressure on the protected historical areas. In fact, in these historical areas, urban land values are higher in the city center compared to the other regions of the city. To protect these historical areas, it is necessary to integrate them with the new development areas in the city, make them more functional, and revive them. In addition, necessary measures should be taken regarding their use and the living conditions in these areas.

Several researchers have indicated that protecting only the structural units is not adequate for serving to the city culture; it should be addressed within the entire urban planning process (Lichfield, 1988). Protection is necessary for the dynamic and changing urban structure in Turkey but it is insufficient for solving the complicated urban problems in Turkey. Moreover, the Government's practices regarding cultural values cannot solve these problems as they insist on preserving the historical unit. In addition, protection and planning methods with no functional aims and actions are still implemented. Instead of them, construction principles and strategies may be determined for a practice based on protecting and renewing these areas. In Turkey, construction principles and strategies regarding urban protected areas should definitely be a part of urban planning activities. With the implementation of renewal strategies within a comprehensive urban planning, all spatial elements in the city have changed to be reproduced. New practices can be developed in all scales by preserving the spaces' functional status according to the changing cultural and physical conditions. This situation should be strengthened using urban planning methods. In this regard, the following should be ensured:

a) Integration of all urban areas,

b) Solving the problems in the project areas through main planning decisions,

c) Avoiding coordination problems during the planning process (Ergen, 1994).

It is known that a dynamic planning argument should be created in urban protected areas. Preserving the structures with a physical spatial and cultural value through functional transformation in the region within the scope of urban development regarding the living culture in the urban area with historical cultural characteristics.

2- AIM

This study aims to develop a method to protect city culture and cultural values. In this regard, several scientists and professionals have indicated that protecting only the structural units is not adequate for serving to the city culture; it should be addressed within the entire urban planning process. Protection is necessary for the city dynamics but it is insufficient because changing urban structure is in question for the solution of the complicated urban problems in Turkey. Moreover, the country's cultural structures cannot solve these problems as they insist on preserving the historical unit. This situation should be strengthened using urban planning methods. In this regard, the following should be ensured:

a) Integration of all urban areas,

b) Solving the problems in the project areas through main planning decisions,

c) Avoiding coordination problems during the planning process.

As can be seen in the conceptual explanation above, this study aims to restore the slummed structure and spaces in the urban area and integrate them into the city.

3- MATERIALS AND METHOD

Material

A new planning method was used in the Reconstruction Plan for Protect regarding Tokat historical urban protected area. In this method, the historical urban protected area was located in the middle of the development areas in Tokat city structure as an urban area subject to two different planning laws (Laws No. 3194 and 2863). Thus, since the city was developed as per the Turkish Development Law No. 3194, the historical urban protected area was left empty as per the Law on the Conservation of Cultural and Natural Property No. 2863. Since this practice has the characteristics of a "hole plan" (Figure 1), planning integrity should first be ensured by obtaining approval from the Committees of Regional Conservation due to the historical urban protected area connection of the main construction plan decisions regarding the city. If planning integrity cannot be ensured, while functional dynamism is created through the construction plan for the development of the city, a "hole plan" emerges with the static phenomenon in the historical urban protected areas.

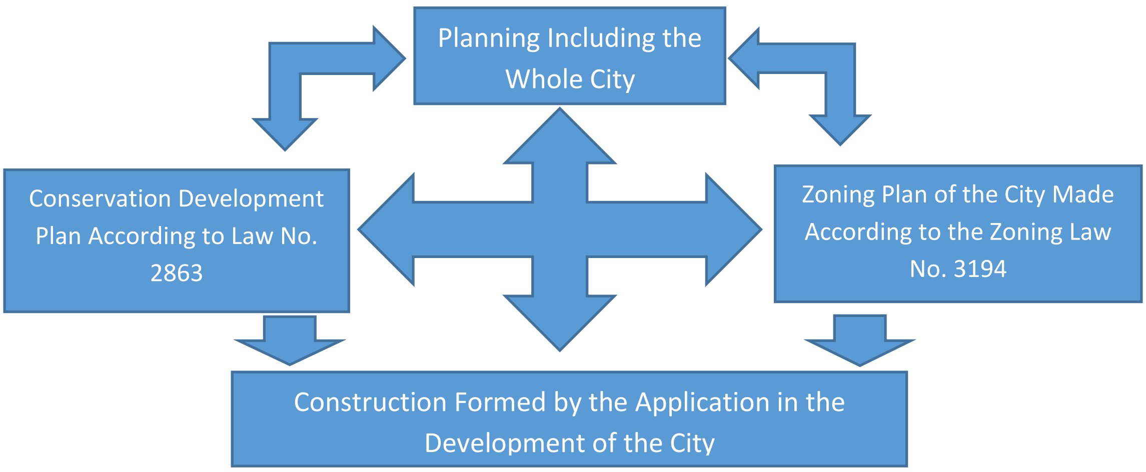


Figure 1. The relationship of "hole plan" in the structuring in urban development within the Construction Plan in the Planning Integrity of the City and the Reconstruction Plan for the Protect Together

In this regard, after the main decisions regarding the integrity of the city and the historical urban protected areas and development areas in the city are integrated, these steps are followed within the scope of the renewal and protection method:

1- The current status is determined and the surveys are prepared.

2- The analysis involves the following:

a) Determining the aims and objectives,

b) Urban analysis studies,

c) Determining the land use,

d) Evaluation of the social structure,

e) Maintaining the integration, and

f) Determining the financial alternatives.

3- Implementation and Control within the existing legislation (Zeren, 1982),

Structural deteriorations can be prevented and new sources of income can be provided to the urban economy through a new building and environment image based on the planning and practices created using the above-mentioned analysis methods.

Reconstruction Plans for Protect include the protection of structure and texture in the historical urban protected areas; therefore, they aim to add value to the economic structure of the area by applying the same method to protect the structure and texture of the protected area while protection, renewal and gentrification practices are implemented (Figure 2). In the plans for protection, protection of historical structures is the first priority and green area arrangement is the second priority (Loures,-Ergen, 2021). The land use plans regarding the historical urban protected areas, which determine the economic, physical, and socio-cultural conditions of urban areas, should be prepared according to the principle of planning activity. Three different urban renewal and protection methods within the concept of planning.

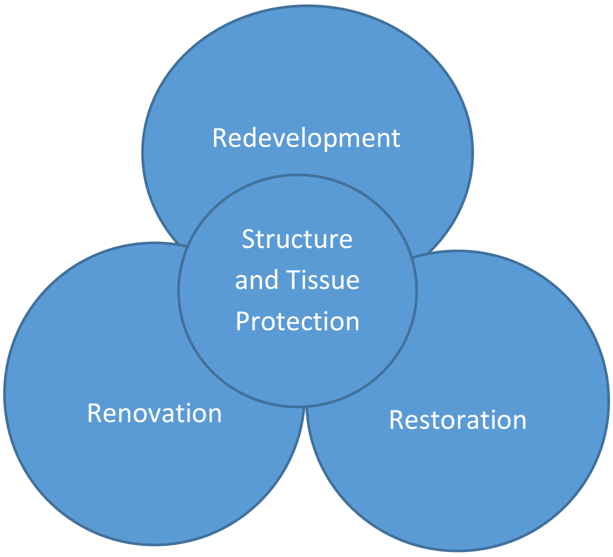


Figure 2. Intervention Methods in the Protection of Structure and Texture in Historical Urban Protected Areas

Important practices in the protection planning:

a-) Redevelopment: Reconstruction of the unplanned slum areas.

b-) Renewal: Adaptation of the existing environment according to new functions and needs.

c-) Restoration: Restoration of the existing structures and open spaces and assigning appropriate functions to them.

Some examples include new functional planning types, restructuring, plans, rehabilitation plans, and renewal plans according to the levels of these concepts.

A new renewal and protection work was started in 1990 and ended in 1992 in Tokat, Turkey. Implementation after the planning is controlled by various sub-projects and functional planning decisions. Cities are dynamic places, and planning leads to static practice pursuant to the decisions made based on the target perspective according to the future period of time. This concept of planning aims to protect the existing cultural assets limited to the laws and regulations in historical protected areas; therefore, a development, renewal and protection planning is implemented on condition that the current dimensions of the physical space and appearance are not changed. The renewal of Tokat historical urban protected area aimed to protect the characteristics of the texture of the existing structural plans by limiting the maximum number of floors.

Method

Analysis of Tokat protected area within the total urban area indicated that the buildings in the abandoned protected areas became slums because they had worn down. In addition, insufficient infrastructure and the fact that low income groups occupied these areas cause serious problems because urban protected areas cannot be integrated with the developed parts of urban areas as they are located on the outskirts of the city. As can be seen in Picture 1, protected areas cause the creation of a threshold in their integration with the infrastructures of the existing city and its developing parts. To exceed this threshold, reconstruction plan for protect should be accepted as the main idea of the comprehensive urban planning. These problems should be solved in developing urban areas with developing technologies.

Picture 1 a - Museum and Immediate Surrounding of Tokat Urban Protected Area
Resource: Ergen, 1994 (Example of Tokat Province in Updating the Practice with Package Projects in Protection Planning)

Picture 1b - A Section of the Behzat Stream Urban Protected Area

Picture 1c - Integrity the Tokat Urban Area and Historical Urban Protected Area

The protection areas are planned according to the existing laws and legislation. The problems arising from the interaction between urban development and protected areas are solved pursuant to the Turkish Development Law No. 3194. Urban design competitions and protection development plans are among the other solutions. However, sometimes negative situations may emerge due to the fact that the plans do not involve the changes in time. The plans can be made according to this situation instead of the legislation and financing terms.

In the package projects, the main principle is to integrate urban growth with the protection and renewal of the protected areas (Ergen, 1994). These projects ensure the integration between the reconstruction plans for protection and urban areas. The package projects (see the planning in Plan 1 a-b-c) can be divided as follows according to the development characteristics:

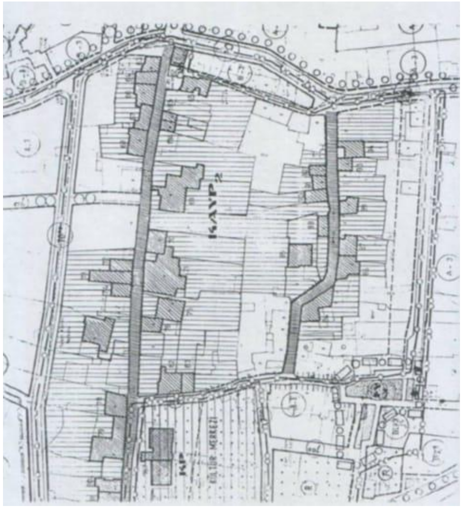
- Public space project,

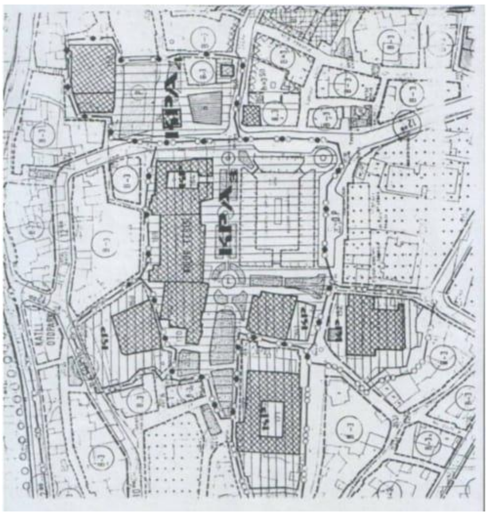
- Public domain projects,

- Public projects, and

- Guiding protection projects.

In these projects, 1:1 scale detail projects are also created. These works aim to obtain a product of a participatory effort. The importance of participation in urban transformation was accepted at the end of 1960s (Baric, 1968). A new typology should be determined in the renewal areas outside of the project areas and it should be implemented in coordination between the municipality and the planner. This guarantees a healthy process (Ergen, 1994).





Plan 1a - Housing Zone guiding Project Plan 1b - Public Project Area

Plan 1c - Public Domain Areas and Public Projects

3- FINDINGS AND DISCUSSION

As a result of rapid urbanization, buildings not suitable for housing such as slums and out-of-planning developments that occur because of insufficient functional areas due to urban growth cause slumization in cities. This process occur faster in historical urban protected areas as the development areas of the historical urban protected areas and the city are created based on different data at different times pursuant to the planning legislation. While this is implemented for physical areas using different methods in different planning interventions, the population uses all areas of the city and cannot equally benefit from the services provided. This causes practices such as hole plans while developing the construction plan of the city. Thus, although urban population and the settlement are integrated, they cannot create a structural and functional integration in the city.

Historical urban protected areas are the first settlements of the city, and in rapid urbanization, the urban population and housing spread within the planning limits. It is necessary to regularly provide feedback regarding the planning technique through construction programs in every four years. Updating the historical urban protected areas in line with technological and functional needs is important for the planning integrity of the settlements in the city.

Reconstruction Plans for Protection should be developed with a dynamic planning understanding instead of a static planning understanding in line with these needs in historical urban protected areas.

4- CONCLUSION AND RECOMMENDATIONS

In conclusion, it is important to address not only the buildings but also their environment to integrate urban growth with the conservation of the protected areas. To do this, planning activities should be defined, and these activities should be in functional type. While determining the problems in urban protected areas, the typology and functional, structural, and economic characteristics of the buildings and the relevant spaces should be defined. For this purpose, the planning should be developed within a long period of time between the upper and lower scales. In addition, the users of these spaces should also be involved in the process. In this way, separation of the participation areas from the other parts of the city will be eliminated and these areas will have an identity depending on their functions. In this regard, first the main decisions should be made regarding the plan integrity of the city and a Reconstruction Plan for Protection should be developed based on these decisions for the historical urban protected areas.

It is recommended to make planning in three phases for historic cities, particularly for the cities with an urban protected area:

1- As urban planning is developed in line with the projected population in the future and the urban settlement integrity, the main decisions in the urban planning should form an integrity.
2- In this planning integrity, the decisions made to protect the existing structure and the cultural values within the historical urban protected areas will create a static plan.
    a) To develop a dynamic plan within this planning, it should be created as an unchanging planning decision because structure and texture will be protected as private properties based on parcels.
    b) The areas including the structure and texture to be included in the implementation of the planning should be addressed as a package project.
3- Package projects should be designed during the implementation by being grouped under the definition of "package project" according to the characteristics of the cultural values that should be protected in the historical urban protected areas.
4- The aim should be minimizing the package projects of the historical urban protected areas in line with the main decisions to the project scales that reflect on the 1:1 scale physical space.

Here, the aim was to integrate the slummed structure and texture in the historical urban protected areas into the city using the planning method analyzed above. This method may allow to create an unproblematic space in the urban development in terms of structure, texture, and economy through the planning decisions regarding the gentrification, renewal and protection of the slum areas in line with the above-mentioned planning recommendation.

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3194 Sayılı İmar Kanunu

2863 Sayılı Kültür ve Tabiat Varlıklarını Koruma Kanunu

DETERMINATION OF THE EFFECTS OF PARKS ON AIR QUALITY IN TERMS OF REGULATING ECOSYSTEM SERVICES; A CASE STUDY OF ÇANAKKALE HALK BAHÇESİ

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Abstract

Urban green areas are the basic component of urban ecosystem. All public spaces such as parks, cemeteries, urban agriculture areas, roof gardens, private gardens are considered under this term. These areas, along with all the other benefits from the ecosystem, are extremely important in terms of improving the air quality and thus increasing the quality of life in cities.

Air pollution is one of the most serious environmental problems worldwide and poses a great risk to human health. In Turkey, the "National Air Quality Index" was created by the Ministry of Environment, Urbanization and Climate Change, for the purpose of monitoring air quality by adapting the United States Environmental Protection Agency (EPA) Air Quality Index to national legislation and limit values. In this framework, air quality index is calculated for 5 main pollutants. These are particulate matter (PM2.5-PM10), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and Ozone (O_3). All these pollutants have a negative impact not only on human health but also on plant and animal health.

In this study, the effect of the "Halk Bahçesi" which is a park used by the public for many years in the city center of Çanakkale, on the air quality has been examined. For this purpose, the i-Tree canopy tool, developed by the US Forest Service, which provides the opportunity to calculate the contribution of the tree canopy to the reduction of air pollution. According the results obtained; tree and shrub canopy covers 30.2% of the park. Approximately 2.64 tons of C was sequestered annually, 66.34 tons of C was stored by plants. In addition, it was calculated that these plants removed about 872.46 g CO, 4,757.33 g NO_2, 47,380.88 g O_3, 2,997.95 g SO_2, 2,302.32 g PM2.5 and 15,870.83 g PM10 particulate matter per year.

Keywords: Urban green area, air quality, canopy assessment, Halk Bahçesi, Çanakkale

Introduction

Human life is directly dependent on the smooth functioning of ecosystems of various scales. The Millennium Ecosystem Assessment (MEA, 2005a) defined products or services obtained from ecosystems as ecosystem services. But in the last 50 years, humans have modified nearly entire ecosystems at an unprecedented rate for increased needs such as food, clean water, timber, fiber and fuel. While these changes have brought significant gains in terms of human well-being and economic development, they have also caused irreversible losses in biodiversity around the world, disruption of many ecosystem services, and poverty in some human communities. This negative process will greatly reduce the benefits that future generations can derive from ecosystems, unless a solution is found (MEA, 2005a).

MEA (2005a), classified ecosystem services under four headings as procurement, regulatory, cultural, and the support services required to produce these three services (Figure 1). Provisioning services; refers to products obtained from ecosystems. Products such as food, clean water, and fuel, which are indispensable for human life, are evaluated under this heading. Regulating services are; benefits derived from the regulation of ecosystem processes. Processes such as regulating air quality, climate, water flow or erosion control are included in this title. Cultural services are the intangible services that people provide from ecosystems. Issues such as various values that people learn from ecosystem processes, cultural diversity created by different ecosystems in human life, spiritual values and inspiration or recreational opportunities are considered among cultural services. Supporting services are; It is necessary for the formation of other services and differs from other services in that its effects on people are indirect and occur over a long period of time.

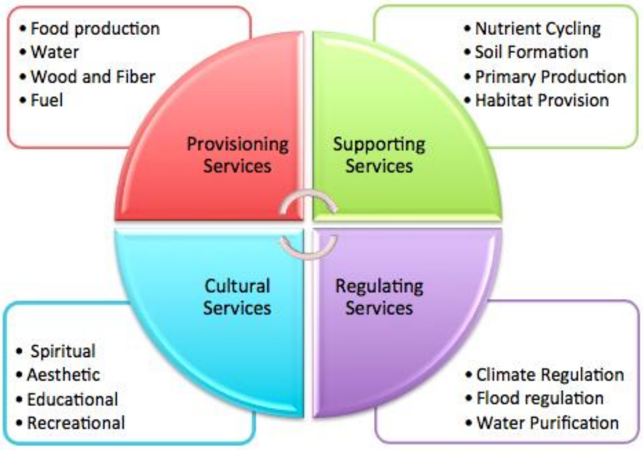

Figure1. Ecosystem services (MEA, 2005a)

Urban areas, where more than half of the world's population live, cover approximately 3% of the world (MEA, 2005b). Despite this, large human communities have great impacts on the world (Niemelä, 2011). According to Gilbert 1989, all this major impact of urbanization on the environment should not be perceived as negative. Various human uses alter existing ecosystems in the urban environment and create a uniquely new one (Niemelä, 2011). Thus, cities contain many ecosystems that have value in terms of biodiversity and ecosystem services (Andersson et al., 2014) and were named “new” by Hobbs et al., 2006. These new ecosystems; contains combinations of species that have not occurred before. In addition, although they are formed by human influence, their continuity does not depend on continuous human intervention (Hobbs et al., 2006).

Despite the great impact of urbanization on land use changes around the world, few studies until recently had focused on the benefits of ecosystems at the urban scale. Gaston (2010) states that this may be due to the perception that urban ecosystems have limited ecological value because they have been modified by human intervention and are relatively smaller in size than other ecosystems (Davies et al., 2011). However, recent studies show that urban ecosystems are of great importance for the quality of urban life in many aspects such as air pollution prevention Jim and Chen, 2008; Kiss et al., 2015; Selmi et al., 2016; Nowak et al., 2018, etc.), micro-climate regulation (Wang et al., 2015, Irmak et al., 2018, Simon et al., 2019 etc.), noise prevention (Klinberg et al., 2017, De Carvalho and Szlafsztein, 2019 etc.) stormwater management (Kandulu et al., 2014, Stout et al., 2017 etc.) and recreational benefit (Tibesigwa et al., 2020, Balzan and Debano, 2018 etc.).

Urban green spaces are considered as the basic component of the urban ecosystem (Qiu et al., 2019). In addition, it includes all public spaces such as parks, cemeteries, urban agricultural areas, roof gardens, road trees, private gardens, which are covered with vegetation and which are easily accessible to the public (Schipperijn et al., 2010; Breuste et al., 2013; Kabisch et al., 2015). Along with all the other benefits from the ecosystem, the improvement of air quality is extremely important in terms of increasing the quality of life in cities.

Air pollution is one of the most serious environmental problems worldwide and poses a great risk to human health (Yli-Pelkonen et al., 2018). However, it is the population in low-income cities that is most affected. More than 100,000 people in 97% of cities in low- and middle-income countries do not have air quality up to World Health Organization standards. In high-income countries, this rate is 49%. Decreased air quality; It increases the risk of stroke, lung cancer, acute and chronic respiratory diseases and heart diseases, including asthma (WHO, 2016). According to the OECD (2014) report, the cost of health problems caused by air pollution in OECD countries was 1.7 trillion dollars in 2010.

In Turkey, the "National Air Quality Index" was created by the Ministry of Environment and Urbanization by adapting the EPA Air Quality Index to our national legislation and limit values in order to monitor air quality. In this framework, air quality index is calculated for 5 main pollutants. These are particulate matter (PM2.5- PM10), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3) (Air Quality Bulletin, 2020).

Particulate Matter (PM) is defined as the suspension in gas of solid or liquid particles of organic or inorganic substances suspended in the air. PM originates from natural events such as wind-generated dust and volcanoes, and from anthropogenic activities such as factories and industrial plants (Steinfeld and Pandis, 2016). Its main components are; sulfate, nitrates, ammonia, sodium chloride, black carbon, mineral salt and water (WHO, 2016). PM whose residence time in the atmosphere can vary from a few minutes to weeks, are classified according to their diameter size (Finlayson-Pitts and Pitts, 2000), and there is an inverse proportion between their harm to human health and their diameter size. Those with particle diameter smaller than 10μm and larger than 2.5μm are called coarse particles (PM10), and particles smaller than 2.5μm in diameter are called fine particles (PM2.5) (Polichetti et al., 2009). Particles with a diameter of less than 10 μm remain in the upper respiratory tract, while particles with a diameter of less than 2.5 μm can pass through the lungs and enter the blood circulation system. This situation; causes lung cancer, heart and respiratory tract diseases (WHO, 2021).

Carbon monoxide (CO) is a colorless, odorless, and tasteless gas proceed by the incomplete combustion of carbon-containing fuels. Carbon monoxide, which is a primary air pollutant, occurs instead of CO_2 as a result of incomplete combustion in the absence of one of the factors such as lack of oxygen, ignition temperature, persistence time of gas at high temperature, and combustion chamber turbulence (Air Quality Bulletin, 2020). CO causes the O and CO_2 carrying capacity of hemoglobin in the human body to be negatively affected (Güler and Çobanoğlu, 1994).

Sulfur dioxide (SO_2) is a non-flammable, colorless gas with a pungent odor at room temperature. The main anthropogenic source of SO_2 is the combustion of sulfur-containing fossil fuels for domestic heating, electricity generation and motor vehicles. SO_2 can stay in the atmosphere for several days and can be transported hundreds of kilometers away depending on meteorological factors. It also dissolves easily in water and causes acid rain (WHO, 2021; Ge et al., 2017;

Barbulescu and Barbes, 2017). In addition, SO_2 causes respiratory system diseases (asthma, chronic bronchitis, etc.), eye irritation and cardiological disorders on human health (WHO, 2021).

The emission of nitrogen oxides (NO_x) due to human activities mostly originates from power plants and motor vehicle exhausts (Aytaç and İlkılıç, 2019). According to Bootdee (2012), the most toxic form is nitrogen dioxide (NO_2). In addition, it has negative effects on human health such as reducing resistance to respiratory tract infections, increasing bronchial reactions to allergens by causing lung function changes in asthma patients. Achakulwisut et al. (2019) reported that NO_2 is one of the main components of traffic-related air pollution, and they found that 4 million new pediatric asthma cases on a global scale can be associated with annual NO_2 pollution.

In addition to its direct effects on human health, NO_2 also absorbs visible solar radiation, causes deterioration of atmospheric vision, has the potential to play a direct role in global climate change if it reaches high concentrations, and increases the amount of tropospheric (ground level) Ozone (O_3) (WHO, 2021). For these reasons, NO_2 is a gas that many countries monitor and control (Delgado, 2005).

Similarly, tropospheric O_3 is one of the causes of various respiratory disorders in humans (WHO, 2021) and remains an unsolved problem in many parts of the world (Heck and Furiness, 2001).

All these pollutants have a negative impact not only on human health but also on plant and animal health. According to Dursun et al., (1998), the leaves of plants are particularly sensitive in this respect. There are acute (immediate death), chronic (decrease in plant quality), and latent (occurring over time, adversely affecting leaf to fruit development) damages on plants (Turalıoğlu, 2011). With many studies on the definition, determination, and solutions of the negative effects of air quality in terms of plants (Öztaner, 2016, Seven et al., 2018, Yücedağ and Kaya, 2016, Emberson, 2020, Yadav and Pandey, 2020, Elkoca, 2002, Türkyılmaz et al., 2020, etc.), there are also many studies on the use of plants to solve this problem. Because plants play an important role in the control of air pollution along with other functions. For example, according to Cardelino and Chameides (1990), urban trees can reduce ozone concentrations in the environment by directly absorbing ozone or other pollutants such as NO_2, or by reducing air temperatures, which reduces hydrocarbon emission and ozone formation rates (McPherson et al., 1998). Similarly, as Nowak (1993) states, trees in urban areas offer a dual benefit in terms of both carbon storage and fewer carbon emissions thanks to energy saving.

Material and Method

The main material of the study is the Halk Bahçesi located in the city center (Figure 2). The history of the area dates to the mid-1800s. The mansion, where the Calvert family, who served as the British and American commercial attaché at that time, lived, had a very large garden. (Kalfa, 2020). This large garden, which was expropriated in 1938, was allocated for the use of various public institutions and institution buildings were built. The remaining 32.000 m^2 area has been serving the citizens for many years under the name of Halk Bahçesi as a park. In addition to the recreational activity opportunities (walking paths, fitness area, walking paths, etc.) it contains, the presence of grown trees makes a great contribution to the air quality of the city (Figure 3).

Figure 2. Study area and location in the city center (Google Earth, 2021)

Figure 3. Various uses of Halk Bahçesi (original, 2021)

The i-Tree software, which aims to clearly demonstrate the air purification function of plants, was developed by the United States Forest Service. One of the tools of this software, the i-Tree canopy model, provides an estimation of the percentage of cover types for any geographic location in the world, and the ability to calculate the contribution of crown cover to air pollution reduction (Hirabayashi, 2014). In the model, land cover types in the study area are defined by a series of random points. The user categorizes the land cover type of each random point on Google Earth. At the same time, the application determines the percentage of land area in each cover class and the sum of the standard error associated with each cover class estimate. Reducing this margin of error is possible by interpreting many points (Hwang and Wiseman, 2020). After the land use classifications are made according to the assigned points, the model is run and the results for the removal of the pollutant from the atmosphere are obtained according to the six criteria defined by the US Environmental Protection Agency (EPA) (Hirabayashi, 2014).

Results

In order to reveal the contribution of the Halk Bahçesi to the air quality, first, the study area map obtained from Çanakkale Municipality has been converted into a format that can be used in the model. By using the I-tree canopy model in the research, three thousand random points were selected on the Google Earth satellite image, the numerical data defining the research area, the land cover represented by these points (1) grass (grass areas), (2) ground cover (areas covered with surface-covering herbaceous vegetation), (3) permeable surface (earth surfaces covered with decorative stones or gravel), (4) shrubs (shrub vegetations), (5) structures and hard floors (buildings and structures, concrete or cobblestone pavement roads), (6) water surface (ornamental pool area), (7) trees (vegetation providing crown cover) are grouped under seven classes. In the continuation of the classification, the model was run and the extent to which the crown cover in the Halk Bahçesi benefited the improvement of air quality in terms of regulatory ecosystem services was calculated. Accordingly, it is seen that approximately 30% of the area is covered by the crown cover. At the same time, there is an impermeable surface of approximately 30% in the area (Table 1).

Table 1. I-tree canopy land cover analysis results

Cover class	Description	Points	%Cover ± SE	Area (m²) ± SE
Grass	grass areas	901	30.03 ± 0.84	9674.06 ±269.58
Ground cover	areas covered with surface-covering herbaceous vegetation	78	2.60 ± 0.29	837.49 ± 93.59
Pervious surface	earth surfaces covered with decorative stones or gravel	275	9.17±0.53	2952.68± 169.70
Shrub	shrub vegetations	102	3.40 ± 0.33	1095.18 ± 106.58
Structure &hardscape	buildings and structures, concrete or cobblestone pavement roads	824	27.47 ± 0.81	8847.31 ± 262.49
Tree	vegetation providing crown cover	804	26.80 ± 0.81	8632.57 ± 260.48
Water surface	ornamental pool area	16	0.53 ± 0.13	171.79 ± 42.83
Total		3000	100.00	32211.07

According to the results of the air quality analysis, 872.46 g (CO), 4757.33 g (NO_2), 47380.88 g (O_3), 2997.95 g (SO_2), 2302.32 g PM2.5 and 15870.83 g PM10 particulate matter are removed from the atmosphere in a year by the vegetation in the Halk Bahçesi (Table 2).

In addition, it has been determined that the trees in the area capture 2.64 tons of C and 9.69 tons of CO_2 per year, and that the trees store 66.34 tons of C and 243.25 tons of CO_2 throughout their lives. In addition, the annual economic value of the air quality improvement service provided by the Halk Bahçesi was calculated as $497, and the value of the service provided by woody plants during their lifetime was calculated as $12471.

Table 2. Amounts of main pollutants removed per year according to I-Tree Canopy anaysis results.

Abbr.	Description	Amount (g)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	872.46	±26.33	0 USD	±0
NO_2	Nitrogen Dioxide removed annually	4,757.33	±143.55	0 USD	±0
O_3	Ozone removed annually	47,380.88	±1,429.65	7 USD	±0

SO_2	Sulfur Dioxide removed annually	2,997.95	±90.46	0 USD	±0
PM2.5	Particulate Matter less than 2.5 microns removed annually	2,302.32	±69.47	15 USD	±0
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	15,870.83	±478.88	5 USD	±0
Total		**74,181.76**	**±2,238.33**	**28 USD**	**±1**

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Air Pollution Estimates are based on these values in g/m²/yr @ USD/g/yr and rounded: CO 0.101 @ 0.00 USD | NO2 0.551 @ 0.00 USD | O3 5.489 @ 0.00 USD | SO2 0.347 @ 0.00 USD | PM2.5 0.267 @ 0.01 USD | PM10* 1.838 @ 0.00 USD (Metric units: g = grams, m² = square meters)

Conclusion

As can be seen from the results obtained, the Halk Bahçesi provides important contributions to the city in terms of air quality. Especially mature trees are of great importance in this respect. The fact that the history of the Halk Bahçesi dates to the 1800s and its rich plant texture are also important. In this respect, the protection of vegetation should be the primary factor in any work to be done in the area. In addition, care should be taken to protect the centuries-old plants found in areas that were used by other institutions over time (that is, the continuation of the Halk Bahçesi), although they were within the boundaries of the Calvert Garden in the past. In addition, any usage changes to be made in these areas must be considered in favor of green areas.

Studies of different scales on the benefits of urban green spaces, of course, offer various results. However, it should not be forgotten that a holistic urban green space planning is necessary in this process.

Studies at various scales on the role of urban open green spaces in urban ecosystem services have been increasing in recent years. Various software and tools developed in this process are also extremely important in terms of these studies revealing clearer results. The I-tree canopy software used within the framework of the research is one of them. This tool provides a practical use that reveals the contribution of plants to air quality based on their crown cover classes and percentages. However, determining the contribution of each species in urban green areas in this process is important in terms of both understanding the value of the area and guiding future plant selections. For this purpose, another study, which is carried out both in the Halk Bahçesi, which is the subject of this research, and in 2 different parks in the city center of Çanakkale, and includes more detailed investigations (plant type, height, age, crown condition, etc.) is about to be completed. It is thought that this paper and other research that will be completed soon will be a guide for future planning and design studies.

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NATURE- BASED SOLUTIONS AND STANDARDS AGAINST GLOBAL CLIMATE CHANGE

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ABSTRACT

As a result of human beings' economic activities, decrease in biological diversity, air, water,and soil pollution, increase in waste and residues, climate change, drought, erosion, and land degradation are increasing day by day. Today's climate change is expected to have negative effects on agriculture, forest and vegetation, clean water resources, sea level, energy, food, human health, and biodiversity in global, national, and regional terms, and even some chain effects in social and economic life. According to IUCN (2016), Nature-based solutions are to conserve, sustainably manage and restore natural and modified ecosystems in a way that effectively and adaptively addresses societal challenges. Thus, they are innovative actions taken to provide both human well-being and biodiversity benefits. Nature-based solutions provide equitable participation, power-sharing, recognition and security of rights, and clarity of responsibilities for humans and nature, with simultaneous benefits to humans and nature in both the short and long terms. A standard consisting of 8 basic and 28 sub-criteria has been proposed by IUCN to determine the success of nature-based solutions. It has been developed for use in design, scaling, and validation applications as a simple yet robust hands-on tool that reinforces best practices, addresses and corrects deficiencies, and ensures that interventions comply with internationally accepted NBS principles. It can be applied to both ongoing and proposed societal challenges interventions. It can be used by Municipalities, Official Institutions and Organizations, NGOs and Private Firms that make strategic action plans against climate change. Nature-based solutions for climate change should be designed to include multifaceted, holistic and cyclical processes. For this reason, nature-based solution approaches should be integrated into legal regulations within the scope of the principle of sustainable life and become a state policy. In this study, strategic actions and standards as a combination of nature-inspired, nature-derived and nature-based solutions are proposed and discussed. Suggestions have been made in 11 titles for nature-based solutions in our country.

Keywords: Nature-Based Solutions, Climate Change, Nature Conservation, Biological Diversity, Sustainability

1. INTRODUCTION

Nature and natural systems are the most basic necessity for life and its continuity. Mankind has used, exploited, altered, and destroyed nature to meet its own needs. Today, as a result of population growth, urbanization and migration, differentiation and increase in production and consumption habits, investments and applications for economic purposes, wrong and unsuitable land uses, industrialization trends, increase in energy and raw material production, and increase in chemical use, balance and harmony in natural systems have been disturbed. Thus, multiple negative effects have emerged. As a result of human beings' economic activities, decrease in biological diversity, air, water, and soil pollution, increase in waste and residues, climate change, drought, erosion and land degradation are increasing day by day. Cities are places where people live together socially. The increase in residential areas with the increasing population, the lack of ecological-oriented planning or the inability to implement the planning, increase the environmental, social and economic problems of the cities as a result of administrative problems. Environmental problems occurring in the environment we live in and their removal are carried out by local governments over time (Clean and Health, 2021). In order for cities to develop sustainably, there is a need to develop an integrative and ecological planning approach in the spatial direction that covers all segments of society. The concept of Sustainability, which has been used since the 1970s, has been adopted as a global understanding of Sustainable Development with the Rio Declaration published at the United Nations Environment and Development Conference in 1992. However, this concept has started to be used in the same way as the concept of a sustainable economy in our country and has started to be used as a state slogan in the legislation.

In parallel with international developments in the use and management of natural resources in Turkey, an approach towards sustainable development has been displayed. Even if it is aimed to reduce the so-called pressures on nature and the environment, it is observed that this cannot be translated into action by reducing the pressure on nature and the environment. However, in response to the sustainable development growth model that started on a global scale, the "green growth" approach has also gained importance. As part of the green and environmentally friendly growth approach, the implementation of clean production and eco-efficiency in production sectors, as well as ecology-based policies in sectors such as agriculture, tourism, and industry will make it possible to protect the environment and increase equal competitiveness.

A green economy is used for the understanding of the circular economy that develops with concepts such as reducing environmental risks and ecological scarcity, low carbon emissions, efficient use of resources, increasing social welfare, increasing social equality and social responsibility. The green economy provides the balance of income, employment and growth with the support of the public and private sectors, reducing carbon emissions, improving biodiversity and preventing the loss of ecosystem services. This approach, which is also expressed as green growth, is the understanding of ensuring economic growth in an environmentally and natural resource-friendly way (Agah 2016).

Today, many climate scientists accept that there are abnormal changes in the climate system on Earth. It is stated that if the human activities that cause the deterioration of the natural balance are continued and the necessary urgent measures are not taken, this change in the climate will increase and have negative consequences. (Ozturk, 2002). It seems inevitable that global climate change will have negative effects on agriculture, forests and vegetation, clean water resources, sea level, energy, human health and biodiversity in global, national and regional terms. It is expected that there will be some chain effects in social and economic life (Yılmaz, 2019).

One of the approaches that will contribute to the mitigation and adaptation process of global climate change is Nature-Based Solutions. Nature-based solutions (NBS) are actions to protect and sustainably manage natural and modified ecosystems to effectively and adaptively address societal challenges, both for human well-being and for the preservation of biodiversity and ecosystem services. The IUCN (World Union for Conservation of Nature) refers to seven societal challenges on a global scale. These are climate change adaptation and mitigation, disaster risk reduction, ecosystem degradation and reversing biodiversity loss, human health, socio-economic development, food security, and water security. In order for an intervention to be considered as (NBS), it must address one or more societal challenges in an integrated way (IUCN, 2020).

The importance and role of nature-based solutions against global climate change have not been adequately evaluated and investigated much. In this study, the importance and relationship of nature-based solutions against climate change has been revealed. The standards (criteria and sub-criteria) for determining the operational success of nature-based solutions proposed by IUCN were examined. In our country, natural-based solutions have been proposed in the adaptation process to climate change.

2. CLIMATE CHANGE AND ITS EFFECTS

Climate change can be defined as “statistically significant changes in the mean state of the climate or its variability over tens or more years”. Climate change may occur due to natural internal processes and external forcing factors and continuous anthropogenic (human-induced) changes in the composition of the atmosphere or land use (Türkeş, 2008). With a general approach, climate change can be defined as “long-term and slow-developing changes in climatic conditions, regardless of the cause, with large-scale (global) and significant local effects” (Türkeş, Sümer, & Çetiner, 2000). According to the Intergovernmental Panel on Climate Change (IPCC), climate change refers to natural or human-induced changes in the basic characteristics of climate demand, which can be determined over a long period of time by statistical studies (Doğan and Tüzer, 2011). In the last report of the IPCC, it is predicted that the temperature increases will be around 2.5-3°C for 2050, and the increases will reach 4-6°C at the end of the century. The economic, social, and environmental risks created by these temperature increases characterize climate change as one of the biggest risks faced by human history (Karapınar, Özertan, Tanaka, An and Turp, 2020). The temperature changes between 1850–1900 versus cumulative CO_2 emissions since January 1, 1876, are given in Figure 1 (Rogelj, Shindell, Jiang, et al., 2018).

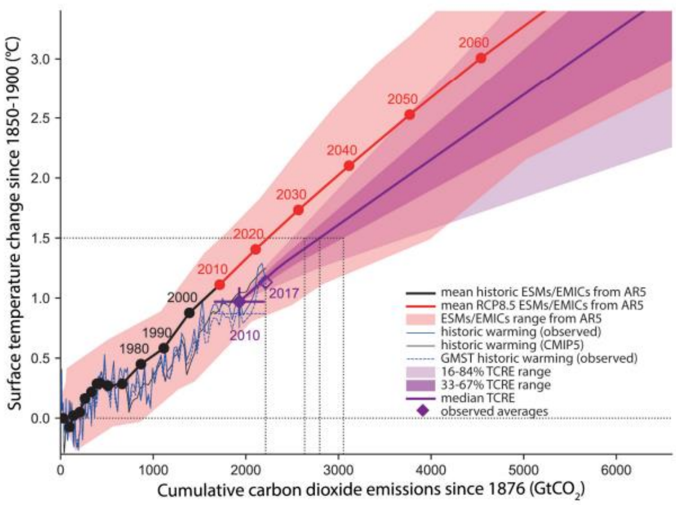


Figure 1. Temperature changes from 1850–1900 versus cumulative CO_2 emissions since 1st January 1876 (Rogelj, Shindell, Jiang, et al., 2018)

Four important decisions were taken at the 26th United Nations Climate Change Conference (COP26), which took place on 31 October-12 November 2021 in Glasgow, Scotland; (UK Government, 2021).

- **Secure Global Net Zero By Mıdcentury And Keep 1.5 Degrees Wıthın Reach:** Countries are being asked to come forward with ambitious 2030 emissions reductions targets (NDCs) that align with reaching net zero by the middle of the century. To deliver on these stretching targets, countries will need to accelerate the phaseout of coal, encourage investment in renewables, curtail deforestation, and speed up the switch to electric vehicles.

- **Adapt to Protect Communitıes and Natural Habitats**: The climate is already changing and it will continue to change even as we reduce emissions, with devastating effects. At COP26 we need to work together to enable and encourage countries affected by climate change to protect and restore ecosystems, build defenses, put warning systems in place and make infrastructure and agriculture more resilient to avoid loss of homes, livelihoods, and lives.
- **Mobilize Finance:** To realise our first two goals, developed countries must deliver on their promise to raise at least $100bn in climate finance per year. International financial institutions must play their part and we need to work towards unleashing the trillions in private and public sector finance required to secure global net zero.
- **Work Together To Deliver**: We can only rise to the challenges of climate change by working together. At COP26 we must finalise the Paris Rulebook (the rules needed to implement the Paris Agreement). And, we have to turn our ambitions into action by accelerating collaboration between governments, businesses and civil society to deliver on our climate goals faster.

One of the most important natural effects on the climate is the greenhouse effect. In a clear and cloudless atmosphere in the Earth's atmosphere, a significant part of the incoming short-wave solar radiation passes through the atmosphere and reaches the earth's surface and is absorbed there. However, some of the infrared radiation emitted from the Earth's surface is absorbed by radiatively active greenhouse gases, most of which are in the lower atmosphere (troposphere), and then re-emitted before escaping into space (Türkeş, 2008). The greenhouse effect is the natural process that causes the Earth to warm up more than expected and regulates the heat balance since the gases in the atmosphere are permeable to incoming solar radiation and much less permeable to back-emitted long-wave ground radiation (Türkeş, 2008).

Increases in greenhouse gas (CO_2, CH_4, N_2O ve O_3) accumulations as a result of human activities in the atmosphere weaken the Earth's cooling efficiency by long-wave radiation, creating a positive radiative forcing that tends to warm it more. As a result, global warming has been caused by the rapid increase in the atmospheric accumulation of greenhouse gases released into the atmosphere by various human activities such as the burning of fossil fuels, deforestation, agricultural activities and industrial processes since the Industrial Revolution, and as a result of the strengthening of the natural greenhouse effect with the effect of urbanization, on the earth and in the lower layers of the atmosphere. (lower and middle troposphere) can be defined as the temperature increase detected (Türkeş, 2008; Doğan and Tüzer, 2011).

Another effect of climate change is that it will affect the composition of natural ecological systems and reduce biodiversity. It is reported that 10% of an ecosystem region will be affected by a temperature increase of 1-2 C° (Doğan and Tüzer, 2011).

It is predicted that climate change will have negative effects on terrestrial and marine ecosystems and its rate and severity will increase in the future. This means that water and food are less accessible, natural disasters occur more frequently, human health is threatened, species are extinct, and ecosystems are lost or destroyed (Stolton, 2011).

Some ecosystems respond quickly to climate change, while others respond rather slowly. The structure, composition, productivity, and geographic distribution of many ecosystems will be disrupted, as individual species will respond differently and differently to changes in climate and deteriorating climatic regimes (for example, precipitation, evaporation, and temperature regimes).

Forests are very sensitive to climatic changes. Forests are among the systems that are most sensitive mainly due to changes in precipitation regime, distribution of pests, changes in age structure and reductions in carbon content (Öztürk, 2002). Another effect of climate change is the decrease in water resources, forest fires, drought and desertification and ecological deterioration. It is predicted that agricultural lands will be adversely affected by bad use, flooding due to water management deficiencies, salinization, barrenness, pollution due to excessive pesticide and fertilizer use, and temperature increase. Therefore, agricultural policies have become one of the national security concerns in many countries (Ozturk, 2002).

The extent of the human impact on climate change and the chain effects of warming are not clearly known. Climate change may lead to changes that will trigger future warmings, such as the melting of fixed glaciers and the high emission of methane gas, which creates a greenhouse effect. There may also be warming mitigating effects, such as plants with increased growth rates due to warmer conditions, as they grow, absorb more carbon dioxide from the atmosphere. But scientists are unsure how the complex balance might respond to these positive and negative influences. (Hekimoglu and Altindeger, 2008).

Developments and events related to climate change lead to many devastating consequences, from loss of life, injuries, and epidemics to the loss of habitats and the deterioration of the balance of the ecosystem. These effects are of such magnitude and nature that they cannot be calculated as economic costs (Uncu, 2019). According to a study conducted on 1692 cities around the world, it was stated that the economic cost of climate change to cities, with the addition of the urban heat island effect, is 2.5 times compared to other regions (Estrada, Wouter Botzen, & Tol, 2017).

3. NATURE-BASED SOLUTIONS FOR CLIMATE CHANGE ADAPTATION PROCESS

The concept of nature-based solutions has been seen as proactively protecting, managing, or restoring ecosystems in tackling a range of major societal challenges, placing greater emphasis on the needs of people, the potential for conservation actions for the sustainable use of nature, and not as passive beneficiaries of nature. NBS was developed as part of the ongoing paradigm shift that began in the late 1980s (Cohen-Shachamark., 2019). NBS recognize that the conservation of biodiversity and the preservation of ecosystem services are essential for various aspects of human well-being, including human health.

According to IUCN (2016), Nature-based solutions are to conserve, sustainably manage and restore natural and modified ecosystems in a way that effectively and adaptively addresses societal challenges. Thus, they are innovative actions taken to provide both human well-being and biodiversity benefits. Nature-based solutions (NBS) are the general name of innovative interventions against climate change that are produced from nature and natural processes, in a sense, designed in harmony with nature (Uncu, 2021). According to IUCN (2016), the main purpose of nature-based solutions is to support the achievement of society's development goals, protect human well-being in a way that reflects cultural and societal values, and improve the resilience, regeneration capacity and service delivery of ecosystems (IUCN, 2016). According to Uncu (2021), the main purpose of natural-based solutions is an approach that is compatible with natural systems, to repair and protect the down climate change, to equate the value of nature with social-economic values, and to look at it from a more general planning perspective.

When dealing with complex systems, nature-based solutions go beyond traditional mechanical approaches to solving problems (Rogers et al., 2013). “The Ecosystem Approach”, which forms the basis of the Convention on Biological Diversity (CBD), forms the basis of the concept of nature-based solutions (CBD, 2004; Holling, 1986; Waltner-Toews & Kay, 2005; Smith & Maltby, 2003).

Nature forms the basis of economy and society by benefiting people both directly and indirectly. Nature-based solutions are important in terms of providing multiple social benefits. It offers people a range of social and environmental benefits, including clean air, water, climate change mitigation and adaptation, food, energy, places to live, recreation, and protection from hazards. Nature-based solutions must be designed to address specific societal challenges effectively and efficiently. When a nature-based solution plan is developed, there is a need to develop a plan for the implementation of the monitoring program to determine its effects. One of the challenges many nature-based solution practitioners face today is a lack of economic or financial planning and long-term resources. Nature-based solutions provide equitable participation, power-sharing, recognition and security of rights, and clarity of responsibilities for humans and nature, with simultaneous benefits to humans and nature in both the short and long terms (IUCN, 2020).

The term "Nature-Based Solutions" was first introduced by the IUCN (World Union for Conservation of Nature) in 2009 and was later put forward as an umbrella term for various conservation approaches, including the previously mentioned. Additional concepts under the umbrella of nature-based solutions are (IUCN, 2020).

- Ecosystem-Based Adaptation (EbA),
- Ecosystem-Based Disaster Risk Reduction (EcoDRR),
- Green Infrastructure (for economic growth and investments in an urban context),
- Natural Infrastructure (for a sustainable Integrated Water Resources Management),
- Holistic or Regenerative Landscape management.

These approaches are highly relevant to the application of nature-based solutions and are complementary actions that can be used in combination and in executing a solution to societal challenges. For an action or intervention to be accepted as a nature-based solution, it must address one or more social challenges in an integrated way and produce solutions. With this statement, IUCN refers to 7 key societal challenges: These targets are; (IUCN, 2020).

- Adaptation and mitigation to climate change,
- Reducing disaster risk,
- Reversing ecosystem degradation and biodiversity loss,
- Human health,
- Socioeconomic development,
- Food safety and
- Water security.

Nature-based solutions, unlike any conservation action, should be part of its design in solving at least one anticipated societal challenge. Nature-based solutions aim to produce hybrid solutions through collaboration with innovative partnerships that should benefit both biodiversity and human well-being while ensuring nature conservation, and addressing several societal challenges.

Nature-based solutions can make significant contributions to climate change mitigation, human health and well-being, and economic recovery while strengthening climate resilience (IUCN, 2020). In order to reduce the effects of climate change, it is necessary to understand the value of nature, develop nature-based solutions, and increase investment in finance.

4. IUCN'S GLOBAL IMPLEMENTATION STANDARD FOR NATURE-BASED SOLUTIONS

By combining the expert knowledge, skills, and experience of a wide range of stakeholders, IUCN adopted standards for nature-based solutions in 2020 at the 98th Meeting of the IUCN Council (IUCN, 2020). Global standards for nature-based solutions are facilitating standard that aims to improve the more detailed design and execution rather than streamlining processes to achieve specific results or outcomes. It contributes to the revision of the implementation process of nature-based solutions to the environmental and social changes that evolve over time, and to the development and improvement of policies. In addition, as stakeholders; They are actors who will provide standardization for design and implementation for politicians, managers, planners, implementers, and representatives of the financial sector. The Standard will enable practitioners to standardise the design and implementation of NBS, by 1) Setting a common basis of understanding for what an NbS is and is not; 2) Contributing to transformational changes, by improving NbS practice, and supporting the clarification and development of NBS-related policy. Nature-based solutions standard has two functions; (IUCN 2020). 1. Guiding the design of nature-based solutions, 2. To provide a means to verify that the design meets the requirements of the standard of the nature-based solution. Nature-Based Solutions Standards, (IUCN 2020).

1. Developed for use in design, scaling, and validation applications as a simple yet robust hands-on tool that reinforces best practices, addresses and corrects deficiencies, and ensures compliance of interventions with internationally accepted NBS principles.
2. Applicable to both ongoing and proposed societal challenges interventions.
3. It can be used by municipalities, public institutions, and organizations, NGOs, and private companies that make strategic action plans against climate change.

5. STANDARDS AND CRITERIA FOR NATURE-BASED SOLUTIONS

Alongside the IUCN definitional framework for NbS launched in 2016, in which NbS were defined as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (IUCN, 2016), eight principles were adopted by IUCN’s members (IUCN, 2016) as shown in Fig.2.

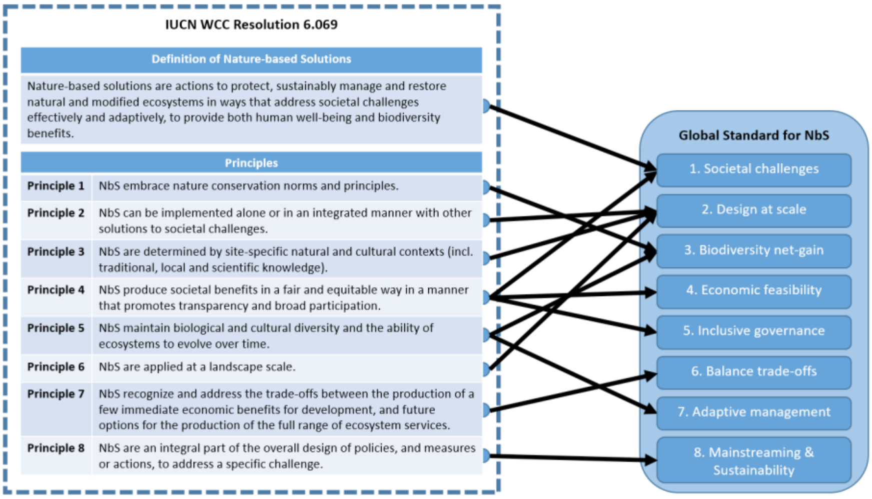


Figure 2: Link between the NBS Principles and the NBS Standard Criteria (IUCN, 2020)

A standard consisting of 8 basic and 28 sub-criteria has been proposed by IUCN to determine the success of nature-based solutions (Fig. 3) (IUCN 2020).

Criterion 1: NbS effectively address societal challenges.

- C- 1.1 The most pressing societal challenge(s) for rights-holders and beneficiaries are prioritized. 17
- C-1.2 The societal challenge(s) addressed are clearly understood and documented.
- C-1.3 Human well-being outcomes arising from the NBS are identified, benchmarked and periodically assessed.

Criterion 2: Design of NbS is informed by scale

- C-2.1 The design of the NBS recognizes and responds to the interactions between the economy, society and ecosystems.
- C-2.2 The design of the NBS is integrated with other complementary interventions and seeks synergies across sectors.
- C-2.3 The design of the NBS incorporates risk identification and risk management beyond the intervention site.

Criterion 3: NbS results in a net gain to biodiversity and ecosystem integrity.

- C-3.1 The NBS actions directly respond to the evidence-based assessment of the current state of the ecosystem and prevailing drivers of degradation and loss.
- C-3.2 Clear and measurable biodiversity conservation outcomes are identified, benchmarked, and periodically assessed.
- C-3.3 Monitoring includes periodic assessments of unintended adverse consequences on nature arising from the NBS.
- C-3.4 Opportunities to enhance ecosystem integrity and connectivity are identified and incorporated into the NbS strategy.

Criterion 4: NbS are economically viable.

- C-4.1 The direct and indirect benefits and costs associated with the NbS, who pays and who benefits, are identified and documented.
- C-4.2 A cost-effectiveness study is provided to support the choice of NbS including the likely impact of any relevant regulations and subsidies.
- C-4.3 The effectiveness of the NBS design is justified against available alternative solutions, taking into account any associated externalities.
- C-4.4 The NBS design considers a portfolio of resourcing options such as market-based, public sector, voluntary commitments, and actions to support regulatory compliance.

Criterion 5: NBS is based on inclusive, transparent, and empowering governance processes.

- C-5.1 A defined and fully agreed upon feedback and grievance resolution mechanism is available to all stakeholders before an NBS intervention is initiated.
- C-5.2 Participation is based on mutual respect and equality, regardless of gender, age, or social status, and upholds the right of Indigenous Peoples to Free Prior and Informed Consent (FPIC).
- C-5.3 Stakeholders who are directly and indirectly affected by the NBS have been identified and involved in all processes of the NBS intervention.
- C-5.4 Decision-making processes document and respond to the rights and interests of all participating and affected stakeholders.
- C-5.5 Where the scale of the NBS extends beyond jurisdictional boundaries, mechanisms are established to enable joint decision-making of the stakeholders in the affected jurisdictions.

Criterion 6: NBS equitably balance trade-offs between the achievement of their primary goal(s) and the continued provision of multiple benefits.

- C-6.1 The potential costs and benefits of associated trade-offs of the NBS intervention are explicitly acknowledged and inform safeguards and any appropriate corrective actions.
- C-6.2 The rights, usage of and access to land and resources, along with the responsibilities of different stakeholders, are acknowledged and respected.
- C-6.3 The established safeguards are periodically reviewed to ensure that mutually-agreed trade-off limits are respected and do not destabilise the entire NBS.

Criterion 7: NBS are managed adaptively, based on evidence.

- C-7.1 An NBS strategy is established and used as a basis for regular monitoring and evaluation of the intervention.
- C-7.2 A monitoring and evaluation plan is developed and implemented throughout the intervention lifecycle.
- C-7.3 A framework for iterative learning that enables adaptive management is applied throughout the intervention lifecycle.

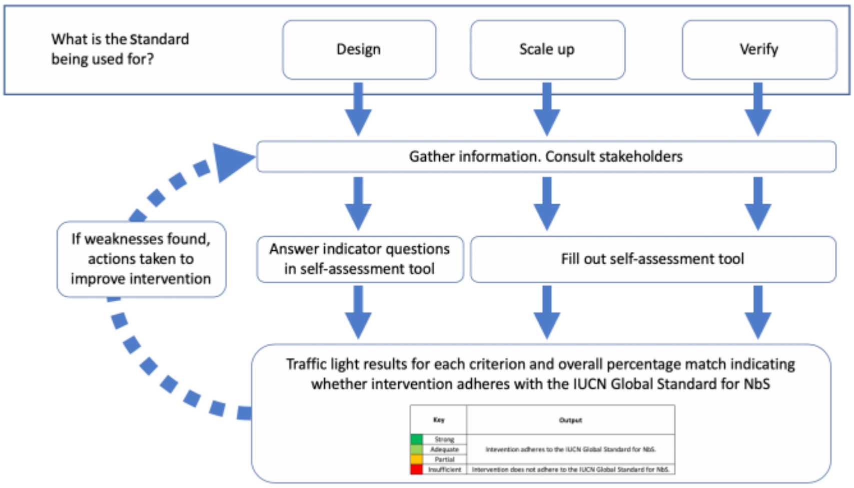
Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context.

- C-8.1 The NBS design, implementation and lessons learnt are shared to trigger transformative change.
- C-8.2 The NBS informs and enhances facilitating policy and regulation frameworks to support its uptake and mainstreaming.
- C-8.3 Where relevant, the NBS contributes to national and global targets for human well-being, climate change, biodiversity and human rights, including the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

NBS Standards Evaluation Process

It has been developed for use in design, scaling, and validation applications as a simple yet robust hands-on tool that reinforces best practices, addresses and corrects deficiencies, and ensures that interventions comply with internationally accepted NBS principles (IUCN, 2020). It can be applied to both ongoing and proposed societal challenges interventions. It can be used by Municipalities, Official Institutions and Organizations, NGOs, and Private Firms that make strategic action plans against climate change. **(Figure 3)**

1. Creation of tools to be used for the standard
    - Design: Creation of 8 criteria and sub-criteria,
    - Scaling: Defining the scales for the interventions and application areas,
    - Validation: Approval of solutions by relevant stakeholders (especially funders and investors, etc.).
2. Gathering information and making decisions and consulting with Stakeholders,
3. Self-Assessment Form and Scoring,



Key (%)			Output
(green)	≥75	Strong	Intervention adheres to the IUCN Global Standard for NbS.
(light green)	≥50 & <75	Adequate	
(yellow)	≥25 & <50	Partial	
(red)	<25	Insufficient	Intervention does not adhere to the IUCN Global Standard for NbS.

Figure 3. Evaluation in nature-based solutions (IUCN 2020).

Benefits for local governments as a result of the implementation of the NBS standard:

• Contributes to the creation of more livable urban environments,

• Increases public satisfaction regarding the environment,

• Facilitates the inclusion of NBS in strategic and operational plans,

• Ensures the creation of green infrastructure together with stakeholders to better meet their social and economic needs through urban renewal and NBS,

• Creates a more attractive environment to diversify urban economies (eg urban agriculture; green infrastructure construction and maintenance) and to revitalize urban centers and encourage inward investment.

• It reduces air and noise pollution and improves public health.

• Provides more cost-effective surface water management.

• It increases its resistance against environmental hazards such as heat stress, flood, and sea level rise.

• Offers more sustainable solutions than hard infrastructures to adapt to and mitigate climate change.

• Ensures efficient use of resources by optimizing the multi-faceted benefits obtained from NBS investments.

6. CONCLUSION AND RECOMMENDATIONS

The Intergovernmental Panel on Climate Change (IPCC) report "Global Warming of 1.5°C" provides ample evidence that human activities are causing global warming by approximately 1.0°C above pre-industrial levels (IPCC, 2018). To keep global average temperature rise "well below pre-industrial levels", the targets set in the Paris Agreement must be met. Transformational changes and innovative approaches to reduce carbon emissions are urgently needed for humanity to limit global warming to 1,5°C. (IPCC, 2018; Rockström et.al., 2009; Steffen et. al., 2015).

One of the main goals of nature-based solutions is to improve and protect the ecosystem while adapting to climate change and at the same time slowing climate change. Reducing carbon emissions, increasing carbon capture and storage, reducing fossil fuel emissions, and ensuring the continuity of ecosystem services and contributions are considered important approaches to limit warming to well below 1.5ºC or 2°C against climate change.

In this context, in order to eliminate the negativities such as loss of biodiversity, climate change effects, and environmental problems experienced today, the issue should be handled holistically, and many factors (political, social, economic, technological, spatial planning/design, management, ethical, etc.) analysis and sustainable strategic actions are needed

To meet human welfare and needs, to ensure the continuity of ecosystem services, to protect and manage natural and modified ecosystems effectively and sustainably, it is necessary to produce nature-based solutions that are compatible with nature, inspired by nature. In the 5th Assessment report of the IPCC, “nature-based solutions” were highlighted as one of the climate change adaptation options.

In Adapt Now, the Global Commission on Adaptation put forward three recommendations to scale up the use of nature-based solutions (NBS) for adaptation: (CAS 2021).

- Raise understanding of the value of nature for climate adaptation
- Embed nature-based solutions into adaptation planning and policy
- Increase investment in nature-based solutions

Nature-based solutions stand out as a key concept in the process of mitigating and adapting to climate change and provide benefits for ecosystems. For example, a nature-based solution proposed for the rehabilitation of an endangered species' habitat not only provides a healthy habitat for that species but also serves to reduce the water cycle and greenhouse gas emissions in the landscape. On the other hand, it contributes significantly to the realization of national and international climate strategies and targets.

Naturally Based Solutions and Suggestions For Climate Change Mitigation and Adaptation in Our Country;

NBS stands out as a key concept in the mitigation and adaptation process of climate change and provides benefits for ecosystems. At the application level, it advocates alternative protection and adaptation methods such as “green infrastructure” applications, instead of conventional interventions based on concrete-weight “gray infrastructure” against the effects of climate change (Uncu, 2021). Today, cities are responsible for 75% of natural resource consumption, 60-75% of energy use, and 70% of greenhouse gas emissions. DBS, which initially emerged as an understanding of issues such as agriculture and water management, has recently become an important tool in the climate struggle of cities (Uncu, 2019).

The climate change adaptation process requires taking scientific-based and financially planned steps and creating sustainable policies for nature-based solutions by being in the interest of governments, politicians, public institutions, NGOs, local administrators, and the private sector.

The nature-based solution proposals in our country in the adaptation process to climate change can be summarized as follows

1. **Solutions for Carbon Storage and Capture:**

- The number and surface area of trees in and around the city should be increased.
- Old trees should be protected and kept alive.
- Urban and non-urban natural ecosystems should be protected.
- The sustainability of ecosystem services of existing protected areas and effective governance should be ensured.
- Sensitive, rare, rich in biodiversity, and carbon-absorbing ecosystems should be legally protected.
- The functions and activities of wetlands should be protected and their sustainability should be ensured.
- Existing forests should be developed and their productivity should be increased.
- In line with the sustainable forest management principles of forests, ecosystem-based and multi-purpose management plans should be made.

2. Solutions for Effective Use of Energy:

- Renewable energy (solar and wind energy, etc.) production should be expanded at the building scale.
- Photo Voltaic panels should be expanded.
- Green Building Certificate in buildings should be disseminated and encouraged.
- Building exteriors should be combined with plants.
- Green infrastructure applications should be expanded.
- Energy-saving should be ensured in private and public areas.
- Hydroelectric power stations (HPS) should be allowed according to the biological diversity and carrying capacity of the rivers. In the location selection and planning of HPSs; In addition to environmental, economic, and socio-cultural effects, the effects of climate change should also be considered.

3. Solutions to Prevent Natural Disasters such as Drought, Flood, Forest Fire

- Natural disasters such as floods, landslides, danger and risk maps should be prepared against the effects of climate change. These maps should be integrated into spatial plans.
- Monitoring, forecasting, and early warning systems should be established, expanded, and developed for natural disasters due to climate change.
- The social, economic, and environmental effects of natural disasters should be determined.
- Preventive measures should be increased in the fight against forest fires and early warning systems should be developed.
- Drought-resistant species should be used in afforestation works.

- Ecological puddles or ecological ponds should be created from precipitation waters. Thus, it should be ensured that excessive precipitation is kept away from the sewerage by preventing direct seepage and providing temporary storage.

4. **Solutions for Food Security and Improvement of Agricultural Production**

- Agricultural lands in and around the city should be protected, I and II class lands should be used only for plant production.
- Effective use of urban agricultural areas should be ensured and expanded through legal regulations.
- Agro-forestry land techniques should be expanded in urban agricultural areas.
- Organic agricultural production and aquaculture should be expanded and encouraged.
- Drought-resistant seed varieties should be developed.
- Producer cooperatives, marketing, and supply chains should be established in urban and rural food production.
- The use of compost organic fertilizers should be increased instead of commercial fertilizers.
- Compost from used food waste should be recycled as fertilizer (carbon emissions from methane emitted as food decomposes can also be reduced).
- An agricultural product pattern should be created at the basin scale according to local conditions.
- Techniques should be used to prevent the evaporation of water and ensure its effective use in agricultural production.
- Land consolidation studies should be completed to increase agricultural productivity.
- Agricultural biodiversity should be protected and local seed production and use should be increased.
- Drought and salinity resistant product varieties should be developed.
- Biological control should be preferred against plant diseases and pests.

5. Evaluation of Waste and Residues:

- Sustainable waste management and recycling mechanisms should be developed.
- Vegetable waste and residues should be used as compost, fertilizer, or mulch material.
- Uncontrolled discharge of wastes (domestic and industrial wastes) to the surface and mixing with groundwater should be prevented.
- Marble residues and wastes should be considered as structural materials and brought into the economy.

6. Solutions for Ensuring and Improving Air Quality.

- Air polluting factors should be reduced.
- Not only fines but also deterrent mechanisms should be developed from those polluting the air.
- The number and surface of green areas should be increased.
- Especially old trees should be protected, the number and surface area of trees should be increased.
- The use of natural gas in urban areas should be expanded.

7. Solutions for the Safety and Effective Use of Water Resources

- Drinking water resources should be protected and environmental pollutants should be prevented.
- Closed irrigation systems (such as sprinklers, drip irrigation) should be applied instead of the flood irrigation system.
- Excessive use of underground water resources should be prevented and artesian and well drilling should be controlled. Illegal use of groundwater must be prevented.
- No pesticides should be allowed to be used around water resources.
- Sewage and rainwater collection systems should be separated in residential areas.
- Public awareness should be raised on the protection of groundwater in the basins and the prevention of illegal groundwater use.
- In the middle and upper basins of the lake basins, dams or irrigation ponds should be kept at a limited level and the lake should be fed.
- Lakes, swamps, and wetlands should not be dried or used for agricultural purposes.
- Projects aiming at the recovery of process and cooling water in sectors with high water consumption and identified as a priority should be supported.
- Wastewater should be treated and used in agriculture and industry.
- Household and industrial equipment that consumes less water should be produced and its use should be encouraged.
- Salinity and sodium increase in irrigated areas in hot regions should be prevented.
- It should not be opened to settlement and industry in an unplanned manner in places where there are underground water bodies.

8. Solutions for Soil Stabilization and Protection of Coastal Areas

- • Reefs and mangroves, which are part of the marine ecosystem, should be protected and repaired, instead of constructing ecological barriers or walls, dams, and water discharge systems to prevent flood and wave damage due to rising sea levels.
- • All activities carried out in coastal areas (on land and in coastal waters) should be carried out in a way that will affect the marine and coastal ecosystems the least, and plans should be made that will not disrupt the adaptation of these ecosystems to climate change.
- • Existing coastal dunes, beach systems, and wetlands should be protected and not used for other purposes.
- • Construction should not be allowed in coastal areas within 100 m of the shoreline.
- • Energy production from waves should be expanded in coastal areas.
- • Multi-purpose planting should be done on marginal and sloping lands,
- • Agroforestry land-use systems (agroforestry systems) should be expanded.
- • Vegetation studies should be carried out in places with erosion risk.
- • Wind curtains and corridors should be installed.

9. Inclusion and Integration of DBAs in Spatial Planning and Design Processes:

- NBS for climate change requires interdisciplinary work and planning and management within the system.
- Spatial planning and design processes and decisions should include sustainable life-oriented, not human-oriented decisions. In particular, ecological decisions should be made, the balance of protection and use should be taken into account, and their capacity to adapt to climate change should be taken into account.
- Plan and design decisions should be equal, fair, participatory, ecological, and sustainable.

- Planning and design processes should be analyzed by taking into account natural parameters, prioritization, and the decision making process should be decided at the scientific and technical levels.
- Biodiversity must be integrated into the planning and design process.
- Sectoral land use decisions should be based on the basin scale, especially in the management of water resources, and the “Integrated Basin Management” approach should be adopted by all relevant institutions.
- Land use decisions should be made according to land capability classification.
- A comprehensive and reliable digital database of natural and cultural resources should be established throughout the country.
- Pasture areas should be protected and improved.
- Tall buildings should not be allowed in residential areas. In new residential areas, it should be designed as low-rise, low-density, or low-density high-rise covered with green areas.
- The amount of open and green areas should be increased in order to balance the building and green space.
- Buildings should be designed and implemented in an ecologically oriented and environment-friendly manner,
- Green roof, ecological and recyclable building materials should be used in buildings,
- Buildings should be constructed with solar panels, insulated roofs, walls, floors, waste recycling (toilet, bathroom, kitchen solid/liquid waste) mechanisms, and features that save energy and do not pollute the environment.
- A drainage system should be established for precipitation waters from building scale to city scale in residential areas and its integration should be ensured,
- Reuse of precipitation waters should be ensured.
- Natural water surfaces should be created at the lowest elevations within the urban area.

10. Solutions for Conservation and Development of Existing Protected Areas and Green Areas;

- The number of existing protected areas should be increased and effective governance should be ensured according to the purpose of protection.
- Organic corridors and connections should be created between the protected areas and natural ecosystems around the city and open and green areas at the scale of the city, neighborhood, and district by creating a holistic green system organization.
- The number and surface area of trees should be increased in residential areas, and the right tree species should be preferred in the right place for the purpose.
- The rate of urban green areas per capita (at least 30 m2/person) should be increased, and their numbers and distribution should be placed in every neighborhood in an equal and balanced way.
- Natural ecosystems and urban forests should be increased in and around the city. Sensitive and fragile ecosystems must be protected.
- Urban agricultural areas should be protected and used for their purpose.
- Vegetable residues should be used as compost fertilizer.
- Natural plant species should be used in plant design applications and species with low water demand should be preferred.
- Green roofs and vertical vegetation should be designed and encouraged to reduce the heating and cooling costs of buildings and to reduce the effects of heavy rains.

- Green roofs or vegetable gardens etc. should be reused by re-functionalizing urban idle structures.
- Urban biodiversity should be protected and integrated with natural ecosystems.

11. Solutions for Transportation and Accessibility:

- Sustainable modes of transportation should be prioritized.
- Public transportation options should be increased.
- The use of renewable energy in transportation should be increased.
- The use of bicycles and scooters should be expanded.
- Since the open car parks cover a large area on the surface, permeable flooring material should be used or car parks should be planned underground.
- Pedestrianized areas should be increased.
- Natural materials with water permeability should be preferred instead of asphalt on the roads.
- Appropriate planting should be done on the roadside and medians.
- Divided highways within or between cities should be planned in such a way that they do not divide or disintegrate natural ecosystems. Where there are natural systems, ecological bridges and ecological underpasses must be built for wild animals.

Nature-based solutions for climate change should be designed to include multifaceted, holistic, and cyclical processes. For this reason, nature-based solution approaches should be integrated into legal regulations within the scope of the principle of sustainable life and become a state policy. By creating green and nature/environment-oriented government policies, it should be reflected in every sector and individual/society, and a lifestyle compatible with nature and green economy should be expanded. There is a need to produce solutions with new paradigms instead of the wrong approaches made today. For example;

> • For economic investments, instead of the "puzzle-fix" approach, the "forecast-precaution-ensure sustainability" approach should be targeted.
>
> • Instead of the "buy more-use-dispose and change" approach applied as a lifestyle, the "buy less-reuse-convert-repair" practice should be adopted.

As the demand for nature-based solutions increases in the future, it is necessary to diversify and increase the resource options in order to generate sufficient financial resources. However, it is necessary to focus on the green economy with an ecological vision, which aims to produce as much as needed, encourage reuse, and make the consumer a participant in the production chain (Milani, 2004).

As a result; Increasing the understanding of the value of nature in terms of discourse and action in the climate change adaptation process, establishing a production and consumption relationship compatible with natural systems, and disseminating organized and conscious collective awareness in nature/environmental protection will play an important role. The future of humanity and nature will be possible if people value nature in terms of discourse and action, with an ecological perspective.

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THE EFFECT OF COAST AND SETTLEMENT RELATIONS ON COASTAL AREA USE CHANGE: CITY OF ABDERA-GREECE

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Abstract

It is known that throughout history, the first settled communities existed in areas close to water to benefit from water resources. We see the understanding that the settlement plans are created by taking advantage of the potentials of water resources. This understanding, which existed in the past, continues today by deepening its importance Evaluation of the potentials to water resources determines the type of coastal areas uses. The quality of coastal area use strengthens the relationship between the coast and the settlement. Evaluation of the variables that make up the environment with sustainability approaches increases the quality of coastal area use. due to the changing environmental conditions in coastal area uses. In line with the changing environmental values, it differs in the variables created by environmental resources. Differentiating variables also affect the coastal area use type. In this study, the types and variables of coastal area use were determined through literature research. The determined variables were evaluated as an example of application in the change of coastal area use plans in the old and new Abdera coastal settlements of Greece. Suggestions have been developed for the sustainable results of the change of Abdera coastal area use plans.

Keywords: Coastal Settlement, Coastal Area Use, Variables, Abdera-Greece

INTRODUCTION

Water has provided human beings with peace in the spiritual sense, necessity in the sense of life and development in the sense of civilization by its nature. When the plans of the settlements near the water are analyzed, it is seen that they have developed by making use of water opportunities. If we summarize this situation with historical readings, the opportunities provided by the Nile river to the city of Egypt or the potentials provided by the Tigris-Euphrates rivers to powerful civilizations such as Mesopotamia cannot be discussed (Köroğlu, 2018). The endless possibilities provided by water resources to the development of coastal cities throughout history have also seem the exhaustibility of water resources in the 21st century. Because it is predicted that water resources, which are seen as inexhaustible, may run out in time. the use of water has increased by about 1% since 1980. This rate is expected to increase even more in 2050. It is predicted that an increase in this rate will increase the global water use level by 20% to more than 30%. In addition, more than 2 billion people have difficulty in getting to water and approximately 4 billion people cannot find water for at least 30 days of the year (CED, 2019). In line with this information, the most important task in waterfront settlements and uses is to get rid of the understanding of generating more income and to ensure that the understanding of sustainability of natural, cultural and historical values is effective.

Coastal areas provide the connection between water and land, specific to their location. This particular position creates a two-way spread: a water ward and a landward spread. But the most important event in the formation of the coast is that it is shaped by the free movement of water. While this free formation constructs the coastline, it also shapes the settlement planning of the city. The unique coastal area with its remarkable location makes a great contribution to the economic input of the city (Avcı, 2017). The type of coastal area uses, which have positive returns in terms of providing economic benefits, changes over time. In this process of change, the sustainability of resources in the changes in coastal land use types in recent years is among the research topics. Coastal area usage types vary with the change of coastal area variables. In this context, determination of coastal area use variables and conservationist sustainability are important for the positive development of the settlement plan.

The old and new settlement of Greece-Abdera is a coastal settlement. These settlements are qualified coastal areas that convey information about the change in coastal area use in the changing process. By reading historical data through concrete examples, determining the coastal area use variables in order to improve and develop the natural resources in terms of sustainability in today's plane provides data for understanding the effect of the coastal and settlement relationship on the coastal area use change.

METHODOLOGY AND APPROACH

The use of coastal areas is important in the coastal settlement relationship. In this sense, the sustainable management of water, which is a natural resource, is becoming importance, because the values of water resources determine the use variability of the coastal area. Sustainability of environmental variables is possible with environmentally sensitive, humane environmental planning and construction. In the study, it is aimed to present suggestions for the improvement and development of the Abdera coastal settlement at the point of sustainable management of natural environmental resources by examining the old and new settlement Abdera-coastal area uses.

In the study, the current situation analysis of the old and new settlements of Abdera coastal settlements was carried out by on-site observation, one-on-one interview and photographing, and also videos methods. The theoretical substructure of the study is based on the conceptual expansions of coastal area use. Suggestions are made regarding the lack of use to the natural resources of the Abdera coastal settlement. It is thought that the proposals brought within the framework of sustainability acceptances will contribute to the sustainable development of the field.

LITERATUR REVIEW: COASTAL AREA USE

Coastal area is a very broad concept that includes the union of land and sea. The coexistence of coastal areas, located at the intersection of two different phenomena, contains not only the rich potentials created by awareness, but also great risks that may occur. Coastal areas that create this opposite situation need to be managed within the sustainable discipline. Both the coastal resources will be protected and the risks that may occur will be prevented with foresight with a sustainable approach. Sustainable coastal area management will allow change in line with the sustainability framework of coastal area use variables (Avcı, 2017; Lavoi, 2007; Özşahin and Ekinci, 2012; Coccossis and Tsartas, 2001).

The coastal areas, known as the leisure area, which is an attraction point, have become one of the study subjects of many different disciplines. The concept of coastal area, which has deepened as a research subject, has increased the use of coastal areas by reflecting on the diversity of use in line with the contribution of different disciplines (Nordstrom, 2000). With the literature research support, we see that coastal land uses are examined in two broad groups. The first of these is the use of the coast with the opportunities created by natural resources; grass cutting, grassland, reed cutting, agricultural production, mineral extraction and even salt production; the second is the possibilities created by the built environment resources and the use of the coast; understand moles, ports, roads, etc as coastal usage types (Avcı, 2017). However, in addition to these, touristic uses, which have come to the forefront as a type of coastal area use that have diversified with the opportunities provided by both natural and built environment resources, attract attention (Figure 1).

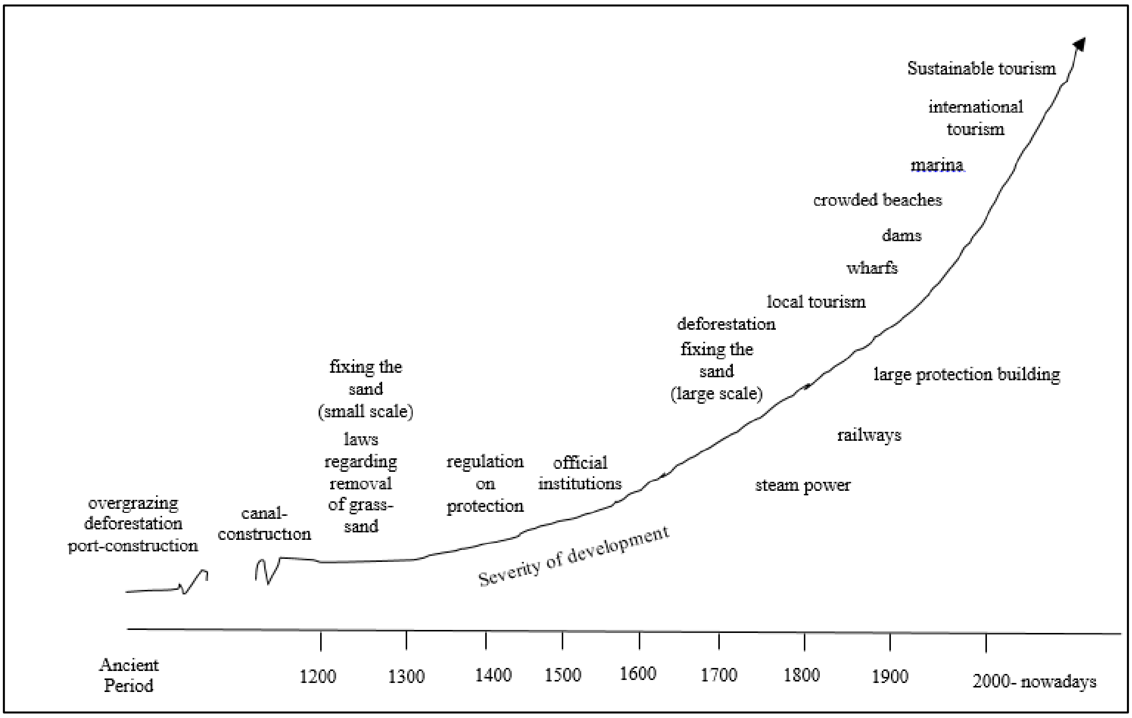


Figure 1. Diversity development process in coastal area uses (adapted from Nordstrom, 2000, developed by Avcı, 2017).

The use of coastal areas has a wide meaning, including the conservation and/or degradation of the natural environment of the coast, as well as the re-evaluation of coastal areas and sustainable natural resource management. In this meaning, it is possible to collect coastal area uses under certain headings. When the titles of coastal area use are listed, there are third types coastal area user: the first is the use of resources (fish stocks, sand and gravel beds, open space, area for development, environment for the distribution of human waste, special geological formations, farmland, archaeological/ cultural remains, marine, energy potential (sun, wind, water etc.) and second is the industrial use (oil and gas development, maritime transport, ports, transport) and as the last type of use, tourism and recreation use (sport fishing, recreation, tourism, tourism facilities), (Kenchington and Crawford, 1993; Karslı etc., 2007; Butler ve Boyd, 2000; Köksal, 2008; Çakır, 2010), (Figure 2).

Coastal areas, which are in a very special position, constitute the natural and built environment resources formed by water and land. Without forgetting the fact that resources can be depleted if not managed well, the efforts to protect resources should be evaluated (Karabey, 1978). In this sense, it is seen that researches, written reports etc. on tourism have increased in recent years. While coastal areas are rich in terms of potentials provided by two different combinations (water and land) in terms of tourism, in parallel they are also sensitive areas. Ensuring the sustainability of the tourism industry by protecting the coastal area resources that allow development is very important in the positive development of tourism. At this point, the concept of sustainable tourism achieves importance (Coccossis and Nijkamp 1995).

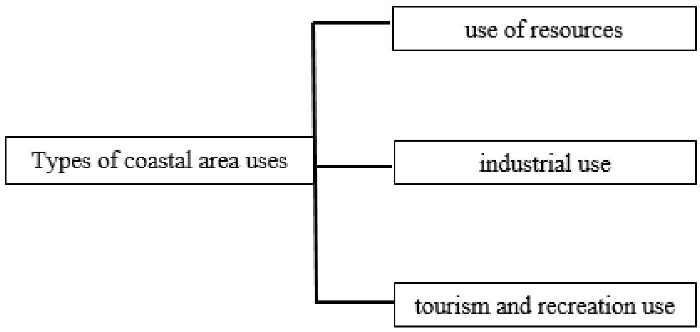


Figure 2: Types of coastal area uses (Kenchington and Crawford, 1993; Karslı etc., 2007; Butler ve Boyd, 2000; Köksal, 2008; Çakır, 2010, developed).

Coastal areas are unique places with their distinctive features. As the variables constituting the type of coastal area use with its own characteristics change, the status of coastal use also changes.

Variables of coastal area use

The unique awareness of coastal areas provides potential resource use with high quality and quantity values for the diversity of coastal use. The diversity of potential resources is increasing in line with the protection of environmental values over time (Doygun etc., 2011; Santhiya etc., 2010). Increasing resource potential, new usage variables and changing environment variables create new usage types again (Özşahin and Ekinci, 2012). The change of environmental variables that create the delicate balance of coastal areas creates a new environment and the created environment is reused in line with new requirements (Pigram, 1980). When the variables of coastal area uses are examined by literature research (Figure 3); The variables of resource use are the natural environment (water, air and soil construction), the variables of industrial use are the built environment (the size of the city, population, economic-social construction) and the variables of tourism-recreation use are both natural environment and built environment elements (water, air, land, city, population, economic-social construction size) (Van Zomeren and Acevedo-Mackey, 2019 developed).

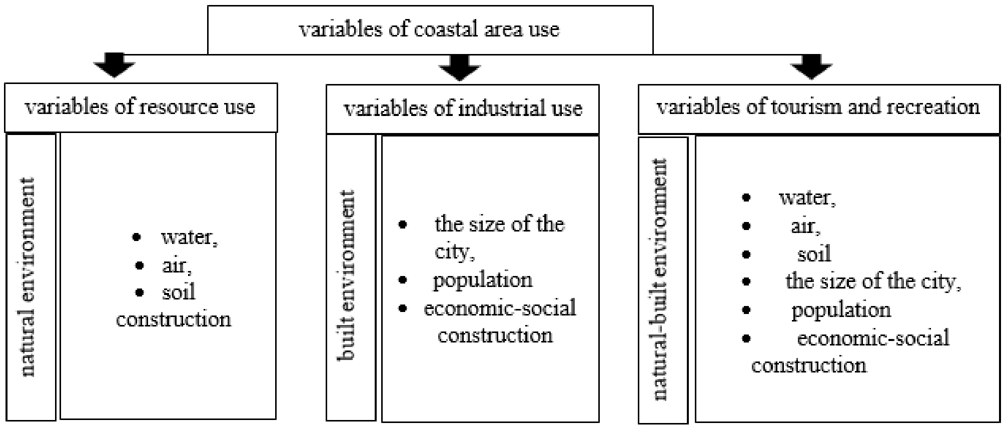


Figure 3. Variables of coastal area use (Van Zomeren and Acevedo-Mackey, 2019 developed).

Ensuring the sustainability of the variables in the use of coastal areas is of vital importance in terms of protecting the coast and increasing it for the future. Only by protecting the flora and fauna of the coastal areas managed with this awareness and understanding can a sustainable coast and a sustainable coastal settlement plan be created.

Study area: Abdera settlement

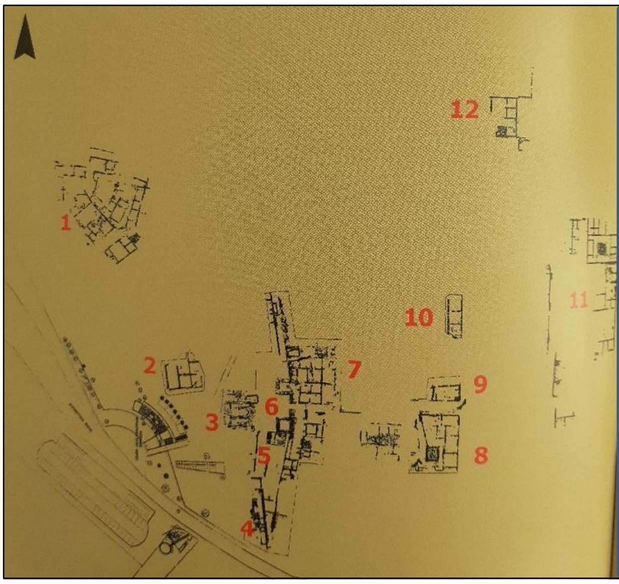
The ancient Abdera is a coastal city in the Eastern Macedonia and Thrace region of Greece. It is an old residential area. The coastal City-Abdera is located 17 km from the east-north direction of the Nestos river and is located right across the island of Thasos. (Figure 4). The city plan has been formed by developing in line with the potentials of the resources created by its special location throughout history. Its particular location controls three gateways: one of Nestos river, other through the mountains north of Xanthi, and last one from their ports passed the sea road, which from Troas led to the Thracian and then the Macedonian coast (Samsaris, D., C.,2005, 91-96). In another sense, it is at the intersection of three different route: the crossing of the land, the river route, and the sea route. In another sense, it was located at the intersection of land, river and sea passage. So that, it has been important besides its original location the city developed and became of major importance in ancient Greece. There are more ancient ruins of the city and it is a protected site. The modern Abdera settlement was re-established in 1924 together with the surrounding villages (Avdira, Myrodato (Kalfalar), Pezoula, Giona, Veloni, Mandra, Myrodato and Mandra). The municipality Abdede was formed in 1997 by the merger of the former communities (Avdira, Mandra, Myrodato and Nea Kessani) (Abdera, 2020).

Figure 4. Located of the ancient Abdera- Greece (www.googlearth.com- 6.10.2021)

Ancient Abdera is known as the city of Democritus in historical studies, but here is not where Democritus was born, grew up, and died. This has been known throughout history as the environment provided by the Abdera settlement carries the meaning of the word Democracy. The ancient Settlement was dominated by a free and democratic regime, meaning Abdera is a democracy city. Abdera, which is a free-democratic city with its well-organized plan, theater and open spaces, is also a coastal settlement due to its location (Figure 5) (Kallinci and Hrisafi, 2014).

Figure 5. The ancient Abdera- Coastal Settlement

Coastal settlement area - Abdera, due to its location, has been under the use of coastal areas for industrial purposes throughout history, as well as maritime/maritime transport and port use. When we analyzed at the old city settlement plans, data on maritime/maritime transport are seen. In the plan, which is tried to be transferred by numbering, 1. Museum Site, 2. Model Building, 3. Main Basilica, 4. Baths, 5. Grave Monument, 6. Wall, Tower, Gate, 7. Residences, 8. Houses with garden, 9. Dolphin Houses, 10. Store amphorae, 11. Island resident, 12. Sector Sea (Kallinci – Hrisafi, 2014) (Figura 6).



COASTAL SETTLEMENT- ABDERA

1.Museum Site
2.Model Building
3.Main Basilica
4.Baths
5.Grave Monument
6.Wall, Tower, Gate
7.Residences
8.Houses with garden
9.Dolphin Houses
10. Store amphorae
11. Island resident
12. Sector Sea

Figure 6. Plan of Coastal Settlement- Abdera

The coastal Settlement-Abdera is a settlement approximately 500 m away from the coastline and The ancient Abdeda, connected to the main transportation axis, Egnatia (Figure 7).

Figure 7. Located of the Abdera-Greece (www.googlearth.com- 6.10.2021)

The fact that it has an old Abdera settlement makes the coastal settlement Abdera important and known. The ancient Abdera settlement, which conveys important information from history, and the Abdera coastal area are being developed as tourism and recreation areas (Figure 8).

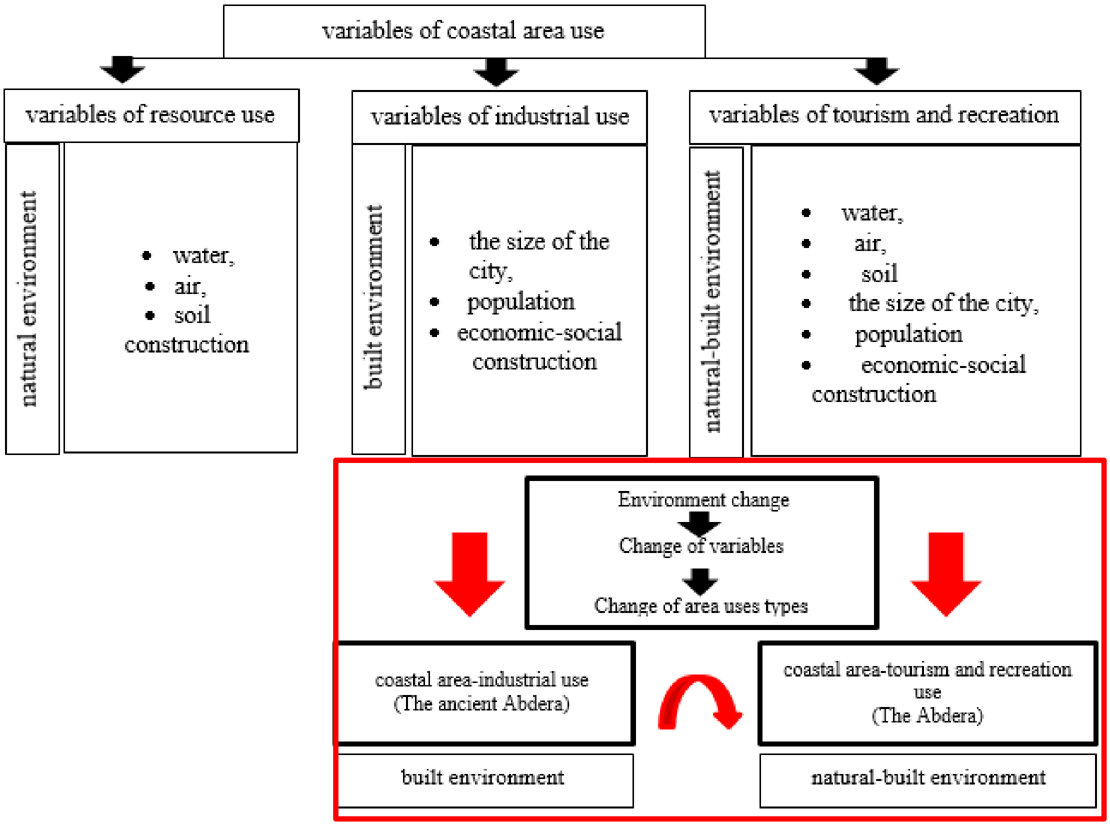


Figure 8. Change coastal area use type of Abdera

We understand that when environmental values change, the type of coastal area use also changes. While the former Abdera coastal areas were used for industrial purposes, it is now seen that they are used for tourism and recreation use. It has been determined by using on-site observation and photographing method analyzes on the sample that when the environment and its variables change, the type of coastal area use also changes.

Conclusion and Recommendations

In this paper, with have illustrated, that it is theoretically and practically understand that, Coastal areas are unique environments located at the intersection of two different combinations. The unique and dynamic form of the coasts also affect the coastal settlement plans. The type and variable of coastal area use is reflected in the coastal settlement plan. The usefully and sustainability of coastal settlement plans should be ensured by preserving the sustainability of the environmental values that create the diversity of coastal area use.

In generally, recommend the following situations:

- By evaluating the potentials of environmental values (natural, built and social environment), coastal area usage type is determined and planning is provided. In the evaluation of potentials, coastal settlement planning should be done in line with the goal of minimizing the risks that may occur.
- As the variables of environmental values change, the type of coastal area use also changes. If the variables are protected and sustainability is ensured, the type of coastal

area use may change, but when sustainability is not ensured, the shore may become unusable with a catastrophic formation. In this case, the environment and its variables disappear. In an environment where coastal environmental values are destroyed, strategy and planning cannot be carried out, including the use of coastal areas.

- When the sustainability of the environmental variables is ensured, the changing environment in the time adventure and the type of coastal area use also change. However, in this process, the main thing is to protect the values that create the environment and transfer them to the next generations with their sustainability. If the case data of the protected variables can be well studied in the next generation, the base with operable data for the new coastal land use type is presented. Evaluation of high potential variables in the use of the coastal area that you plan to reconstruct leads to the sustainable development of the coastal settlement plan.

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A RESEARCH ON FUNCTIONAL AND MATERIAL CHANGES IN RESTORATION APPLICATIONS IN HISTORICAL ENVIRONMENT: THE SAMPLE OF SAFRANBOLU OLD BAZAAR

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ABSTRACT

Cities are constantly changing and transforming due to the physical, social and economic needs of the human element. It is aimed that the cities, which meticulously preserve their history, continue to develop in areas called "old" settlements in harmony with the urban spaces and without harming each other. In accordance with the conservation plan, the criteria and boundaries of new structures on the border of restoration and interaction of registered structures should be drawn.

The concept of conservation includes the processes of preservation, maintenance, repair, restoration and replacement of functions. Variables such as the wrong choice of function, poor workmanship, and wrong selection of materials may be negative factors for the registration of the building. Studies are carried out that will positively affect these areas, many of which contribute to tourism, in terms of physical, social, cultural and economic aspects. The increase in studies in this field should be directly proportional to academic and practical principles, and should increase the awareness of the public and experts.

In this study, the obsolescence caused by the acquisition of new functions in the Historical Bazaar in the Safranbolu district of Karabuk, which was taken under protection by UNESCO in 1994, was evaluated with use or idleness. While transforming, it preserved its old texture and reached the present day with the least damage. In the study, sample projects carried out in order to restore functions and simple repairs in historical buildings are expressed in tables and graphic descriptions with their plans, sections and views. The points that make up the difference in the process and their reasons have been determined. The cultural and architectural approaches of the intervention to the buildings were analyzed. Requirements, changes required by the function are evaluated in the results section.

Keywords: Historic Environment, Conservation and Transformation, Restoration, Functioning, Material, Form, Dimension, Safranbolu

INTRODUCTION

SECTION 1: GENERAL DEFINITIONS

1.1. Historic Environment and Conservation

In the definitions and abbreviations section of the first part of the law no 2863 on the Protection of Cultural and Natural Assets: "Protection"; and "Protection"; Conservation, maintenance, repair, restoration, change of function in immovable cultural and natural properties; In movable cultural properties, they are preservation, maintenance, repair and restoration works. "protected area"; It is an area that must be protected, which is effective in the preservation of immovable cultural and natural assets or in the protection of them in the historical environment.

“Settlements and ruins from past civilizations constitute our historical environment. Hasankeyf, which gains value with the density of outstanding monuments from the Middle Ages, and Eyüp, which is equipped with social complexes, tombs and cemeteries with the prestige gained in the Ottoman period, are historical environments that reflect different life patterns and architectural traditions. When "historical environment" is mentioned, mostly urban sites are meant, but rural, historical and archaeological sites are also evaluated within this scope. In an age of space travel, some may consider trying to keep the urban fabric of Amasya or Bursa alive as unnecessary or even wasted efforts. However, historical environments are an indicator of the creativity of societies with their admirable general appearance, rich arrangements that contain various styles and forms, curved streets that allow pleasant surprises, and careful craftsmanship. Examining the old city and neighborhoods is a tool that helps to understand today, to know and define ourselves. Many details about the social and economic structure, philosophy of life and aesthetic sensitivity of past civilizations are hidden in these circles.

Historical environments are also instructive and interesting as spaces arranged according to human scale. They have an environment that positively affects social relations and helps to reinforce the sense of unity among individuals. Being in such an environment makes one happy.

In a world where living conditions, traditions and construction techniques are changing rapidly, historical city spaces can also be thought of as open-air museums that show what kind of environment they lived in in the past. Historical environments are protected because of their folkloric values as well as their archeological, historical and aesthetic significance. Small museum-cities preserved with their original interior equipment in many countries offer a direct view of the past from the industrial age. It is interesting for the people of the industrial age that arts such as coppersmithing, silverwork, saddlery and weaving are kept alive in our historical cities in a traditional environment. The buildings in the historical environment are valuable as historical data that define the architectural identity of the region, with the architectural styles, space designs, construction techniques and the quality of the decorations such as wood carving and wall painting. Rather than the pieces exhibited in museums as isolated from time and space, it is much better to see the buildings and their elements, which are the components of a living village or city: doors, cabinets, stoves, windows, ceilings and bay windows in their original position and to grasp the integrity of the environment.

It is interesting and impressive. Examining the historical city gives us clues about the architectural solutions and creativity of past artists; Today, perhaps, design makes us feel the power of the creative source behind private living spaces that we cannot even imagine. Even though the people living in it are gone, the survival of the spaces surrounding them is very important as living history for us and for future generations. These original data contribute to the understanding and imagination of life styles that have not survived to the present day and about which there is very little written information." (Ahunbay, 2017, p:116).

1.2. Conservation and Transformation

Cities change according to many living and non-living variables. The city changes and transforms as it lives. While it covers protection, preservation, maintenance, repair and restoration; It reveals concepts such as renewal, revitalization, rehabilitating, and remaking. There are three reasons for the emergence of these concepts: physical obsolescence, functional obsolescence and economic obsolescence.

1.2.1. Physical Attrition

Completion of the physical superstructure and infrastructure in the city; we can specify them as the different life span of each building material, the effect of the climate factor on the material, the maintenance and neglect factor, the aging of the bearing elements of the buildings, the aging of the other materials of the buildings, and the aging of the infrastructure materials.

1.2.2. Functional Impairment

It is the transformation of the region into a functional change (housing: commerce, warehouse, etc.), user profile change (transition from the upper socio-economic group to the lower socio-economic group) due to the inability of the region to meet the needs of today's city. Regions that continue to live by adapting their old function to the present, regions that have lost their original functions but assumed a harmonious new function, regions that have lost their functions, cannot gain a new function and are in the process of becoming obsolete will again be a part of the transformation.

1.2.3. Economic Obsolescence

Despite the high purchase-sale and rental values of the surrounding land, it transforms due to the fact that the buildings in the region are physically obsolete and/or cannot maintain their new functions (Dinçer, 2016).

1.3. Restoration and Functioning

Functional change in general; It is the creation of new usage opportunities, including interventions that will meet the spatial requirements of historical buildings, while preserving the architectural, aesthetic, social and cultural values of these buildings. Functional change in historical buildings is a contemporary conservation approach. This understanding of conservation saves structures that are out of use, that cannot meet the needs of the age or their users, from destruction; It creates new usage opportunities for unusable buildings that overlap with their spatial and structural features, and thus ensures the continuation of the existence of historical buildings and their participation in urban life. In other words, functional change is one of the means of bringing to life the historical values that enable the society to interact with its past. Reasons that require functional changes in historical buildings; The loss of original function of buildings can be classified as Environmental Factors, Economic Reasons, Socio-Cultural Changes. Before making functional changes in historical buildings, first of all, the boundaries of the intervention should be determined precisely. In the intervention decisions to be made; Irreversible practices that will affect and change the architectural and aesthetic features of the building should be avoided; It should be given importance to ensure that the historical building acquires a quality that will respond to a different function. The building should be utilized to the maximum extent without changing the characteristics of the existing building (Uğursal, 2011).

MATERIAL

SECTION 2: GENERAL INFORMATION ABOUT SAFRANBOLU DISTRICT

2.1. Geographical Position

Safranbolu district center is 65 km away from the sea in the Western Black Sea Region. located in the interior. The district is surrounded by the central districts of Ulus (BARTIN), Eflani (KARABÜK), Araç (KASTAMONU), Ovacık (KARABÜK) and Karabük, starting from the north. The total area of the district is 1013 km2. The district is rugged in terms of geographical structure. The lowest point of the district center is 400 meters, the highest point is 600 meters, the lowest point of the whole district is 300 meters and the highest point is 1750 meters. The rivers of the district are Araç Stream, Soğanlı Stream, Ovacuma Stream and Various Streams. The climate of the district is the temperate Black Sea climate, which is also affected by the continental climate of Central Anatolia. Summers are warm, partly hot and rainy, winters are cool, partly cold and snowy. The highest average temperature is 38 degrees, the lowest average temperature is -10 degrees, the annual average rain is 500 mm. and the annual average number of snowy days is 35. The vegetation is generally forest. Apart from forests, there are fragmented agricultural areas (BAKKA, 2015).

2.2. Place in the Transport Network

Fıgure 1: Road Transportation Map (KGM)

As of the end of 2012, there are 324 km of divided roads in the region. Divided road works continue in the sections between Karabük and Kastamonu within the scope of road network improvement works in the region. There is no highway in the region, but Karabük is 98 km from the Ankara-Istanbul highway.

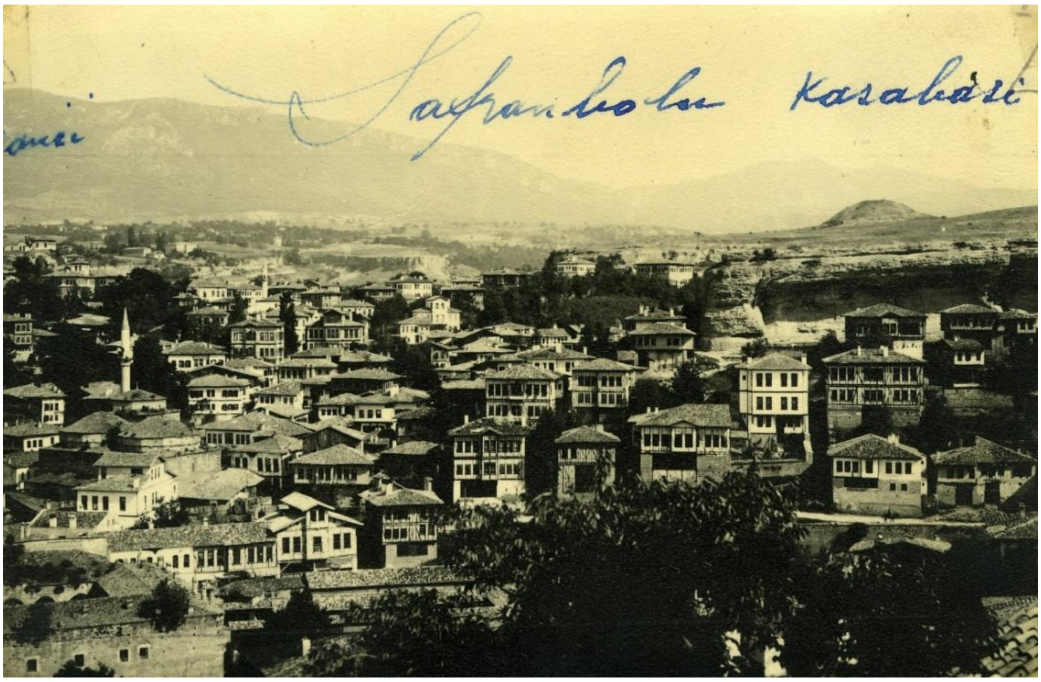
Although it is an advantage to have a railway network in Karabük, it provides a limited service especially for passenger transportation. 189 km of the Irmak-Karabük-Zonguldak (IKZ) railway line, whose length is 415 km, is located within the region. The railway in the region is only available as a single line between Zonguldak-Karabük-Çankırı-Irmak (BAKKA, 2015).

2.3. Historical Cultural Structure

According to the results of the archaeological survey conducted in Ovacık and Eskipazar settlements in 1998 by a team led by British Archaeologist Dr.Royer MATHEWS: The oldest settled life in this region begins in the Early Bronze (Bronze) period. The region is mentioned as Paplagonia in the Iliad of the historian Homer (in ancient times). Hittites, Phrygians, indirectly Lydians, Persians, Hellenistic Kingdoms (Ponds), Romans, Seljuks, Çobanoğulları, Candaroğulları and Ottomans dominated the region, respectively.

It is known that Safranbolu Castle (the hill where the old Government Office is located today) was taken under the domination of Turks in 1196 by Ankara Meliki Muhittin Mesut, son of Seljuk Sultan II.Kılıç Arslan. Candaroğlu Süleyman Pasha added Safranbolu to his domain in 1326. Ibn Batuta, who visited Safranbolu in 1332, gives detailed information about the state of the city at that time. In 1927, the district was connected to Zonguldak, in 1945 Ulus Sub-District, Eflani and Karabük Sub-districts were turned into districts and separated from Safranbolu. With Karabük becoming a province in 1995, Safranbolu was connected to Karabük.

There are various artifacts related to the Ottoman period in the district. Among them, the OLD MOSQUE, which is thought to have been converted from a church to a mosque by Gazi Süleyman Pasha, KÖPRÜLÜ MOSQUE opened for worship in 1662 by Köprülü Mehmet Pasha, KAZDAĞLI MOSQUE known to have been rebuilt in 1779, İZZETPAŞA MOSQUE built by Grand Vizier İzzet Mehmet Pasha in 1769, Cinci Hoca Mosque in 1640-1648. CİNCİ HANI, which was built by the Sultan, the old and new baths, the Government House, which is the work of more recent times, the Syphilis Hospital, the Tokatlı Aqueduct and many fountains. There are also wooden Turkish Houses in the district, the oldest of which is estimated to be 200 years old. Today, 1457 works are under protection in the district (BAKKA, 2015).



Pıcture 1: Safranbolu Municipality Photo Archive

Pıcture 2: Safranbolu Municipality Photo Archive

Pıcture 3: Safranbolu Municipality Photo Archive

METHOD

SECTION 3: EXAMINATION OF SAFRANBOLU HISTORICAL BAZAAR IN TERMS OF CONSERVATION APPLICATIONS

3.1. General Features of Traditional Safranbolu Houses

The patriarchal general family structure, which was based on the closed indoor production economy that it had at the end of the 19th century and at the beginning of the 20th century, affected the design principles of Safranbolu houses. It is known that economically and socially wealthy, educated and well-mannered individuals live in Safranbolu houses (Bayazıt, 2014, Ulukavak, 2007 in S:1).

During the construction of Safranbolu houses, wooden materials brought from the surrounding forests were used. For the people of Safranbolu, who have embraced ephemerality and chosen a modest life, it is desirable for a wooden house to live 100-150 years. In Anatolia, the tradition of angular house building, where rooms are brought together for thousands of years, has continued (Akın 2008 in Bayazıt, 2014, S:2; Akın 1985).

"The plan motif consisting of an open space with two rooms and an eaves extending in front of them while describing the house with an eyvan and the traditional Ottoman house" is the most interesting and continuous feature that can be observed in the design of traditional Ottoman houses (Akın 1985, 55). Especially the houses with iwans, which constitute the majority of the city houses, are concentrated in Gaziantep, Urfa, Diyarbakir and Mardin. Apart from these four cities, there is a density of houses with iwans in small-scale settlements where the climate is less warm than the general Southeastern Anatolia due to their geographical location" (Bayazıt, 2014, S:2 in Akın 1985, 138).

It is also interesting that the tripartite unit, which is necessarily symmetrical, is so important in the traditional Ottoman house, which is said to have no concern for symmetry, and requires its origin to be sought outside of the aforementioned house tradition.

Pıcture 4: Safranbolu Municipality Photo Archive

The simultaneous analogues of the unit formed in the triple space group in Anatolia appear in their closest form in houses with iwans and in hilanis in rural settlements. In addition, the mentioned features of the symmetrical triple unit originating from a contrast also continue in the traditional Ottoman House. Typological Characteristics of Safranbolu Houses Safranbolu Houses also have rooms and iwans varying from one to four. The rooms are separated from each other by iwans. Nuclear families within this extended family structure are given a separate "living unit" and are expected to meet all their living needs in these rooms. Men's place in Safranbolu is Selamlık. This is also the place where business meetings are held and important guests are hosted. Almost every house has a selamlık floor or a selamlık room next to the entrance. This floor or rooms are decorated with care. The ground floors of the houses are built with stone walls and conform to the formless plot boundaries. The upper floors are made of wood carcass. The ground floors are completely closed to the outside. Living floors are on the middle and upper floors. Usually houses are built with one or two wooden floors above the ground, although there are rarely three wooden floors. Rooms on the mezzanine and upper floors usually have three windows in one or both directions. As the windows can be opened from the lower parts of the two sides, they can also be opened completely. The standard appearance of the windows is related to the spacing and wood dimensions of the wood frame structure on the mezzanine and upper floors. For this reason, a rhythm was created in the whole city. The roofs of these structures are generally four-sided pitched hipped roofs (Bayazıt, 2014).

Safranbolu houses are not different from other Turkish houses in terms of plan typology. Elements that make up the plan of Ottoman Turkish houses

•Rooms

•Sofas (arbors), iwans and other elements

• Passages, passages and stairs

• They are listed as stables and gizzards.

Fıgure 2: Plan Chart (Bayazıt, 2014

Pıcture 5: Sofa

Pıcture 6: Room

Although some other elements do not affect the floor plans, the functional parts of the house are the kitchen, laundry, cellar, bath and toilet. When these enter the house, they are placed at one end of the sofa.

RESULTS

SECTION 4: Evaluation of Survey and Restoration Projects in the Scope of Conservation

4.1. Analyzes

The study area covers the part of the Historical Bazaar as shown below. There are 143 registered buildings in the area. 94 of them have been restored and 49 of them are idle. The restoration of 51 of 94 buildings was carried out without designing as simple repairs. The projects of the remaining 43 buildings were scanned. In the results obtained; There is a project of 24 session areas. But 8 of them are not team projects. For this reason, the studies were carried out on 16 structures.

Fıgure 3: Restoration of Proprietary Structures

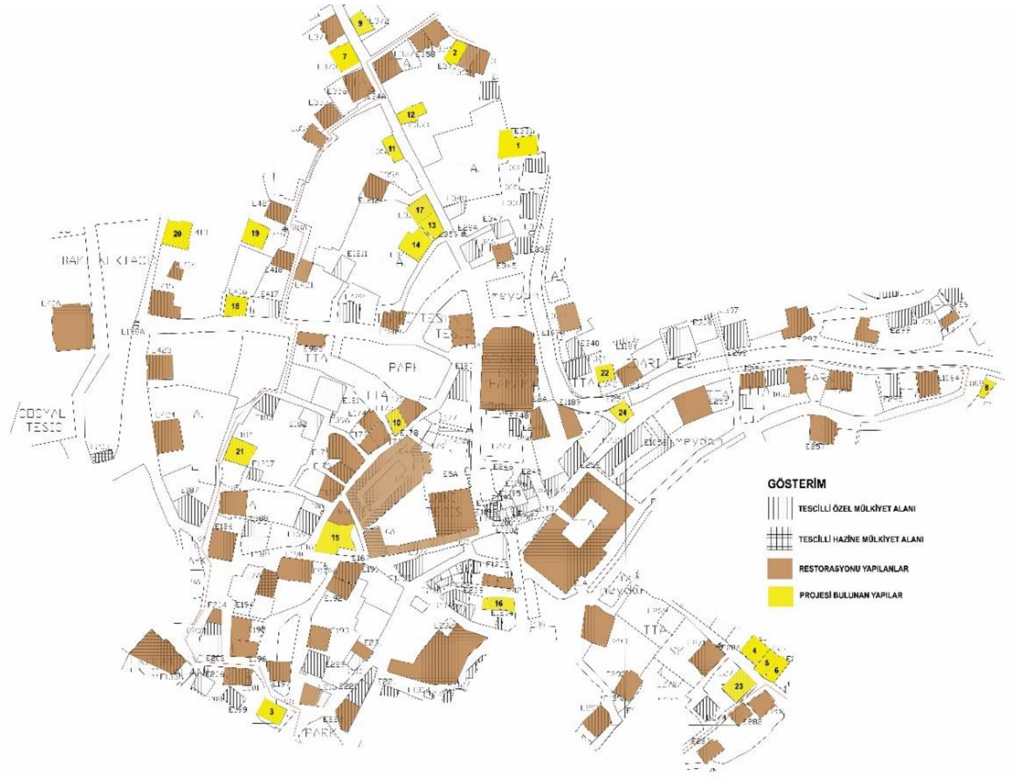


Fıgure 4: Restored Buildings, Projects of which were Completed

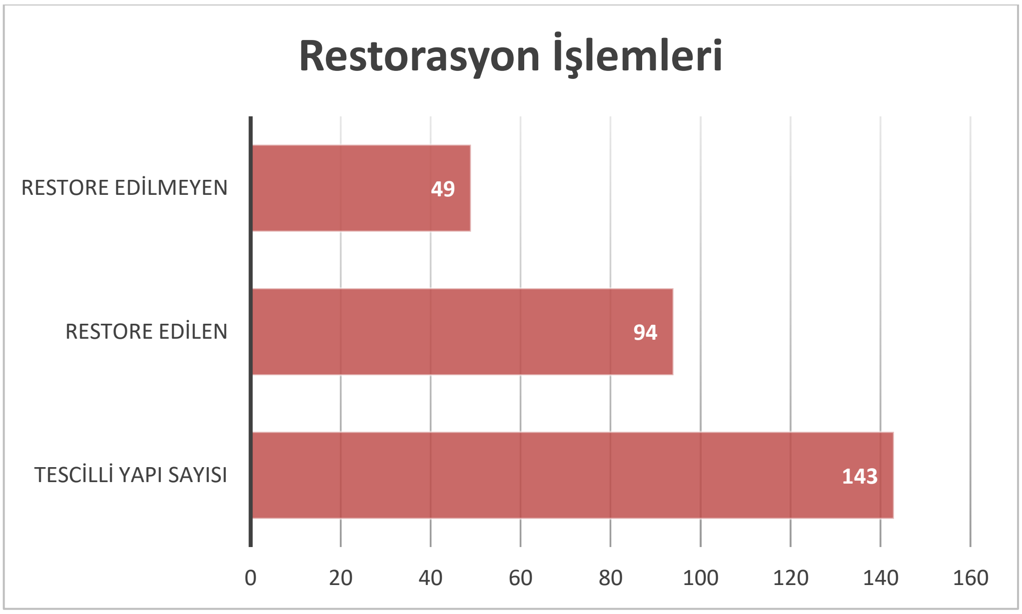


Fıgure 5: Restoration Operations Chart

4.1.1 Basement

When the projects are examined, there are stony and barns in the basement floors. There are 3 projects with a basement. These in all 3, changes were made in terms of material and form.

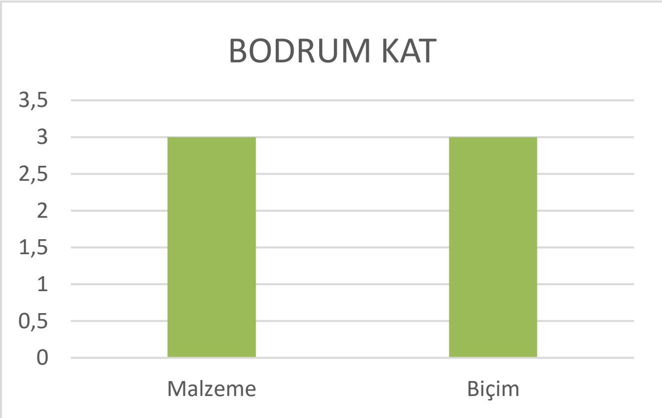


Fıgure 6: Basement Floor Changes Graph

4.1.2. Ground floor

When the projects are examined, there are barn, life, room, sofa, hammam, resting area on the ground floors. There are 16 projects with ground floor. Material changes were made in 12 of them and format changes were made in 13 of them.

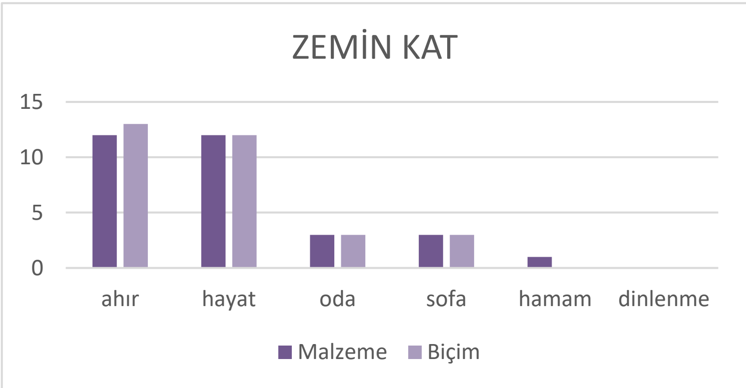


FIGURE 7: Ground Floor Changes Graph

4.1.3. Entresol

When the projects are examined, there are rooms and sofas on the mezzanine floors. There is 1 project with a mezzanine floor. Material and form changes were made in the project.

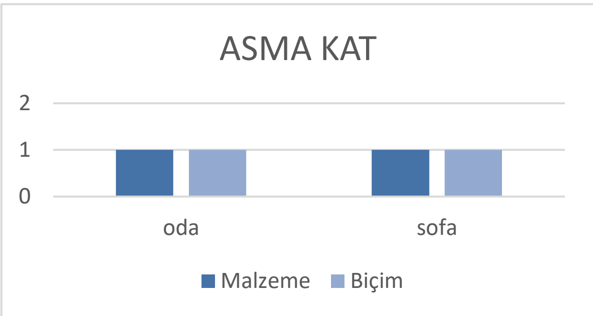


Fıgure 8: Mezzanine Changes Graph

4.1.4. 1. Floor

When the projects are examined, there are rooms, ghuslhane, sofa and iwan on the first floor. There are 15 projects with the 1st floor. Material changes were made in 13 of them and format changes were made in 15 of them.

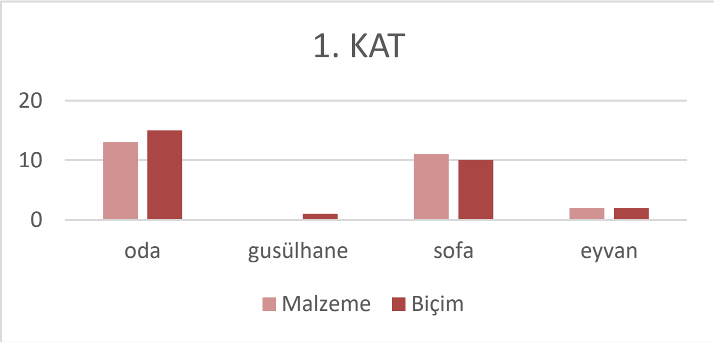


Figure 9: 1st Floor Changes Graph

4.1.5. 2. Floor

When the projects are examined, there are rooms, gusülhane, sofa and iwan on the 2nd floor. There are 14 projects with the 2nd floor. Material changes were made in 13 of them, and format changes were made in 13 of them.

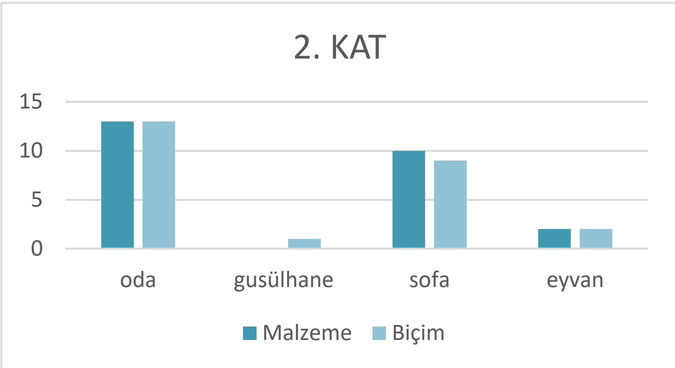


Figure 10: 2nd Floor Changes Graph

4.1.6. 3. Floor

When the projects are examined, there are rooms, gusülhane, sofa and iwan on the 3rd floor. There is 1 project with 3rd floor. Material changes were made in 1 of them, and format changes were made in 13 of them.

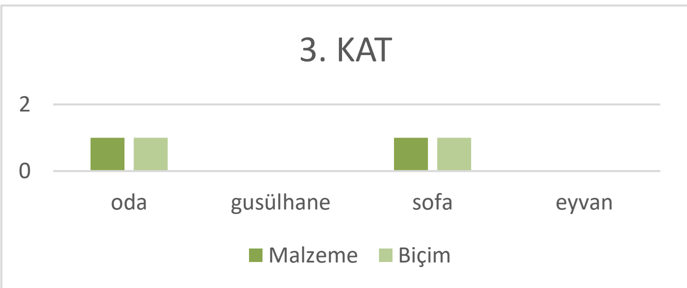


Figure 11: 3rd Floor Changes Graph

4.2. Examining and Evaluating Their Appearances
4.2.1. Frontage
When the projects are examined, there are windows, doors, balconies, roofs, stairs and glisten on the front facades. There are 16 projects with a Front Façade. In 8 of them, shape changes were made in 12 of them.

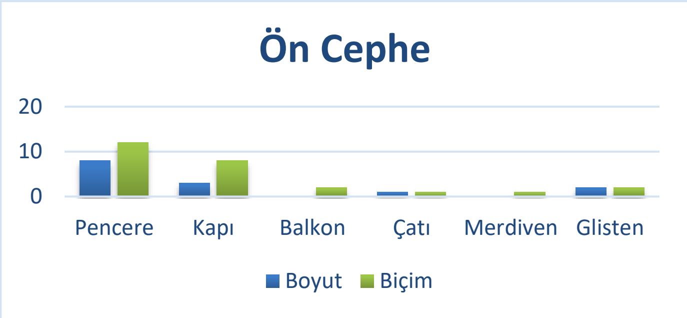


Fıgure 12: Graph of Frontline Changes

4.2.2. Right Side Facade
When the projects are examined, there are windows, doors, balconies, roofs, stairs, wooden horizontal and vertical belts and glisten on the front facades. There are 13 projects with Right Side Front. In 7 of them, shape changes were made in 12 of them..

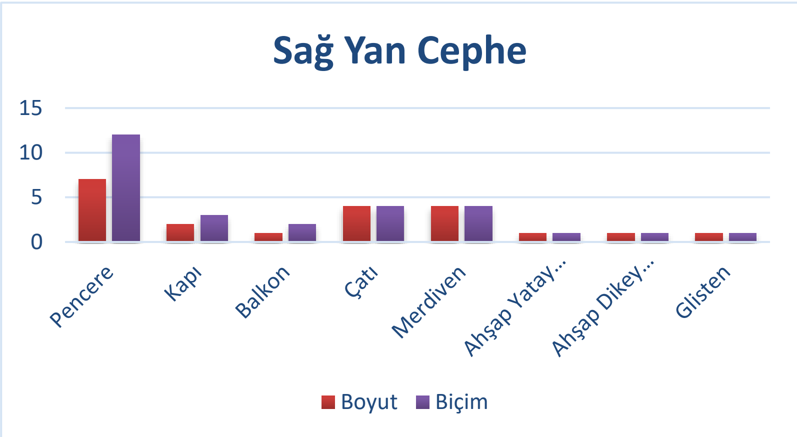


Fıgure 13: Right Side Side Changes Graph

4.2.3. Rear Facade
When the projects are examined, there are windows, doors, balconies, roofs, wooden horizontal belts and fountains on the rear facades. There are 12 projects with a Rear Façade. Size 11 was changed in 10 of them.

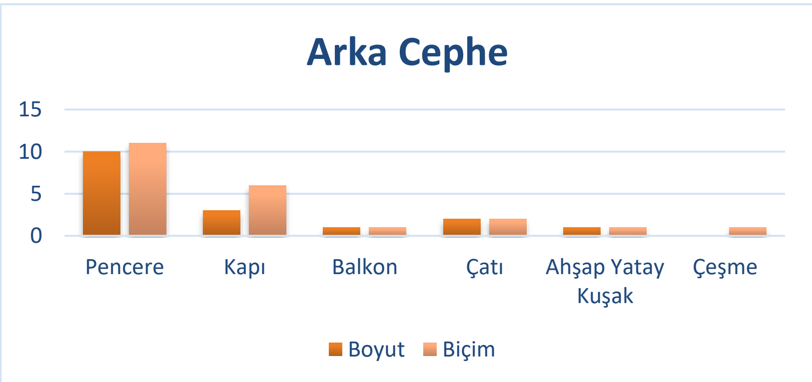


Fıgure 14: Rear Facade Changes Graph

4.2.4. Left Side Facade

When the projects are examined, there are windows, doors, balconies, roofs, stairs and glistens on the Left Side Facades. There are 11 projects with a Rear Façade. In 9 of them, size 9 was also changed.

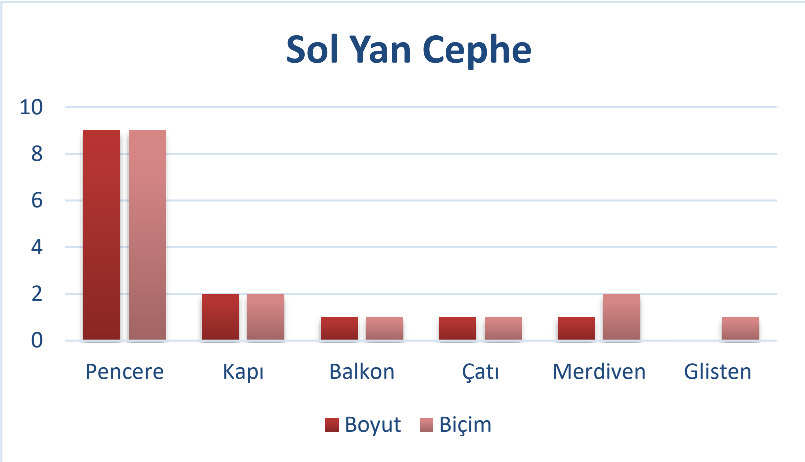


Fıgure 15: Left Side Facade Changes Graph

4.3. Synthesis

Survey and Restoration projects “What was yesterday? What happened today?" were compared over 16 samples. First of all, the comparison was made for the plans, and the areas that changed in form and material in the restoration in the survey were scanned and numbered. Then, these changes were expressed verbally under the heading of changes on the table. The same operations were done for the views, just by changing the variables to size and format. As a result, it was transferred to tables and graphics, so there was an opportunity to evaluate. In Chapter 3, numerical data and graphics were mentioned. The tables of those graphs are given in detail below.

CONCLUSION

"Place"; It is included in the dictionaries of the Turkish Language Association with the meanings of place, current place, home, dormitory, and its meaning in an urban area includes the meaning of living spaces of individuals living in an urban area defined by its elements. In this context, the space in the urban area includes the building, the building environment and its close surroundings, extending from the past to the present and from the present to the future. According to this short statement, for the importance and necessity of transferring cultural values to future generations by using the technique and technology in preserving the historical feature of a living space;

- Determining a border that includes all the features of such historical environments that make up the living space,
- Determining the problematics of the area by preparing analysis sheets in the area within this border with this analysis study,
- Preparing a "Conservation Framework Development Plan" within the scope of Spatial Planning in order to integrate the area into the functional area of the city,
- In this context, a decision should be taken for the functional revitalization in this region and the restoration and rehabilitation of the structures should be designed.

- This decision should be designed in the context of "Urban Transformation and Urban Design" and the implementation of the integration of the area into the city should be a priority,
- Most importantly, this application should be applied in the whole of the determined place.

This application process is handled with the same method in historical environments, but when conservation, renewal and functional transformations are not in unity, since spatial preservation integrity cannot be established, it takes place in practice as a continuous construction, repair and maintenance, in this context, protection is both functional and structural. does not sufficiently achieve its purpose.

As the example of Safranbolu is one of the firsts of this practice in Turkey, we can say that it embodies the above principles with the method of continuous protection, improvement and renewal.

Table 1: Comparison Chart of Appearances

		Boyut	Biçim
Ön Cephe Görünüş	Pencere	8	12
	Kapı	3	8
	Balkon	0	2
	Çatı	1	1
	Merdiven	0	1
	Glisten	2	2
		Boyut	Biçim
Sağ Cephe Görünüş	Pencere	7	12
	Kapı	2	3
	Balkon	1	2
	Çatı	4	4
	Merdiven	4	4
	Ahşap Yatay Kuşak	1	1
	Ahşap Dikey Kuşak	1	1
	Glisten	1	1
		Boyut	Biçim
Arka Cephe Görünüş	Pencere	10	11
	Kapı	3	6
	Balkon	1	1
	Çatı	2	2
	Ahşap Yatay Kuşak	1	1
	Çeşme	0	1
		Boyut	Biçim
Sol Cephe Görünüş	Pencere	9	9
	Kapı	2	2
	Balkon	1	1
	Çatı	1	1
	Merdiven	1	2
	Glisten	0	1

Table 2: Comparison Chart of Plans

		Malzeme	Biçim
Bodrum kat	Taşlık	3	3
		Malzeme	Biçim
Zemin kat	Ahır	12	13
	Hayat	12	12
	Oda	3	3
	Sofa	3	3
	Hamam	1	0
	Dinlenme	0	0
		Malzeme	Biçim
Asma kat	Oda	1	1
	Sofa	1	1
		Malzeme	Biçim
1. kat	Oda	13	15
	Gusülhane	0	1
	Sofa	11	10
	Eyvan	2	2
		Malzeme	Biçim
2. kat	Oda	13	13
	Gusülhane	0	1
	Sofa	10	9
	Eyvan	2	2
		Malzeme	Biçim
3. kat	Oda	1	1
	Gusülhane	0	0
	Sofa	1	1
	Eyvan	0	0

Change is a process, transformations belong to us. If conservation and transformation are sharecroppers, the future wins!

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THE ROLE OF URBAN AGRICULTURE IN ADAPTING TO CLIMATE CHANGE FOR SUSTAINABLE CITIES

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Abstract

Climate change and overconsumption of natural resources are the biggest problems of humanity and these problems are threats modern humanity has ever faced. Cities have a major role in climate change. Sea levels rise, deterioration of air quality, destruction of wetlands, decrease in agricultural production and productivity are major impact of climate change and affect cities. It is necessary to develop sustainable strategies and take urgent steps to combat the impact of climate change on cities.

Urban agriculture has the potential to play a crucial role in reducing the effects of climate change in cities. Urban agriculture provides many functions and services to the ecological systems of the city such as reducing air pollution, increasing biodiversity, decreasing the urban heat island (UHI) effect, etc. Besides, urban agriculture has many benefits for protecting and sustainability of natural resources.

Besides, urban agriculture has important benefits for protecting natural resources in line with the principle of sustainability and for urban waste management. The study is aimed at highlighting the contribution of urban agriculture to the sustainable cities against climate change and discussed the role of urban agriculture in adapting to climate change. As a result of the study, it has been proven that the ecosystem services of urban agriculture can play a vital role in mitigating the effects of climate change.

Keywords: Urban agriculture, climate change, global warming,

1.Introduction.

Climate change has become one of the most important global issues recently because of natural and anthropogenic effects on the environment from the beginnings of humankind to the present. Many systems have affected direct and/or indirect because of climate change. Human domination over nature and overexploitation of natural resources have caused global warming. Aksay et al. (2005) stated the consequences of global warming as follows:

- **Changes in climate**
  - Increase in Co^2 level
  - Changes in precipitation, soil moisture and climatic factors affecting agricultural production,
- **Sea level rise**
  - Increase Sea level because of thermal expansion in the ocean

• Increase Sea level because of melting glaciers

The above-mentioned problems are a reaction of nature to mankind and have important global consequences. One of the most affected by these consequences is cities. Urban growth after the industrial revolution, overexploitation of natural resources, destruction of nature sped up the global warming.

Cities contribute significantly to the impact of global climate change (Hughes et al. 2020). Cities will be impacted by climate change due to greenhouse gases and the effects of urbanization, such as the UHI effect (McCarthy et al. 2010). Climate change causes food supply problems, UHI effect, and other indirect effects in cities (Dubbeling and De Zeeuw, 2011). According to current planning and design approaches, urban areas may not adapt to global warming (Url-1). Therefore, cities will be more fragile by the negative effects of global warming than rural areas.

The aim of this study is to reveal the problems of cities because of climate change and to discuss the role of urban agriculture in adaptation to climate change.

1.2. Urban Heat Island Effect

The UHI effect was first introduced by Luke Howard in 1810 (Howard, 2012). The UHI effect is the difference in temperature between the rural area around the urban area because of high impervious surfaces.

Urban areas are warmer than rural areas due to the local effect of UHI in addition to overall climate change due to greenhouse gas emissions. Warming from greenhouse gas emissions is because of sequestration of outgoing long-wave radiation while warming from the UHI effect is mainly because of reduced evaporation-sweating, increased solar radiation absorption, and anthropogenic waste heat (Oke, 1982). Huang et al. (2019) found that Urban areas will expand from 0.6 to 1.3 million square kilometers between 2015 and 2050 and will increase by 78% – 171% of the urban footprint in 2015. This urban land expansion will cause summer day and night warming. Warming caused by urban sprawl will increase the risk of extreme heat for about half of the future urban population.

1.3. Food supply problem

Changes in precipitation patterns affect agricultural production. Türkeş (1997) stated that climate change has slow and long-lasting and effects on a global and local scale. Agriculture is one of the industries most affected by climate change (Akyüz and Atış, 2016). Ogunbameru et al. (2013) stated the impacts of climate change on agriculture as follows:

• Stunting in crops

• Increase in diseases and pests

• Drying of seedlings

• Product loss

• Low efficiency

• Low quality

• Loss of producer's income.

• Raw material losses

- Technological development issues
- Changes to the size of small businesses.
- Negative impact on water resources
- Delay ripening of fruits

In this context, the impact of agriculture because of climate change causes serious problems, such as food supply problems and high food prices. These problems affect global food security. The World Bank (1986) defined food security as access to adequate food for everyone at any time. Most of the world's population has food security issues. “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. (World Food Summit, 1996). Food safety comprises 4 dimensions: availability of food, access to food, benefiting from quality and clean food, and continuity (Fao, 2006). In order to ensure food safety, these 4 dimensions must be provided.

Climate change will affect food security problems for 49 million people by 2020 and 132 million people by 2050 (IFAD, 2018). Urban economies will be affected by agricultural production in the surrounding rural areas by disasters and shortages. The drop in agricultural output will affect not only the rural population, but also the city dwellers (Dubbeling and De Zeeuw, 2011). Maxwell et al. (2008) Temporary and permanent natural causes can lead to increased food prices, food shortages, outbreaks and migrations because of the economic crisis, and this can affect cities. The natural causes of food crises are often cyclical and affect the same regions or zones repeatedly.

1.4. The Role of Urban Agriculture in Adaptation to Climate Change

The ecosystems are deteriorating faster than ever before and threatening the health of humans and all other creatures. The foundations of the economic systems, livelihoods, food security, health systems and quality of life on a global and national scale are declining. Climate change has become one of the most important drivers of biodiversity loss after 2020. IPCC (2019) emphasizes that sustainable land management is also significant, along with the holistic protection of the ecosystem. Urban agriculture is a significant phenomenon as an effective tool in providing sustainable urban land management. Urban agriculture has become a resource for social cohesion and eco-education, a new expression of culture and politics, and land-use fashion worldwide as a recreation activity (Camps-Calvet et al. 2015; Coles and Costa, 2018; Hardman et al. 2018; Robineau and Dugue, 2018).

Türker and Akten (2020) define urban agriculture as a productive land-use model. Urban agriculture is not only a sustainable land-use model that contributes to the city's food systems but also an element of the urban ecosystem that provides important contributions and services to the ecological systems of the city. The ecological and economic advantages of urban agriculture can help in reducing the negative impacts of climate change. Urban agriculture can play a key role in adapting to climate change for sustainable cities.

Urban gardens, agricultural lands and other forms of green areas have the potential to reduce solar radiation, increase evaporation, and lower temperatures due to evapotranspiration and shade (Simon, 2013). Many studies have stated that urban agriculture can greatly reduce the UHI effect and contribute to the formation of stronger communities and more sustainable cities (Tidball et al. 2007; Dubbeling, 2013). In addition, Emecen and Erdem (2019) revealed that green areas have positive effects on the UHI. Green spaces play a positive role in reducing the UHI. (Shih 2017; Yu et al. 2017). Community gardens, roof gardens, home gardens provide mitigation of the UHI effect (Qui et al. 2013).

Mougeot, (2000) Urban agriculture can provide an alternative for urban food security, Smit et al. (2001) stated that urban agriculture contributes to local and national food systems. In addition, urban agriculture makes positive contributions to the food security of low-income groups (Armar Klemesu, 2000). Urban agriculture contributes to the household budget and provides employment, helping to improve the urban economy. Therefore, it can contribute positively to urban food security.

Urban agriculture is an alternative food system, and it is always interacting and cooperating with the city's food systems and rural agriculture. Therefore, the food system in the city can offer an important solution tool for the food supply problem caused by climate change.

2. Results and Recommendation

Climate change and its effects are among the most serious problems on the world agenda. Climate change causes many problems in cities, especially food supply problems and the UHI effect.

Urban agriculture provides an important tool for planners, designers, and related disciplines with its ecological and economic benefits in adapting to climate change for sustainable cities. In this context, the following should be considered for effective urban agriculture against global climate change and for more sustainable cities:

- Creating laws and regulations for urban agriculture
- Enhancing action on adaptation
- Enhancing national/international action on urban agriculture.
- Integrating an urban agriculture vision for long-term cooperative action
- Determining the processes and tools for the spatial planning of urban agriculture
- Integrating sustainable environment appoarch
- Integrating sustainable urban agriculture practices and systems
- Integrating build strategic action plans for urban agriculture
- Developing food security policy and agenda (Dubbeling and De Zeeuw, 2011).
- Maintaining and managing agriculture projects (Dubbeling and De Zeeuw, 2011).
- Promotion of land use for urban agriculture (Dubbeling and De Zeeuw, 2011).
- Integrating urban agriculture in water management plans of the city (Dubbeling and De Zeeuw, 2011).
- Protecting Class I and II lands in the city for agriculture
- Integrating agroforestry systems to the urban agriculture

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THE IMPACTS OF COASTAL LAND RECLAMATION AREAS ON URBAN CLIMATE

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Abstract:

In the last decades, Istanbul has been undergoing intensive land-use changes due to the investment strategies turned onto the construction sector and urban transformation studies. In the meantime, the demand for the disposal of debris from building demolitions with minimum cost has made the creation of land reclamation areas a current issue. But it's known that the land reclamation areas that pose a threat to the marine ecosystem also have effects on the local climate, depending on the land use/cover changes that take place in the urban area. In this study, the changes in coastline cooling distances and thermal changes in the urban area that occur after the coastal land reclamation process were investigated by handling the Yenikapı and Maltepe reclamation areas and their peripheries. In the analyzes where the summer and winter periods were examined separately, the surface temperatures which were obtained from satellite images were used. The results of the study demonstrate that coastal reclamation has significant effects on the urban climate and thereby the issue must be considered within the scope of planning.

Keywords: Urban climate, coastal reclamation, urban cooling, urban planning, remote sensing

1. Introduction

Recently, Istanbul has experienced land use/cover change (LUCC) intensively due to the investment strategies intended for the construction sector and the urban transformation works. In this process, the demand for the disposal of debris from building demolitions with minimum cost, as well as the efforts of the administrations to gain new urban areas for profit, has made the creation of land reclamation areas a current issue to meet needs, such as the meeting area by dumping the debris into the sea, recreation areas, social facilities, etc. (Kuşçu Şimşek and Arabacı, 2021). But on the other hand, many scientific studies have emphasized that the projects that have been and will be conducted have / will significant effects in climatic, ecological, and social terms (Kuşçu Şimşek and Arabacı, 2021; Uzun and Akyüz, 2019; Kırbaş Akyürek, 2018; Gazioğlu et al., 2016; Kaplan Çinçin and Erdoğan, 2016; Özkan et al., 2015).

Built-up areas differ from natural land surfaces due to the increasing rate of impermeable surfaces which causes an increase in Bowen ratio and a decrease in evaporation (Ge et al., 2007). Land use/cover changes (LUCC) that occur in the urban area cause changes in albedo and surface roughness and, consequently, in surface heat balances (Deng et al., 2014). While the sensible heat flux due to urban surface changes plays a key role in climate change, changes in the roughness of the urban surface affect the spatial heterogeneity of the climate (Ke et al., 2014). On the other hand, coastal sides play an important role in climate regulation with their evapotranspiration and heat storage characteristics (Gou, Qu, & Han, 2014; Nakayama & Fujita, 2010). The thermal capacity of water is greater than that of soil, rock, and vegetation. In comparison with land, water bodies can store more heat and decelerate temperature variation; thus, wetlands can regulate the surrounding climate (Kuşçu Şimşek and Ödül, 2018; Zhang, Zhu, & Jiang, 2016; Oda and Kanda, 2009). In order to reveal these relationships clearly, the climate responses caused by the changes in the land surface parameters via land use/cover changes should be evaluated by making analyzes on different scales.

In this study, the changes in coastline cooling distances and thermal changes in the urban area that occur after the coastal land reclamation process were investigated by handling the Yenikapı and Maltepe reclamation areas and their peripheries.

2. Material and Methods

2.1 Study Area

The Yenikapı and Maltepe land reclamation areas, which are located on the Sea of Marmara coast of Istanbul and which have been arranged as a recreation and meeting area, were selected as the study area.Yenikapı, which was completed in 2014, has a total area of 715.000 m², of which 518.000 m² is a land reclamation area (Istanbul's Mega Projects, 2012). The Maltepe land reclamation area, which was also completed in 2014, consists of an area of 1.200.000 m² in total together with a 1.010.000 m² area built in addition to the existing 190.000 m² area (Fig. 1) (Istanbul's Mega Projects, 2011).

Figure 1: Study Area

2.2 Data Sets

In the study, in which both study areas were examined separately, the satellite images were obtained for both the winter and summer seasons. Detailed information on Landsat images was given in Table 1.

Table 1. Satellite image acquisition dates

Image acquisition date	Summer	Winter
Before the coastal reclamation	30.05.2011	22.11.2011
	17.07.2011	26.02.2012
After the coastal reclamation	20.07.2015	27.12.2015
	06.09.2015	12.01.2016

2.3 Methodology

In the study, the surface temperatures were obtained from Landsat 7 and Landsat 8 satellite images for the summer and winter months. To obtain data to be prepared from satellite images, raw satellite images should be pre-processed, and image corrections should be made. The images were corrected in accordance with the Landsat 7 ETM (USGS, 2016) and Landsat 8 radiometric calibration parameters (USGS, 2018), before starting the image processing studies.

After obtaining the surface temperatures, the spatial analysis step was started to determine the thermal changes that occur after the reclamation process. Firstly, the effects of the coastal side were measured by their "*cooling distances*" which are defined by the distance from the edge of the coast to the point where the cooling effect disappears. At this step, the distance of each grid to the coastal line before and after the coastal reclamation was calculated and the relationship between the change in surface temperatures and the changing in coastal line was examined. The analyses were made for both winter and summer seasons.

Then, to determine the thermal changes after the construction of land reclamation areas, the method recommended by Kuşçu Şimşek and Ödül (2019) was used. The method is based on the comparison of the average surface temperatures between the reference year and the comparison year image. In this way, the sites where the climatic conditions had changed in the direction of cooling or warming were determined and mapped that are around the reclamation areas.

At the final stage of the study, the climatic effects of the land reclamation areas are discussed via the thermal changes that occurred in their peripheries, and their climatic effects on the urban areas were revealed.

2.4 Results

The analyses were performed by using spatial statistics to be able to examine the effects of land reclamation areas on the micro-climatic structure of the region.

In the cooling distances graphics which are given below (Fig. 2 and Fig. 3); while the dashed lines represent the maximum distance that benefits from coastal effects, the solid lines represent the distance of the urbanized area to the coast. According to the bivariate correlation tests for 300m; high correlation that reaches 0.700 in 0.01 significance level was determined between the surface temperature and distance to the coast in summer seasons. But in winter, these correlations decreased up to 0.206 in 0.01 significance level.

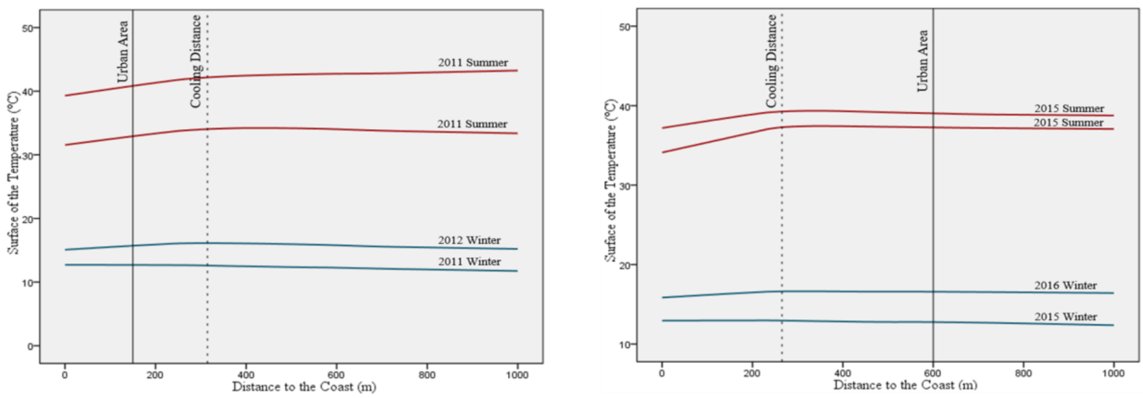

Figure 2: Yenikapı

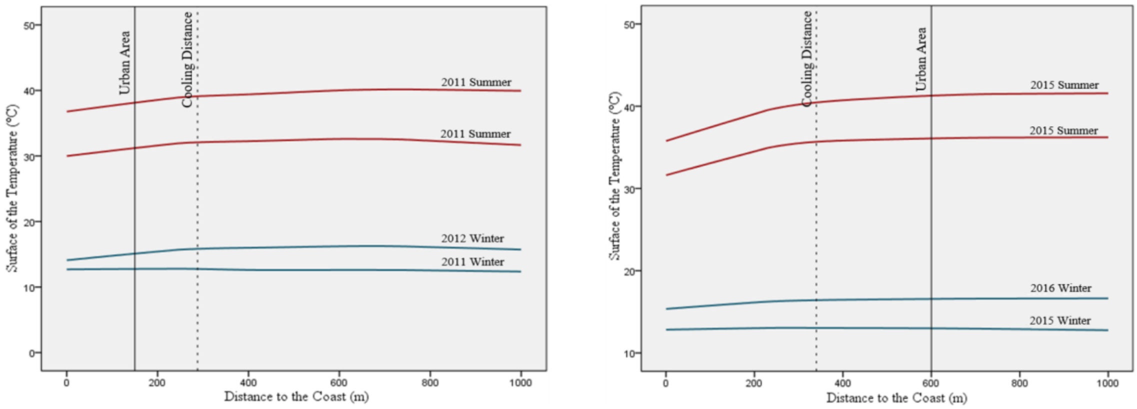

Figure 3: Maltepe

If the results are interpreted both for the reclamation areas and for winter and summer seasons separately;

Yenikapı

- In summer seasons, before the construction, while the urban area started from 150 m, the cooling distance reached 300 m to the direction from coast to land. But after the construction of the reclamation area, it was determined that the urban area shifted to 600m and the cooling distance of the coast decreased a bit.
- In the winter season, although the cooling distance is not as obvious as in the summer seasons due to the low-temperature difference, it reached 300m. But, after the construction of the reclamation area, the cooling distance lost its clarity.

Maltepe

- In summer seasons, while the urban area started from 180 m, the cooling distance reached to 300 m from coast to land. But after the construction of the reclamation area, it was determined that the urban area shifted to 600m and the cooling distance of the coast was 330m.
- In the winter season while the cooling distance reached 250m, after the construction of the reclamation area, the cooling distance lost its clarity.

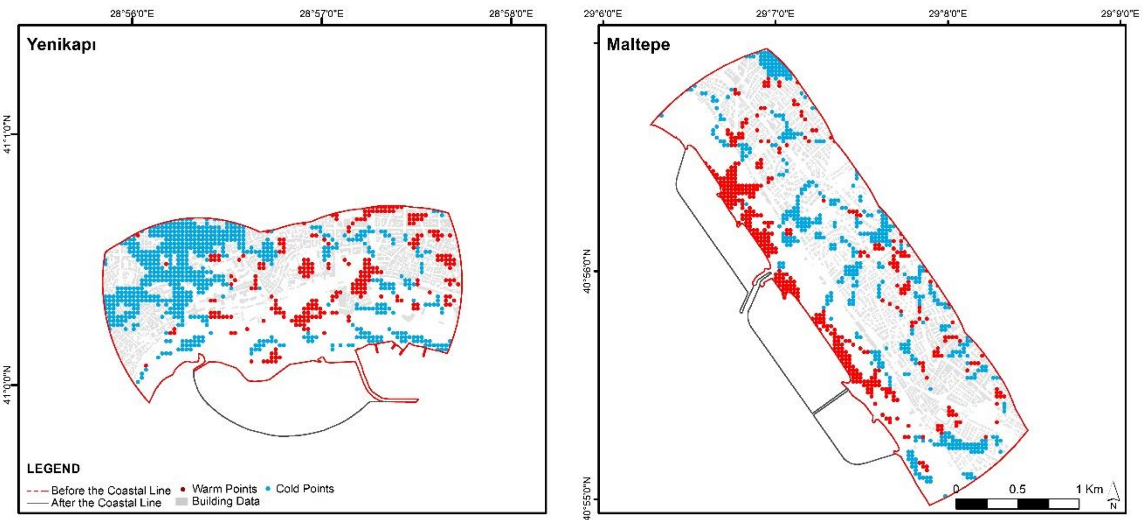

Figure 4: Thermal Change Detection Analysis

Lastly, the thermal change detection analyses were applied to determine the cooled and warmed areas (Fig. 4). As can be seen easily from the result maps intense heating and cooling changes occurred in the peripheries of both reclamation areas.

3. Conclusion

In Istanbul, the prevailing wind directions are different for the summer and winter seasons. While the wind blows from the south to the north in the summer seasons, in the winter season it blows from the north to the south. So, it is thought that the cooling effect of the sea could be seen more clearly in the summer seasons.

However, the study results demonstrate that the urbanized area couldn't benefit from the coastal cooling effect after the construction of the reclamation areas. Also, these results reveal that the reclamation areas have changed the climate balance of the region on the neighborhood scale.

As a result; the coastal reclamation areas have significant effects on the urban climate and the issue must be considered within the scope of climate action plans.

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THE EFFECT OF DIFFERENT SETTLEMENT PATTERNS ON THE SURFACE URBAN HEAT ISLAND: THE CASE OF ELAZIĞ PROVINCE ÇARŞI AND DOĞUKENT NEIGHBORHOODS

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Abstract

Cities are at the center of the debate on global climate change. According to the Intergovernmental Panel on Climate Change (IPCC) Reports, urbanization is the driving force of global climate change. While the changes in the microclimate caused by the change of different space use affect the thermal comfort and health of people, they also emerge as the main causes of temperature changes. Compared to rural areas, urban areas are generally warmer. This phenomenon, which has emerged as a result of urbanization and industrialization, and called the Urban Heat Island (UHI), is considered one of the biggest issues that have befallen humankind in the 21st century. Within the scope of this study, Çarşı and Doğukent Neighborhoods in the city center of Elazığ province, Turkey have been examined in terms of land use and land cover (LULC). The effects of these land uses on land surface temperature (LST) have been analyzed on Landsat 8 satellite images and their effects on UHI have been evaluated in the period of July 2021. As a result of the study, the average of the July 2021 LST value of the Doğukent District of Elazığ province has been recorded as 41.0 °C, and the 2021 July LST value average of the Çarşı District has been recorded as 43.8 °C. The average of LST values of Çarşı Mahallesi is 2.8 °C higher during the day time. This difference is a clear indication of the UHI effect due to Land Use Change in the city of Elazığ.

Keywords: Elazığ province, land surface temperature, land use, Landsat 8, urban heat island

Introduction

The phenomenon of urbanization, which is one of the most important problems of the twenty-first century, has become a problem that exists all over the world. There are constant migrations to the cities for reasons such as the attractiveness of the cities, a better life expectancy, and the increase in living standards. This situation causes an increase in urban population rates. Today, half of the world's population lives in cities (Musco, 2016). According to United Nations data, it is estimated that 70% of the world's population will live in cities by 2050 (United Nations, 2017).

According to the Intergovernmental Panel on Climate Change (IPCC) 2013 Report, global urbanization together with population growth, land demand, energy consumption, industrialization and technological development are the main drivers of global climate change. (Oke et al., 2017).

One of the most prominent environmental features of urban areas is the local climate phenomenon known as the urban heat island (UHI), which is characterized by higher temperatures within the city than in rural environments (Saaroni et al., 2018). The UHI effect is a phenomenon where densely built urban centers are warmer than surrounding rural or suburban areas (Rajagopalan, 2021). This phenomenon, which is accepted as a serious problem all over the world (Takebayashi, 2015), describes a micro-climatic phenomenon that occurs in urban environments. Although not a direct result of climate change, the phenomenon of UHI is expected to intensify in the second half of this century (Musco, 2016).

Within the scope of this study, Çarşı and Doğukent Districts of Elazığ province have been examined in terms of Land Use Change (LUC), and the effects of these land uses on land surface temperature (LST) have been analyzed with the ArcGIS 10.4.1 program on Landsat 8 satellite images and their effects on UHI have been evaluated.

Material and Method

Material

Located in the Eastern Anatolia Region of Turkey, the province of Elazığ is located between 38°30' and 40°0'21" east longitudes, and 38°0'17" and 39°0'11" northern latitudes. Elazığ is at an altitude of 1078 m above sea level (Wikipedia, 2021). The climate is continental in Elazığ. Summer months are hot and dry, winter months are cold and harsh. Compared to other provinces of the Eastern Anatolia Region, winters are milder (MGM, 2021).

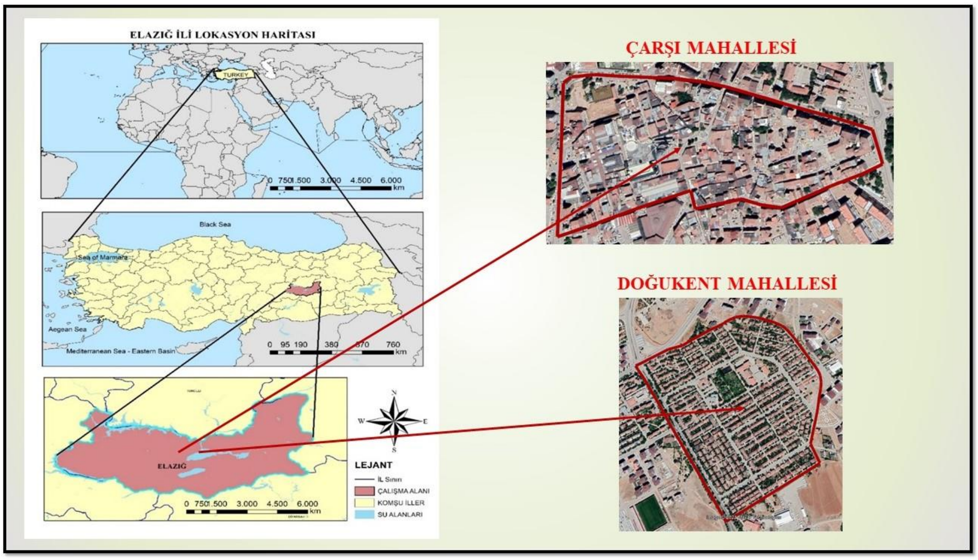

Figure 1. Elazığ province study area location map

The main material of the study is the Çarşı and Doğukent Neighborhoods of Elazığ Province (Figure 1).

Çarşı Neighborhood: This neighborhood is one of the first established neighborhoods of the province of Elazig. Çarşı Neighborhood and its nearby neighborhoods generally consist of complex series of parcels with irregular geometry. While old buildings ranging from 2 to 4 floors are dominant in the Çarşı Neighborhood, new buildings are 5-8 floors.

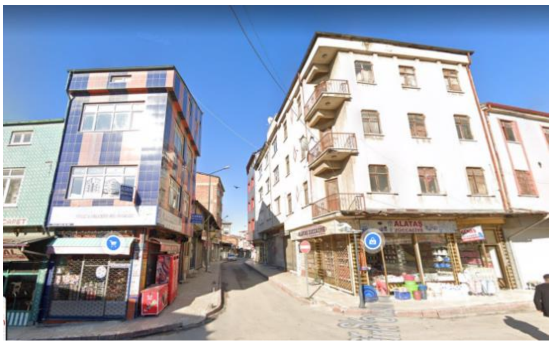

Figure 2. Examples of residences and workplaces in Çarşı Neighborhood

Doğukent Neighborhood: Doğukent Neighborhood, located in the east of the city, has a geometric and regular street network and settlement texture. In this neighborhood, most of which consists of 2-storey villas, the back part of the houses is used as a courtyard-garden.

Figure 3. Examples of residences in Doğukent Neighborhood

Method

Remote sensing techniques are widely used in the analysis of the urban heat island. Remote sensing studies with thermal satellite images are upper-scale studies.

Within the scope of this study, Land Surface Temperature (LST) analyzes have been made in Çarşı and Doğukent Neighborhoods of Elazığ Province. The method flow chart used in these analyzes is given in Figure 4.

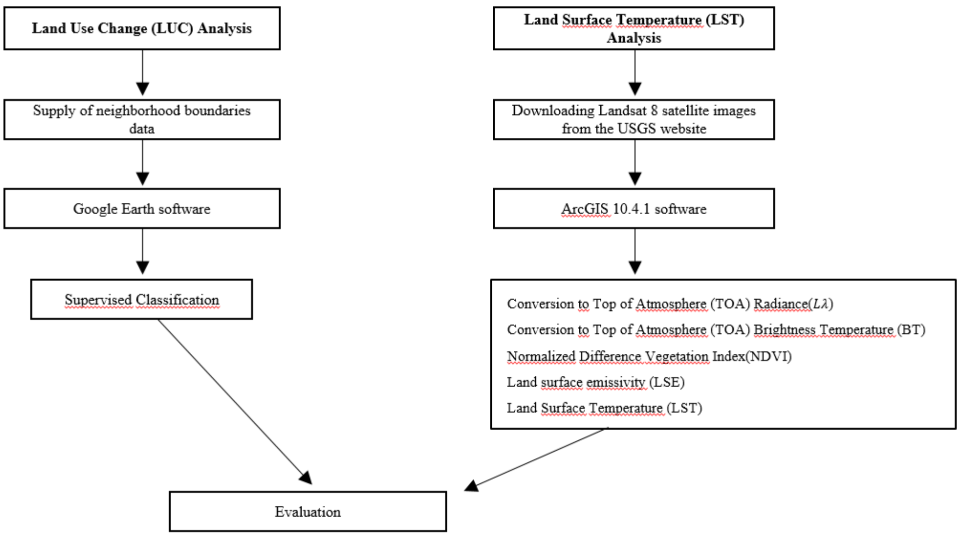

Figure 4. Method flow diagram

Performing the LUC analysis: Within the scope of the LUC analysis, the area use classification of the Çarşı and Doğukent Neighborhoods of the Elazığ Province has been made on the Google Earth satellite images. "Supervised classification" method has been used in LUC analysis.

Performing the LST analysis: Landsat 8 satellite images downloaded from the USGS website have been used to calculate the land surface temperature (LST) values. Landsat satellite images of Elazığ province for July 2021 have been downloaded. ArcGIS 10.4.1 software has been used during the preparation and evaluation of LST maps.

To determine the UHI effect in Elazığ province, Chen et al. (2014), Avdan and Jovanovska (2016) and Du et al. (2017) calculated LST values using Landsat images. The steps of this method are given below:

a. Conversion to Top of Atmosphere (TOA) Radiance

Using to radiance rescaling factor, Thermal Infra-red Digital Numbers can be converted to TOA spectral radiance

$$L\lambda = ML * QCal + AL - Oi \qquad (1)$$

L_{λ} = TOA spectral radiance (Watts/(m^2 * srad * μm))
M_L =Band-specific multiplicative rescaling factor from the metadata (RADIANCE_MULT_BAND_x, where x is the band number)
A_L=Band-specific additive rescaling factor from the metadata (RADIANCE_ADD_BAND_x, where x is the band number)
Q_{cal} = Quantized and calibrated standard product pixel values (DN)

: Correction value for band 10.

b. Conversion to Top of Atmosphere (TOA) Brightness Temperature (BT)

Spectral radiance data can be converted to top of atmosphere brightness temperature using the thermal constant Values in Meta data file.

$$BT = \left(\frac{\mathrm{K2}}{\ln\left(\frac{K1}{\mathrm{L}\lambda}\right)} + 1\right) - 273{,}15 \qquad (2)$$

BT=Top of atmosphere brightness temperature (°C)

L_{λ} = TOA spectral radiance (Watts/(m^2 * srad * μm))

K1=K1 Constant Band (No.)

K2=K2 Constant Band (No.)

c. Normalized Difference Vegetation Index (NDVI)

Normalized Difference Vegetation Index (NDVI) is a standardized vegetation index which Calculated using Near Infra-red (Band 5) and Red (Band 4) bands.

$$NDVI = \frac{NIR\ (Band\ 5) - R\ (Band\ 4)}{\mathrm{NIR\ (Band\ 5) + R\ (Band\ 4)}} \qquad (3)$$

NIR= DN values from Near-Infrared band

R= DN values from the RED band

d. Land surface emissivity (LSE)

Land surface emissivity (LSE) is average emissivity of an element of the surface of the Earth calculated from NDVI values

$$Pv = \left(\frac{NDVI - NDVImin}{NDVImax - NDVImin}\right)^2 \qquad (4)$$

Pv= Proportion of Vegetation

NDVI= Dn values from NDVI Image

$NDVImin$: Minimum Dn values from NDVI Image

$NDVImax$: Maximum Dn values from NDVI Image

$$\varepsilon = 0{,}004 * Pv + 0{,}986 \qquad (5)$$

ε =Land surface emissivity

Pv= Proportion of Vegetation

0.986 corresponds to a correction value of the equation *e. Land Surface Temperature (LST)*

Land Surface Temperature (LST) is the radiative temperature Which calculated using Top of atmosphere brightness temperature, Wavelength of emitted radiance, Land Surface Emissivity.

$$LST = \frac{\mathrm{BT}}{1+\left(\frac{\lambda.BT}{\mathrm{c2}}\right).\ln(\epsilon)} \quad (6)$$

BT=Top of atmosphere brightness temperature (°C)

λ =Wavelength of emitted radiance

ε =Land surface emissivity

c2= h*c/s= 14380 Mk

h=Planck's constant= 6,626*10-34 Js

s= Boltzmann constant= 1.38*10-23 J/K

c= Velocity of light= 2,998*108 m/s

After LUC and LST analyzes of Çarşı and Doğukent Neighborhoods of Elazığ Province were made, charts and maps of these analyzes have been created and the urban heat island profile of these neighborhoods has been revealed.

Findings and Discussion

Canyon Characteristics Analysis of the Study Area: An urban canyon or street canyon is a structure formed by the joint arrangement of a street and its adjacent buildings. Canyons are defined by their two-dimensional section expressed as a ratio of height (H) and width (W); where H is the height of buildings adjacent to the street and W is its width.

Canyon aspect ratio (λs = H / W) (7)

The value of the aspect ratio can be used to classify street canyons as follows (Anonymous, 2021a):

Normal canyon - aspect ratio ≈ 1
Street canyon - aspect ratio <0.5
Deep-Narrow canyon - aspect ratio ≈ 2

Street canyons can cause a temperature increase of 2-4 °C depending on the geometry of the street (Anonymous, 2021b). In a study, it has been determined that the most suitable street canyon ratio (H/W) should have values between 0.5 and 1.0 for ideal thermal comfort (Shishegar, 2013).

The buildings in the Çarşı Neighborhood of the Elazığ Province are generally 1, 2, 4, 5 storeys. Since the streets where these structures are located are narrow (3, 4, 5 m.), they are included in the deep canyon classification.

Most of the buildings in Doğukent Neighborhood of Elazığ Province consist of 2-storey villas. The building height of these structures is 6-7 m. The streets on which the buildings are located have a wide system and are generally 6-7 m. has width. For this reason, the streets of Doğukent Mahallesi are described as normal canyon classification or wide canyon.

Thermal Band and Satellite Image Analysis: LUC classes obtained by "Controlled Classification" method over Google Earth satellite images are shown in Table 1.

Table 1. LUC classes used in the study

LUC Classes	Explanation
Residential/Settled Areas	Residential areas, commercial areas, workplaces, office areas etc.
Impervious Surfaces	Transportation networks, asphalt and concrete covered roads, impervious pavements, etc.
Green Spaces	Urban green spaces, medians, courtyards, neighborhood parks, etc.
Open/bare Spaces	Unused lands, open, bare, earthen areas etc.

While the housing/settlement area ratio is 70.9 % in Çarşı Neighborhood of Elazığ Province, it is 25.4% in Doğukent Neighborhood. There is a great difference in the housing/settlement area ratios of the two neighborhoods. The area of impervious surfaces is 23.1 % in Çarşı Neighborhood and 26.2 % in Doğukent Neighborhood. These rates are close to each other and there is no big difference (Table 2).

The rate of green areas is 3.8% in Çarşı Neighborhood. This rate is quite low. On the other hand, the rate of green areas in Doğukent Neighborhood is 43.2%, which is above the rate of green areas in Çarşı Neighborhood. The ratio of open/bare areas is 2.2 and 5.2%, respectively (Table 2).

Table 2. LUC class area and percentage distribution of Çarşı and Doğukent Neighborhoods of Elazığ province

	Çarşı Neighborhood		**Doğukent Neighborhood**	
LUC Classes	**Area (Ha)**	**Percentage Value (%)**	**Area (Ha)**	**Percentage Value (%)**
Residential/Settled Areas	9.50	70.9	9.70	25.4
Impervious Surfaces	3.10	23.1	10.00	26.2
Green Spaces	0.50	3.8	16.50	43.2
Open/bare Spaces	0.30	2.2	2.00	5.2
Total	**13.40**	**100**	**38.20**	**100**

The 2021 (July) LST (°C) values of the Çarşı and Doğukent Neighborhoods of Elazığ are shown in Table 3. Accordingly, the maximum, minimum and average LST values of Çarşı Neighborhood are higher than the maximum, minimum and average LST values of Doğukent Neighborhood. There is a difference of 1.0 °C between maximum LST values, 2.0 °C between minimum LST values, and 2.8 °C between average LST values. The average LST value of Çarşı Neighborhood is 2.8 °C higher than the average LST value of Doğukent Neighborhood (Table 3).

Table 3. 2021 (July) LST (°C) Values of Carşı and Dogukent Neighborhoods of Elazığ Province

Year	LST (°C)		
	Maximum	Minimum	Average
Çarşı Neighborhood	45.4	40.4	43.8
Doğukent Neighborhood	44.4	38.4	41.0
Difference	1.0	2.0	2.8

When the LST values of the Çarşı and Doğukent Neighborhoods of Elazig are examined according to the land use changes, it is seen that these temperature distributions are closely related to the residential areas, impervious surfaces, the distribution of the vegetation and the street canyon characteristics. While the sum of residential areas and impervious areas is 94% in Çarşı Neighborhood, this rate is 51.6% in Doğukent Neighborhood. Again, while the rate of green areas in Çarşı Neighborhood corresponds to 3.8% of the neighborhood area, this rate is 43.2% in Doğukent Neighborhood. On the other hand, while the streets in Çarşı Neighborhood are generally narrow canyons, they are generally normal canyons in Doğukent Neighborhood. Due to the excess of residential areas and impervious surfaces, the lack of vegetation, and the negative features of street systems, the average of the LST values of the Çarşı Neighborhood in July 2021 has 2.8 °C higher than the average of the LST values of the Doğukent Neighborhood.

Conclusion

Although different climatic features appear in different parts of the world, the problems and challenges associated with climate change are universal. Reducing urban heat island effects is an important task not only for scientists but also for planners and designers.

In this study, in which the LST values of the Çarşı and Doğukent Neighborhoods of Elazığ province for July 2021 have been evaluated in terms of different housing patterns on Landsat 8 satellite images, an average temperature difference of 2.8 °C has occurred due to the change in the housing pattern. It has been determined that this difference is due to the fact that these two neighborhoods in the city of Elazığ have different housing texture characteristics. This danger will continue to increase as the urban population, urban canyon, housing pattern and anthropogenic activities increase. The results of similar studies will set an example not only for the city of Elazığ, but also for the determination of urban transformation areas, new housing areas, and climate change in most cities of Turkey, and will provide support for sustainable and more livable urbanization.

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DETERMINATION OF URBAN HEAT ISLANDS BY USING LOCAL CLIMATE ZONES

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Abstract

The rise of surface temperature in urban areas and losing the thermal balance in urbanized spaces are some of the radical effects of rapid urbanization practices on urban climate. Cities are always warmer than their surrounding lands, which are defined as urban heat islands. Urban heat islands cause significant rise of energy consumption used for cooling/heating the buildings in urban areas; which also leads to an increase of CO_2 emissions. Considering the fact that the average surface temperature of the earth has risen 1.18 degrees Celsius since the late 19th century; it is predicted that uncontrolled urban heat islands will increase CO_2 emissions by up to five times in 2050.

It is of great importance to understand the local situation in urban areas to take the appropriate steps in urban climate adaptation process. The purpose of this study was to map the urban heat islands in Çiğli district of İzmir, which was chosen as the sample area, using Local Climate Zones (LCZ), which is developed by Stewart and Oke to analyze and classify urban heat islands. The LCZ scheme is a systematic and quantitative way for describing and explaining the physical features of urban morphology and their associated urban climatic qualities. World Urban Database and Access Portal Tools (WUDAPT); is an alternative method for developing LCZ's at developing countries and regions which don't have GIS data. Within the scope of the study the LCZ's are developed by WUDAPT for Çiğli district of İzmir and the areas under the heat island effect were mapped.

Keywords: Climate change, Local Climate Zones, WUDAPT

1. Introduction

The main source of global climate change is human-induced changes in atmospheric composition. These perturbations primarily result from emissions associated with energy use, but on local and regional scales, urbanization and land use changes are also important (Karl & Trenberth, 2003). There are two major reasons of global climate change: Earth's magnetic field changes and greenhouse gases in the lower levels of Earth's atmosphere (Chen and Chen, 2016).The presence of radiatively active gases in the Earth's atmosphere (water vapor, carbon dioxide, and ozone) raises its global mean surface temperature by 30 K, making our planet habitable by life as we know it. There has been an increase in carbon dioxide and other trace gases since the Industrial Revolution, largely as a result of man's activities. This heating is likely to be enhanced by resulting changes in water vapor, snow and sea ice, and cloud (Mitchell, 1989). The temperature of our atmosphere has risen 1.18 degrees Celsius since the 19th century. It is predicted that uncontrolled urban heat islands will increase CO_2 emissions by up to five times in 2050 (Royal Society, n.d.). The greenhouse effect is a rise in the temperature of the earth's surface caused by the increase in greenhouse gases in the lower layers of the atmosphere. As a result, the air temperature is higher than it should be, resulting in permanent repercussions such as climate change and global warming (Huang et al., 2016). Figure 1 describes how the greenhouse effect occurs.

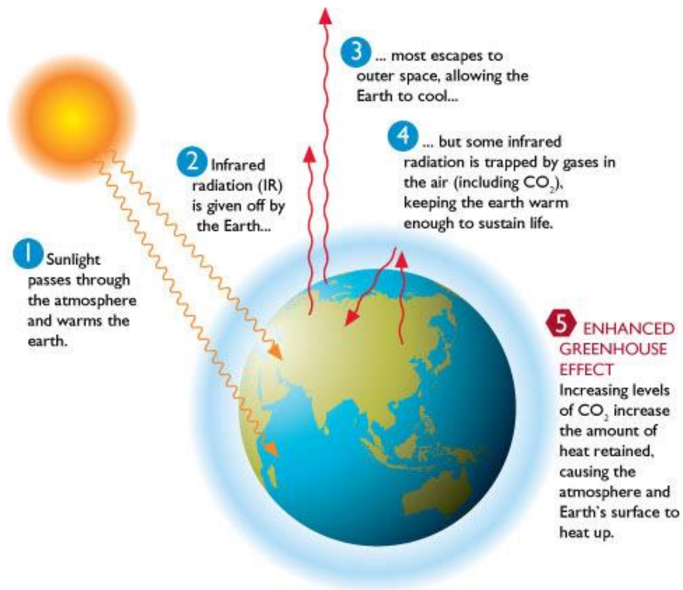

Figure 1: Greenhouse effect (Kong, 2015)

By Climate change effects polar ice shields are melting, the sea is rising, in some regions extreme weather events and rainfall are becoming more common while others are experiencing more extreme heat waves and droughts. These impacts are expected to intensify in the coming decades. World Health Organisation (WHO) predicts global temperatures to rise by up to 4 °C by 2100, with associated alterations in precipitation patterns. Figure 2 explains what can happen if the earth's atmosphere warms up to 4 degrees. According to WHO, 4 degrees warming is going to emerge diseases by drinking and utility water as a result of warming waters and increased floods, infectious disease are going to spread as a result of the increased prevalence of malaria and dengue viruses as humidity and temperature rise and two hundred fifty thousand deaths by 2030 due to this diseases and heat stress, drought is going to aggravate the global hunger crisis, making it more difficult and costly to obtain food, with increased air pollution and a longer pollen season, allergies and asthma is going to become more prevalent and seven million deaths due to these diseases and air pollution.

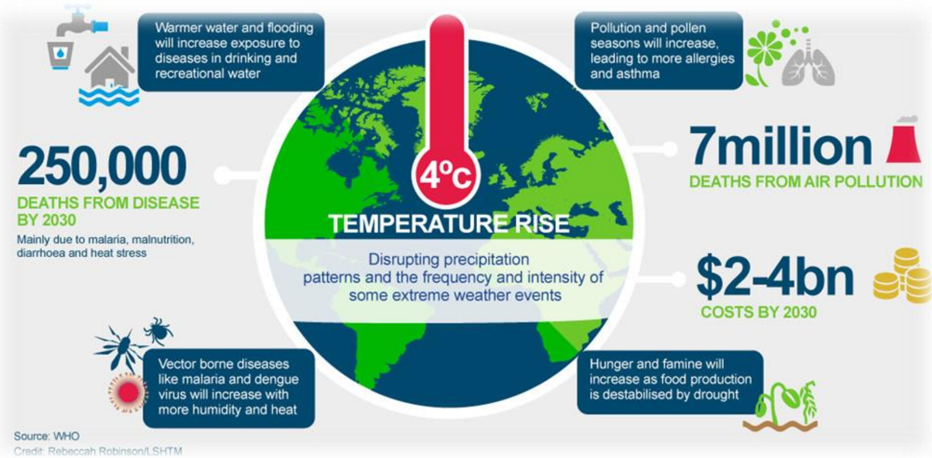

Figure 2: Consequences of the Earth atmosphere's 4°C warming (*Lecture 7: Urban Climate Change Mitigation and Adaptation*, n.d.)

Cities around the world are the "main cause of climate change" but can also offer a part of the solution to reducing the harmful greenhouses gases that are causing global temperatures to rise. Over half of the world's population lives in cities, and this is likely to increase to over two thirds by 2030. Cities use a large proportion of the world's energy supply and are responsible for around 70 per cent of global energy-related greenhouse gas emissions which trap heat and result in the warming of Earth (Hughes et al., n.d.; Mi et al., 2019). The huge carbon footprint created by our cities results from poor planning and layout. Low-density suburban sprawl with little public transport and homes far from work and shops means more cars on the roads emitting carbon dioxide. In addition,most of the ever-increasing number of buildings still use fossil fuels for their energy needs. But Energy, building, mobility and planning solutions and innovations in cities have the potential to deliver major emission cuts (Lombardi et al., 2017).

Since cities are the primary contributors to climate change, urban planning should be used to solve this problem. An advantage of urban planning is the universality of the profession and the tools available to it. Tools such as plan-making, stakeholder engagement, development management and design standards are available and used by urban planning regimes worldwide (Matthews, 2011). These are important for developing and delivering urban adaptation across a variety of scales. Urban planning is a whole consisting of social, legal, economic and design policies and is one of the most important tools that can produce solutions to climate change (*Climate Change Impacts and Spatial Planning Decision Support Guidance*, 2008). This research focuses on the spatial design aspect of urban planning as it relates to climate change adaptation. Mapping the urban heat island formation helps in generating solution-oriented planning approaches. Urban heat island is a term first coined in the 1940s, refers to the atmospheric warmth of a city compared to its countryside (Balchin & Pye, 1947). The traditionally described heat island is that which is measured at standard screen height (1–2 m above ground), below the city's mean roof height in a thin section of the boundary layer atmosphere called the urban canopy layer, most all urban areas, large or small, in warm climates or cold (I. D. Stewart & Oke, 2012).

Local Climate Zones (LCZ) that is developed by Stewart and Oke to analyze and classify urban heat islands, has become an international standard. Local climate zones as regions of uniform surface cover, structure, material, and human activity that span hundreds of meters to several kilometers in horizontal scale (I. D. Stewart & Oke, 2012).

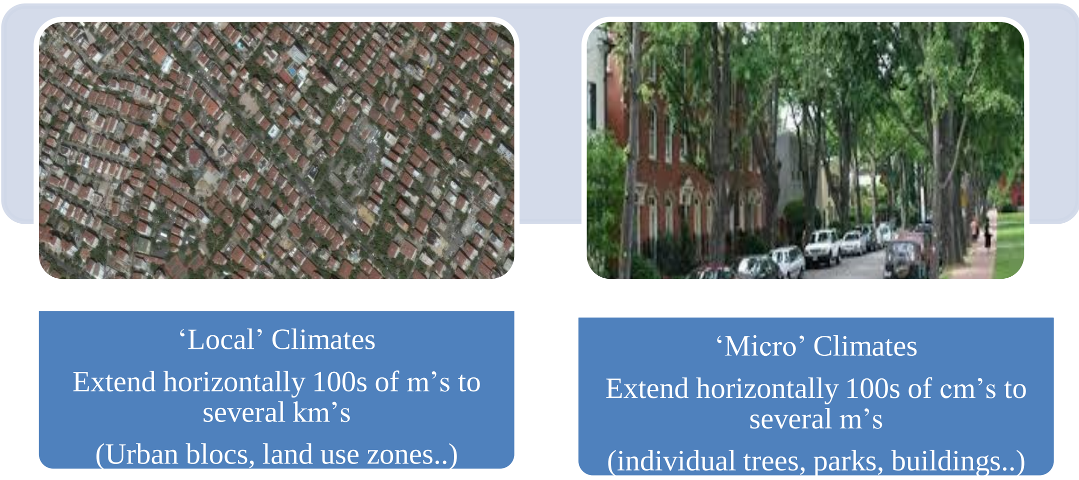

Figure 3: Comparison of local climate and micro climate (I. Stewart & Oke, n.d.)

Local Climate Zones refer to a classification system that exists out of 17 classes, 10 of which can be described as built types and 7 as land cover types. The system is originally designed to provide a framework for urban heat island studies, allowing the standardized exchange of urban temperature observations for urban heat island researchers, but it has derivative uses for city planners, landscape ecologists, and global climate change investigators. LCZ scheme serves as a standardized and quantitative method to describe the physical properties of urban morphology and explain their corresponding urban climatic properties (I. D. Stewart et al., 2014).

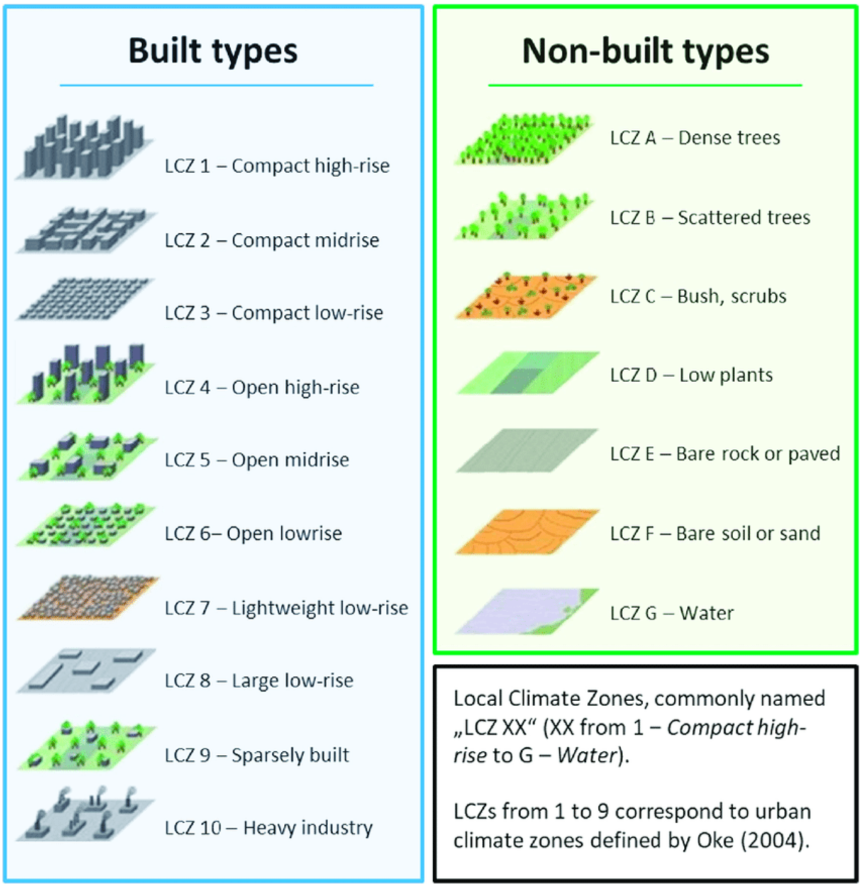

Figure 4: LCZ Classification (I. D. Stewart & Oke, 2012)

The system's principal goal is to make consistent and climatologically appropriate classifications of urban and rural field locations for temperature readings at standard screen height possible. At the local level, the system consists of 17 standard classes (102 to 104 m). Each class has a distinct surface structure (building/tree height and spacing), cover (pervious fraction), fabric (albedo, thermal admittance), and metabolism (anthropogenic heat flux). Each LCZ should have a distinct air temperature regime at screen height when compared under equivalent meteorological and surface relief circumstances. Individual LCZs are called and arranged based on one (or more) defining surface characteristic, which is usually land cover or the height/spacing of trees and structures. The surface attributes of all zones are measured and unrelated to time or location (I. D. Stewart et al., 2014).

The creation of LCZs, which we can describe as the first step of climate adapted urban planning, can be created with different methods. The primary methods include in-situ measurement, GIS-based and remote sensing analyzing methods. In-situ measurement is the most basic method used in LCZ classification. In-situ measurement has advantages since its ease of operation, but the time and labor costs are disadvantages of method. The data for GIS based methods are derived from real urban morphologies so this method have high accuracies. However, not every city's GIS data are complete or accessible to the public, especially in developing countries and regions. Aside from these, there are World Database and Access Portal Tools, which do not need any software or data other than Google Earth and the researcher's him/herself, using remote sensing and gis methods, through a site that we can access online (Ching et al., 2018; Wang et al., 2018).

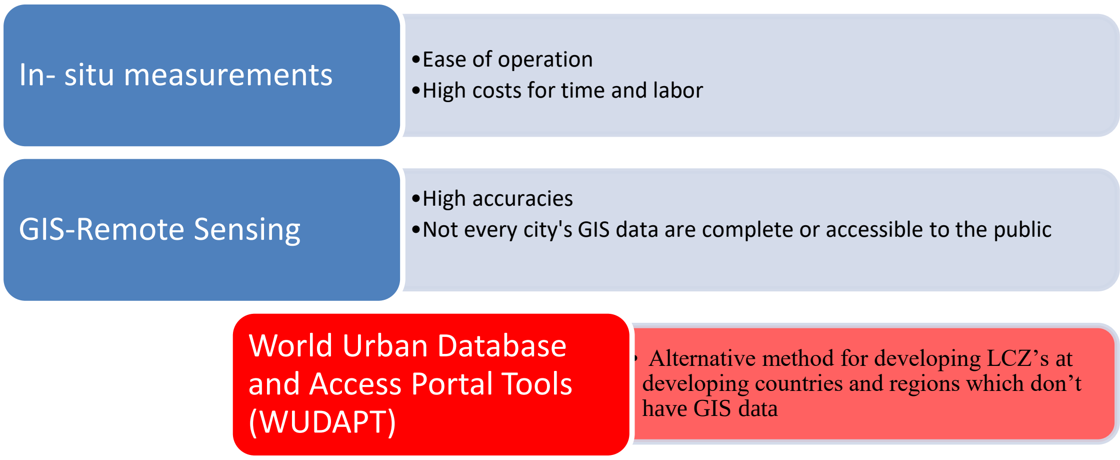

Figure 5: Methods for developing LCZ’s.

Local climate zones can be utilized to define urban heat island magnitude, public scrutiny of heat island literature, climate modeling, weather forecasting, and historical temperature analysis, architecture, city planning, and landscape ecology. The purpose of this study was to map the urban heat islands in Çiğli district of İzmir, using Local Climate Zones (LCZ), which is developed by Stewart and Oke to analyze and classify urban heat islands for futher urban climate studies.

2. Materials and Methods

The study area is Çiğli district, located in the north of İzmir. Çiğli is located in the north of İzmir's gulf. It is surrounded by Menemen and Karşıyaka districts. The reason for choosing Çiğli district is that Atatürk Organized Industrial Zone, one of the important organized industrial zones of Izmir, Sasalı Bird Sanctuary, that is of great importance for our country, ramsar sites and residential areas of different qualities are located together.

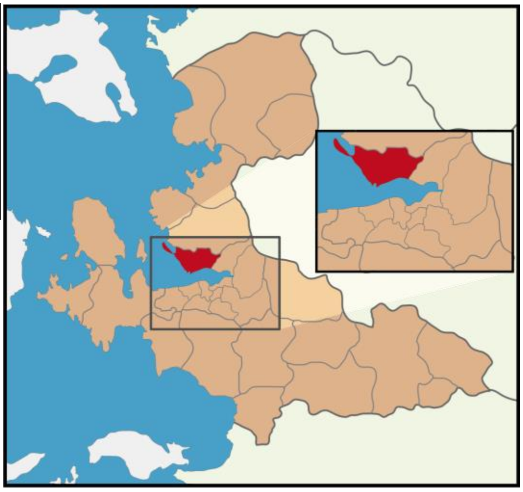

Figure 6: Study area

In this study World Urban Database and Access Portal Tools (WUDAPT) is used as an alternative method for developing LCZ’s for Çiğli district of İzmir and the areas under the heat island effect were mapped. WUDAPT is an international community-generated urban canopy information and modeling infrastructure to facilitate urban-focused climate, weather, air quality, and energy-use modeling application studies (Demuzere et al., 2021). We can list the goals of WUDAPT as below:

1) to acquire and make accessible coherent and consistent descriptions and information on form and function of urban morphology relevant to climate, weather, and environment studies on a worldwide basis and

2) to provide a portal with tools that extract relevant urban parameters and properties for models and for model applications at appropriate scales for various climate, weather, environment, and urban planning purposes (Demuzere et al., 2021).

Wudapt handles data at different levels. These are designated as L0, L1 and L2. The detail level of the data increases from L0 to L2. It is possible to access online LCZ data of more than 80 countries prepared at L0 level. Within the scope of this study, L0 level LCZs were produced. In the preparation of L0 level data, the urban experts are critical to the process, as they create the training areas (TAs) that identify the parts of the city under study that exemplify each LCZ type (Bechtel et al., 2015; Ching et al., 2018; Demuzere et al., 2021).

The LCZ Generator is an online platform that maps a city of interest into LCZs, solely expecting a valid training area file and some metadata as input. The LCZ Generator web application consists out of three major step. In a first step, personal and training information needs to be submitted via the web application. Upon successful submission, the LCZ classification and quality control is launched in the back-end, to produce a quality-controlled LCZ map, metadata statistics, and labels for suspicious polygons. In a third and final step, compressed results are sent to the user via e-mail, and simultaneously added to the online submission table (Demuzere et al., 2021).

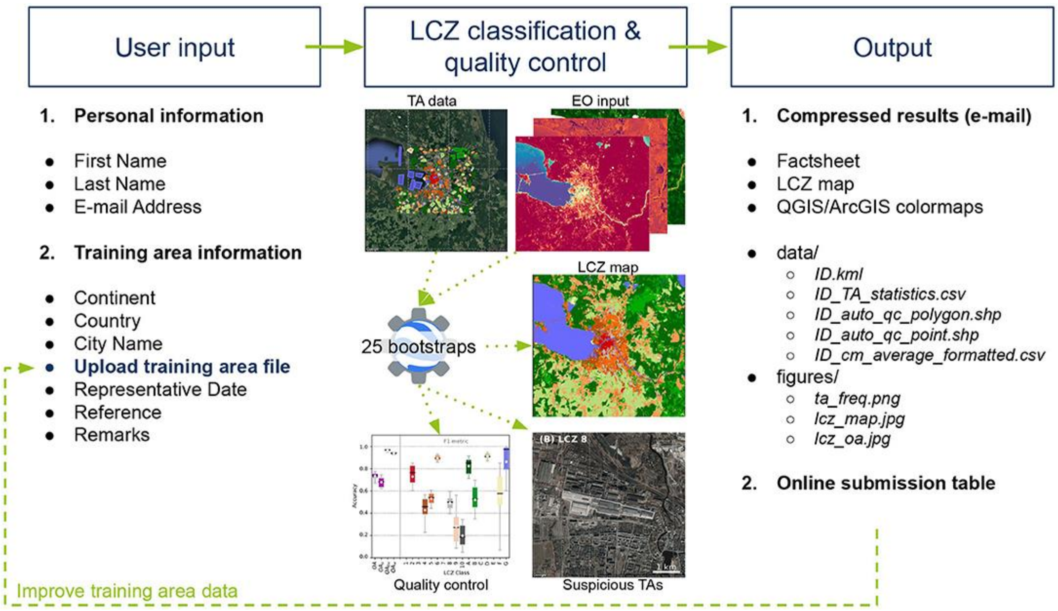

Figure 7: WUDAPT -The LCZ Generator (Demuzere et al., 2021)

Training Areas are image samples from city of interest that are produced via google earth. A template is obtained from the WUDAPT website in order to construct TAs. This template is opened in Google Earth, and sample regions are drawn from the city's various land uses. Apart from the layers belonging to all LCZ groups, this template contains metadata such as the researcher's name, the city of study, and the date. As a rule, the more (and the larger) training areas for each LCZ type, the better for classification. A larger number of training pixels provides a better representation of the variety of spectral characteristics associated with a LCZ type.

3. Results

For Cigli district, which has been determined as the study area, first TA's were created on google earth for the LCZ creation process. Since there is no high rise building in Çiğli, TA could not be established in LCZ 1 and LCZ 4 categories. Then the TA file shown in figure 8 is saved as *kmz and the submission is completed on the website.

Figure 8: Training areas for Çiğli district

The results were received by e-mail. According to factsheet; LCZs, prepared by the TAs we had developed, have %65 accuracy. By using the open source LCZs seen in Figure 9, studies such as climate-oriented planning or climate modeling studies can be done by any researcher.

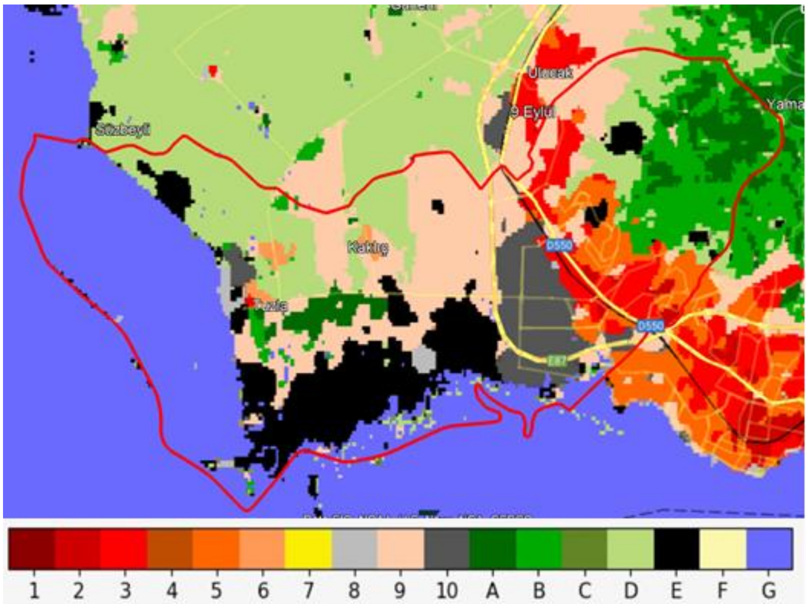

Figure 9: LCZ's for Cigli (*LCZ Factsheet*, n.d.)

As seen in Figure 9, the built up areas with high heat island effect are in compact form. However, open and green areas with low heat island effect are detached from construction in the east and west. The absence of open and green areas that reduce the heat island effect among the built-up areas is an important problem that needs to be addressed in terms of planning.

Urban planners can use local climate zones to observe how the spatial distribution and heat islands of the city have changed over the years. While the current zoning plans for the city practice either a land use or activity based strategy, LCZ based approach allows easy identification of critically stressed areas. It helps to make spatial decisions to prevent or control the urban heat island formation. Planning practices can be compared by finding cities with similar LCZ structures.

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SITE SELECTION FOR CARBON SINKS IN URBAN AREAS; CASE STUDY OF ÇİĞLİ/ İZMİR

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Abstract

Climate change effects have been a major struggle for both the authorities and decision makers in urban planning for the last decades as urbanized areas are the most effected regions due to dense population and intensive human activity. Mitigating the hazardous effects and adaptation of urbanized areas to cope with the new conditions of climate are of great importance for ecological, economic, and social sustainability of cities. Carbon pollution is one of the main problems of urbanized areas, which leads to urban heat islands and serious diseases along with. Establishing carbon sinks in suitable places in urban areas may reduce the amount of carbon and urban heat island effect in a region, which is a multifunctional way of mitigating climate change effects.

Çiğli district is a good sample to investigate the ways of reducing carbon amounts as the district has a combination of multiple land use types including residential and industrial areas, and the district has a wide range of new urbanizing areas and also it is reported that the air pollution values of the district is above the limits. Therefore, the purpose of this study was to provide a site selection plan of suitable areas for carbon sinks using geographical information systems. Within the scope of the study, the contaminated areas were classified according to the contamination rates, and the areas with the need of carbon sinks were mapped. Results of the study showed that it is possible to create multifunctional open green spaces that can serve as carbon sinks in some parts of the district; however, in majority of contaminated areas the best solution is to improve the ecosystem services quality of existing open green areas.

Keywords: Climate change, Carbon sinks, Open-green spaces

1. Introduction

Cities are the areas of high-energy consumption and often responsible for the majority of greenhouse gas emissions that cause climate change due to crowded population and intense human activities (Wright et. Al, 2011). Carbon dioxide levels in the atmosphere have climbed from roughly 280 parts per million (ppm) before the Industrial Revolution to 413 ppm as of early 2020. This level of carbon dioxide has never been seen before in recorded history. In terms of greenhouse gas emissions, fossil fuels account for more than 80% of global energy use. Future carbon dioxide emissions in the twenty-first century will thus result in both short and long-term climate changes that are essentially irreversible (where irreversible is defined here as a time scale exceeding the end of the millennium in year 3000; note that we do not consider geo-engineering measures that might be able to remove gases already in the atmosphere or to introduce active cooling to counteract warming). Physical climatic changes caused by anthropogenic carbon dioxide already in the atmosphere are projected to be mainly irreversible for the same reason (Solomon et al, 2009; Ahmed et al, 2020; Zhang et al., 2020).

Population, energy usage, and economic production are all concentrated in cities across the world. Cities are thus carbon hotspots, with significant fossil fuel CO_2 emissions from energy use, ground transportation, and residential and commercial structures. Furthermore, industrial activity have increased around and inside cities in various locations, contributing to CO_2 emissions. Cities have unique potential to minimize fossil fuel consumption by managing energy and materials among residences, companies, infrastructure, and industries in close proximity. An growing proportion of the world population is moving to cities, and this trend, which is especially prominent in emerging countries, will contribute to rising CO_2 emissions in the future decades. Mitigation in cities relies heavily on planning, technology, and behavioral changes. As a result, global cities are important locations to concentrate on in order to reduce global CO_2 emissions (Dhakal, 2010; Davies et al, 2011; Lahde and Di Marino, 2019).

The main causes of greenhouse gases that cause global climate change are the transition to modern society life after the industrial revolution and the use of fossil fuels, land cover/use change with the urbanization process and waste production. According to the IPCC study report, the biggest greenhouse gas factors causing global warming are electricity, warming, industry and transportation factors. The common point of these factors is that they lead to fossil fuel production. In this respect, the main determinant causing the use of fossil fuels is the need for energy and transportation (Ersoy Mirici, 2021).

The main cause of carbon emissions in Turkey is energy consumption as well as the rest of the world as presented on Figure 1. When the areas with the highest energy consumption in cities of Turkey are examined, it is seen that the industrial areas are responsible for the highest rate of energy consumption (Kahraman, 2019; TUIK, 2021).

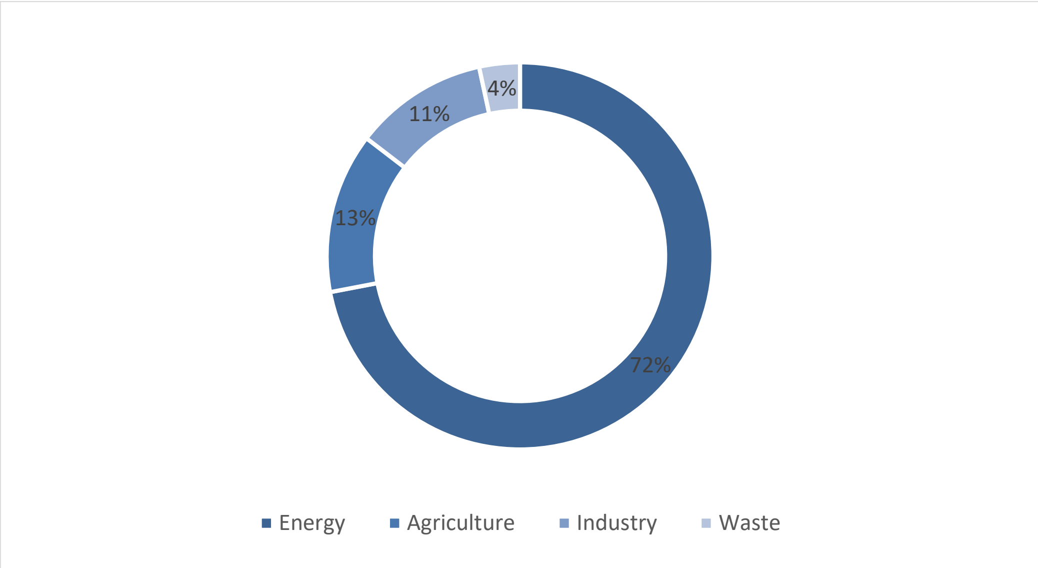

Figure 1. Carbon emmissions according to the sectors in Turkey (2019)

Long-term removal, capture, or sequestration of carbon dioxide from the atmosphere to delay or reverse atmospheric carbon dioxide pollution and attenuate or reverse global warming consequences is known as carbon sequestration or carbon dioxide removal. The methods of carbon sequestration are (Baurov, 2021):

- Terrestrial Sequestration
- Ocean Sequestration
- Geologic Sequestration
- Mineral Sequestration
- Hydrodynamic Trapping

In cities, the amount of carbon emissions differ according to the land use types. It is a well known fact that industrial sites and transportation areas are both the most energy consumer and the carbon releaser components of the cities. Capturing the carbon released by these areas and breaking the spreading network of adverse effects caused by these are of great importance. The sites producing the greatest amount of carbon must be seperated from the other components of cities (Francis, 2013).

The most prevalent and natural means of collecting and storing carbon is through terrestrial sequestration. The entire procedure is carried out through photosynthesis. Plants take carbon dioxide from the air as they absorb and alter various important components for their growth. The carbon dioxide is then digested and stored in the plant's roots and stems. The carbon that is not used is eventually stored in the soil. Carbon is twice as abundant in a plant's stems and roots as it is in the air. The soil may also store up to 2.5 times the carbon that is found in living organisms. After the plant dies, the carbon cycle continues, and carbon mixes with oxygen as it joins the components of air. It returns to the atmosphere as carbon dioxide, which is utilised by other plants (Baurov, 2021).

More trees should be planted for two key reasons in order to minimize carbon emissions in the atmosphere: Trees take up more CO_2 from the atmosphere than smaller plants. Trees take a long time to release carbon into the atmosphere. As a result, trees are the most popular technique for combating global warming (Song et al, 2012).

CO_2 emissions differ among cities even within the same country, and these differences rely on socioeconomic factors, such as access to energy, urban forms, and climate conditions driving heating in winter and electricity consumption for air conditioning in summer. Establishing carbon sinks in suitable places in urban areas may reduce the amount of carbon and urban heat island effect in a region, which is a multifunctional way of mitigating climate change effects. This study aims to offer a site selection model for carbon sinks in an urbanized area depending on the carbon release rates of land use types.

2. Materials and Methods

The study area is Çiğli district, located in the north of İzmir. It is surrounded by Menemen and Karşıyaka districts (Figure 2)x. Çiğli district is a good sample to investigate the ways of reducing carbon amounts as the district has a combination of multiple land use types including residential and industrial areas, and the district has a wide range of new urbanizing areas and also it is reported that the air pollution values of the district is above the limits.

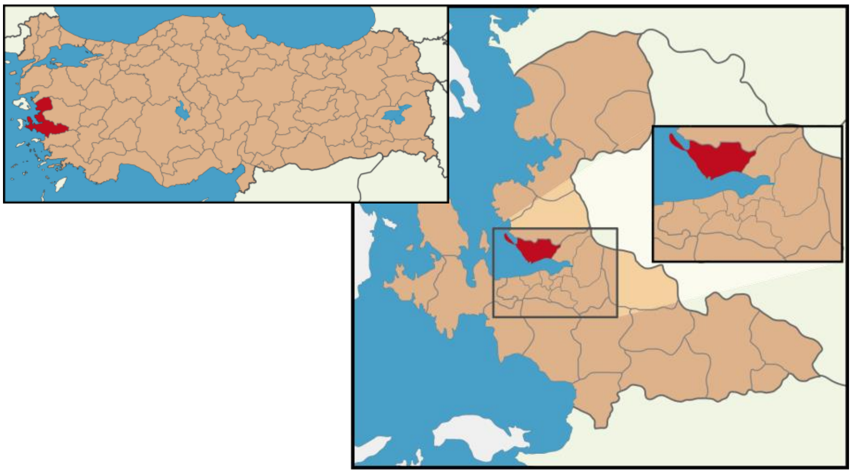

Figure 2: Study area

Other materials used fort his study are Corine Land Cover 2018 data, Open Street Map road network and Arcmap 10.4.1 for suitibility analyzes.

The study consist of 4 phases. First phase is geodatabase design. In first phase that we design geodatabase, Corine data and Open Street Map data are downloaded, clipped and reclassied for study area. In second phase, criteria are determined to locate carbon sinks. In third phase, Rasters and fuzzificated maps are composed for every criteria taking into account the distance from landuses. And in last phase criteria combined and areas that need carbon well have been identified (Figure 3).

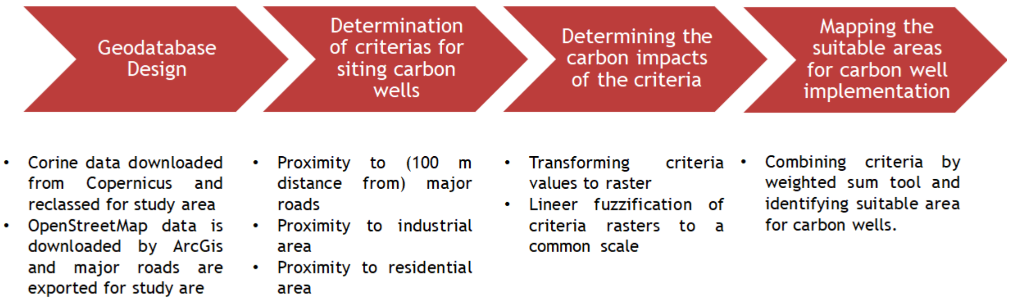

Figure 3: Phases

3. Results

Corine 2018 data was collected from Copernicus and reclassified for the Çiğli district in the research. In figure 4, large areas east and west of Cigli are green, agricultural and wetlands with no carbon emission effect. However, industrial and residential area, located in the middle of the district, are having a significant impact on these zero carbon landuses.

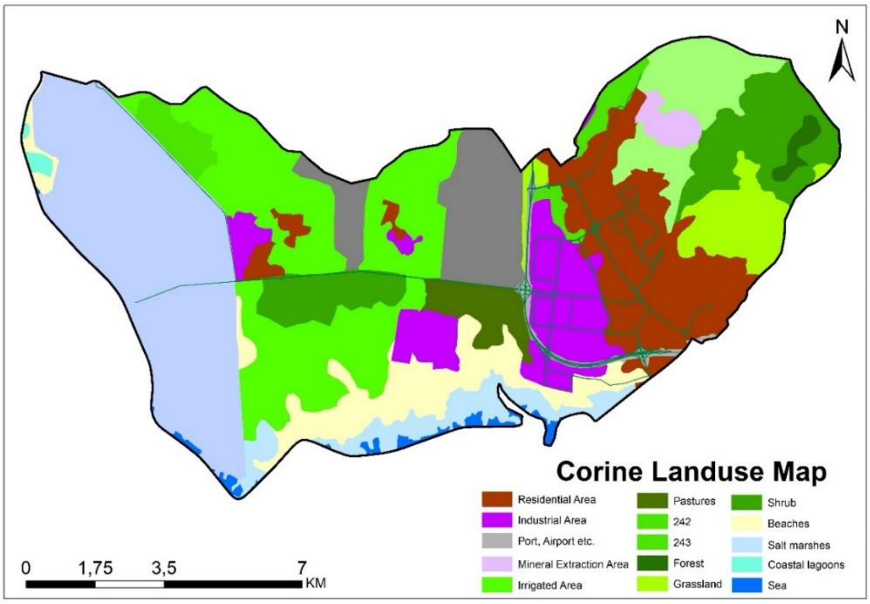

Figure 4: Corine Landuse Map

In the second phase, the location selection criteria of carbon sinks / land uses with high carbon emissions were determined as follows in line with the data available;

- Major roads carbon impact
- Industrial area carbon impact
- Residential area carbon impact.

Carbon impact maps of these criteria prepared by using the euclidean distance tool (Arcgis) to take into consideration the distance. Each criteria was transformed to raster. By using the linear function, it is assumed that the carbon effect decreases, when the distance increases from the land use that have high carbon emission.

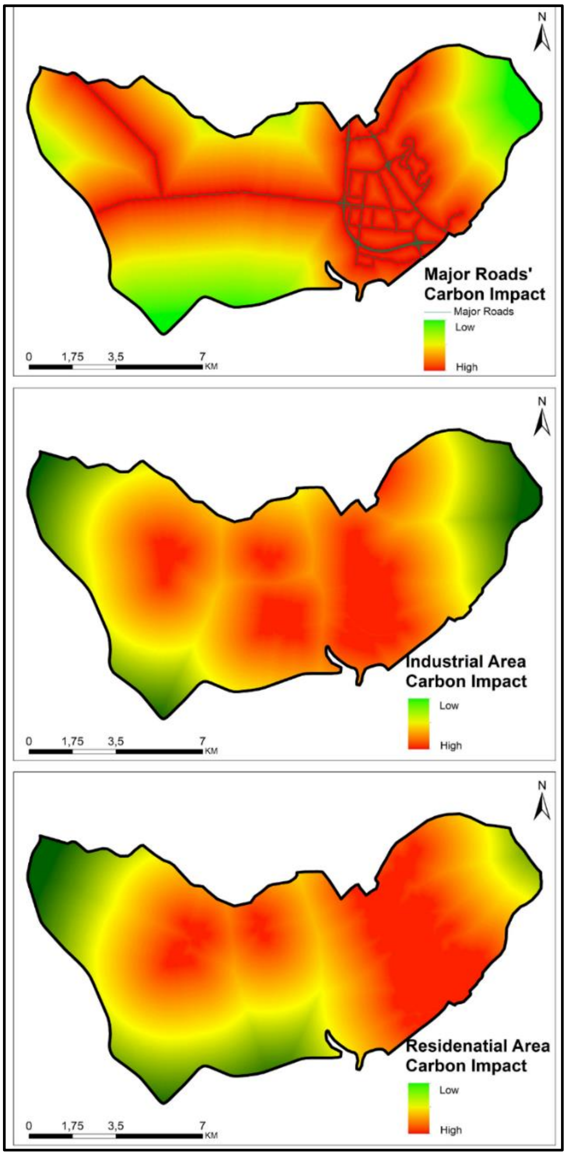

Figure 5: Carbon impact maps of criteria

In figure 5, the areas that are most impacted by carbon are depicted in red, while the areas that are least affected by carbon are displayed in green.

Fuzzy membership functions were used to rank factor layers within themselves in the preference analysis. Linear fuzzy membership function with proper parameters were performed to convert each preference factor to a common scale, as shown in Figure 6. Using the fuzzy membership tool, the carbon well need level is rated between 1 and 0 according to each criterion. The areas that are most suitable / need carbon sinks most are depicted in green, while the areas that are least suitable / need carbon sinks least are displayed in red.

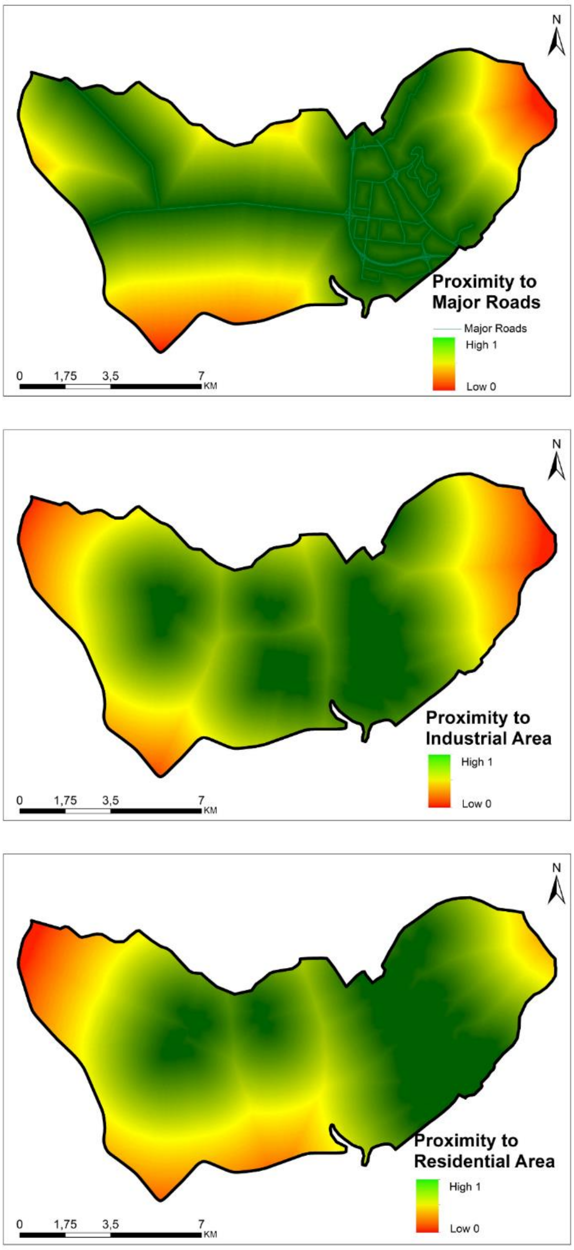

Figure 6: Fuzzied criteria maps

The weighted sum tool in ArcGIS was used to aggregate all of the criteria and build a suitability index map. The final land suitability map was in raster format with 5 m cell size resolution since the input fuzzified rasters were prepared in 5 m cell size resolution. The regions over the suitability index threshold value were then identified as carbon well sites.

At suitibility phase all criteria have been accepted with equal weight. The index of the areas that need carbon well most has been realized as 3 and the index of the areas that need it least has been realized as 0. Accordingly, in figure 7, areas with an index greater than 2.5 are mapped as areas that need carbon well.

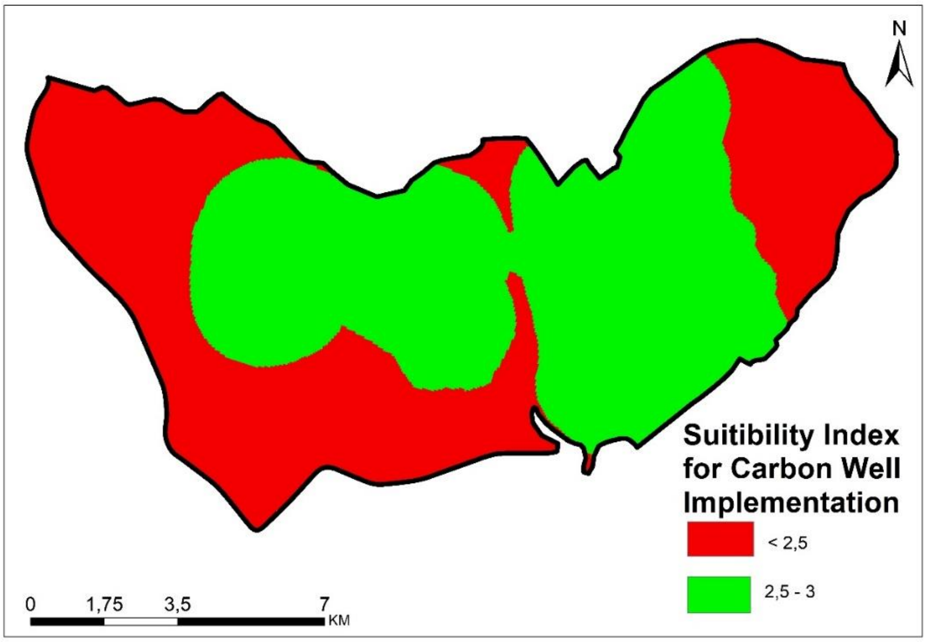

Figure 7: Suitibility index map

4. Conclusion

Reducing the carbon emission has become one of the most urgent priorities of current urban authorities. Establishment of carbon sinks is the most natural and effective spatial implementation method that both reduces the amount of carbon in air and also provides several other ecological services. However, there are some issues that need to be taken into account when establishing carbon sinks in cities. There are numerous studies that use trees as the biomonitors of airpollution and they refer that dangerous amount of heavy metals can be observed up to 50-100 metres away from the source area. So the size of the carbon well to be established must be planned appropriate to the carbon production rate of source area.

In this study, a model was developed using GIS to discover the most ideal sites for carbon sinks, and it was applied to the İzmir Çiğli district. According to the nature of the function to be selected, a site suitability study may be performed by analyzing a variety of factors. The criteria for selecting carbon well location in the study were molded in accordance with the availability of data. Adding criteria such as existing green area, vacant plots and so on would improve the study's quality, but such data was not available.

In carbon sinks, will be built in the relevant places specified by the research, plant species must be selected depending on their carbon capturing capacity. Plants with wider leaf surfaces and wider canopies are capable of capturing and storing more amounts of carbons compared to small plants. Local or adapted species are more useful for these areas as those species will need less maintenance.

Carbon sinks must be planned as multifunctional areas providing multiple ecological services such as contribution to cities green infrastructure, connection opportunity with nature, increasing biodiversity in urban ecosystem, providing areas for recreation etc.

Carbon sinks must be energy and water efficient and usage of chemicals such as pesticides must be avoided. They must contribute to the functionality of whole urban ecosystem by creating a natural ecological network integrated with other components of urbanized areas.

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A BIBLIOMETRIC ANALYSIS OF GRADUATE THESES ON CLIMATE AND LANDSCAPE ARCHITECTURE IN TURKEY

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Abstract

In the face of developing world, population increases and also technological investments cities do not meet with human needs and life qualities anymore, in today's world. Therefore, urban and architectural heritages and environment have been destroyed unless they do not preserved and sustained. However, as built environment has a strong background and history in it, the solutions should not destroy the existing situation and identity. For this reason, to overcome the crisis for better future scenarios there are some discussions and solutions around the world. This paper focus on climate-based solutions for urban design scenarios. On that matter, a bibliometric analysis about landscape architecture related to climate has been studied in this article. Within the scope of this paper, the bibliometric analysis has concentrated on graduate thesis studied in Turkey about the topics including climate and landscape architecture. The article aims firstly reviewing related literature from Thesis Center of Council of Higher Education of Turkey. While reviewing, "climate" has been chosen for title keyword and "Landscape Architecture" has been chosen for topic keywords in detailed searching method of the center. 23 research results have been found. Afterwards, thesis about climate and landscape architecture will be sub-divided according to year of publication, topic, city that studied about and research method. Later, how landscape architecture and urban design is affected by global and local forces of climate change is argued in this paper. Lastly, the deficiency of knowledge about climatic studies on landscape architecture will be investigated on the point of theses studied in Turkey throughout the history.

Keywords: acclimatize, architecture, graduate dissertation, urban design

Introduction

Natural environment has been affected by human activities. In today's world, with rapid urbanization depending on particularly population increase, ecosystem services and systems' balance have been changing. To preserve and maintain urban infrastructure and communities, technological, social and natural-based solutions are required (Lin et. al., 2021). Problems such as flooding, extreme heat or drought could be alleviated via nature-based solutions (Scott et. al., 2016). To protect and enhance sustainable urban ecosystem within cities, paradigms such as conservation, restoration and adaptation have been practices to various extents in urban planning and designing (Ramyar, Ackerman and Johnston, 2021). Therefore, climate has become vital factor in the planning and design stages in order to enhance resilience of urban ecosystems.

In the early 1970s "urban ecology" was examined as a sub-discipline of ecology as a definition to study human impression on urbanized landscapes (Niemelä et al., 2011). Although the core studies in this subject is predominantly studied by ecologists, dominantly at regional scales, urban ecology movement advanced the multidisciplinary approach to problems like urban heat and climate change (Ramyar, Ackerman and Johnston, 2021). From this perspective, since landscape architecture is an ecologic based science field, studies should have been carried out considering landscape and climate relationship.

From this point of view, to investigate and support studies about climate-based landscape architecture, first, researchers should have known existing data about the issue. Collecting data of these studies, separating them into certain criteria and create a general assessment of the situation sheds light on scientific studies and facilitates the work of researchers for future. In order to simplify research about specific, mainstream topics, academics studied on bibliometric analysis.

The concept of the bibliography was defined by Edward Wyndham Hume in 1992 as a concept founded on collecting information about any discipline determined by analyzing written sources in statistical method (Hume, 1923). Afterwards, Norton (2001) is defined “bibliometrics” to evaluate text and information. Historically bibliometrics have been used for extracting data from academic studies citations (Morris et. al., 2002). On the other hand, bibliometric methods can be used to investigate the past and even probably to predict and project future scenarios (Daim et. al., 2006). Bibliometric analysis has a significant role for analyzing quantitatively large-scale research literature and crucial tools to classify the research productivity and development status in the field (Zhang and Liang, 2020). By doing this, data studied in the past could be explore, identify, categorize in a single paper to help researchers about their distinct studies.

Accordingly, the main objective of this paper is to investigate bibliometric analysis of the postgraduate theses studied in Turkey about climate-based landscape architecture between 1996 and 2021 within the framework of various parameters to provide a broad overview. These bibliometric analysis results could enlighten similar studies to be carried out in the future.

DATA SOURCES AND METHODS

To find relationship between climate and landscape design, the authors conducted a bibliometric analysis of graduate theses on climate and landscape architecture in Turkey. In other words, the paper inspects post graduate researches mainly focused climate issue about landscape. The datum was retrieved from records accessed from the website of the Thesis Center of Council of Higher Education of Turkey. Theses are listed using the following words “climate” in titles and “landscape architecture” in topic field. 23 research have been showed in the results.

In order to analyze theses, the parameters such as “year of publication”, “city that studied about” and “research method in the thesis” were determined. Percentage and frequency analysis were used in the evaluation of the data related to the theses. In addition, the content analysis method was used in the inferences for the theses. A total of 23 postgraduate theses, 19 of which are master's and 4 doctoral dissertations, have been reached as a result of the scanning.

RESULTS

To review the current research trends among graduate studies dealing with climate and landscape architecture, the authors started with verifying the number of theses according to thesis types (Tab. 1). The distribution of postgraduate theses was determined as shown in Table 1 and it is understood 82.6% of postgraduate theses are doctoral theses and 17.4% were master theses.

Table 1. Distribution of Graduate Theses by Types

Thesis Type	Number (n)	%
Master	19	82,6
Doctorate	4	17,4
Total	**23**	**100**

In the chronological distribution of theses by years, it has been determined that 2021 is the most prominent year (Tab. 2). During the year, 4 master thesis and 1 doctorate thesis is studied. The first study on climate-based landscape architecture was a master's thesis studied in 1996. On the other hand, it could be analyzed that the first doctoral thesis was published in 2009 about related topic.

Table 2. Distribution of Graduate Theses by Years

Publication Year	Thesis Type					
	Master		Doctorate		Total	
	n	%	n	%	n	%
1996	1	5,2	-	-	1	4,35
2004	1	5,2	-	-	1	4,35
2007	1	5,2	-	-	1	4,35
2009	-	-	1	25	1	4,35
2010	1	5,2	1	25	2	8,70
2014	2	10,6	-	-	2	8,70
2015	1	5,2	-	-	1	4,35
2017	1	5,2	1	25	2	8,70
2018	2	10,6	-	-	2	8,70
2019	1	5,2	-	-	1	4,35
2020	4	21,1	-	-	4	17,39
2021	4	21,1	1	25	5	21,74
Total	**19**	**100**	**4**	**100**	**23**	**100**

The distribution of the cities where the postgraduate theses of the National Thesis Center database were examined and shown in Table 4. Among the cities, it is seen that the postgraduate theses studies, was mostly focused on Ankara-the capital city of Turkey. Antalya, İzmir and Trabzon took the second place with 7,70%. Some theses (%19,23) have been studied without site, these are focused on theoretical fields. In addition, total number is exceeded the number of theses listed in filtered results. It is because, some theses were studied more than one city in same paper. Besides, 4 master theses and 1 doctorate thesis were studied theoretically rather than studied on a specific site practically.

Table 3. City Distribution by Types of Graduate Theses

Publication Year	Type					
	Master		**Doctorate**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**
Adana	1	4,50	-	-	1	3,80
Ankara	3	13,60	-	-	3	11,50
Antalya	2	9,10	-	-	2	7,70
Balıkesir	1	4,50	-	-	1	3,80
Bartın	-	-	2	50	2	7,70
Gaziantep	1	4,50	-	-	1	3,80
Isparta	1	4,50	-	-	1	3,80
İzmir	2	9,10	-	-	2	7,70
Malatya	1	4,50	-	-	1	3,80
Mersin	1	4,50	-	-	1	3,80
Muş	1	4,50	-	-	1	3,80
Sinop	1	4,50	-	-	1	3,80
Şanlıurfa	1	4,50	-	-	1	3,80
Trabzon	1	4,50	1	25	2	7,70
Van	1	4,50	-	-	1	3,80
Şehir Yok	4	18,20	1	25	5	19,23
Total	**22**	**100**	**4**	**100**	**26**	**100**

In Table 4, the methods used in postgraduate theses on “climate” keyword reviewed in “landscape architecture” topic in the National Thesis Center database are discussed. Frequency analysis was carried out on a total of 22 theses due to the permission restriction for 1 master thesis. As the table examine, the quantitative method was used in 100% of the thesis studies on climate-related landscape architecture, while the qualitative method was used in 0%.

Table 4. Distribution of Graduate Theses by Research Methods

Research Method	Master		Doctorate		Total	
	n	**%**	**n**	**%**	**n**	**%**
Quantitative	19	100	4	100	23	100
Qualitative	0	0	0	0	0	0

CONCLUSION AND DISCUSSION

Based on the bibliometric analysis shown above, this research reviews the literature in landscape architecture field on climate from 1996 to 2021. The main conclusions are listed below as follows.

In order to link between climate and landscape fields and limit scope of this study, theses are search with the keyword “climate” and title “landscape architecture”. Studies extracted from

National Thesis Center of the Higher Education Institution and it could be seen 23 postgraduate theses have been found covering the years between 1996 and 2021. As a result of the research, first, it could be seen that the postgraduate theses on climate-based landscape architecture are mostly composed of master's theses and there are insufficient researches at the doctoral level.

Analyzed published postgraduate theses were carried out using various parameters such as “year of publication”, “city that studied about” and “research method in the thesis”.

From the results, it is understood that first doctorate thesis was studied in 2009 and master thesis was studied in 1996. It could be eliminated studies about climate-based landscape architecture should be increased in today’s world. As stated above, present day is swiftly urbanized and its impacts should have been analyzed as soon as possible to adopt cities for changes.

Another result shown in the tables, Ankara is the city that studied most in theses (3 out of 23). Nevertheless, the number is inadequate to understand every effect or climate change.

Last result from analysis is research method. It is common belief that qualitive research method, generally, used for social and behavioral sciences (Holosko, 2001). On the other hand, landscape architecture is regarded as natural and applied science field. Therefore, all theses about the issue studied in a quantitative method as shown. However, for future studies could be conducted with qualitative methodology to enlighten scientific studies about participant observation about climate change and its effects on cities.

Finally, there are also some research limitations such as the deficiency of the number of studies in the field. Second, urbanization is ongoing process facing world in today, so, its impacts on cities still cannot be measured effectively. Moreover, climate has been changing throughout the history, its effects cannot be forecasted effectually either. Nevertheless, studies should have been continued and increased to minimize negative effects.

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URBAN PARKS AND CONSERVATION STATUS

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ABSTRACT

Urban parks are significant open and green spaces both to maintain the ecological balance of the city and to meet the recreational needs of residents of the city. Moreover, in terms of urban memory, urban parks are public places where the experiences that form the memory are obtained.

In Turkey, the concept of conservation and conservation statuses in urban areas has been discussed through the building structure and its surrounding. However, urban parks, that substantial pieces of urban areas ensuring the continuity of social memory from past to present are necessary to be conserved. In addition to maintaining the ecological balance of the city, the protection of these areas is crucial for preserving urban memory and ensuring that the social values related to the city are transferred to future generations.

In this context, the importance of urban parks shaping the cities from past to present was examined through examples and recommendations regarding their conservation status.

Keywords: Urban parks, conservation status, protected urban site, urban memory

1. INTRODUCTION

According to Ertekin (1992), urban parks are open green spaces that include facilities and opportunities to meet the active/passive recreational needs of people from all age groups in the city and also they should be at the focal points of the city to protect the ecological balance and to meet the recreational needs of the citizens (Özkır 2007).

Urban parks are areas that are used daily, where people contact nature and social interactions take place. Besides, they provide various environmental, aesthetic, and recreational benefits closely related to human well-being and quality of life (Huai &Van de Voorde 2022).

Urban parks are a part of the city's open green space system and generally have the same importance and functions as other open green spaces (Özkır 2007). It is possible to collect these functions under the headings of ecological, recreation, health, education, socio-cultural, social memory and belonging, aesthetics, economic, social equality, security and land organization (Table 1).

Table 1 Functions of city parks

Ecological Zhang, Sun, Shen, Peng & Che (2021). Peng et. al. (2021); Torabi, Lindsay, Smith, Khor & Sainsbury (2020).	✓ Climate regulation (mitigation of the heat island effect, shading, evaporation) ✓ Improving air quality ✓ Noise reduction ✓ Surface flow regulation (increasing permeability) ✓ Habitat (step stone, shelter and feeding area)
Recreation Boyacı (2010), Tibesigwaa, Ntulib & Lokinaa (2020).	✓ Sports facilities, hiking, etc
Health Zhang et. al. (2021)	✓ Mental ✓ Physical
Education Boyacı (2010); Tibesigwaa et al. (2020).	✓ Environmental education ✓ Observation opportunity (history, culture, botany and wildlife)
Socio-cultural Boyacı (2010)	✓ Concerts, theater, and other events ✓ Social interaction
Collective Memory and Place Attachment Uludağ & Aycı (2016); Bazrafshan, Tabrizi, Bauer & Kienast (2021).	✓ Creating collective memory (republican period parks, etc.) ✓ Creating an individual's memory and sense of belonging (place attachment) (e.g., historical parks)
Aesthetic Boyacı (2010).	✓ Softening the sharp lines of building masses ✓ Appearance that changes with the seasons
Economic Boyacı (2010); www.npca.org (2021)	✓ Tourism opportunities ✓ Increase in land and housing prices
Social Equality M¨antymaa, Jokinen, Juutinen , Lankia & Louhi (2021)	✓ Providing recreational opportunities to low-income individuals
Security Bogar & Beyer (2015); Zhang et. al. (2021).	✓ Decrease in crime ✓ Emergency assembly area
Land Organization Boyacı (2010).	✓ Connecting cities and the organic system (nature) ✓ Regulating mass-clearance adjustment ✓ Acting as a buffer between different areas ✓ Influencing the settlement characteristics and form of the buildings

Urban parks are important areas for the city due to their functions listed above, and these areas are public lands that should be taken under protection. In this context, the aim of this study is to make suggestions regarding the conservation status of urban parks in Turkey. Therefore, examples of the concept of protection in urban parks abroad, the protection status in the country's legislation and the place of the concept of urban parks in the country's legislation were examined, and suggestions were made regarding the protection status of urban parks in Turkey.

What Is Conservation? Why Do We Need Conservation?

Definitions related to conservation and protected areas are defined as follows in the Law No. 2863 on the Protection of Cultural and Natural Assets.

"Conservation" is the preservation, maintenance, repair, restoration, changes in functional operations in immovable cultural and natural properties; and preservation, maintenance, repair and restoration works in movable cultural properties. **"Protected area"** is an area that must be protected, which is effective in the preservation of immovable cultural and natural assets or their protection in the historical environment (Kültür ve Tabiat Varlıklarını Koruma Kanunu [KTVKK], 1983).

As expressed in the definition of the concept of protection, one of the assets that require preservation, maintenance and repair is urban parks.

By defining the protection status of urban parks in the national legislation, the qualities, problems and possibilities of urban parks will be defined and the importance of these areas in the formation of social identity will be understood and internalized, and it will be ensured that they are an integral part of cultural identity.

2. THE CONSERVATION APPROACHES OF URBAN PARKS IN OTHER COUNTRIES

Within the scope of the study, the relevant parks and their legislation status were examined in order to reveal the understanding of conservation regarding urban parks at the international level. In this context, two well-known urban parks were selected among the examples of urban parks; Hyde Park and Central Park. These parks are important urban areas in terms of being the parks that have been talked about from the past to the present, both their history and other functions (recreational, ecological, social etc.). In this respect, the examination of these urban areas in terms of the concept of protection is important for revealing the conservation approach of the city parks in our country.

Hyde Park (England)

According to the laws of United Kingdom, every property belongs to the Royal family. Hyde Park is also owned by the Crown. Just as the royal palace is under protection, the same applies in the park. Thus, the general character of the park was preserved (Özkır 2007).

As of 2017, the Royal Park Agency was established under the Ministry of Culture, Media, and Sports. These two organizations work together for activities such as park management and fundraising (*Hyde Park Management Plan [HPMP] 2014).*

Central Park (United States)

In the United States, parks are protected by local NGOs, councils, and municipal cooperation. Central Park in New York City (NYC) is protected by the Central Park Conservancy. This private entity was established under a contract with the City of New York (government) and NYC parks. The organization in question is a non-profit organization and raises funds through donations. The organization meets all the needs of the park (maintenance, garbage management, visitor method, maintenance of architectural structures, *etc.*) (centralparknyc.org, 2021).

In addition to these sample parks, the Historical Urban Public Parks Doctrinal Text by the International Council of Monuments and Sites (ICOMOS) has been examined. The text was prepared by the International Scientific Committee on Cultural Landscape (ISCCL), one of the 28 technical advisory committees established under the International Council of Monuments and Sites (ICOMOS) and the International Federation of Landscape Architects (IFLA) ICOMOS.

The statement includes descriptions of Historic Urban Public Parks, values and special character defining elements of historical urban public parks (spaces, landscapes, plants and landscapes), conservation and management of historically important parks, design adaptations that can be applied at the universal level, and explanations about the place of the statute. (Anonymous 2017).

3. CONSERVATION STATUS IN OUR COUNTRY

Areas that need to be protected, including natural and cultural assets in the country's legislation, have been taken under protection by the Law on the Protection of Cultural and Natural Assets, the Law on National Parks, the Decree on the Establishment of the Special Environmental Protection Agency, and the regulations pertaining to the aforementioned laws. The concepts related to the protection of natural and cultural assets in the said legislation are given in Table 2. Although these concepts are divided into two as natural assets and cultural assets, the Special Environmental Protection Area includes areas with protection value in terms of both natural and cultural assets.

Table 2. Concepts related to the protection of natural and cultural assets in the country's legislation (KTVKK,1983; Arkeolojik Sitler, Koruma ve Kullanma Koşulları [ASKKK], 1999; Korunan Alanların Tespit, Tescil ve Onayına İlişkin Usul ve Esaslara Dair Yönetmelik [KATTOİUEDY] 2012.**)**

NATURAL ASSETS	**CULTURAL ASSETS**
National Park	Historical Protected Site
Natural Protected Site (I. Degree Natural Protected Site, II. Degree Natural Protected Site, III. Degree Natural Protected Site)	Archaeological Protected Site (I. Degree Archaeological Protected Site, II. Degree Archaeological Protected Site, III. Degree Archaeological Protected Site)
Nature Park	Urban Protected Site
Natural Monument	Urban Archaeological Protected Site
Nature Reserve	
Wetland	
Wildlife Development Site	
Special Environmental Protection Area	

Among the concepts given in Table 2, the concepts related to the protection status of natural assets occur at the upper scales and generally have national or international, national and world-wide ecological importance, are sensitive to environmental pollution and degradation, and include species and natural events that contain distinguished examples of natural events. It covers areas or elements that are expressed with concepts such as the absolute necessity of protection.

Concepts related to the protection status of cultural assets include areas created by people of importance on both a local and global scale. In the scope of the study, the mentioned concepts were taken into consideration while considering the protection status.

4. THE PLACE OF THE URBAN PARK CONCEPT IN THE COUNTRY LEGISLATION

The laws and regulations in which the term of ‘urban park’ is expressed in the legislation of the country have been examined. In this context, Spatial Plans Construction Regulation, Planned Areas Zoning Regulation, Municipal Law, Coastal Law, Regulation on the Implementation of Coastal Law, Bosphorus Law and Regulation on Land and Land Arrangements were found. The concepts related to open and green spaces in the relevant legislation are green space, park, playground, picnic and entertainment (recreation) area, recreational area and national garden. It has been determined that the concept of urban park is only mentioned in the Regulation on Land and Land Arrangements. There is no specific definition of a city park in the said regulation. In these regulations, the closest discourse to the concept of urban park is the national garden. Apart from these expressions, there is no classification for open and green areas (pocket park, neighborhood park, etc.) in Turkey legislation.

5. CONCLUSION AND RECOMMENDATIONS

Currently, there is no legislation in our country that includes classifications for green areas and there is no study on the protection status of these areas. Green areas in cities are within the jurisdiction of municipalities; therefore, all decisions regarding green areas are at the disposal of the municipalities. In this context, the relevant administration takes all decisions regarding green areas and can make any changes they want. Especially city parks that are important for the history of the city may suffer from this situation.

One of the best examples of this situation is Gençlik Park in Ankara. Gençlik Park, which is one of the important parks of the Early Republic period, displays a very distant appearance from its past appearance due to the changes it has undergone over time. This situation has led to the forgetting of the social and spatial practices that make up the collective memory. As of now, the traces of the city have been erased and the urban memory has been lost (Uludağ & Aycı 2016).

In the legislation, the concept of urban park is discussed as a conservation status in urban areas. However, the concept in question generally deals with the cultural structure and its environment, not green areas or urban parks alone. Urban parks are rare areas when viewed from the perspective of the city, with both natural values (ecological) and cultural values (historical value, urban memory, cultural activities, *etc.*) contributing to the city and should be evaluated in this context.

As such, it may be appropriate to evaluate the urban site under the concept of protected site in the legislation. Expanding the definition of the concept of urban sites and urban parks can also be evaluated within this concept. In this context, in addition to the protection of historical city parks, today's modern city parks should also be evaluated within the framework of their protection status. Although modern city parks have not taken their place in historical processes, their contributions to the city are areas that should be protected with both natural (ecological) and cultural values.

Within the scope of the relevant legislation, the service areas, sizes, functions of the parks should be defined and classified. In addition, studies should be carried out to establish the necessary standards (historical, ecological, social memory, etc.) in order to protect these areas. The conservation status of the city parks to be determined as a result of these studies will be a guide for the studies and decision mechanisms related to urban design.

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MAJOR EPIDEMICS IN HISTORY AND THE IMPACT OF CLIMATE CHANGE ON OUTBREAKS

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Abstract

Throughout history, epidemics have caused significant changes and developments on societies in social, cultural and economic terms, especially in health. Since the last quarter of the twentieth century, one of the obvious consequences of the effects of human beings on natural resources has emerged as climate change. When the overall effects of both factors are considered, it becomes necessary to evaluate the subject holistically in order to make healthier and more sustainable spatial plans based on the future. In this context, the first epidemics throughout history were (1) the 14th century plague and the rise of Western Europe, (2) smallpox deaths and climate change in the Americas, (3) yellow fever disease and Haiti's revolt against France, and (4)) were evaluated in the categories of African rinderpest and the spread of colonialism. Secondly; The sectoral effects of current epidemics such as the covid-19 pandemic, including catching the disease, deaths and the use of physical spaces, were examined at (1) world and (2) Turkey scales. Thirdly, based on the 1.5 °C Global Warming Special Report, approaches regarding the potential triggering process of climate change to global epidemics have been put forward. In this process, the World Health Organization (WHO) stated that with the emergence of the coronavirus in Wuhan, China in 2019, climate change and extreme temperatures will directly harm human health with stress, mosquito-borne diseases including cholera and malaria, and that this problem will be a problem. warning that it could potentially "become the biggest health threat in the 21st century" is seen as an important projection. In the last part, considering the effects of climate change and current epidemics, the measures taken in the tourism, transportation, education, industry, entertainment, logistics sectors will have economic, social and cultural consequences, and subsequently, development plans, sectoral planning, physical planning, urban design, management, and marketing. It has been evaluated that it will also affect the processes fundamentally.

Keywords: Epidemics in History, Covid-19 Outbreak, Development, Spatial Planning, Climate Change

Özet

Tarih boyunca salgın hastalıklar toplumlar üzerinde başta sağlık olmak üzere sosyal, kültürel ve ekonomik anlamda önemli değişimlere ve gelişmelere neden olmuştur. Yirminci yüzyılın son çeyreğinden itibaren insanoğlunun doğal kaynaklar üzerindeki etkisinin bariz sonuçlarından biri de iklim değişikliği olarak ortaya çıkmıştır. Her iki faktörün genel etkileri düşünüldüğünde, geleceğe dayalı daha sağlıklı ve sürdürülebilir mekansal planlar yapabilmek için konuyu bütüncül olarak değerlendirmek gerekli hale gelmektedir. Bu bağlamda, tarih boyunca ilk salgın hastalıklar (1) 14. yüzyıl vebası ve Batı Avrupa'nın yükselişi, (2) Amerika kıtasında çiçek hastalığı ölümleri ve iklim değişikliği, (3) sarıhumma hastalığı ve Haiti'nin Fransa'ya karşı isyanı ve (4)) Afrika sığır vebası ve sömürgeciliğin yayılması kategorilerinde değerlendirilmiştir. İkincisi; Kovid-19 pandemisi gibi güncel salgınların hastalığa yakalanma, ölümler ve fiziki mekan kullanımı gibi sektörel etkileri (1) dünya ve (2) Türkiye ölçeğinde incelenmiştir. Üçüncü olarak, 1.5 °C Küresel Isınma Özel Raporuna dayalı olarak, iklim değişikliğinin küresel salgınları tetikleme potansiyeline ilişkin yaklaşımlar ortaya konmuştur. Bu süreçte Dünya Sağlık Örgütü (WHO), 2019 yılında Çin'in Vuhan kentinde koronavirüsün ortaya çıkmasıyla birlikte iklim değişikliği ve aşırı sıcaklıkların stres, kolera ve sıtma başta olmak üzere sivrisinek kaynaklı hastalıklar ile insan sağlığına doğrudan zarar vereceğini belirtti. bu sorun sorun olacaktır. potansiyel olarak "21. yüzyılın en büyük sağlık tehdidi haline gelebileceği" uyarısı önemli bir projeksiyon olarak görülüyor. Son bölümde ise iklim değişikliği ve mevcut salgınların etkileri dikkate alınarak turizm, ulaşım, eğitim, sanayi, eğlence, lojistik sektörlerinde alınan önlemler ekonomik, sosyal ve kültürel sonuçlar doğuracak ve akabinde kalkınma planları, sektörel planlama, fiziksel planlama, kentsel tasarım, yönetim ve pazarlama. Süreçleri de temelden etkileyeceği değerlendirilmiştir.

Anahtar Kelimeler: Tarihte Salgınlar, Covid-19 Salgını, Kalkınma, Mekansal Planlama, İklim Değişikliği

1. INTRODUCTION

Cities are known as centers for home to most of the world's population and promoting economic growth and innovation. On the other hand, increasing human density and activities in cities can make them vulnerable to stress factors, which can be expressed by both natural and human-induced disasters. In the last few decades, a great deal of research has been published on the effects of various disasters on cities and the spatial planning, urban design, urban renewal and rehabilitation and adaptation measures that should be taken to cope with them (Sharifi, 2020; Sharifi and Khavarian-Garmsi 2020).

However, it is known that in human history, pandemics have affected cities repeatedly, and limited research on cities and pandemics was given before the emergence of the COVID-19 pandemic (Matthew and McDonald, 2006; Magahed and Ghoneim, 2020; Jedwab et. All, 2021). Regional and urban studies of previous pandemics mainly focus on issues such as the effects on wars, migration, and inequalities that make poor and marginalized groups more vulnerable to pandemics (Wade, 2020). The Covid-19 pandemic, on the other hand, brought the issue of urban vulnerability to pandemics to the fore and led to a revival of interest in this issue. As various forces such as climate change and anthropogenic interventions to natural habitats may increase the frequency of pandemics in the future, better knowledge of the patterns and dynamics underlying pandemics, their impact on cities, and the necessary preparedness, response and adaptation measures is needed. (Connolly et al., 2020a).

In this context, the issue of how countries, regions and cities may be affected by pandemics in the past few decades and centuries has also become interesting. The aim of this study is to evaluate the social, cultural, economic and political effects of past pandemics and to present some assessments and approaches on what actions are needed to increase regional and urban pandemic resilience.

2. MATERIAL AND METHOD

In this study, epidemics that caused important political, spatial changes, economic and ecological consequences in history were investigated based on literature review and compilation. Evaluations and findings were tried to be obtained by classifying the epidemic chronology presented in Table 1, (1) the period, (2) the affected regions/countries, (3) the estimated number of deaths, and (4) the type and effects of the epidemic. In this process, the material of the research consists of current and historical reports on epidemics, research articles, theses, and internet resources including reputable newspaper news. In the last part, suggestions are made for spatial planning and urban design agendas by taking advantage of the absolute effects of past and current epidemics.

Table 1. An Overview of Epidemics

Period	Affected Regions/Countries	Estimated Number of Dead	Outbreak Type and Impact	References
1500 and Before	Ancient Greece, Europe, Western Asia, Northern Europe, British Isles	30% of the 5 million population living in the first periods and 30-60% of the 75-100 million population living all over the world in the last period	Typhus, Smallpox, Measles, Plague	Compiled from URL-1
1500-1699	It has been effective in a wide geography in Europe, America and North Africa.	5-15 million in the first periods; 80% of the population and recently 76,000 in Austria in the 1690s	Hemorrhagic Fever, Viral Hemorrhagic Fever, Plague, Yellow Fever, Bubonic Plague, Influenza, Smallpox, Chickenpox, Typhus	Compiled from URL-1
18th century	It has been effective in America, Canada, Russia and Europe continents and regions.	It is estimated that there are more than 100,000 deaths in total.	Smallpox, Measles, Plague, Yellow Fever, Influenza, Influenza, Dengue Fever, Typhus	Compiled from URL-1
19th century	There are epidemics that are effective all over the world and it is understood that they are kept in the records of the Ottoman Empire.	It is estimated that over 4 million deaths occur worldwide	It has been observed that cholera Compiled from URL-1 has been added to the diseases listed above.	Compiled from URL-1
20th century	There are epidemics that are effective all over the world and it is understood that they are kept in the records of the Ottoman Empire.	While over 110 million deaths are estimated worldwide, it is noteworthy that only 75 million of this figure is from Spanish Flu and 30 million from HIV/AIDS in the Congo Basin.	Apart from the above, Polio, HIV/AIDS, Meningitis, Malaria and Spanish flu accounted for the largest proportion of deaths.	Compiled from URL-1
21th century (In recent years)	Although it is seen all over the world, the disease known as Covid-19, which is the most effective and up-to-date, has emerged in China, and the highest death rates are recorded in Southern Europe, England and the United States.	While tens, hundreds, thousands and 10 thousands of deaths were detected in all disease agents in 2016 and before, according to their types, the number of people who died only from Coronavirus reached 219,456,675 and the number of deaths reached 4.5 million in just over 1.5 years. it has been troubling. In Turkey, around 8.2 million cases were detected and over 72 thousand deaths occurred.	In this period, apart from those listed above, SARS, MERS, Hand, Foot and Mouth Disease and CoronaVirus diseases are seen to be effective.	Compiled from URL-1, URL-2 and URL-3.

The 14th Century Plague and the Rise of Western Europe

The plague that struck Europe in the 1350s is known as a massive epidemic that killed 3 percent of the population. However, after the death of millions of people, the countries affected by the epidemic grew rapidly and became the richest countries in the world today. The bubonic plague, which is thought to have caused the death of a high proportion of people, mostly cost the lives of the villagers. This caused the landowners to experience labor shortages, and the remaining healthy agricultural workers had more bargaining power (URL-4; İstek, 2017).

While sea voyages and explorations were considered extremely dangerous until that time, the high death rates caused by the plague made people more willing to take long sea voyages to escape the epidemic. This, in turn, helped spread European colonialism. With the effect of modernizing the economy, investing in technology and encouraging openness, Western Europe has become one of the strongest regions in the world over time (URL-4; Tavukçu, 2020).

Smallpox Deaths and Climate Change in America

It is estimated that the colonization of the Americas in the 15th century resulted in the death of many people and changed the climate of the world. Research by scientists at University College London revealed that in that century alone, the world's population fell from 60 million to 5-6 million, which was 10 percent of the world's population at that time. Smallpox was the leading cause of death among them and had some consequences all over the world (URL-4; Ünver, 2015).

Huge areas turned into forests or meadows, as the few survivors were unable to adequately cultivate the remaining lands. It is considered that this unexpected growth in plants and trees causes a decrease in carbon dioxide levels and causes a decrease in temperature in large regions of the world (Tolunay, 2020).

Scientists believe that this event, along with volcanic eruptions and decreased solar activity, caused the beginning of the so-called "Little Ice Age", where temperatures fell in many parts of the world (URL-5).

Yellow Fever and Haiti's Revolt against France

An outbreak in Haiti helped France out of North America, resulting in the growth and rapid strengthening of the United States on the continent. After some revolts against European colonial powers in 1801, Toussaint Louverture ruled Haiti with the cooperation of France. However, when the French leader Napoleon Bonaparte declared himself ruler for life, he had to send tens of thousands of soldiers to Haiti to take full control of the island. However, the effect of yellow fever changed the course of the war, causing about 50 thousand soldiers, officers, doctors and sailors from France to die and only 3000 to return to France (URL-4).

The fact that the European powers had no natural immunity to the African disease defeated the military forces and demoralized Napoleon not only left Haiti; He also gave up all of France's goals in North America. Only 2 years after this event, the French leader sold a land of more than 2 million square kilometers to the US administration with the Louisiana Shopping, and the young USA doubled the country's area (Uyanık, 2014).

The African Rinderpest and the Spread of Colonialism

Between 1888 and 1897, the rinderpest virus killed 90 percent of Africa's cattle and radically changed the lives of communities in the Horn of Africa, West Africa, and Southwest Africa regions. The loss of cattle has led to starvation, a social and economic collapse in the society, and the fleeing of refugees from areas affected by the epidemic. Indirectly, areas other than animal husbandry, where agricultural production is made, were also affected by this epidemic. Crop growing areas have also suffered from this negative process, as many of the farmers rely on the ox to plow the land. The chaos caused by the disease also made it easier for European countries to colonize large areas of Africa in the late 19th century (URL-4).

At a conference in Berlin in 1884-1885, 14 countries from Europe, including the United Kingdom, France, Germany, Portugal, Belgium and Italy, discussed their ambitions on Africa, and the implementation process of the plans became official after this conference. While in the 1870s only 10 percent of Africa was under European control, by 1900 this proportion had risen to 90 percent. The unjust land acquisition was supplemented by the chaos of the rinderpest epidemic (URL-6).

Current Epidemics and Their Effects in the World

While SARS and MERS are among the most effective epidemic diseases of the 21st century, at the end of 2019, Coronavirus began to be seen all over the world with its political, economic and social effects. The COVID-19 pandemic, also known as the 2019-21 coronavirus pandemic, is an ongoing outbreak of coronavirus disease 2019 (COVID - 19) caused by severe acute respiratory syndrome coronavirus 2 (SARS -CoV-2). The epidemic was detected in December 2019 in Wuhan, China. The World Health Organization declared the outbreak a pandemic on 30 January and the International Organization for Public Health and Emergency Concern on 11 March. As of the end of November 2021, more than 250 million cases of COVID-19 have been reported worldwide, with more than 5 million deaths. Close to 230 million cases have been reported to have recovered.

Common symptoms include fever, cough, fatigue, shortness of breath and loss of smell. Complications include acute respiratory distress syndrome. The time to appearance of symptoms is typically five days, but it can take between two and fourteen days. Primary treatment is symptomatic and supportive treatment (URL-7).

Current Outbreaks and Their Effects in Turkey

The first detected case of COVID-19 in Turkey of the 2019-20 coronavirus epidemic, which spread throughout the world, was announced by the Ministry of Health of the Republic of Turkey on March 10, 2020. The first death due to the virus in the country occurred on March 15, 2020. Health Minister Fahrettin Koca, in his statement on April 1, 2020, announced that the coronavirus cases had spread all over Turkey. As of the end of November 2021, it was announced that around 75,000 people infected with coronavirus died in Turkey, and the total number of cases was over 8 million (URL-7).

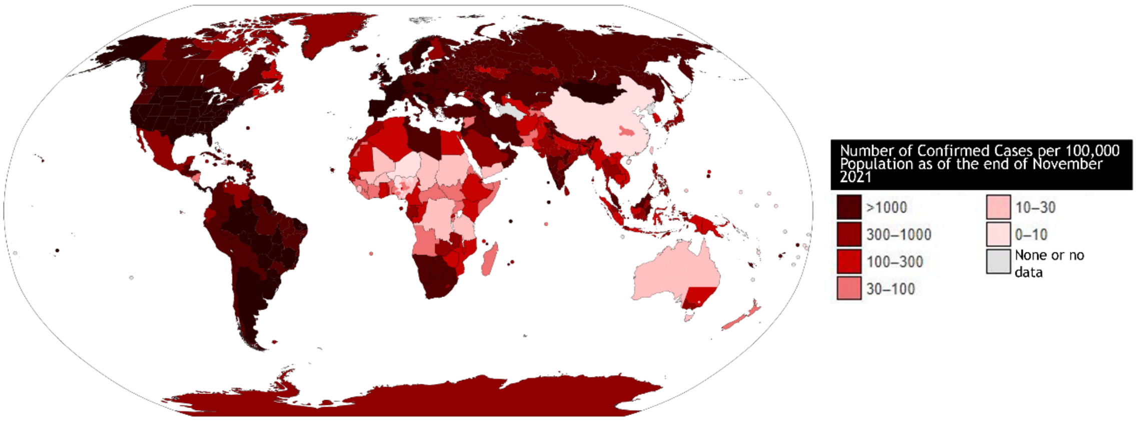

Figure 1. Number of Patients Caught with Covid-19 Worldwide (URL-7)

In Turkey, as in the whole world, it is seen that a process in which activities in education, transportation, sports, faith, entertainment, tourism sectors come to a standstill and activities are continued with a controlled application in other sectors in order to combat coronavirus.

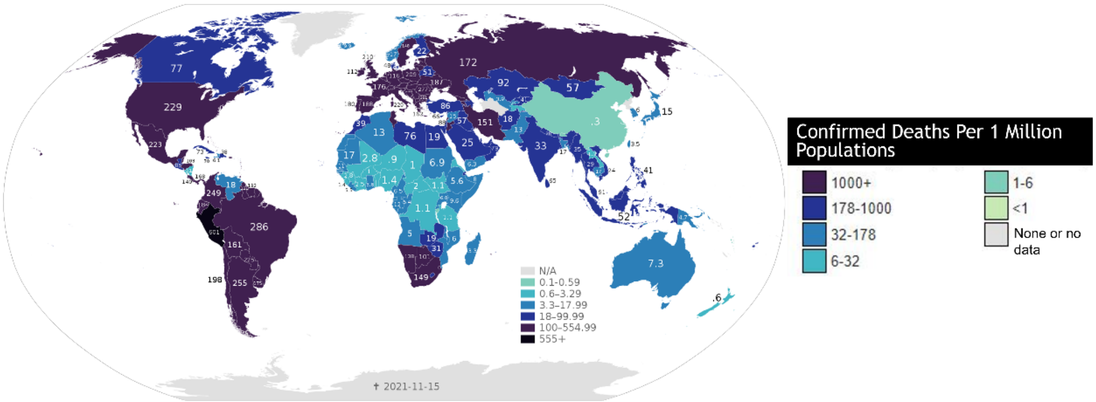

Figure 2. Number of Deaths from Covid-19 Worldwide (URL-7)

Current Epidemics and Their Effects in the World

The pandemic is causing severe global socioeconomic disruption, including the largest Sglobal recession since the Great Depression, and its effects are predicted to be much longer-lasting. It has led to the postponement or cancellation of sporting, religious, political and cultural events and organizations, widespread supply shortages exacerbated by panic buying, and reduced emissions of pollutants and greenhouse gases. Schools, universities and colleges have closed nationwide or locally in 194 countries, affecting approximately 98.5 percent of the world's student population. Misinformation about the virus has spread online, resulting in incidents of xenophobia and discrimination against Chinese people and those coming from areas where they are Chinese or have high infection rates (URL-7).

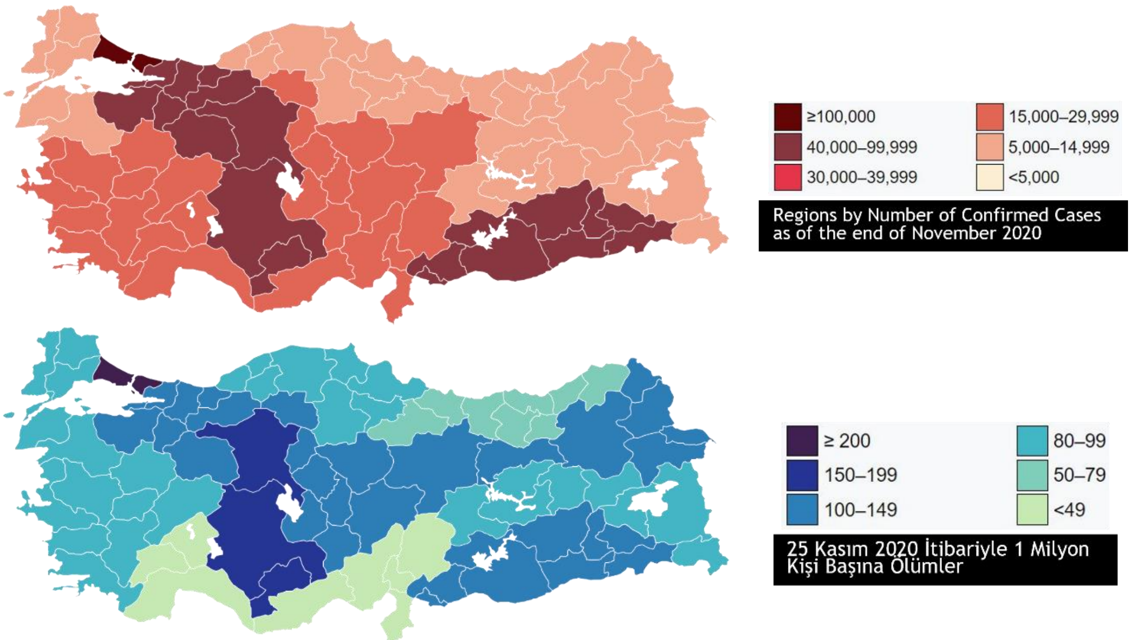

Figure 3. Number of Patients Caught Covid-19 and Deaths in Turkey (URL-8)

1.5 °C Global Warming Special Report (SR15)

Although there is no confirmed evidence regarding the coronavirus pandemic as to whether the disease spreads to the world naturally or by being produced in a laboratory environment, the 1.5 °C Global Warming Special Report (SR15), which was adopted as a result of the UNFCCC Intergovernmental Panel on Climate Change in 2018, endangered the ecological resilience of humanity and human and human beings. It was emphasized that the management of environmental health became more difficult (URL-9).

When the Paris Agreement was accepted, it appears that there were concerns about many risk factors, including the epidemic, when the UNFCCC invited the Intergovernmental Panel on Climate Change to write a special report on "How can humanity prevent global temperature rise by more than 1.5 degrees Celsius above pre-industrial levels". The IPCC's Special Report on Global Warming at 1.5°C provided projections on pre-industrial levels and the associated global greenhouse gas emission status in the context of strengthening the global response to climate change, sustainable development and poverty eradication efforts (URL-9; URL-10). It is also possible to associate the coronavirus measures currently implemented all over the world with climate change-global warming scenarios.

The report summarizes the scientists' findings and states that it is possible to sustain a temperature increase of less than 1.5°C, but that it is sustainable only through "rapid and far-reaching transitions in energy, land, urban and infrastructure, and industrial systems." The 1.5 °C (2.7 °F) Paris target is possible to achieve, but it has been stated that it is considered to require "deep emission reductions", "rapid", "far-reaching and unprecedented changes in all aspects of society". It is reported that to reach the 1.5 °C target, CO2 emissions need to decrease by 45% (compared to 2010 levels) by 2030 and reach net zero around 2050. There will also be profound reductions in non-CO2 emissions (such as nitrous oxide and methane). it will be necessary to limit warming to 1.5 °C (URL-9).

Under the promises of the countries entering the Paris Agreement, a sharp rise of 3.1 to 3.7°C is expected to continue until 2100. Keeping this rise to 1.5 °C will also lessen the worst effects of a 2 °C rise. However, it also suggests that 1.5 degrees of warming will lead to massive drought, famine, heat stress, species extinction, loss of entire ecosystems and livable land, and more than 100 million people will be impoverished (URL-9; URL-10).

World Health Organization (WHO) Climate Change Warning on Outbreaks

With the emergence of the coronavirus in Wuhan, China, the World Health Organization (WHO) stated that together with climate change and extreme temperatures, stress, mosquito-borne diseases, including cholera and malaria, will directly harm human health, and that this problem will potentially harm human health. In the last months of 2019, he warned that "it may be the biggest health threat in the 21st century". In the statement made by WHO Director-General Tedros Adhanom regarding the Health and Climate Change Status Report (2018) prepared by WHO, the expression "Climate change is not only a bill that future generations must pay, but also a price that people pay with their health today." Adhanom has evaluated that it is "an ethical imperative for countries to take action against climate change and have the resources they need to protect human health today and in the future" (URL-11). Considering the effects of climate change and current epidemics, an infographic depicting various scenarios regarding the future of the world and humanity as an amulet is given in Figure 4.

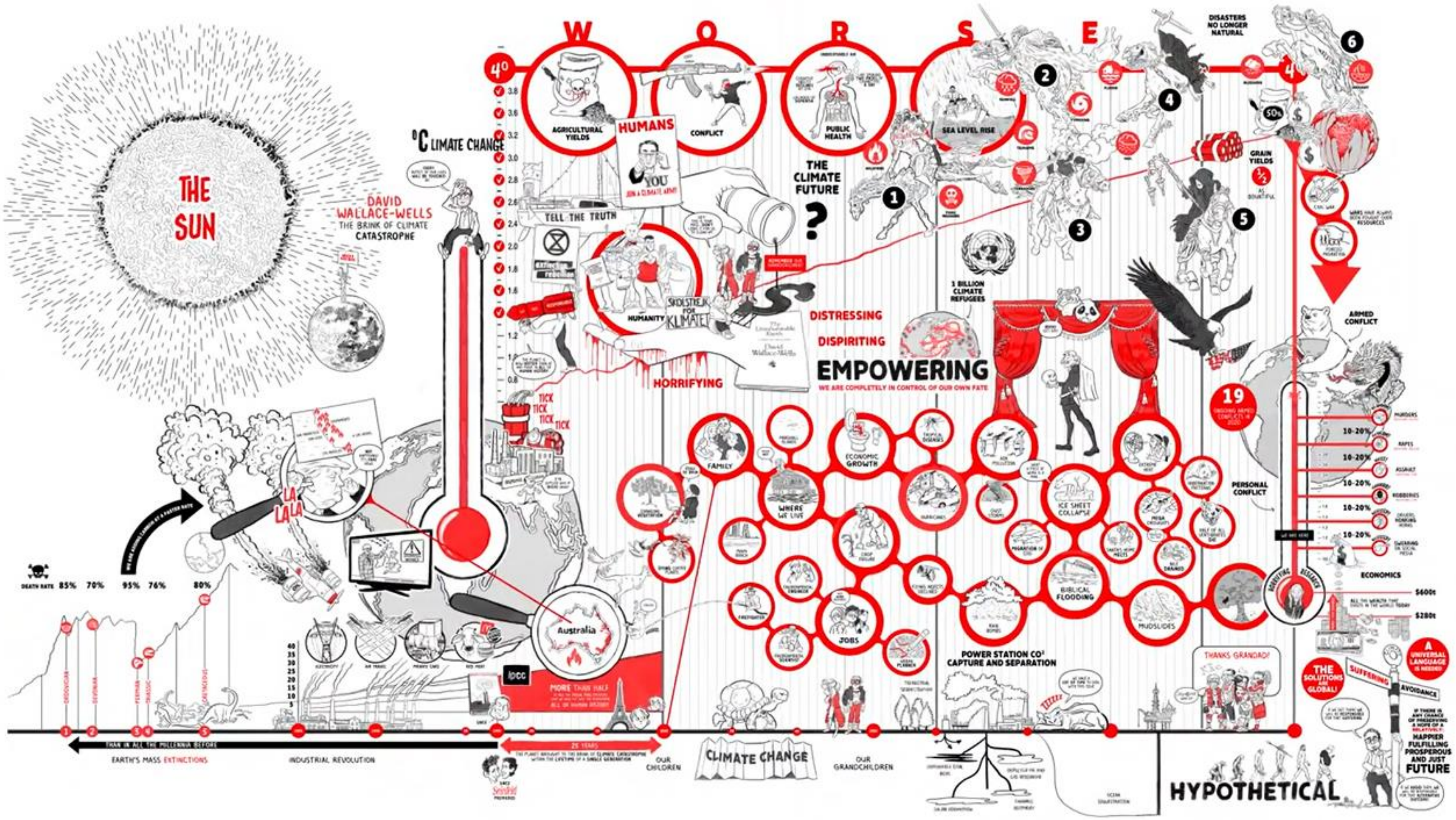

Figure 4. *Summary of scenarios on climate change, epidemics and the future of humanity (URL-12)*

3.CONCLUSIONS

Human interventions that cause ecosystem destruction such as deforestation, mining, urbanization, opening new agricultural areas, excessive wood production, opening new roads in natural areas, establishing facilities can have unpredictable negative effects on epidemics. Deforestation and ecosystem destruction also have an increasing effect on climate change. As a result of climate change, epidemic diseases are increasing and it is possible to spread to larger areas.

Although there is no direct deforestation or ecosystem destruction by humans, it is estimated that ecosystem destruction caused by the effects of exacerbated climate change such as the drying of wetlands and forest fires will cause similar results to the ecosystem destruction-epidemic disease relationship explained above.

It is also expected that there will be loss of life directly caused by disasters such as heat waves, floods, tornadoes, forest fires, avalanches, which are exacerbated by climate change and whose frequency is increasing.

It is emphasized that health problems and thus epidemic diseases may become widespread, as accessibility to food and clean water decreases in underdeveloped countries, especially African countries, where rural poverty is high.

In connection with the water and food crisis that may be experienced due to climate change, between 2030 and 2050, 250 thousand premature deaths are expected every year due to malnutrition, malaria, diarrhea and heat stress.

It is predicted that diseases such as cholera, dermatitis, conjunctivitis and salmonella, which are transmitted by polluted waters along with drought and water scarcity or floods, will increase.

The ecology of millions of living things in nature, the relationships between these living things, and the effects of other abiotic factors, including climate, on living things are not yet fully known. For this reason, it is not possible to predict the consequences of people's interventions in nature (Tolunay, 2020).

It is considered that the measures taken in the tourism, transportation, education, industry, entertainment and logistics sectors to prevent Covid-19 all over the world will have ecological consequences in terms of socio-economic consequences, and will affect sectoral planning, design, management and marketing processes.

It is considered that research collaborations will develop especially between Health and all components of spatial planning and design.

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DETERMINATION OF BICYCLE ROUTES ON THE BASIS OF NATURAL LANDSCAPE SENSITIVITY: ISPARTA EĞİRDİR KOVADA STREAM CATCHMENT

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Abstract

The use of bicycles, in addition to contributing to the physical and mental health of people, offers an alternative to the use of motor vehicles which are causing environmental problems. One of the most important causes of the environmental problems is the planning approaches that do not evaluate the human-nature relationship and interactions in the context of the landscape context. In this study, bicycle routes based on landscape sensitivity were determined in the Kovada Stream Catchment example. Excess water of Lake Eğirdir, located in Eğirdir district of Isparta province in the Mediterranean Region, reaches Kovada Lake in the south via Kovada Stream (Canal). On the other hand, the gradual decrease in the water level of Lake Eğirdir threatens the existence of water and the natural landscape of Kovada Stream and Lake. Land use decisions based on the soil and water functions of the landscape can provide resilience to this threat. In this study, in determining the soil and water functions of the landscape, erosion risk analysis by adapting the soil protection indices of MAPA ICONA (1983) method, and surface runoff and water permeability analyses by adapting the SCS Curve Number method and Buuren (1994) approach were carried out. Thornthwaite water balance model is integrated into the SCS Curve Number method to be able increase the accuracy of the surface runoff calculations. Natural areas with high landscape protection value, which are determined by the integrated evaluation of the analyses carried out, also indicates areas with high landscape sensitivity. Results showed that the cycling potential in the Kovada Stream Catchment is extremely low. In this study, bicycle routes were determined by evaluating together the strategies on the basis of landscape sensitivity and spatial requirements for use. This approach can make a significant contribution both to the provision of protection-use balance and to the sustainable management of water and soil resources.

Key words: landscape sensitivity, erosion, surface runoff, water permeability, bicycle route

Introduction

Cycling among recreational and sports activities are increasingly preferred for leisure times (Şahin and Kocabulut, 2014). The route suitability, quality and accessibility are the main consideration to meet existing demand for cycling.

Cycling is increasingly supported by nations and city administrators. Non-motorized transportation, especially bicycle transportation, is a useful solution against the problems caused by the high rate of motor vehicle use to human life and cities (Forester, 1994; İyinam and İyinam, 1999; Uz and Karaşahin, 2004; CROW, 2006; Uslu et al., 2009; Mert and Öcalır, 2010).

One of the most important causes of environmental problems is the planning approaches that do not evaluate the human-nature relationship and interactions in the context of the landscape concept (Şahin et al., 2013). In addition to contributing to the physical and mental health of people, the use of bicycles offers an alternative to the use of motor vehicles which are now causing global environmental problems. In this study, bicycle routes based on landscape sensitivity were determined in the Kovada Stream Catchment example. This approach can make a significant contribution both to the provision of protection-use balance and to the sustainable management of water and soil resources.

1. Study Area

The Kovada Stream Catchment (Figure 1.1) in the Mediterranean Region is located in the middle of the Western Taurus Mountain Range, which constitutes the most important and widest karst region of Turkey, between the Mediterranean Region and the Anatolian plateau. Kovada Lake is a karst lake and located 8 km from Eğirdir district of Isparta Province in the south. The lake extends in the north-south direction and has a surface area of 7.9 km² (Karadağ and Barış 2009). Excess water of Lake Eğirdir reaches Kovada Lake in the south via Kovada Stream (Canal). The catchment of his stream constitutes the study area boundary of this study.

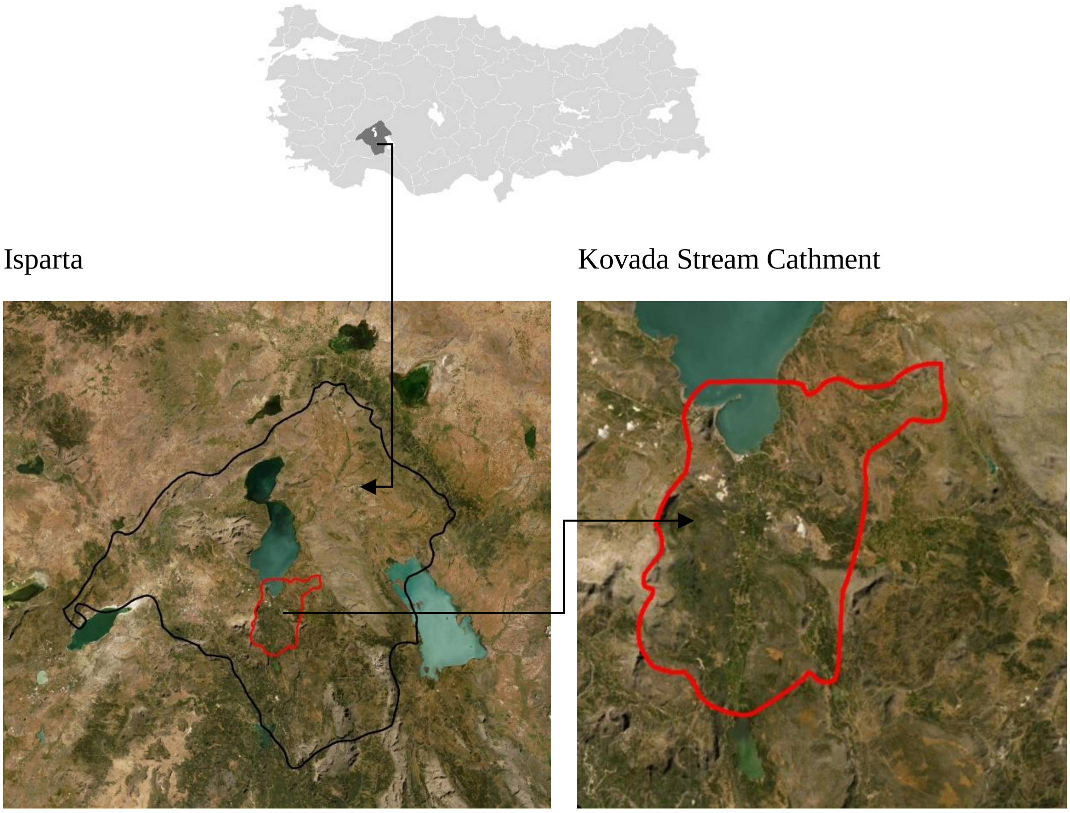

Figure 1.1 Study area

2. Material and Method

The data used in the study are given below.

- 2018 CORINE Land Cover Classification
- European Union Copernicus Land Monitoring System EU-DEM v1.0 Digital Terrain Surface Model, 25 m resolution
- 1/25.000 scale national soil database

In this study, in determining landscape functions related with the soil and water, erosion risk analysis by adapting the soil protection indices developed by IFIE (MAPA/ICONA 1983) and surface runoff and water permeability analyses by adapting the SCS Curve Number method and Buuren (1994) approach were carried out. Thornthwaite water balance model is integrated into the SCS Curve Number method to be able increase the accuracy of the surface runoff calculations.

Natural areas with high landscape protection value, which are determined by the integrated evaluation of the analyses carried out, indicates also areas with high landscape sensitivity. In the study area, bicycle routes were determined by evaluating together the strategies on the basis of landscape sensitivity and spatial requirements for use.

3. Determination of Natural Landscape Sensitivity

3.1. Landscape Pattern

The structure or pattern of a landscape can be defined as the composition of perceptible elements that make up that landscape (Şahin et al., 2014). Within the scope of this definition, CORINE land use data was elaborated to determine the landscape pattern (Figure 3.1).

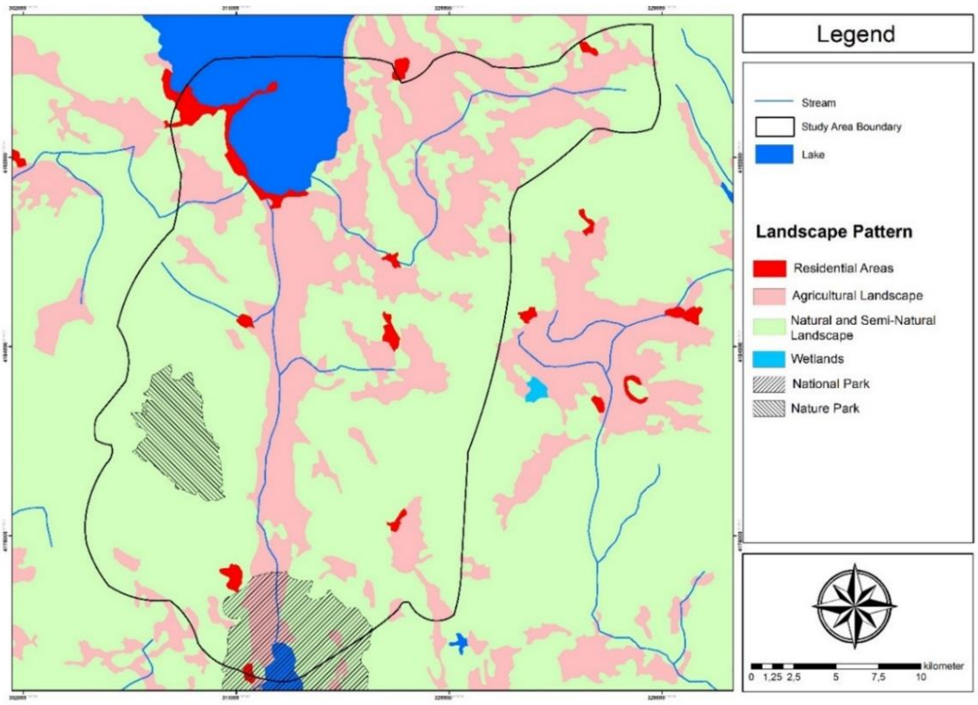

Figure 3.1 Landscape pattern map (from CORINE 2018 data)

3.2. Natural Landscape Function

In order to determine the natural landscape functions, as the basic geomorphological processes, surface runoff potential, water permeability and erosion risk analysis were conducted.

3.2.1. Surface Runoff Potential

The hydrological characteristics of a soil or soil group are the main factor in the hydrological analysis of the basin (Özer, 1990).

Rainfall surface runoff analysis was carried out by adapting the SCS Curve Number method referring Apaydın (2007) and Şahin et al (2013). Originally, the Soil Conservation Service (SCS) Curve Number (CN) method was introduced in 1956 by the Soil Conservation Service US Department of Agriculture in 1956, and followingly has been revised in 1964, 1965, 1971, 1972, 1985, and 1993. Thornthwaite water balance model is integrated into the SCS Curve Number method to be able increase the accuracy of the surface runoff calculations. Water permeability analyses was conducted referring Buuren (1994) and Şahin (1996).

The climate data for the study area were obtained from the General Directorate of Meteorology. Temperature and precipitation data of 32 stations within the boundary of the study area and close surroundings during the measurement period between 1930 and 2018 were used for the

Thornthwaite method. According to the monthly average temperature data of the measurement period between 1930-2018, it was determined that the month with the highest temperature in the basin was August with 23,6 °C, and the month with the lowest temperature was January with 2,2 °C. When the average precipitation of study area is examined, it is determined that the average annual total precipitation amount is 767,06 mm. The relationship between precipitation and runoff was tried to be evaluated, the month with the highest precipitation was January with 144,8 mm, but the month with the highest surface flow was determined as February with 121,4 mm. Considering the method result; since the water lost by evaporation is calculated in the Thornthwaite method, temperature values are important in the calculation. The result (surface runoff) obtained from the Thornthwaite method was evaluated in the SCS Curve Number method and used.

According to the Thornthwaite method, climates are grouped into two main classes as humid and arid climates, depending on the relationship between precipitation and evapotranspiration. Humid climates were divided into 6 (C2, B1, B2, B3, B4, A) climates and arid climates were coded into 3 (E, D, C1) climate types and a total of 9 climate classes were created. This classification system and symbols are given below in Table 3.1 (Thornthwaite, 1948; Dönmez, 1984; Özdemir, 2015; Köse et al., 2018).

In the Thornthwaite method, the Precipitation Efficiency Index (Im), calculated according to the equation below, is used to determine the climate classes (Thornthwaite, 1948; Ölgen and Birsoy, 1994; Köse et al., 2018). The data obtained for the Kovada stream catchment were used to define precipitation efficiency using below formula in accordance with the Thornthwaite method (Thornthwaite, 1948; Ölgen and Birsoy, 1994; Köse et al., 2018).

$$\mathrm{Im} = \frac{100s - 60d}{n}$$

According to the formula; Im= precipitation activity index, s= Annual excess water (mm), d= Annual water deficit (mm), n = Annual Evapotranspiration. Using the climate data of Isparta province, Im (Rainfall Activity Index) in Table 3.1 was found to be 36.17. Therefore, this value shows that it corresponds to the "B1" symbol in the climate types chart, that is, to the "Humid Climates" climate class of the region.

Table 3.1 Thornthwaite Climate Classes (Thornthwaite, 1948; Ölgen and Birsoy, 1994; Köse et al., 2018)

RAIN EVENT INDEX (lm)	RAIN EVENT	CLIMATE CLASS	SYMBOL
less than -40	Arid (desert)	Arid climates	E
(-40)-(-20)	Semi-arid	Arid climates	D
(-20)-0	Arid-less productive	Arid climates	C1
0-20	Semi humid	Humid climates	C2
20-40	Humid	Humid climates	B1
40-60	Humid	Humid climates	B2
60-80	Humid	Humid climates	B3
80-100	Humid	Humid climates	B4
greater than 100	Very humid	Humid climates	A

The values of the water balance of the Isparta province Eğirdir district obtained from the Thornthwaite method are given in Table 3.2 and the monthly change graph of the water balance is given in Figure 3.2.

Table 3.2 According to Thornthwaite method, water balance values of Isparta Province (Köse et al., 2018)

WATER BALANCE SHEET ACCORDING TO THORNTHWAITE METHOD													
Storage capacity (mm)	100												
Weather station name:	Isparta- Eğirdir												
	Months												
Balance Sheet Elements	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Temperature	2,2	3,2	6,6	11	15,8	20,5	23,8	19,5	14	8,1	4,2	12,7	11,8
Temperature index	0,29	0,51	1,5	3,30	5,71	8,47	10,61	7,85	4,75	2,08	0,77	4,10	49,96
Uncorrected Potential Evapotranspiration	5,1	8,3	21,2	41,0	65,5	91,7	111,3	86,0	56,0	27,6	11,8	49,3	574,6
Corrected Potential Evapotranspiration	4,3	6,8	21,5	44,6	79,4	112,0	137,8	99,6	57,2	26,2	9,8	40,0	639,0
Precipitation	144,8	109,05	102,37	68,06	58,67	28,48	6,1	9,52	25,49	59,77	67,04	87,71	767,06
Monthly change of accumulated water	0,0	0,0	0,0	0,0	20,7	79,3	0,0	0,0	0,0	33,6	57,3	9,1	200,0
Storage	100,0	100,0	100,0	100,0	79,3	0,0	0,0	0,0	0,0	33,6	90,9	100,0	703,8
True evapotranspiration	4,3	6,8	21,5	44,6	79,4	107,8	6,1	9,5	25,5	26,2	9,8	40,0	381,4
Water deficit	0,0	0,0	0,0	0,0	0,0	4,2	131,7	90,0	31,7	0,0	0,0	0,0	257,6
Excess water	140,5	102,2	80,9	23,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	38,6	385,7
Surface runoff	89,5	121,4	91,6	52,2	11,7	0,0	0,0	0,0	0,0	0,0	0,0	19,3	385,7
Humidity rate	32,9	14,9	3,8	0,5	-0,3	-0,7	-1,0	-0,9	-0,6	1,3	5,9	1,2	57,0
s=385,67	**Im= 36,17**												
d=257,56	**ETP= 638,96**												
n=638,96	**Ia=40,31**												
	Temperature regime= 54,67												

The hydrological characteristics of a soil or soil group are the main factor in the hydrological analysis of the catchment and soils are classified into four groups according to their hydrological characteristics as A (highly permeable), B (moderately permeable), C (poorly permeable), and D (very poorly permeable) (Özer, 1990). By using Table 3.3 suggested by Öztürk and Batuk (2011) according to the Major Soil Groups in the national soil database, the Hydrological Soil Groups map was created (Figure 3.3). Then, SCS CN method which is based on hydrological soil conditions, slope and surface cover type was implemented and mapped (Figure 3.4).

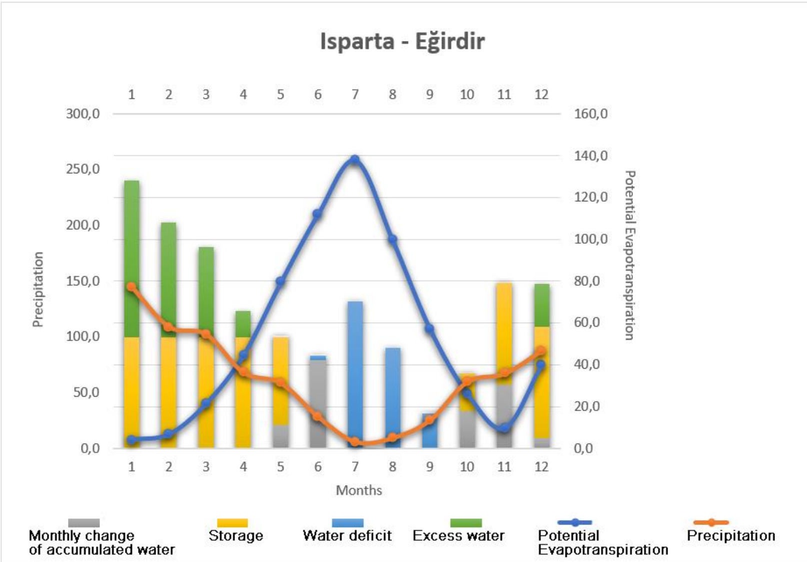

Figure 3.2 The monthly change graph of the water balance (Köse et al., 2018)

Table 3.3 Hydrological soil groups (Öztürk and Batuk, 2011)

HYDROLOGICAL SOIL GROUPS	MAJOR SOIL GROUPS	COMBINATION OF SOIL PROPERTIES
A **Minimum degree of infiltration: 7,5 – 10 mm/h**	L	1-11, 13-15, 17-19, 21,22
	A	3, 6, 9, 10
	E, T	1-16
	O	with one or more of the symbols m, p, r or together with h, s, a, k, v
B **Minimum degree of infiltration: 3 - 7,5 mm/h**	P, G	1, 2, 5, 6, 9, 10
	C, D, M, N	1-10
	E, T	17-24
	B, F, R, Y	1-8
	U	1, 2, 3
	L	12, 16, 20, 24
	X	1-4
	K	4-6, 13-15, 22-24
	A	3, 6, 9, 10 with one or more of the symbols h, s, a, k, v
C **Minimum degree of infiltration: 0,8 - 3 mm/h**	P, G	3, 4, 7, 8, 11-22
	C, D, M, N	11-18
	B, F	9-23
	U	4-21
	R	9-21
	L, E, T	25
	Y	9-25
	X	5-20
	K	1-3, 10-12, 19-32
		3, 6, 9
	A	2, 5, 8 with one or more of the symbols h, s, a, k, v
D **Minimum degree of infiltration: 0 – 0,8 mm/h**	P, G	2, 24, 25
	C, D, M, N	19-25
	B, F	24, 25
	R, U	22-25
	V	1-25
	Z	1-4
	A	with 1, 4, 7 or one or more of the symbols h, s, a, k, v
	H	H or with one or more of the h, s, a, k, v symbols
	S	S or with one or more of the h, s, a, k, v symbols
	X	21-25

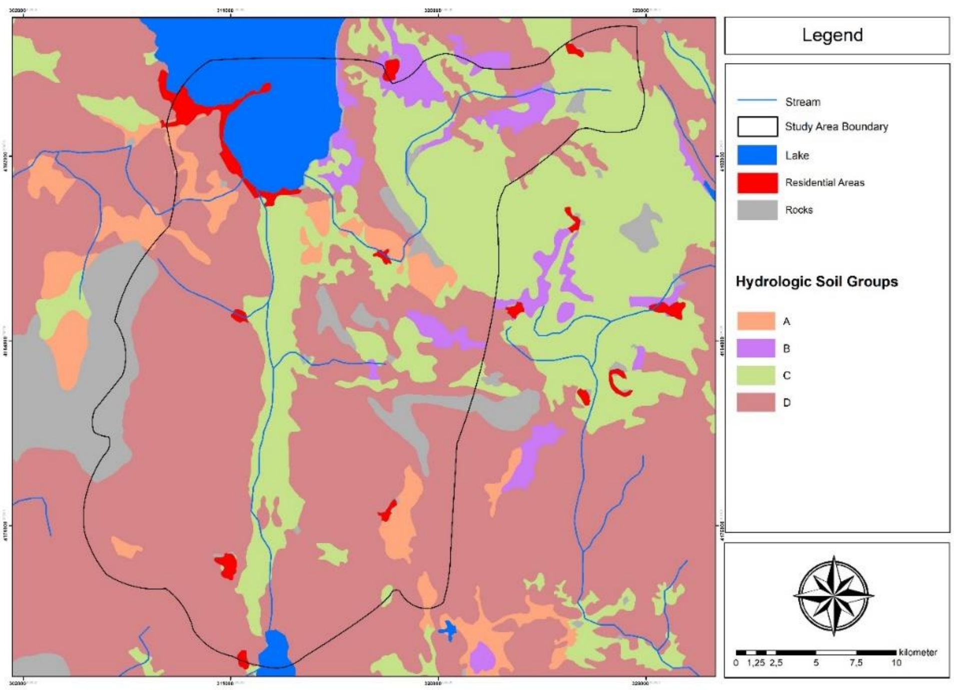

Figure 3.3 Map of the hydrologic soil groups

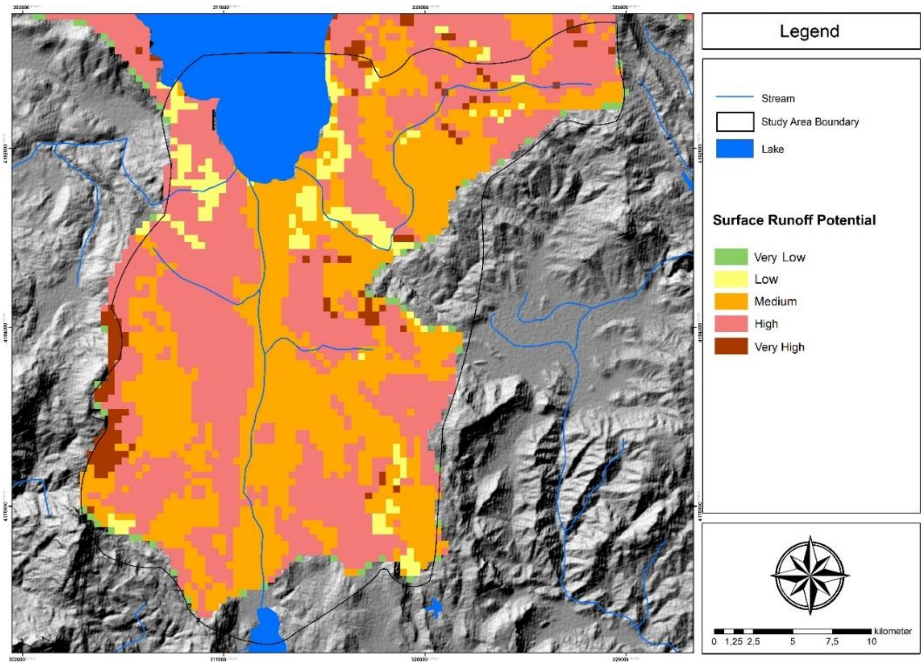

Figure 3.4 Surface runoff potential map (Original, 2019)

3.2.2. Water Permeability

The water permeability analysis was evaluated according to soil and geological permeability bu adopting the method of Buuren (1994). By combining geological permeability and hydrological soil groups according to Table 3.4, water permeability map was created in the study area (Figure 3.5).

Table 3.4 Evaluation criteria for water permeability analysis

EVALUATION OF CRITERIA FOR WATER PERMEABILITY ANALYSIS							
PERMEABILITY STATUS (HSG)			GEOLOGICAL PERMEABILITY STATUS				WATER PERMEABILITY
High	Medium	Low	High	Medium-High	Medium	Low	
		x				x	Low
		x			x		Medium-Low
		x		x			Medium
		x	x				Medium
	x					x	Medium-Low
	x				x		Medium
	x			x			Medium
	x		x				Medium-High
x						x	Medium
x					x		Medium-High
x				x			High
x			x				Very High

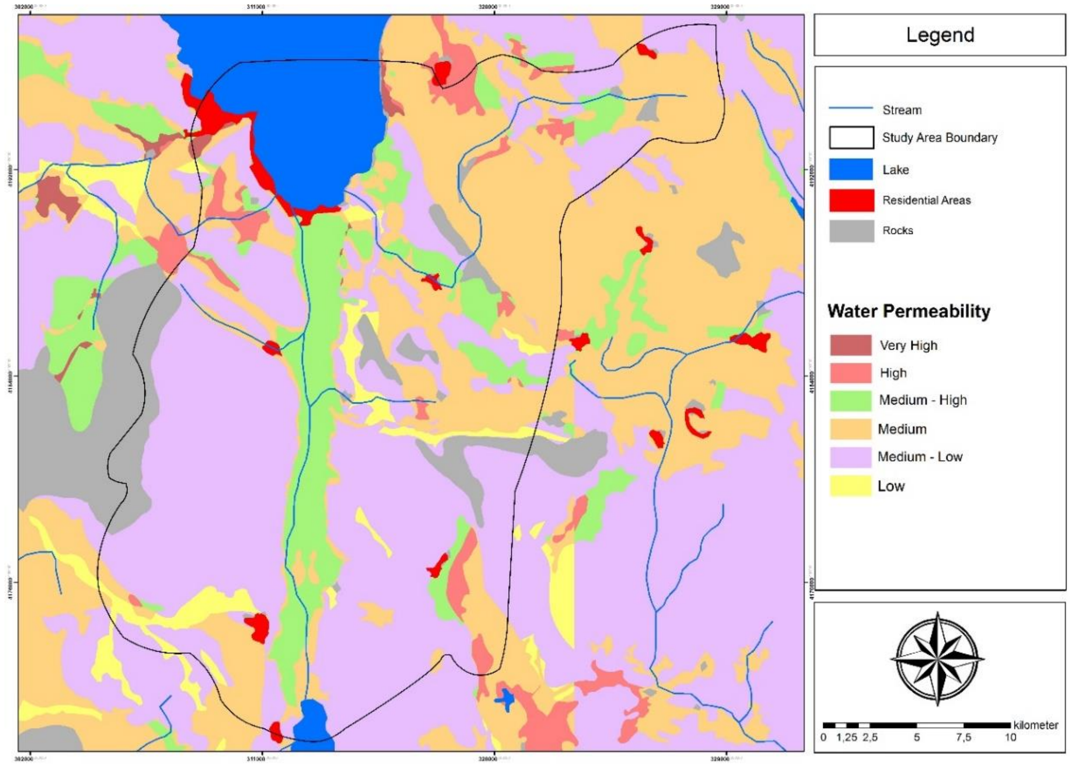

Figure 3.5 Water permeability map (Original, 2019)

3.2.3. Erosion Risk

According to the method for erosion risk analysis, slope, aspect and soil protection indices are evaluated. The soil protection indices are defined according to vegetation cover and slope by IFIE (MAPA/ICONA 1983). By overlapping the aspect (Figure 3.6), slope (Figure 3.7), and soil protection levels according to the Table 3.5, erosion risk map was created for the study area (Figure 3.8).

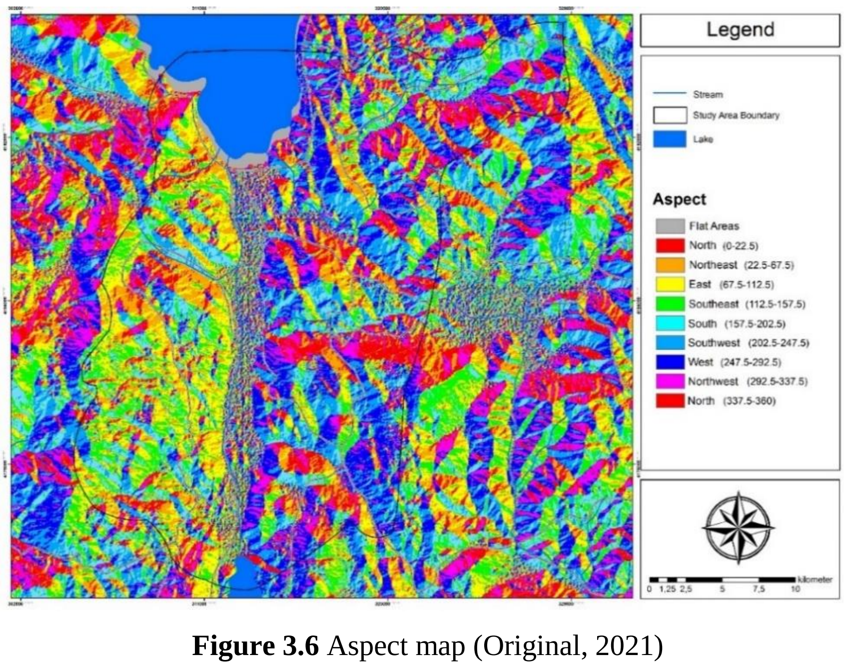

Figure 3.6 Aspect map (Original, 2021)

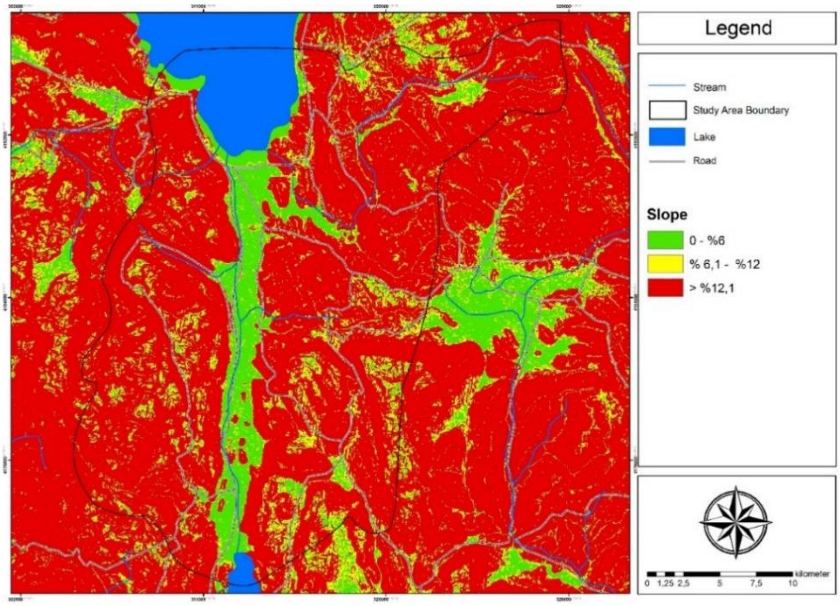

Figure 3.7 Slope map (Original, 2021)

Table 3.5 Evaluation criteria for erosion risk analysis

EVALUATION OF CRITERIA FOR EROSION RISK ANALYSIS					
EROSION	**SOUTH-FACİNG**	**THE OTHERS**	**SOIL PROTECTION STATUS**		**EROSION RISK**
			Available	**Unavailable**	
Slope > 12	x			x	Very high
			x		Medium
		x		x	High
			x		Medium
Slope < 12	x			x	High
			x		Medium
		x		x	Medium
			x		Low

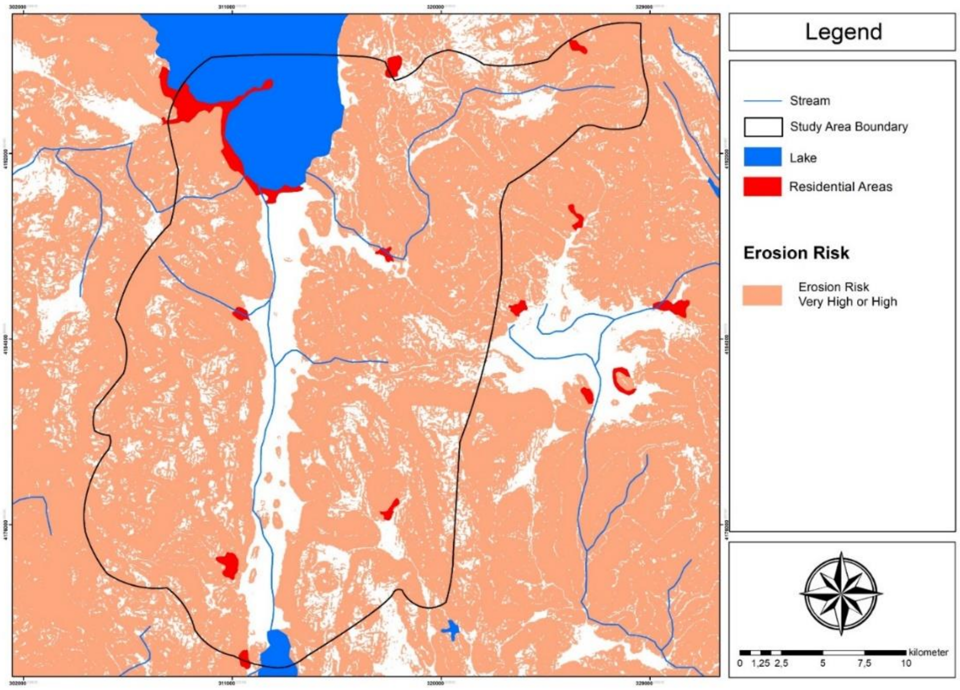

Figure 3.8 Erosion risk map (Original, 2021)

3.2.4. Landscapes at Higher Protection Value

In order to determine the areas with high landscape protection value, the areas with high landscape function value regarding erosion risk, water permeability and surface runoff were integrated and mapped (Figure 3.9).

Concerning the functions of the landscape in these areas, general aims and policies such as the protection of important groundwater recharge areas, surface runoff and erosion control should be established (Şahin et al., 2014).

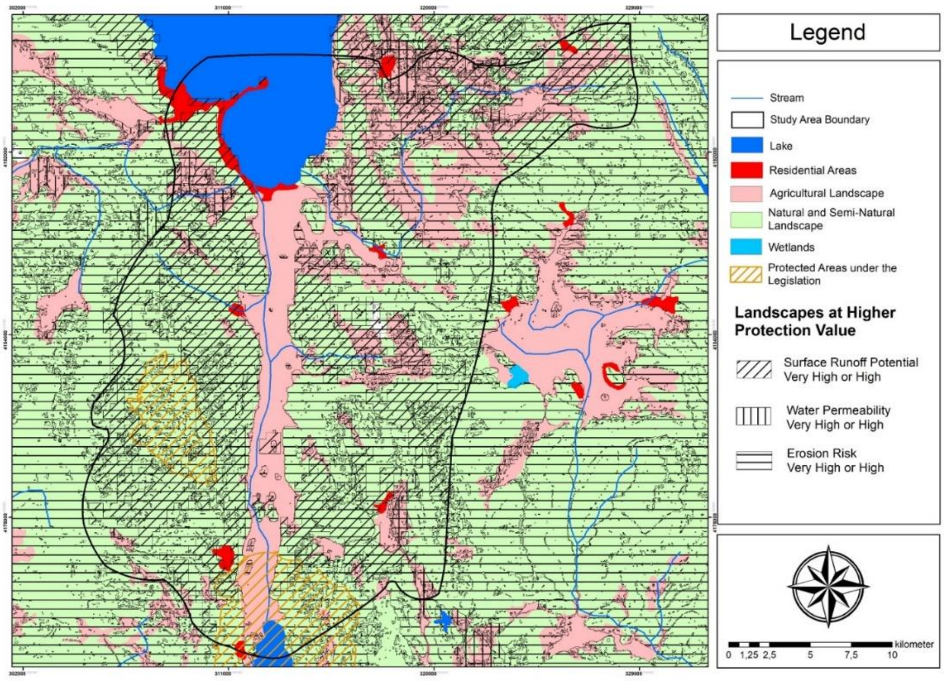

Figure 3.9 Map of landscapes at higher protection value (Original, 2021)

4. Result and Discussion

As a first step, areas with slope of 0-6% were accepted as an evaluation criterion for the bicycle route definition. As the slope increases, the use of bicycles becomes more difficult and the preference rate of the determined route decreases (Küçükpehlivan, 2015). Finally, the bicycle route was suggested and mapped by overlapping the areas with high landscape protection value with the bicycle suitability analysis based on slope parameter (Figure 4.1).

Most of the study area covers the areas with high landscape protection value, as this can be followed from Figure 4.1. Especially the high level of erosion risk restricts human uses. Along with the Kovada Stream, on the slopes faces of the valley, in addition to the risk of erosion, the existing high level of surface runoff risk increases the sensitivity of the landscape. In the study area, there is a need for measures to prevent soil loss by erosion before any human activities. Therefore, the potential for cycling in the study area is extremely low. There is only one major route suitable for bicycle use between Lake Egirdir and Lake Kovada at the valley bottom.

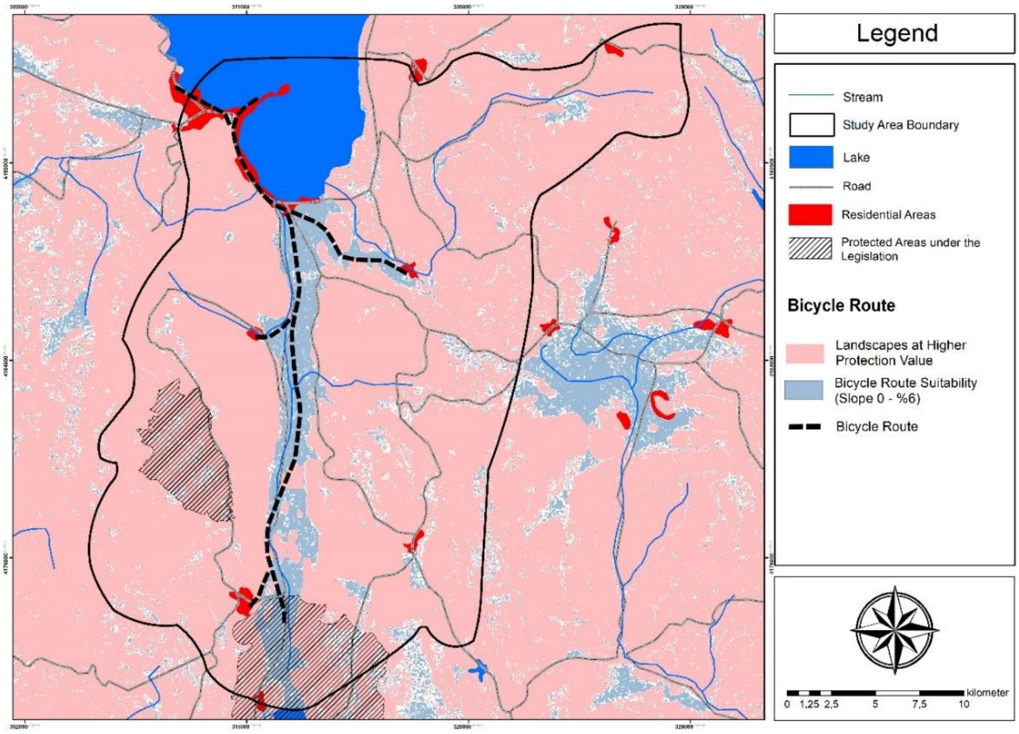

Figure 4.1 Bicycle route potential of the study area (Original, 2021)

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STREET REHABILITATION PRACTICE IN CONSERVATION OF HISTORIC URBAN TEXTURE: THE CASE OF ISPARTA DAMGACI STREET

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Abstract:

Continuous growth and rapid urbanization in cities are factors that degrade the traditional urban fabric. Despite the fact that the city's historical regions and structures are protected by the quality of registered works, these sites are abandoned to their fate as a consequence of the detrimental impacts of urbanization, construction materials losing their durability, and a lack of historical conservation awareness. With the street improvement application of Damgacı Street, which is located in the core of the city of Isparta, this research intends to disclose the historical element of the street and to achieve benefits that will make it visible again in the city. This is a zone densely populated with high-rise structures and high-grade roadways that is included in the conservation plan's scope. In study, the concepts of street rehabilitation practice and historical preservation will be examined and spatial analysis and observation studies which will be conducted on the current situation of the study area. For Damgacı Street, physical, functional, environmental, legal, and management concepts will be prepared in accordance with the law. It is feasible to employ rehabilitation to not only preserve an area, but also to load functional elements into that region and enhance it in a usage-protection balance. Damgacı Street will be rehabilitated in a way that avoids producing make-believe or copycat structures on the street, instead creating a location that lives and breathes history. An example will be offered to the residents of the city, historical tourism, economics, local governments, and planning as a consequence of the research.

Keywords: Historical Streets, Traditional Buildings, Urban Conservation

INTRODUCTION

Continuous growth and rapid urbanization in today's cities appear to be a component that destroys the urban fabric. With this circumstance, it is unavoidable that the city's texture will deteriorate and historical districts will disappear over time. In recent years, the city of Isparta has also been regarded as a quickly developing city. The historical texture of the city and the historical buildings within that texture cannot be entirely preserved with this development. Over time, the detrimental consequences of urbanization, the deterioration of building materials, and a lack of historical conservation knowledge all have an impact on this scenario. Despite the fact that historical sites, protected areas or historical structures that have begun to vanish in the city center have been placed under protection based on the quality of recorded items, the lack of necessary activities has left these locations to their fate.

The concept of Street Rehabilitation, which is one of the conservation studies, provides the possibility to restore historical regions inside the city center back to the city without demolishment and to reflect the historical texture in a balance of use and protection. A holistic approach is offered by the application of rehabilitation to buildings and streets, and these regions are returned to the city and residents without falling victim to the modern urbanization notion of rent. The study investigates the feasibility of implementing street rehabilitation in the Damgacı Street urban protected area of Isparta. Within the scope of the street rehabilitation application in the planning, Damgacı Street, which has started to disappear in the city center of Isparta and has become an area that we can describe as a collapsed area, aims to bring the city back economically, socially, culturally and to exhibit the historical texture of the city. Working example; it is limited to a section in Isparta's city center that is part of the conservation plan.

This region encompasses the district between Hasan Fehmi and Fevzi Paşa Caddesi, which contains 1306 (Damgacı Sokak), İrfan Yolu, 1311., 1306., 1313., 1410., 1411., 1471., and 1413. Streets and Cumhuriyet Primary School.

1. Conceptual Framework

1.1. Historic Preservation

> Conservation are defined as follows in Law No. 2863 on Cultural and Natural Assets Conservation and Protection: “Conservation and protection; immovable cultural and natural properties preservation, maintenance, repair, restoration, and change of function; portable cultural properties: conservation, maintenance, and restoration operations”.
>
> According to Keleş (1998); conservation in the urban sense is defined as the protection of historical and architectural monuments, monuments, and natural elements in specific portions of cities against all types of destructive, aggressive, and damaging acts for the benefit of individuals living in the city today and future generations (Yaygel, 2007:31).

The concept of historical preservation emerged as an awareness much later in our society as a result of its place in the law and literature. As a result, many historical items have vanished today. Despite the fact that it is frequently attempted to be articulated today, with the increasing pressures of urbanization and contemporary life, it has unfortunately remained in the background. The lack of social and cultural consciousness, sometimes by society and sometimes by administrations as well as the insufficiency of economic conditions, reflect an unsatisfactory state of historical preservation. The concept of protection is far too vast to be restricted solely to architecture. It underlines the importance of not only physical protection but also transferring its social and economic components to projects in this regard. For the historical texture, historic preservation is addressed with a comprehensive plan approach rather than a structure-based method.

1.1. Street Rehabilitation

The notion of street rehabilitation is an application that provides for the environmental preservation of registered or immovable cultural assets through conservation studies rather than individual assessments. In addition to the Law on the Protection of Cultural and Natural Assets, there is a sub-regulation that defines the notion of rehabilitation.

> “Conservation plans or development plans in urban protected areas and protection areas determined within the scope of Law No. 2863 on the Protection of Cultural and Natural Assets, both registered and unregistered immovable culture plans, in accordance with the decisions of the High Council for the Protection of Cultural and Natural Assets, the decisions of the Conservation Regional Board, and the conservation plans or development plans in the urban protected areas and protection areas determined within the scope of Law No. 2863 on the Protection of Cultural and Natural Assets, a survey and restitution for the preservation and documentation of all elements that define the street texture, as well as the protection of courtyard walls, outbuildings, fountains, and similar architectural elements, as well as the facades that give a view to the street, keeping them alive and integrating them into contemporary life by improving them with the original street texture and urban furniture” is defined as.

The term and other parts of the law are primarily concerned with the historical environment, with minimal mention of the social context. As a result, it gives the impression that rehabilitation work can only be done in historical areas.

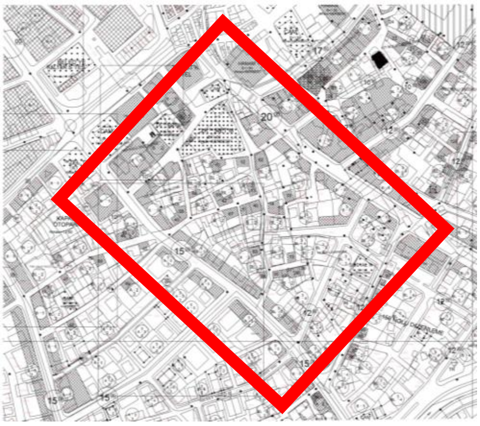
In terms of breadth and substance, rehabilitation is defined as the process of rehabilitating physically damaged and useless regions that have been reintegrated into the city.

“The owners of immovables, which are cultural treasures that must be preserved, are constrained by the high expenses of fixing them, which is where street restoration begins. Individual property protection, on the other hand, indicates that a comprehensive urban protection is either impossible or only possible over extremely lengthy periods of time. As a result, in addition to individual cultural asset preservation, the concept of treating urban fabric and the immovables that make up the streets, which are the major components of these textures, in a tighter framework than restoration, that is street rehabilitation, has evolved” (Ünver, 2017:97).

2. Findings

2.1. Information About The Field

There are just a few locations with protected areas that have a significant historical significance in Isparta. Damgacı Street, which is reported to date back to the early nineteenth century and is designated as the conservation plan's third region, is one of these locations. Despite its location in the city center, this street has vanished due to Isparta's increasing urbanization and has lost its character. Because of the need for housing, the region has been encircled by high-rise buildings and has become an in-between zone. This region, which should have been introduced to the city with the homes that illuminate Isparta's history and urban texture, has now become a destroyed and neglected place. Although the value of the area is known by citizens and experts, and it is intended to begin a study in every political period, it has not yet seen its required value. The parcels in the area are organically formed, as can be seen from the zoning plan, and the building positions have a traditional texture.



Section of the zoning plan (created in Arcgis program)

The area has been proclaimed an urban protected area by the High Council of Monuments and brought under protection because of the examples of civil architecture it contains. Today, however, this decision has been abolished, and only choices made under the protection of the building are given. Today, 25 structures in the area have been registered and protected.

2.2. Analysis of the Street

2.2.1. Problem Analysis of Damgacı Street

Physical Issues

- The streets in the street are paved in the style of traditional stone roads, however there is a lack of maintenance work and residents in the area do not pay attention to their usage.

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➢ Buildings that have been torched on the street and have fallen over time receive none upkeep. In fact, the materials from the burnt structures were left untouched. This condition, in addition to causing visual pollution, also poses a security risk in unattended and uncontrolled structures.

 

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➢ In the renewal and growth of infrastructure systems, there exist physical issues. The primary infrastructural issues include a shortage of waste collection locations and dumpsters, as well as a rainfall drainage system.

➢ Today, the problem of changing vacant spaces in the city center into irregular parking places is encountered in the empty spaces on Damgacı Street as a result of a lack of parking space for rising car ownership.

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➢ The limited and organic street space, which is typical of Turkish-Ottoman urban settlements, is incapable of providing answers to today's growing vehicle traffic and car ownership. This condition breaks up the flow of the stroll across the area and renders the structures in the area invisible from vehicles.

 

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➢ The freshly installed parquet-keystone or concrete floors produce negatives in keeping the historical-traditional texture by modifying the original natural stone pavements of the roadway over time. While strolling in the same region, the integrity is broken when each street has a different ground.

 

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Socio-Economic Issues

- The owners of the buildings do not have the financial resources to complete the essential repairs and renewals of the cultural assets. At the same time, due to inheritance and other factors, irreconcilable structures have been left to their destiny throughout the years as the number of building owners has increased.
- Some building owners are vacating their properties in order to live in more modern homes as their economic circumstances improve, or low-income residents are moving into these properties.
- The neighboring buildings' 4 or 5 stories lead the roadway to become trapped inside and vanish. The roadway is collapsed and abandoned due to the lack of visibility of the region around which many people pass by in the city center. When viewed from the area's entrances, this arrangement also highlights the textural mismatch of newly created multi-story structures with historic buildings. These structures, which provide a sense of place in the city center, have become victims of the new construction that surrounds them.

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- ➢ Due to the high volume of traffic in the area, four major road axes were opened over time, causing the area to remain enclosed.

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Law and Administration Issues

- ➢ While it has significant potential owing to its nation and regional location, as well as historical, ecological, and cultural characteristics, it has challenges in forming new economic sectors due to a lack of policies, strategies, and procedures to assess these potentials.
- ➢ Studies focusing on the building and investment sectors are carried out rather than works for city protection due to the legislative foundation and policies of the governments.

2.2.2. Potential Analysis Of Damgacı Street

- ➢ The fact that the region is on a little incline and has an organic road and parcel structure gives the individual distinct viewpoints in the circulations produced there.
- ➢ Several of the region's old structures have been renovated and are presently in use by institutions and people. Mansions, foundations, organizations, and commercial spaces are all housed in these structures. The existence of such buildings makes it easier for residents to re-recognize and safeguard the location.

Personal Archive of the Author, 2021

- ➢ It provides the possibility to expand historical tourism by utilizing the region's ancient period structures and architectural, as well as the city of Isparta's rich historical texture.
- ➢ Attempts are made to enhance the region within the scope of Rehabilitation Projects within the parameters of the Municipality's planning work.
- ➢ Cumhuriyet Primary School, which is located in the area, is a historical artifact that was built at the end of the 19th century and is still in use as a primary school the lower floor is cut stone, the upper floor is bagdadi, it has a hipped roof with Marseille tiles and double-winged doors, and it is covered with a hipped roof with Marseille tiles.

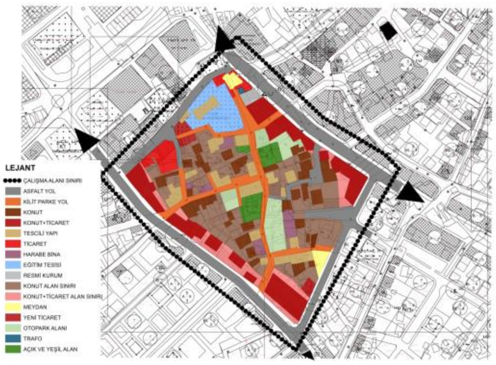
Personal Archive of the Author, 2021

2.3. Analysis Of The Current Situation In Damgacı Street

2.3.1. Status Of Land Use

The research area is bounded by four big road axes measuring 15-20-12 and 10 meters in length. Residential and commercial structures are arranged along the road axes.

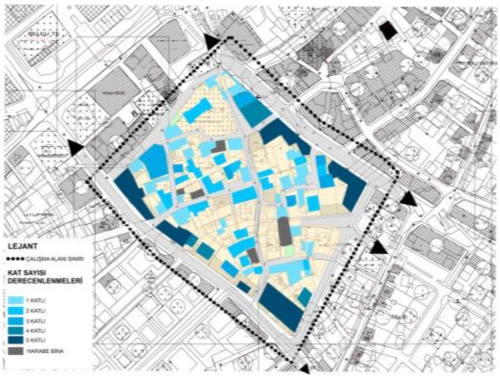
The region has a variety of structures, the bulk of which are houses. Over time, several of these constructions have deteriorated into ruins. In the region, there is a commercial zone with small eateries that serves as a tiny arasta. Apart from the garden usage of the buildings, there is no other open and green space in the region.



Within the scope of the study, it was produced in the Arcgis application.

2.3.2. Analysis Of Floor Numbers

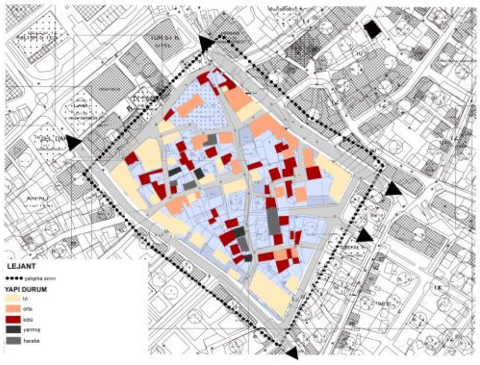
4- and 5-story houses surround the structures in the area. The view of the building blocks inside multi-story structures is entirely blocked. The majority of the structures in the area are single or two-story structures.



Within the scope of the study, it was produced in the Arcgis application.

2.3.3. Analysis The State Of The Structure

The majority of the structures on the street are in terrible condition. Only the buildings in the near area, as well as the historical structures in the region that have been renovated by individuals or institutions, appear to be in decent shape. Because they were left in a dilapidated state and were not used, several of the structures in the region became ruins. As a consequence of natural or human influences, certain structures have been damaged.



Within the scope of the study, it was produced in the Arcgis application.

RECOMMENDATIONS AND CONCLUSION

In order to establish a rehabilitation intervention for the area, there are certain issues that must be addressed first. First and foremost, the field's concerns must be solved. The entire region should be treated holistically, and the architectural, urban, and social characteristics that contribute to the area's historical worth should be assessed. It is critical to retain the historical fabric's original properties as much as possible. Because of the potential for inequitable income gains in this region of the city center as a result of this circumstance, suggestions should not result in major shifts in the field. The improvement that is needed in the region is largely for the preservation and reflection of the historical texture, rather than for economic reasons. The interventions that will be created are grouped and presented in this section.

Physical Suggestions

- Some of the structures in the area (those in fair condition) should be improved with the same materials and architectural elements as restoration projects, with no need for immediate intervention.
- Low-rise structures were constructed in the region, which were incompatible with the historical texture but did not express the character of the neighborhood. These structures' external components should be modified and made to blend in with the surrounding structures.
- Some of the structures along the roadway are now burned or in ruins. Some of these constructions have been registered. Simultaneously, they have lost their current identity and uniqueness. Experts should analyze these structures. If the choice to demolish is taken, new structures should be erected in a way that preserves and reflects the original identity, or new roles should be added to the usage of the regions, in accordance with the essential projects.
- New construction in the region should harmonize in with the existing structures. In terms of material and workmanship, these constructions should be historically accurate, but they should be given an original shape by avoiding copying. Architectural components such as windows, doors, and eaves, as well as color and exterior cladding, should be chosen with care and harmony.
- Damgacı Street and the surrounding area's road pavements should be totally rebuilt. Road pavements that are incompatible with the traditional texture should be replaced to match the rest of the region, and they should be maintained and repaired on a regular basis. The facades of the multi-story buildings around the region, which face the ancient street, should be harmonized to create a new impression.

Functional Suggestions

- The primary goal is to maintain the area's heritage as a consequence of the street reconstruction. This protected region, however, should not be left isolated. The area's buildings and streets should be functional and have new functions.
- According to their silhouettes, the historic buildings in the region that are being repaired should be utilized for commercial purposes. Some of these functions should be determined, such as rose product sales centers, carpet weaving, and sales centers, which are among the city of Isparta's identity elements.
- Restaurants, cafes, and commercial services for tourists should be erected on the bottom floors of the buildings in the neighborhood, or, if suitable, all of them open to the street.
- Small and medium-sized structures make up the majority of the existing structures in the region. As a result, these structures should continue to serve as both residential and commercial constructions. On the other hand, in buildings that are suitable with the historic texture to be developed, the usage of boutique hotels or hostels for tourists should be proposed. As a result, the region will be turned from a daytime tourist attraction to a nighttime residential area.
- Suggested functions should be defined at the start of the research, based on a list of requirements.

Environmental Suggestions

- There are no objects of urban furniture in the vicinity. Because the renovated area will be utilized regularly by residents, it should have seating, garbage cans, and street lighting that is historically appropriate and adequate.
- As the area's use grows, and it aspires to become a historical tourism destination, urban infrastructure aspects should be enhanced. Installations for electricity, telephone, and natural gas must be placed underground so that they do not obstruct the environment or generate visual pollution.

- Within the region, adequate open and green places should be provided. Parks and resting spaces should be constructed not just for the buildings but also for public usage, despite the fact that traditional buildings are typically built with gardens.
- Due of the harm it causes to structures and history, the region should be restricted to motor traffic except for emergency vehicles. It should be built with pedestrians and bicycles in mind. Vehicles transporting items for business purposes should be permitted on specific days and times.

Legal and Administrative Suggestions

- Because a rehabilitation proposal for the entire environment will be created, all structures with a traditional texture must be registered first.
- For their distinct shapes and values, each of the buildings in the neighborhood should have its own intervention strategy. Buildings in the region are in poor condition for a variety of causes. Each of these factors should be assessed separately, and appropriate treatments should be implemented.
- One-time studies should not be included in the plans or applications that are being created; they should be audited on a regular basis and appropriate actions done.

Example of a Rehabilitation Project on Damgacı Street

As a consequence of the analytical studies conducted particularly for the area, structural intervention forms were devised. These are the interventions:

Destruction Of The First Degree	Buildings in the region that are in ruins, without registration value, and registered buildings and constructions that are incompatible with the texture and prevent examples of civil architecture from being displayed should be demolished first. A new building or public space should be built in the destroyed areas in compliance with historical preservation criteria and the design justification for the location.
Destruction Of The Second Degree	Because no structural repairs or maintenance can be carried out on the buildings in the vicinity, particularly on parcels of registered buildings or buildings with a registered value but are now covered in burnt rubble, these structures should be demolished. A new structure should be created in their place, in accordance with historical preservation guidelines.
Study on Building Maintenance	Major to moderate maintenance should be performed on structures that do not require structural alterations or destruction.
Harmony of Structure	It's a type of intervention that will need to be reapplied once the buildings' economic lives are through. Changing the facade colors and plasters to match the texture of the building, hiding signboards, cables, and pipes that cause visual pollution, facade cladding, door and window joinery, replacing balcony or window irons, and renewing the eaves roof materials are all examples of applications that should be carried out.
Repairing the Structure	In buildings that are in poor or intermediate condition, structural repairs should be undertaken and the structure should be strengthened, according to local analysis.
Structure That Does Not Require Physical Intervention	It refers to structures that do not require intervention and are in good condition based on the area's analysis.

Within the scope of the study, it was produced in the Arcgis application.

Every application to registered structures in the area where street restoration will be carried out should be governed by laws and regulations. Following the start of the rehabilitation application, the inspection studies to be conducted on a regular basis should be defined in accordance with the Protection Board's judgments. The structure that would develop as a result of these actions has been determined using data from Türk's (1995) research on the traditional home texture of Isparta, "Preservation of Urban Identity in Urban Conservation Approaches, Isparta Example."

Buildings	The floor height in newly constructed structures in the region shall be no more than 2. According to the construction of traditional Isparta homes, basements can be employed on the floors of the structures. A settlement and use permit for each of the new buildings should not be obtained until the outside cladding, facade components, roofs, and all other construction elements have been completed. Buildings in freshly developed lots should be designed in harmony and integrity in terms of architectural features in order to retain the texture.
Layout of the Facade	On the ground levels of buildings, a maximum of one floor should be set aside for commercial functions, with housing above. A maximum of two stories should be acceptable in structures that will solely be utilized for business or accommodation purposes. For commercial use, the width of displays, doors, and window openings should not exceed 2 meters. Buildings should be oriented as much as possible toward the street. In line with the home typology, building entrances should be made after rising a few steps from the ground. If bay windows are to be installed in structures, they should be made of wood or stone.
Windows and Exits	The exits in the buildings should be made on the second level, facing the street. Guillotine window arrangements should be made on the windows as a kind. The windows in stone homes should be framed with stone jambs, while the windows in wooden houses should be framed with wooden moldings.
Cladding for the Facade	On the building's front margins, angle brackets made of wood or stone will be installed. Motifs that match the texture can be utilized in these corners.
Roofs and Eaves	Roofing should be a requirement for all structures. Tile that is acceptable for texturing should be used for the roof. Other than the energy panels with chimney and textural harmony, there should be no usage on the roof. Wooden stuff should be used for the eaves. A research should be conducted in accordance with historical decoration and craftsmanship.
Colors and Materials of the Facade	The major construction material for ground floors and basements should be stone. The walls of the top floors of some structures can be built as mud-filled "hms" or bagdadi in line with traditional use. Mud, which is formed into a straw-added plaster

	mortar suited for traditional home structures, can be used as a plaster material. A paint that is suitable with the prevailing hue of the building should be used for buildings that require painting.
Elements of Infrastructure	Electricity, telephone, natural gas, and other infrastructure pieces should all be buried underground.
Furniture for the Urban	Billboards for commercial purposes should be placed in accordance with the conservation board's recommendations and in a way that does not harm or conceal the historical texture. Street lighting fixtures should be selected in accordance with the historical texture and positioned appropriately. Garbage cans and other street features should also be properly and harmoniously maintained in the region.

Damgacı Street and its environs were initially designed with structural alterations in mind. New structures and regions have evolved as a result of these activities. All of the existing roads in the region are accessible by car, but all of the roadways inside have been pedestrianized as part of the restoration project. An open car park area was planned for the area's eastern entrance, while an underground car park was planned for the area's southern entrance. The apertures were turned into square usage and green space planning was developed by utilizing the organic shapes of the buildings in the region.

Damgacı Street, located in Isparta's city center, is an area that has to be protected and maintained alive because of its historical and architectural monuments. It is inevitable for this region to deteriorate over time owing to physical-structural, human-induced, natural, and legal factors. Despite the fact that it is in the hands of planning to avoid and rectify this scenario, no comprehensive study for the region has been conducted throughout the years. As a consequence of the investigations and analyses conducted, recommendations for essential initiatives to salvage this street before it is demolished are made. The term "street rehabilitation" is commonly used in the literature and in the planning industry. Buildings with historical importance, such as Damgacı Street, which symbolizes the city's texture and culture, and streets surrounded by roadways, are returned to the city using this approach, rather than being demolished or damaged. It is possible to not only safeguard a region, but also to restore and rejuvenate functional functions in that area, using rehabilitation.

Damgacı Street and its environs will be left to their destiny unless action is taken, and they will eventually succumb to contemporary life. Zoning plans and new developments are beginning to homogenize the texture of city centers and obliterate the street texture that has existed for generations. The texture of this region is crushed by the high-rise structures that surround Damgacı Street. With the correct planning research, reversing tissue's overpowering power and making history dominant will be achievable. At this stage, the work that has to be done on the plan should try to create a living place that preserves history by avoiding any form of make-up or copycat structures on the street.

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PARTICIPANT-BASED CO-DESIGN WITH WASTE MATERIALS: TEKİRDAĞ OSMANLI NEIGHBORHOOD WORKSHOP EXPERIENCE

Atık Malzemeler İle Katılımcı Esaslı Birlikte Tasarım: Tekirdağ Osmanlı Mahallesi Çalıştay Deneyimi

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Özet

Kentlerde yaşayan insan nüfusunun artışı, teknolojik gelişmeler, sanayileşme, hızlı kentleşme ve buna bağlı olarak artan ve farklılaşan tüketim alışkanlıkları beraberinde atık üretimini artırmıştır. Artan atık miktarı ise çevre ve insan sağlığı açısından olumsuz etkilere yol açmakta, bu durum ise günümüzde yaşanan önemli çevre sorunlarından biri haline gelmiştir. Doğal kaynakların sonsuz olmadığı gerçeği doğrultusunda, atıkların daha bilinçli bir şekilde tekrar kullanımı ve geri dönüşümü; çevrenin korunumu, kaynak israfını önleme ve enerji tasarrufu açısından önem kazanmaktadır

Atık, "kullanılmayan, kullanılmak istenmeyen, herhangi bir değeri olmayan ve dışarı atılan her türlü madde ve malzeme" olarak tanımlanmakta ve genel olarak, "katı atıklar, sıvı ve gaz atıklar, ambalaj atıkları" olarak sınıflandırılmaktadır. Bu atık türlerinden katı atıklar "üreticisi tarafından istenmeyen insan ve çevre sağlığı açısından düzenli bir şekilde bertaraf edilmesi gereken katı maddeler" olarak tanımlanmaktadır.

Günümüzde çevrenin korunumu ve atık yönetimi ülkelerin çevre koruma politikaları arasında öncelikli konulardan biri olmaktadır. Doğal kaynakların sonsuz olmadığı gerçeği kaynakların dikkatli ve verimli şekilde kullanılmasını zorunlu kılmaktadır. Bu durum beraberinde atıkların yeniden kullanımı ve geri dönüşümü, kaynak israfını önlemek, çevrenin korunumu ve enerji tasarrufu açısından önem kazanmaktadır. Bu doğrultuda Tekirdağ gibi gelişmekte olan kentlerde atık dönüşümü konusunda yerel yönetimler kadar kentlinin farkındalığına yönelik çalışmaların da önemli bir yeri bulunmaktadır. Farkındalık çalışmaları katılımcılık esaslı süreçlerle entegre edildiğinde kentliye kaynakların verimli kullanımı, üretim-tüketim biçimleri hakkında daha bilinçli davranış geliştirme ve yaşadıkları alanlara dair daha kuvvetli bir aidiyet hissi oluşturma açısından verimli sonuçlar doğurmaktadır.

Bu kapsamda bu çalışmada Tekirdağ'da atık dönüşümü konusunda giderek artan farkındalık çalışmalarına paralel olarak Süleymanpaşa İlçesi Osmanlı Mahallesi hanehalkıyla birlikte atıklarla ile ilgili çevresel farkındalığı arttırmak amacıyla 2019 yılında iki fazlı ve katılımcı esaslı bir çalıştay düzenlenmiştir. Çalıştayın çıktılarına bağlı olarak hane halkı ve TNKÜ Mimarlık Bölümü 3. Sınıf öğrencileri ile yerleşmede beliren fiziksel mekân ihtiyaçlarına yönelik gerçekleştirilmek üzere mekan tasarımları üretilmiştir. Çalıştaydan çıkan görüşler doğrultusunda mahallenin atıklarının tekrar kullanım yöntemi ile mahallede ihtiyaç olarak beliren kütüphane, yerel ürünlerin satış alanı, bir spor sahası için tribün ve soyunma alanları vb. tasarımlar katılımcı esaslı süreçler doğrultusunda gerçekleştirilmiştir. Bu bağlamda bu çalışma çevresel farkındalığın demokratik yaklaşımlarla ele alınması konusunda katılımcılar ve tasarımcıların rol paylaşımı konusunda bir örnek olarak belirmektedir.

Anahtar kelimeler: Atık, atık yönetimi, katılımcılık, birlikte tasarım, çevresel farkındalık.

Abstract

The increase in the human population living in cities, technological developments, industrialization, rapid urbanization and accordingly increasing and differentiating consumption habits have increased waste production. The increasing amount of waste causes negative effects in terms of the environment and human health, which has become one of the important environmental problems experienced today. In line with the fact that natural resources are not endless, more conscious reuse and recycling of waste; It gains importance in terms of protecting the environment, preventing waste of resources and saving energy.

Waste is defined as "all kinds of materials and materials that are not used, not intended to be used, have no value and are thrown out" and is generally classified as "solid wastes, liquid and gaseous wastes, packaging wastes". Solid wastes from these types of waste are defined as "solid materials that are undesirable by the producer and must be disposed of regularly in terms of human and environmental health".

Today, environmental protection and waste management are one of the priority issues among the environmental protection policies of countries. The fact that natural resources are not infinite necessitates the careful and efficient use of resources. This situation gains importance in terms of reuse and recycling of wastes, preventing waste of resources, protecting the environment and saving energy. In this respect, efforts to raise awareness of citizens as well as local governments have an important place in waste recycling in developing cities such as Tekirdağ. When awareness activities are integrated with participation-based processes, it produces fruitful results in terms of efficient use of resources, developing more conscious behavior about production-consumption styles and creating a stronger sense of belonging to the areas they live in.

In this context, in this study, in parallel with the increasing awareness on waste recycling in Tekirdağ, a two-phase and participant-based workshop was held in 2019 in order to raise environmental awareness about waste with the households of Süleymanpaşa District, Osmanlı Neighborhood. Depending on the outputs of the workshop, space designs were produced to meet the physical space needs of the households and the 3rd year students of the Department of Architecture of TNKU. In line with the opinions that emerged from the workshop, the library, sales area for local products, tribune and dressing areas for a sports field, etc. designs were made in line with participant-based processes. In this context, this study appears as an example of the role-sharing of the participants and designers in dealing with environmental awareness with democratic approaches.

Keywords: Waste, waste management, participation, co-design, environmental awareness.

1. Introduction

The increase in the human population living in cities, technological developments, industrialization, rapid urbanization, and accordingly increasing and differentiating consumption habits have increased waste production. The increasing amount of waste causes negative effects in terms of environment and human health, and this situation has become one of the important environmental problems experienced today (Palabıyık & Altunbaş, 2004, p. 103).

Waste is defined as "all kinds of matter and materials that are not used, not intended to be used, have no value and are thrown out" (Şahin & Hatunoğlu, 2016, p. 75). Wastes are generally classified as "solid wastes, liquid and gaseous wastes, packaging wastes" (Gündüzalp & Güven, 2016, p. 2). Solid wastes, one of these types of waste, are defined as "solid materials that are undesirable by the producer and must be disposed of regularly in terms of human and environmental health" (Gündüzalp & Güven, 2016, p. 2). Global waste is expected to reach 3.40 billion tons by 2050. Daily waste generation per capita in high-income countries is expected to increase by about 40 percent or more, increasing by 19 percent compared to low- and middle-income countries (Kaza et al., 2018, p. 3). Therefore, today, environmental protection and waste management are among the priority issues among the environmental protection policies of countries (Kaçtıoğlu & Şengül, 2010, p. 90). In a world where natural resources are not endless, this requires careful and efficient use of resources. This situation gains importance in terms of reuse and recycling of wastes, preventing waste of resources, protecting the environment and saving energy (Anon, 2018).

Disposal methods of solid wastes are classified as reuse, recycling, recovery, incineration, composting, storage (regular/irregular) (Palabıyık, 2001, p. 30). Reuse is evaluation of the wastes in the same way "without any treatment other than cleaning", and recycling is the process of "putting the wastes into the production process as a second raw material after physical and/or chemical processes" (Palabıyık, 2001, p. 36). Recycling includes the concepts of reuse and recycling; It is the process of using the wastes more than once by converting their components into other products or energy by physical, chemical or biochemical methods, by taking advantage of their properties" (Palabıyık, 2001, p. 36). Incineration is a method of "reducing waste in volume and/or removing it by incineration to obtain energy and obtaining energy" (Erdoğan Bayram, 2017, p. 64). Composting is "the biological decomposition of the organic part of solid wastes under controlled conditions" (Erdoğan Bayram, 2017, p. 64). With the help of this process, solid wastes are stabilized and used as a soil conditioner (Karakaya, 2008, p. 9). It is divided into two as storage and regular storage. Irregular landfill is "the removal of wastes by randomly giving them to open areas, sea or rivers without taking any precautions in a way that will cause disturbing sights and odors, water, soil and air pollution" and regular landfill is "simply pouring solid wastes into sealed large areas, compressing them and covering them turning it into a natural biological reactor" (Erdoğan Bayram, 2017, p. 64).

With the reuse method, which is one of the disposal methods of solid wastes, the service life of the product is extended, and with the recycling method "solid wastes can be converted into secondary raw materials for use in production" (Karagözoğlu et al., 2009, p. 4) With recycling, "as raw material consumption will decrease, natural resources will be protected and energy savings will be achieved, as well as the amount of solid waste will be reduced in volume" (Karagözoğlu et al., 2009, p. 4).

Waste management is defined as "prevention of waste, reduction at source, reuse, separation according to its characteristics and type, accumulation, collection, temporary storage, transportation, intermediate storage, recycling, recovery including energy recovery, disposal, monitoring after disposal processes, control and audit activities" (Resmi Gazete, 2015). Waste management, which can also be defined as the "sustainable use" of waste, "not ensures that wastes are disposed of, but that they can be converted into other materials and partially released into the environment in a way that feeds the raw material cycles" (Doedens, 2006 as cited in Aydın and Deniz, 2017, p. 439). For this reason, methods such as reuse, recycling and recovery are the disposal methods that should be preferred in terms of conservation and sustainability of natural resources, environmental pollution, energy saving and economy. In particular, it provides an advantage in terms of "reducing the amount and volume of solid waste for countries that cannot find sufficient resources and space to dispose of solid wastes regularly" (Erdoğan Bayram, 2017, p. 65).

In addition to the studies on awareness in architectural education about waste, the practices that discuss and apply through learning models to create waste awareness have started to gain momentum in Turkey, albeit limited. However, studies on the concept and awareness of waste remain at the theoretical level, and as a learner and instructor, the student remains disconnected from the practices of learning together by doing and touching in the design studio.

In this study, awareness raising about waste, creating practices and learning practices are discussed through a two-phase study with Tekirdağ Osmanlı Neighborhood households, which was chosen as the plot study area within the framework of the architectural studio of Tekirdağ Namık Kemal University 3rd year architecture students in 2019. Although the production phase has not been realized due to the Covid-19 pandemic, this study gains importance in terms of active participation and the enriching and instructive experience of designing together.

2. Participation in Waste Evaluation and the Role of Dwellers

One of the design-oriented approaches, participatory design or cooperative design approach, called co-design in the USA, was born in Scandinavia in the 1960s. This design approach includes a process "in which the entire stakeholder is actively involved in the design processes and procedures" (Akdemir, 2017, p. 87). In this approach, all users are accepted into the design process and are included (Akdemir, 2017, p. 87).

In the 1960s, the role of the designer as a subject in the design processes in architecture was questioned more, and participant-based design principles began to be applied in order to provide a more balanced power distribution and balance between the designer-user-participant. In this context, architects and planners aimed to involve the future users of the participants in the process through workshops and consultancy, offices established in the neighborhoods. For example, Lucien Kroll included students, who were the main users of the building, and other users in the design process in the student accommodation design of Maison Médicale or Mémé at the University of Louvain in Brussels in 1971. Kroll used a physical model to develop design so that the participants could intervene, or modify the model. This process became an evolving design process (Blundell Jones, 2005, p. 142). Similarly, in mass housing design, John Habraken has expanded the participation of the housing user at different levels, together with other actors involved in housing production, in layers, under the names of "open housing" and "open building". This approach, which enables the space to allow for various interventions and changes in the future, has revealed flexible planning processes (Spatial Agency (n.d.)).

Henry Sanoff, one of the pioneers of participant-based design approaches, mentioned public participation as: "People choose to participate if they see themselves affected by an issue because of a possible threat or benefit of a proposed facility," "have an economic interest in the outcome of a particular decision," "need to protect or increase access to the use of a facility or service," "perceive and environmental or health risk associated with a proposed action, or if an issue affects strongly held religious or political beliefs" (Sanoff, 2000, pp .17-18).

The role of the architect in participant-based design processes is controversial. Blundell-Jones argues that "architecture has become too important to be left to architects" (De Carlo, 2005, p. 11). When the boundaries between actors, producers and users in architecture are dissolved, a metamorphosis will occur in architectural practice. In this way, "building and using become two different parts of the same planning process" (De Carlo, 2005, p. 11).

Similarly, as De Carlo mentions:

> Therefore the intrinsic aggressiveness of architecture and the forced passivity of the user must dissolve in a condition of creative and decisional equivalence where each – with a different specific impact – is the architect, and every architectural event – regardless of who conceives it and carries it out – is considered architecture (De Carlo, 2005, p. 11).

Collective participation includes an unpredictable process with multiple goals and actions; only behaviors and tendencies can be designed before the process. However, as De Carlo states, "identifying with the users' needs does not mean planning 'for' them, but planning 'with' them" which means an enlargement of the participation (De Carlo, 2005, p. 12). In these processes, "co-design, participatory design approaches and participatory methods" are "democracy-oriented motivations" (Binder, Brandt, & Gregory, 2008, p. 82). Although participant-based workshops are becoming more common today the planning of the workshops differs in terms of scale, duration, process and stages (Binder, Brandt, & Gregory, 2008, p. 82). A paradigm shift towards "interdisciplinary generation of knowledge and open collaboration in scientific, industry, government and civil society partnerships that are inclined towards participation of diverse public communities" (Binder, Brandt, & Gregory, 2008, p. 82).

3. The Role of Participation and Co-Design Practices in the Architecture Studio Experience

Participant-based studio work in architectural education is becoming more and more common today. These studies have taken their foundations from the versatile and multidisciplinary practices in Bauhaus in order to reduce the lack of experience in the fields of design and construction, which appear as new tendencies in architecture schools (Carpenter, 1997, as cited in Karslı, 2014). These studies; It is called with different names such as "design-build", "learning by building", "learning by doing" (1/1 learning) (Karslı, 2014).

The “design-build” approach is the opportunity to explore the interaction and relationship between the design and the product, where “design, construction techniques, material selection, the whole process is simultaneous” due to the restrictive real conditions such as the user of the architectural product, the place of construction, and the construction possibilities (Karslı, 2014). “Design and build” studio internships at MEF University Architecture Department can be given as an example. In line with the production practices integrated into the design studio at MEF University, students are involved in all processes of design and production during the summer term at the end of the first year. Students gain experience with users in communicating with all actors involved in design and production, developing team skills, and the role of design in improving human life. Programs similar to the design and build application are carried out in approximately 30 schools in the USA and Canada (Avcı et al., 2020, p. 68). An example is the “Dinner is Served!” project. The project was realized as a four-week simultaneous design and production process for a food and beverage area on the banks of the Rideau River in the campus, where the students gained “group work and intergroup cooperation experiences during the construction phase” (Karslı, 2014).

The “learning by building” approach is an integrated system in which the idea that is revealed at the beginning of the process is made three-dimensional and every design, trial, and return to idea action is the “catalyst” of the other (Carpenter, 1997, as cited in Karslı, 2014). In this process, which is learned by experience, the space is built on a 1/1 scale (Karslı, 2014). “1/1 learning”, on the other hand, is the process that is generally realized in the form of internship during the summer months, where the student practices at 1/1 scale, learns and experiences the techniques of building production. The student is articulated to this “productive” and “constructive” process as an “individual who both acquires and produces knowledge” (Gür & Yüncü, 2004, p. 9). The student, who is both the “subject” and “object” of the building process, and “the person who learns and implements at the same time” (Gür & Yüncü, 2004, p. 9). Arılı Summer Internship at METU Department of Architecture can be given as an example for this. “Summer internships allowed students to experience the design-build-learn process with the constraints of real conditions. In summer internships, students get the opportunity to get to know the local material-traditional construction techniques relationship first hand, apart from experiencing the integrated design-construction process” (Karslı, 2014). In this example, a computer workshop was designed and built in a 2-month summer internship with wooden material, which is the traditional building material for primary school students, which was determined as a result of the negotiations with the local administrations in Rize-Fındıklı Arılı Village in 2003. Whistle; It was realized with the participation of 2 coordinators, 54 architecture students, consultants, technical staff and masters and supporting institutions (Gür & Yüncü, 2004).

4. Osmanlı Neighborhood Workshop as a Collaborative Design Model

The study discussed in this article, on the other hand, is discussed in a process where the above-mentioned methods provide the students with the materials and production practices that they experience simultaneously with the design, and in a process that is learned together with the participants as well as being instructive. In this context, the students not only managed the design and production process in line with a determined function, but also designed the process in the form of co-design, in which the function and need emerged in the field and the participants had an active voice.

This study helped students gain an experience of being involved in Tekirdağ’s local potentials, construction methods and rural production styles by seeing and experiencing the cultural life in situ. In addition, they have created an experience area where they design by foreseeing the procurement, evaluation, management of waste materials and how the designs they propose will transform when their life is completed, in other words, the death of the building. Students have experienced in the Osmanlı Neighborhood scale that design is a socio-cultural phenomenon as a unifying element beyond its environmental values and economic dimension.

4.1. Osmanlı Neighborhood and Its History

Osmanlı Neighborhood is a settlement located in the Süleymanpaşa District of Tekirdağ province, 18 km from the district. The settlement, which had the status of a village before 2012, turned into a neighborhood after Tekirdağ gained the status of Metropolitan Municipality (Süleymanpaşa Municipality (n.d.)) (Figure 1).

Figure 1. Osmanlı Neighboorhood (KEOS, 2021)

Yoruks were settled in the region, which is known to be the oldest settlements during the Roman Empire period, in 1357, after the conquest of Tekirdağ during the Ottoman Empire. According to the tax-registry book dated 1515, 20 households were found in the settlement. According to the same registry, 13 of these households were the ones cultivating the land with their income belonging to the palace. According to the tax-registry book dated 1572, 3 farms were found within the settlement boundaries. With the collapse of the timar system in the Ottoman Period, the peasants who worked the farms in the area bought the land. With the republican period, with the settlement of the people coming from Bulgaria to the village, the village turned into a structure consisting of two quarters, the local quarter and the immigrant quarter. “The part of the village called Muhacir Neighborhood was built by the CHP government of the period led by İsmet İnönü, and 10 acres of land per capita was allocated to the immigrants” (Süleymanpaşa Municipality (n.d.)).

The livelihood of the people living in the settlement, which became a neighborhood after 2012, is based on agriculture and animal husbandry. The most important agricultural livelihoods are wheat and sunflower. In the village, “beet, corn and watermelon cultivation is carried out in the parts where the irrigation canal passes”, and partially “canola cultivation is carried out” (Süleymanpaşa Municipality (n.d.)). Apart from the irrigation canal, there are 3 ponds used for irrigation in the settlement. In relation to the livestock sector, cattle breeding and fattening are carried out. Although there is a primary school in the neighborhood, it is not used, and education activities with bussed education are carried out in the neighborhood (Süleymanpaşa Municipality (n.d.)). According to the 2020 address-based population registration system, the population of the Osmanlı District is 316 people, 167 men and 149 women (TUIK, 2020).

4.2. Osmanlı Neighborhood Workshop Method and Process

The study was carried out in the 2019-2020 Academic Fall Semester with 55 third year students from Tekirdağ Namık Kemal University, Department of Architecture, within the scope of architectural studio, spread over a period of 15 weeks. The study area was chosen as the Osmanlı Neighborhood as a result of the negotiations with the local governments. Within the scope of the study, a two-phase workshop was held in the neighborhood on 24.10.2019 and 04.11.2019. In line with the demands of male and female households, it was necessary to conduct the workshop in two different environments and times.

The first phase of the workshop was held on 24.10.2019 in the open area of the Women's Coffeehouse in the settlement with the neighborhood household consisting of architecture students, women and children, and the mukhtar. In the first phase, the purpose of the workshop was conveyed to the relevant household by the students, and then a presentation was made in which various samples made from wastes in Turkey and abroad were shared. After the presentation, a total of 25 household participants consisting of 21 women, the mukhtar and 3 children were divided into 7 groups consisting of approximately 10-12 people, and various drawings were made with free expression techniques and exchange of views on the spaces needed in the neighborhood under the coordination of architecture students. At the end of the phase, the ideas and suggestions discussed in the group by each group spokesperson were transferred to all groups collectively, and common suggestions were discussed. The needs that emerged in this phase were determined as a wedding hall, sales areas for handicrafts, a meeting area for religious events, and a library (Figure 2).

Figure 2. Phase I: Women's Coffeehouse workshop (Authors, 2019)

Workshop II. phase was held on 04.11.2019 with the participation of 20 male households in a coffeehouse in the neighborhood, the practices made in the first phase of the workshop were repeated in this phase as well, and the needs that emerged in the first phase were conveyed to the participants in this phase. In this phase, the needs that emerged in the phase of the project were determined as changing rooms, tribune and library for the sports field to be built in the neighborhood (Figure 3).

Figure 3. Phase II: Workshop at neighborhood coffeehouse (Authors, 2019)

During these two phases, students worked individually and designed a total of 55 projects. These projects mainly consisted of the library, changing room and tribune design needed in the neighborhood, as well as the soap workshop and the places where the food and handicrafts produced in the neighborhood are sold. In these designs, materials such as earthbag, pallets, plastic bottles and car tires were suggested. Afterwards, the projects were collected in 5 groups according to their subjects, and the students developed their designs by doing group work for the later stages of the process (Figure 4).

Figure 4. Some of the individual student projects (Authors, 2019)

In order to give criticism to the projects carried out by the students in line with the emerging needs of the two phases; II. phase participants were invited to the TKNU architectural design studio as a jury, and they were criticized for developing mainly designed changing rooms, tribune and library designs. The designs were presented as technical drawings, models, three-dimensional modeling and animations. After the designs were developed by the students, a presentation was made to the phase II participants in the neighborhood, and as a result of the voting made by the participants, the sports field, changing room and tribune design, which is being built near the mukhtar's office, was selected for production (Figures 5, 6).

Figure 5. Jury and critics at university (Authors, 2019)

Figure 6. Jury and critics at the neighborhood coffeehouse (Authors, 2019)

4.3. Design Proposals

4.3.1. Changing Room and Tribune

In the design, a proposal was presented to meet the needs of the changing room and tribune, which are needed for the football field facility that is being built near the mukhtar's office in the neighborhood. It is suggested that the changing rooms and the tribune be positioned in the south direction of the field. In the project, the changing room produced with the earthbag method are 38 m2 and the whole structure is 70 m2. The height of the building is 3.2 meters. 10 wooden posts of 20 x 20 cm were used as the main carrier of the cabinet. In the masonry structure built with this technique, light tubes were placed between the earthen sacks on the south, east and west façades, mainly on the south façade, with the use of 1.5 liter waste plastic bottles, in order to ensure that the changing room receives natural light. In addition, 4 waste water pipes were wrapped with aluminum foil on their inner walls and it was aimed to reflect the light coming from the outside and provide light to the cabinet (Figures 7-13).

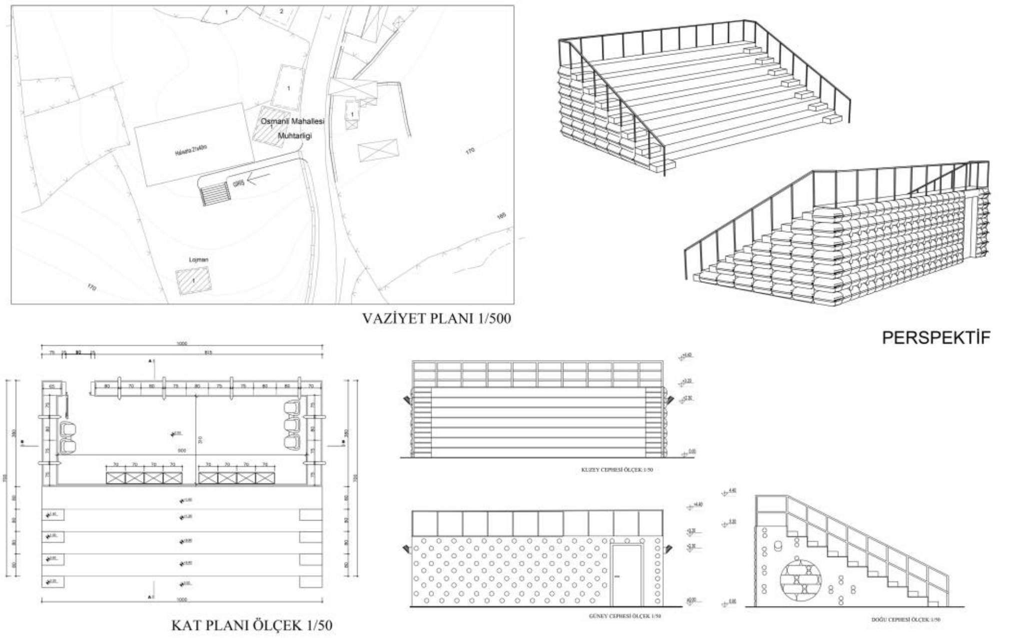


Figure 7. Layout plan, plan and views of the 7 x 10 m changing room and tribune designed with the earthbag technique

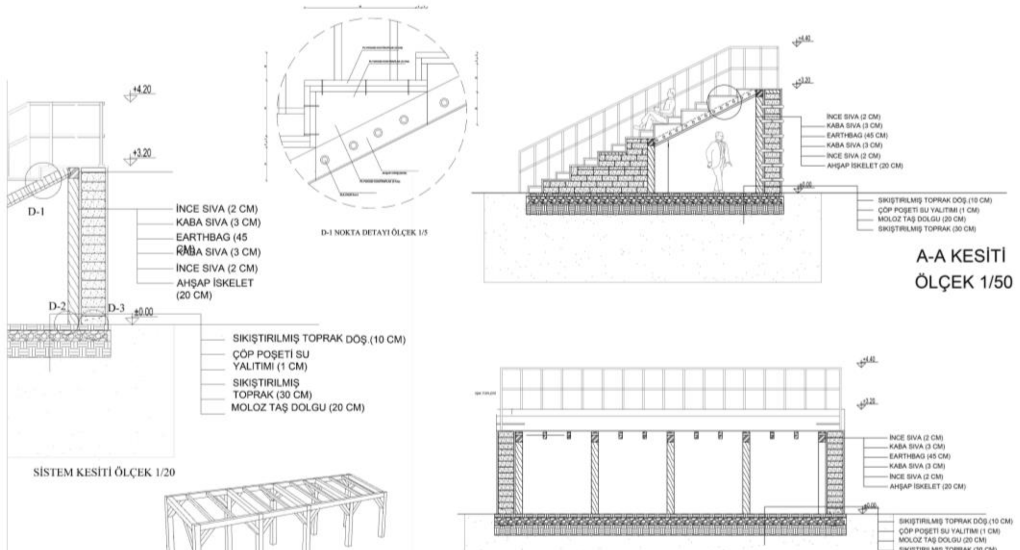


Figure 8. Changing room and tribune section and system details

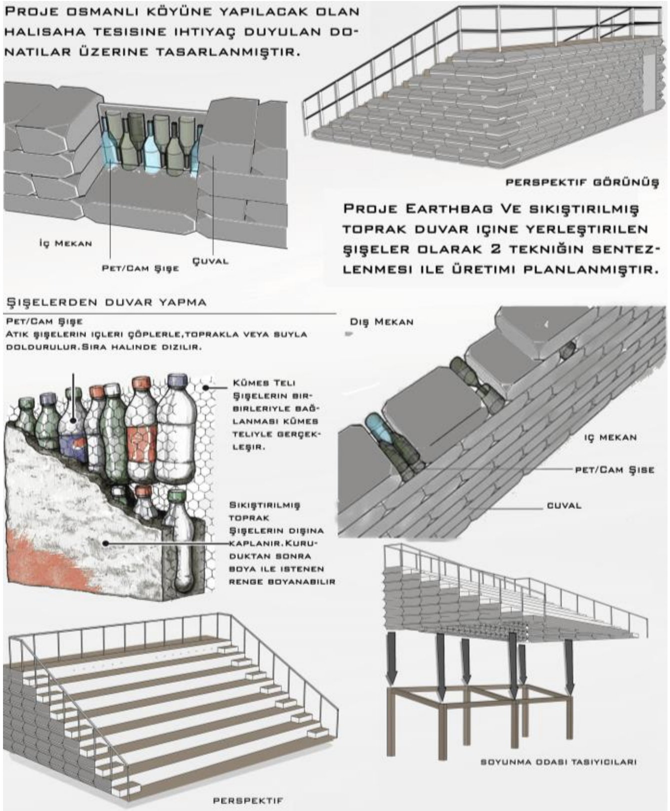


Figure 9. Changing room and tribune with earthbag technique and light tubes

Figure 10. Changing room and tribune perspective

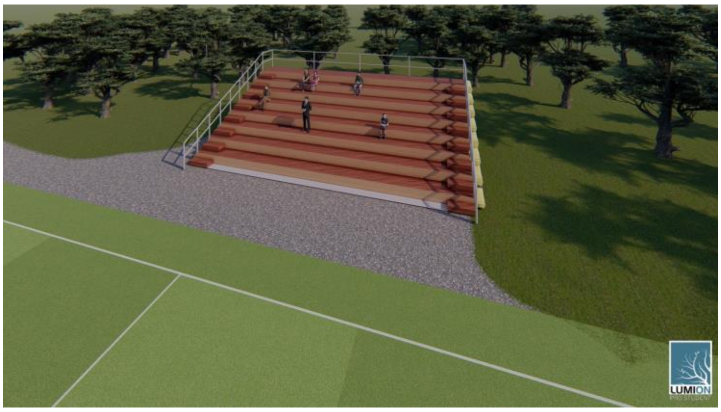


Figure 11. Changing room and tribune perspective

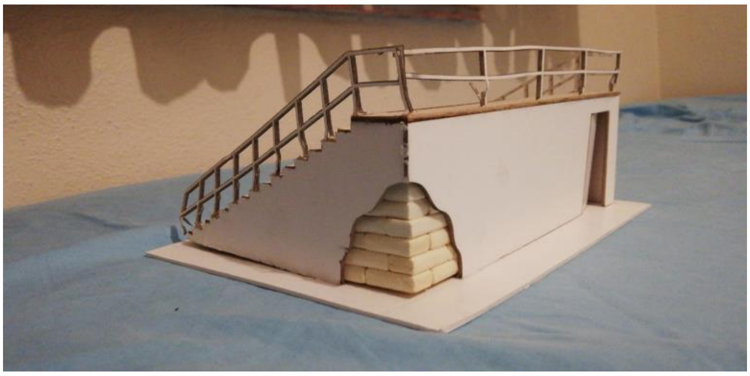


Figure 12. Changing room and tribune model

	MALZEME	MİKTAR	ÖZELLİKLER
	ÇUVAL	460 ADET	Kullanılan malzeme un çuvalına benzer polipropilen malzemeden üretilen tekstil çuvalıdır.
	KONTRAPLAK	30 ADET	Tribünün oturma alanlarında kontraplak kullanılmıştır.Kullanılan kontraplaklar inşaat atıklarından temin edilebilir.
	TOPRAK	22 m^3	Duvarlar earthbag tekniğiyle yapıldığından, çuvallar toprakla doldurulmuştur. Bir çuval yaklaşık 0,048 m^3 toprak almaktadır. Toplamda 22 m^3 toprak kullanılacaktır.
	5x10 Ahşap Dikme	30 ADET	Soyunma odasını ve tribünleri taşıyan iskeleti oluşturan ahşap dikmeler toplamda 3'er metrelik parçalardan elde edilecektir.
	Atık Su Borusu Dirsek Elemanı	2 ADET	İçi alüminyüm folyo kaplı dirsek boruları ışık tüpü işlevi görmektedir.
	Atık Su Borusu Çatal Elemanı	2 ADET	İçi alüminyüm folyo kaplı çatal boruları ışık tüpü işlevi görmektedir.
	Pet şişe 1,5 Litrelik	120 ADET	Pet şişeler çuvalların arasına sıkıştırılıp iç mekanın ışık almasını sağlar.

Figure 13. Waste materials used in the design

4.3.2. Changing Room

A 5,6 x 4 m changing room was designed to the north of the sports field and accessed by a ramp. In the design, 55 pieces of waste wood pallets with dimensions of 120 x 100 cm, waste wood timber with dimensions of 10 x 10 x 100/120/264/420/540/600 cm, polycarbonate boards serving as skylights, 11 pieces of 120 x 244 cm OSB boards, 10 pergola legs for mounting the structure on the floor, 6 x 10 cm wooden timbers for the roof frame and 1 door were used (Figures 14-19).

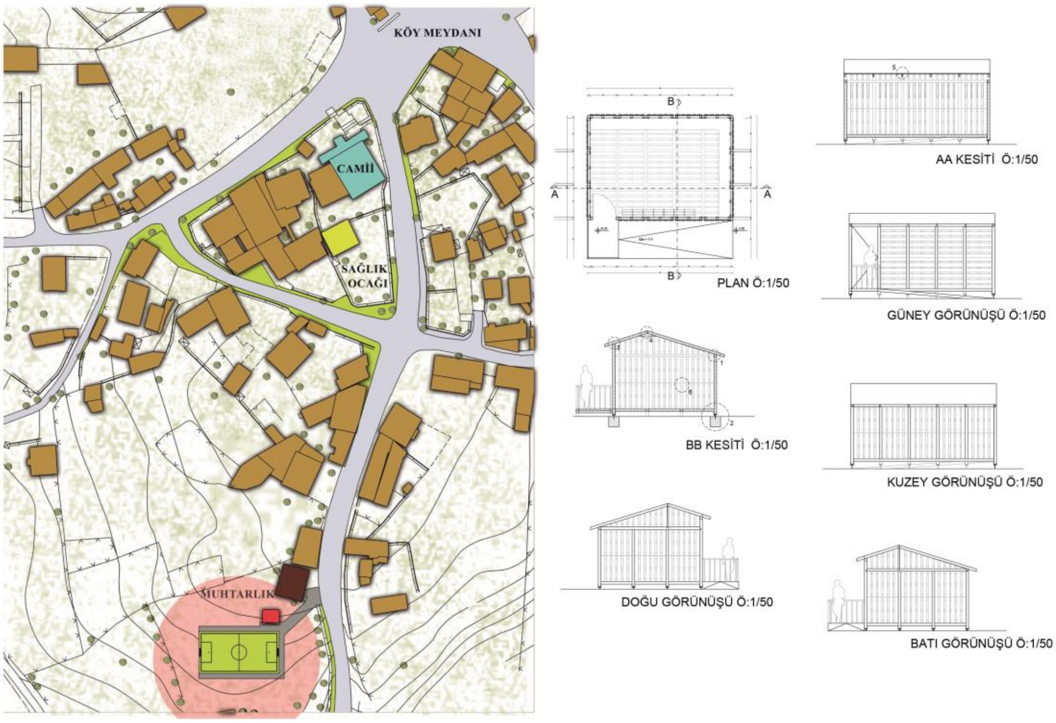


Figure 14. Changing room layout, plan, section and elevations

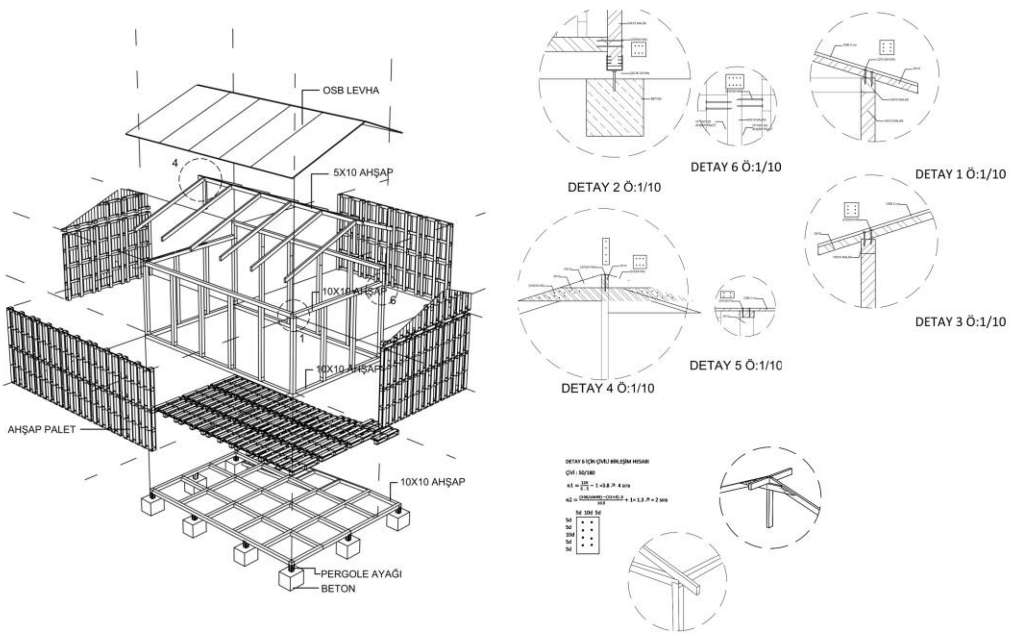


Figure 15. Changing room construction details

Figure 16. Changing room perspective

Figure 17. Approaching the changing room

Figure 18. Perspective from east view

Figure 19. Changing room model

4.3.3. Changing Room and Tribune

Located in the east-west direction next to the sports field in the design and built with the earthbag technique, the 6 m. in diameter and 3.7 m. Two alternatives of height were produced. One of the alternatives has been proposed as a wooden roof and the other as an earthen sack technique. The steps formed by placing the earth bags on top of each other also serve as a tribune (Figures 20-27).

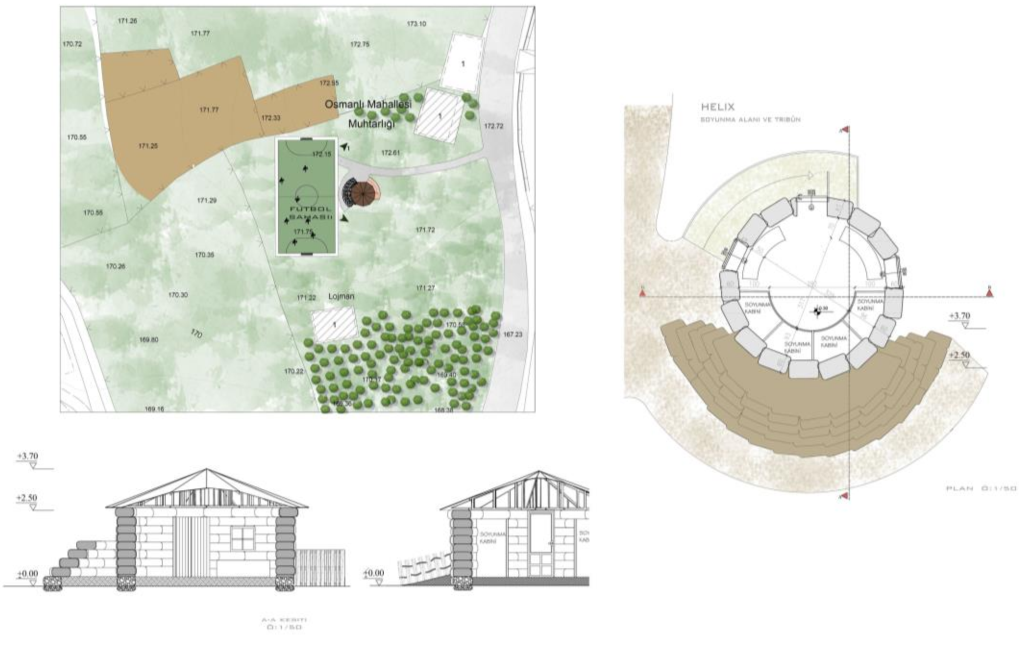


Figure 20. Changing room and tribune site plan, plan, section

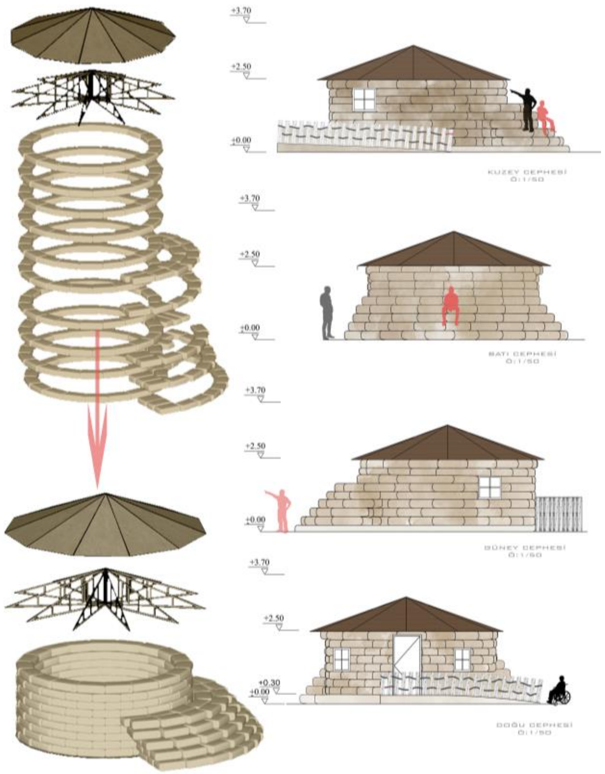


Figure 21. Alternative 1: View and perspective of the wooden roofed changing room and tribune

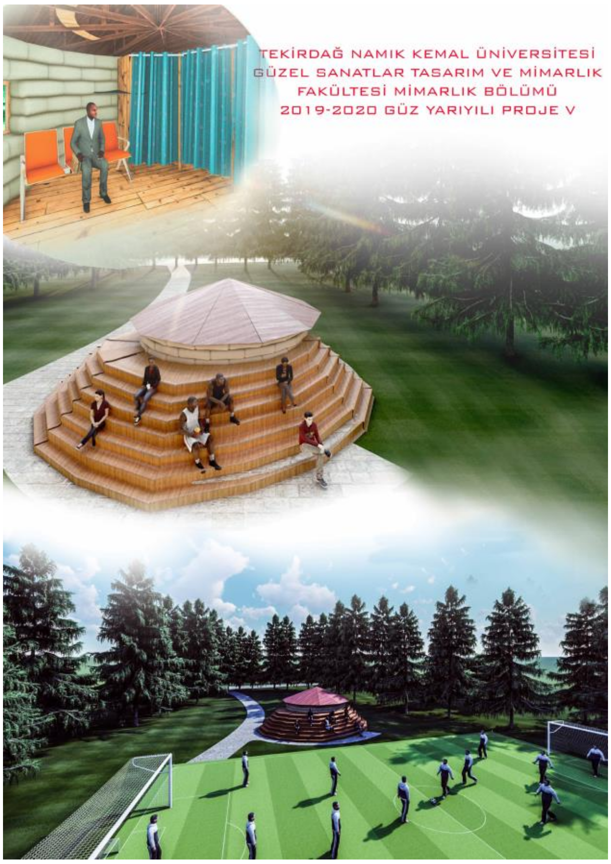
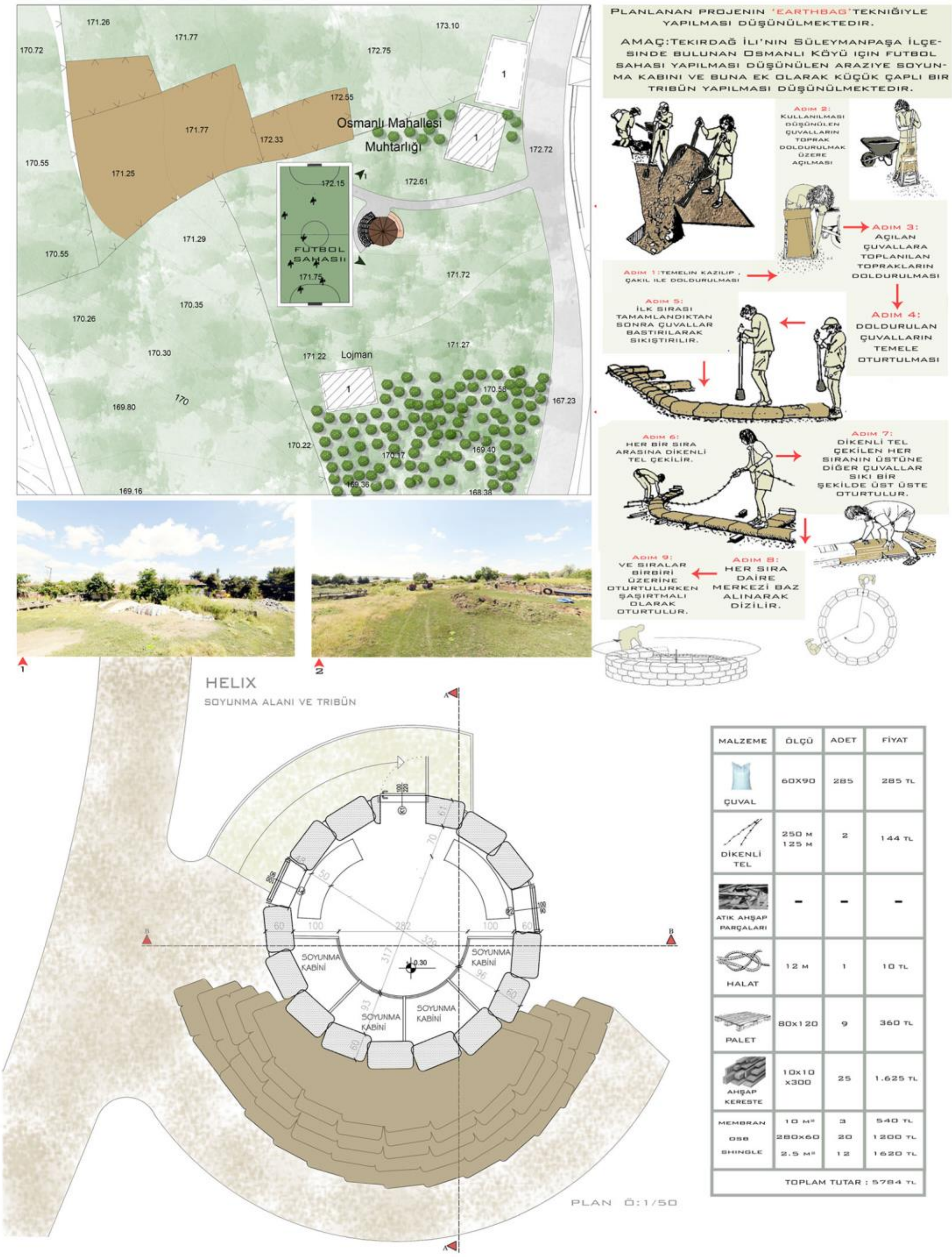


Figure 22. Alternative 1: 3D modeling

MALZEME	ÖLÇÜ	ADET
 ÇUVAL	60X90	285
 DİKENLİ TEL	250 M 125 M	2
 ATIK AHŞAP PARÇALARI	-	-
 HALAT	12 M	1
 PALET	80x120	9

Figure 23. Alternative 1: Waste materials used in the wooden-roofed changing room and tribune



MALZEME	ÖLÇÜ	ADET	FİYAT
ÇUVAL	60X90	285	285 TL
DİKENLİ TEL	250 M 125 M	2	144 TL
ATIK AHŞAP PARÇALARI	-	-	-
HALAT	12 M	1	10 TL
PALET	80x120	9	360 TL
AHŞAP KERESTE	10x10 x300	25	1.625 TL
MEMBRAN	10 M²	3	540 TL
OSB	280x60	20	1200 TL
SHINGLE	2.5 M²	12	1620 TL
TOPLAM TUTAR : 5784 TL			

Figure 24. Alternative 2: Earthbag-roofed changing room and tribune layout, plan and waste materials used

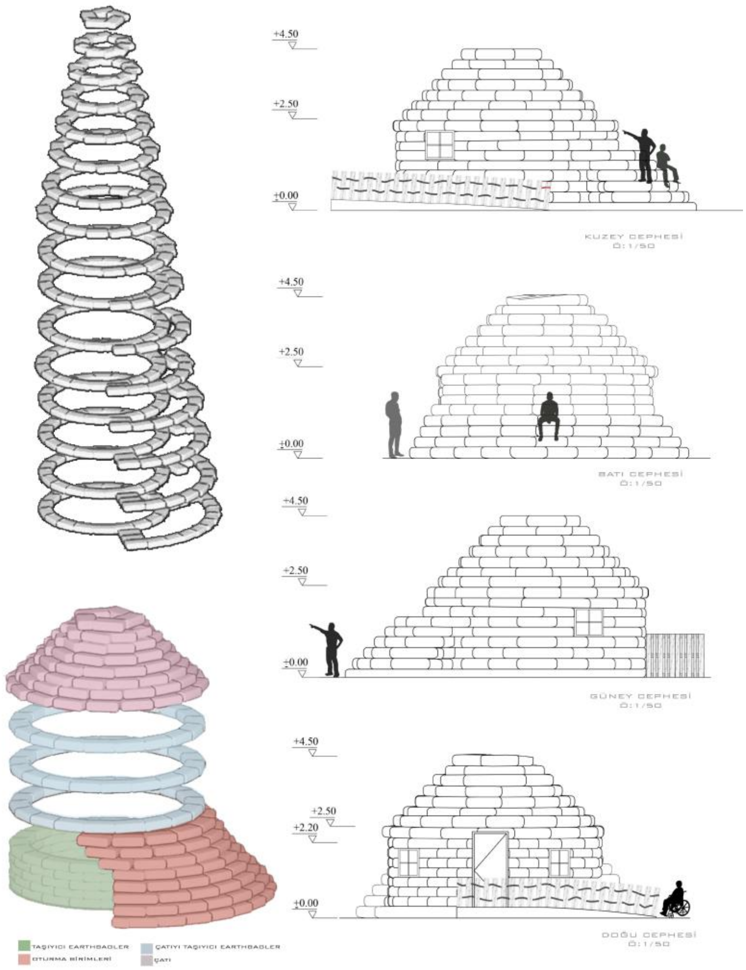


Figure 25. Alternative 2: Earthbag-roofed changing room and tribune elevation and perspective

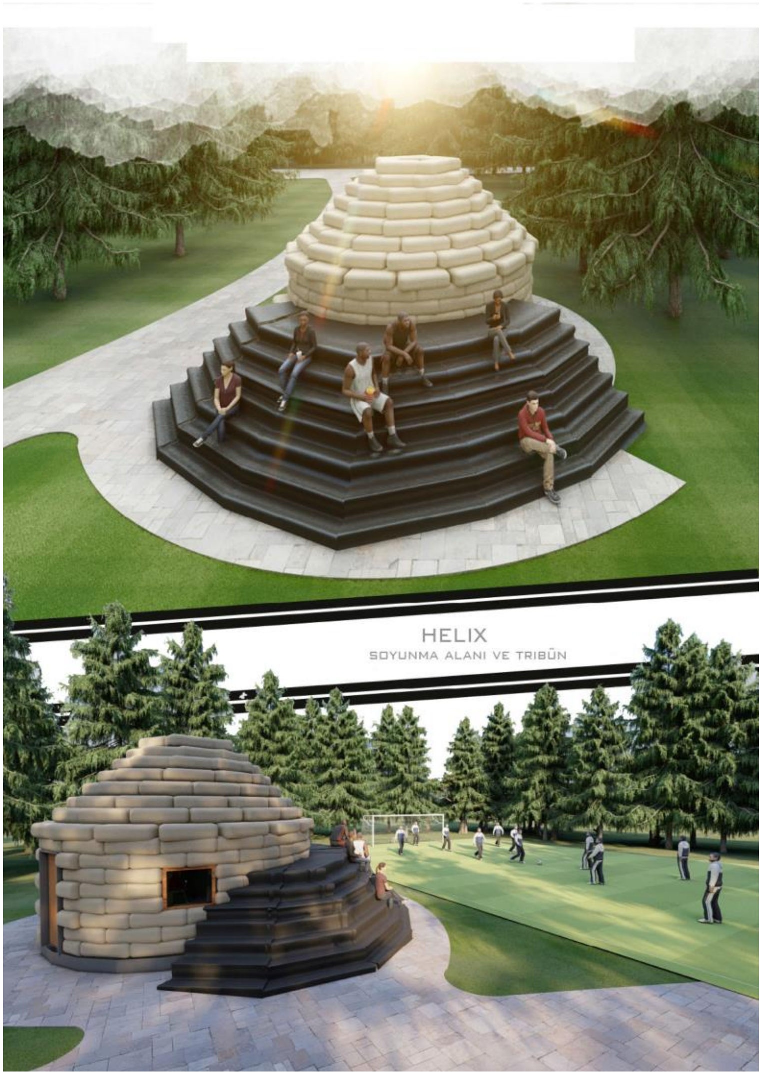


Figure 26. Alternative 2: Earthbag-roofed changing room and tribune perspective

Figure 27. Alternative 2: Earthbag-roofed changing room and tribune model

4.3.4. Library Building

The space, which is used as a library and gathering area in the neighborhood, is 8.58 m. in diameter, as a circular plan and with 4.35m height realized with earthbag technique. The place is located in the east-west direction within the existing lodging area, whose entrance area is close to the mukhtar's office.

Waste materials used in the building are; 50 m3 of rammed earth to be obtained from the site. Materials to be procured as waste from outside the neighborhood are; 384 pieces of linen sacks (60x90 cm); 120 pieces of car tires; 1800 pieces of waste cobblestone to be used in the foundation and sub-basement, and 80 m2 waste plywood/planks to be used in roof covering. The new materials to be supplied are; 30 wooden profiles for roof construction, 120 cm wide variable length 80 m2 compressed straw plate for roof insulation, spax chipboard screw 6,0 x 120 mm for roof joint or nails and enamel stove pipes for heating in the library which is required to remove the gases released as a result of the burning fuel of the stove recommended to be used for heating purposes from the building (Figures 28-31).

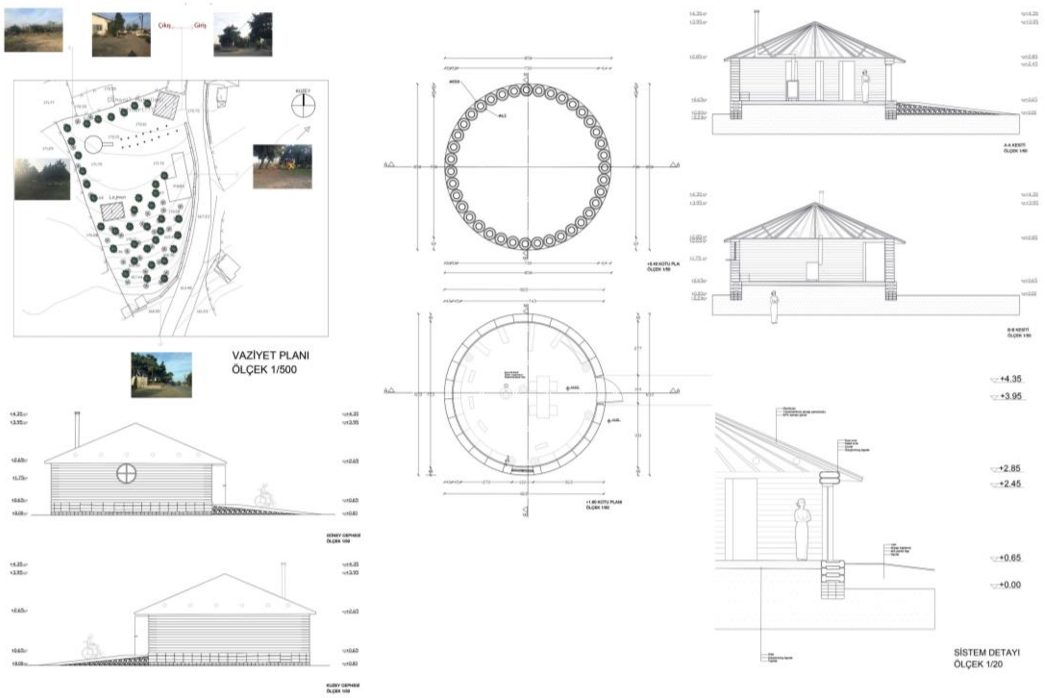


Figure 28. Library site plan, plan, section, elevation and system section

Figure 29. Library interior modeling

Figure 30. Library interior modeling

Figure 31. Library interior modeling

4.3.5. Library Building

The design is a meeting place with a hexagonal plan scheme with a floor area of 88 m2 and a height of about 4 meters for various events and activities for different functions. The venue is located in the lodging area near the mukhtar's office, with the entrance direction to the east. The hexagonal plan scheme was preferred due to factors such as creating large and functional areas, providing strength and the strength of wooden pallets. The building, which is designed as closed and semi-open areas, is supported by roof sheds on the west and northwest facades to protect it from the prevailing winds. The design proposes to use 80 x 120 cm euro pallets as waste material on the walls and floors of the building, and plywood sheets on the roof. A total of 146 pallets, 54 metal corner joint profiles and 60 pallet joint profiles were used in the building (Figures 32-40).

Figure 32. Library building site plan, plan and elevations

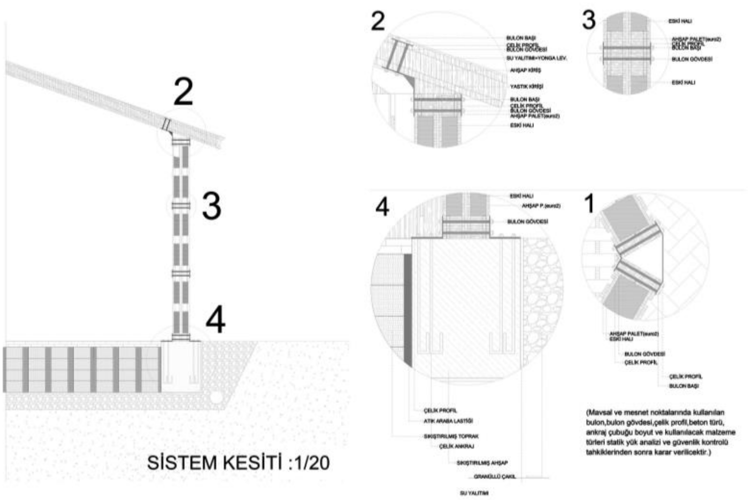


Figure 33. Library building system section and point details

Figure 34. Exterior view of the library building

Figure 35. Exterior view of the library building

Figure 36. A detail from the exterior of the library building

Figure 37. A view from the interior of the library building

Figure 38. Interior of the library building

Figure 39. Library building roof detail

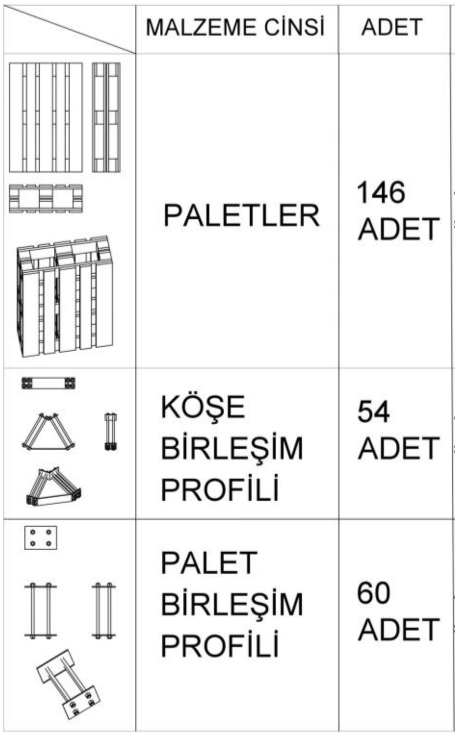


Figure 40. Waste materials used in the building

5. Conclusion

In this study, urban participation and co-design practices were realized in an interactive way between students and Osmanlı neighborhood households in order to raise awareness about environmental awareness and waste. The study process provided positive experiences for students in areas such as learning by doing and learning together in design, from a pedagogical point of view, both in terms of planning and organization, and making decisions by seeing in the field and together with the participants. Students also developed awareness of where materials come from during the design process.

Efforts to raise awareness of citizen's as much as local governments have an important place in waste recycling. However, if awareness studies are integrated with participation-based processes, they will yield more efficient results. In this context, this study emerges as an example of the role-sharing of participants and designers in dealing with environmental awareness with democratic approaches.

Although the production phase of the study could not be realized due to the Covid-19 pandemic, it gained experience in the evaluation of local materials as waste and where the materials recommended in the design came from and their raw materials. At the same time, he became aware of the labor and collective cooperation and coordination spent at many stages in transforming materials and components into structures. The study also provided an enriching and instructive experience in the context of concepts such as interaction with the user, ambiguity and uncertainty in the field.

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The POTENTIAL PLACE of GEOTOURISM in EDUCATIONAL TOURISM in TURKEY and THE EMERGING ASPECTS of RURAL DEVELOPMENT

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Abstract

Developing countries, which were influenced by neoliberal policies until 2002, have a significant impact on the physical and social cultural environment due to the rapidly developing movements in tourism, they did not consider the resulting pressure and they are focused on economic return.

However, the increase in the level of education and culture of people has also created significant changes in the structure of tourism. Some of the current practices that develop ecotourism in a sustainable structure with its economic, ecological, and social cultural dimensions are also the subject of this study.

Geotourism is also an important form of tourism that takes place in areas sensitive to ecological approaches. We can consider geotourism as an educational tourism, in this sense, the geography of Turkey is also located in a potential region.

The study is an effort to question the possibilities of rural development in Turkey through geotourism-oriented education. In addition, it aims to trace the dynamics of rural development from the past in the footsteps of rural sociology in our country through villages with geologically valuable natural settlements selected from the rural fields.

Keywords: Protected Areas, Rural Planning, Mountains, National Parks.

1. INTRODUCTION

Developing countries, which were influenced by neoliberal policies until 2002, have a significant impact on the physical and social cultural environment due to the rapidly developing movements in tourism, they did not consider the resulting pressure and they are focused on economic return.

Mass tourism has left its place to individual tourism over time. Ecotourism has been the only tourism movement that is widely accepted to ensure planned and controlled development and renews itself compared to other types of tourism (Demir, Çevirgen, 2006).

The legal foundations of the protection reflex began to be laid with the Early Republican Period. With the 1950s, it seems that it started to develop and protection areas with different statuses were declared, and protection plans started to be made.

In Turkey, it is seen that the term "National Park" is included in the Environmental Legislation together with the Forest Law. At that time, 35 areas with natural, historical, and archaeological values, natural plant communities, ornithological, geological, and geomorphological features have been taken into the status of National Park until today.

2.MATERIAL VE METHOD

Some of the current practices that develop ecotourism in a sustainable structure with its economic, ecological, and social cultural dimensions are also the subject of this study.

The study is an effort to question the possibilities of rural development in Turkey through geotourism-oriented education. In addition, it aims to trace the dynamics of rural development from the past in the footsteps of rural sociology in our country through villages with geologically valuable natural settlements selected from the rural fields.

The study, in fact, takes an educational approach that draws lessons from what has been experienced in the sensitive mountainous rural areas of Turkey in the last 25 years. For this purpose, the "melt to non-existent method" was used in the study.

3.FINDINGS

The subject has been examined through some sub-titles: Site definitions, Geoheritage, Geotourism and Geotourist, the prominent aspects of geotourism in rural development, a field example from Turkey (Kaçkar Mountains National Park).

It is investigated whether healthy ties can be established with geotourism in rural life through some selected field examples.

3.1.Site types

The sites are referred to as different groups as below. The number of protected areas in our country as of 2004 is also given in the table (Table 1).

Table 1. Site types and general scopes

Site types	Sites (#)	Scope
Urban site	188	It refers to human-made artifacts and the places where these artifacts are found.
Historical site	125	
Archaeological site	5278	
Natural site	831	It refers to areas that need to be protected and immovable natural assets, which have interesting features and beauties and are rare.

Source. The numbers of protected areas in our country are reported in the relevant sources. The table is derived from these sources (Anonymous, 2003).

Apart from these definitions, there is also a definition for "immovable natural property" as follows:

"Immovables belonging to geological, prehistoric and historical periods and which need to be protected because of their rarity or their properties and beauties, which are above ground, underground or underwater"

It should also be noted that this definition has a similarity with the "monument of nature".

The geological structure, which is one of the factors affecting the natural landscape, can have very different heterogeneous features in each region.

3.2.Geoheritage

The long journey of mankind on the planet has reached a very destructive point since the second half of the last century. Despite the destructive effect of man on the world, heritage geographies are areas that have survived by resisting this.

In addition to world-wide important areas in terms of natural life, places with unique geological, archaeological, historical, and cultural characteristics can be defined as heritage geography (Green Atlas Magazine, 2003). The gradual enlargement of human footprints in nature, along with the geography's unique physiognomy, is rapidly destroying very special landforms.

This extinction also means the disappearance of the history of the Earth, which is called the biological sphere. The work to protect the geological heritage first started in 1991 with the "Geological Heritage Conservation Symposium" held in Digne, France. Founded in Turkey in 1999, JEMIRKO (Geological Heritage Preservation Association) has started to take out the geological heritage inventory of our country.

3.3.Geotourism ve Geotourist

Geotourism is also an important form of tourism that takes place in areas sensitive to ecological approaches. However, in recent years, stone and mine quarries have been an important threat area. Therefore, considering the "industrial" reasons, urgent measures should be taken to protect the sensitive "geological areas" and the rare geo-heritage.

It will be seen that geotourists, like ecotourists, increase over time and geotourist initiative groups take place in tourism (Picture 1).

Picture 1. Visitors in the geological rock garden (Stenenpad) in Kattevennen (Genk), one of the gates of the Hoge Kempen National Park (photo Robert Croes) (DREESEN, 2012).

In fact, many examples that have gained worldwide value and recognition can be given, but first, attempts to create a global strategic idea for the protection of such "geological areas" should be supported and further developed without delay.

As scientific studies on Geotourism/Geopark/Geoheritage increase, other educational and supportive studies such as visualization and virtual animation of areas are also increasing. There are also civil society initiatives aimed at these.

3.4. Potential place of geotourism in education tourism in Turkey

Geological interest is also highly related to biological, historical, and cultural elements. Due to the interdisciplinary aspects, the richness of the educational dimension is a reality. For this reason, geotourism can also be counted among educational tourism, in the first place, in this sense, it can be easily seen that the geography of Turkey is in a very potential region.

3.5. The prominent aspects of geotourism in rural development

In terms of development through planning, the weaknesses stated below should be developed as stated in the final declaration of the relevant symposium. Articles with direct participation (4th-10th art.) are as in the source. The first 3 items to be emphasized are primarily stated below:

1. Examining the existing laws on nature protection, preparing, and enacting a comprehensive PROTECTED AREAS LAW, which is contemporary and includes all the principles of nature protection (but does not create contradictions in the legislation), suitable for the conditions of our country,

2. Establishment of a "Protected Areas Network" (real and virtual, even in 2/3 dimensional environments separately) representing all ecological and biological differences of our country,

3. Making "Long Term Development Plans" and "Management Plans" in line with the international principles regarding the fields, and the implementation of the ones made and approved in accordance with these principles (with strict penal sanctions) in the field,

The other articles (4th-10th art.) in the Concluding Statement, which include approaches that strengthen the starting point of this study, will also be discussed in detail by expanding the application study, as well as being the subject of the article study.

UDGP includes processes that can be downloaded both to young people as a voluntary educational process and to local people with its mandatory aspects.

3.6. A Field Example from Turkey

A National Park was highlighted in the fieldwork. First, it is necessary to include the relationship of National Parks with planning. It is obligatory to plan in the areas declared as National Parks and similar natural protection areas within the scope of the relevant law (Long Term Development Plan). Some areas that need to be determined with priority, areas with geological inconveniences and areas with geological importance are of particular importance.

Kaçkar Mountains National Park has been chosen as an example where geological features come together. Based on the effects on the existing land uses and natural resource values in the parks, traces of geotourism awareness and development dynamics in the park area have been examined. The National Park is one of the important rural settlements. The region was visited on a field trip with mountaineers in 1995 and frequent meetings were held with the villagers. However, it has been observed that the environmental polluting relations between the ongoing daily life in rural settlements in the park and the natural and cultural resources of the park continue. Through these observations in the park area, it is seen that tourism has increased in the region in a continuous consumption-oriented way. Moreover, it is understood once again from the literature that the awareness of geotourism is still not formed.

4.CONCLUSION

The study explores rural development opportunities in Turkey through geotourism-oriented education. As the visibility of natural destructions caused by environmental insensitivity in the past increases, it is expected that lessons will be learned from lack of education.

In the footsteps of rural sociology in our country, it has tried to trace the traces of rural development dynamics from the past through the settlements in some geologically valuable natural protected areas selected from the rural area.

The assumption in the study tests the long-term field research results over the selected National Park together with the literature.

Kaçkar Mountains National Park has been exposed to human-induced destruction since 1995 with the increasing tourism effect (Kurdoğlu, Ç. Kurdoğlu, Şen, 2005). The relationship with the residential areas in this National Park was reviewed comparatively in 1995, together with the literature reflecting from local contacts to the present.

The life in the rural settlements in the National Park was observed and studied in the field, primarily as physical and then socio-cultural relations between the natural and cultural resources of the park. It is understood that healthy ties with geotourism have not yet been established through these relations.

Therefore, as one writer said, in Anatolia; Much more comprehensive protection systems can be created that connect the protected areas where people live, areas with cultural values and natural reserve areas or National Parks (Güneş, 2005).

The Concluding Declaration of the Protected Areas Symposium also illuminates our day with its suggestions. General details are also given in the relevant section (3.5).

The study should also briefly emphasize the differences between the diversified tourism types within the framework of today's sustainable tourism understanding. It is delayed for the awareness of geotourism. However, with the Anatolian mountains, it has preserved its vitality and abundance until today.

When the assumption that geotourism awareness can create an effect as true and real as the invisible real effect of ecotourism is tested, it is understood that this could not be achieved through the selected sample. While it is expected that people can establish much healthier relationships with nature through geotourism, the current situation shows that they are acting in the opposite direction.

Moreover, although this reality is extremely clear, nothing is being done. Educational approaches that realize the use and management of natural resources together with the local people should also be considered. Scientific studies on geotourism should be increased. Examples of foreign countries related to geotourism, geoparks, geoheritage and geosites can be examined.

Within the scope of the National Parks Law No. 2873, in the titles of the Long-Term Development Plan (UDGP), which is obligatory to be made in the areas declared as National Parks and similar natural protection areas, geologically inconvenient areas and areas of geological importance are also specifically specified.

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THE IMPORTANCE OF GREEN SPACES IN DISASTER MANAGEMENT

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Abstract

Green spaces exert numerous benefits including improving the ecological environment, meeting recreational needs, providing socialization, protecting and improving physical and mental health, adding aesthetic benefits, providing a workforce, and increasing the property value of a building. Furthermore, it is one of the factors that have been emphasized in recent years that it makes important contributions to disaster management. Disasters that seem natural disasters but mostly caused by the misuse of nature, such as floods, erosion, forest fires increasing in number and severity especially due to climate change, threaten our lives. Green spaces are of vital importance in reducing and even preventing disasters. However, contrary to classical approaches, in the area selection and design of urban green spaces, it should be handled with different approaches by considering both adaptations to climate change and disaster management. As Turkey is a country in the northern hemisphere mid-latitude, it is among the countries that will be greatly affected by climate change. Moreover, in recent years, Turkey unfortunately dramatically experienced such disasters related to this situation. However, there is a lack of approach and practice in planning green spaces, especially urban green spaces, for climate change adaptation and mitigation in Turkey.

In this study, the examples of urban green spaces that have been realized for adaptation to climate change and disaster management on a global and local scale will be discussed. Also, it is aimed that the study will provide ideas and contributions on how urban green spaces should be handled in disaster management.

Key Words: adaptation, climate change, mitigation, urban green space

1. INTRODUCTION

Awareness of the disasters caused by climate change in the international arena has gained momentum after the 4th Intergovernmental Panel on Climate Change (IPCC) initiated by the United Nations (UN) shared its report with the public in 2007. It has been accepted that the climate crisis has arrived and the reason for this was not only natural global warming but also climate change caused by human activities (Akay, 2019). The effects of climate change on nature and people are first experienced in cities (Kabish et al., 2017). It has been emphasized that cities are the areas that most affect climate change and are also the most affected by climate change (Otto et al., 2021; Cortekar et al., 2016). Due to climate change, the rate of so-called natural disasters worldwide has almost quadrupled in the last 30 years, resulting in increased losses of life and property (Wamsler et al., 2013). Especially in recent years, major floods, droughts, an increasing number of forest fires in Europe, and devastating hurricanes in America reveal the extent to which natural disasters have come in terms of number, scale, and economic impact. (2014-2023 Roadmap Document for Climate Change and Related Disasters (AFAD, 2014). Since climate change is the source of many dangers that threaten long-term development actions, consensus, and a planning approach linking development to disaster should take climate change into consideration (O'Brien et al., 2006).

The WWF states that, with the behaviors that have emerged since we entered the Anthropocene era (the Human Age after the Halocene), we need 1.6 times the current area of Earth. Especially clean air and clean water are the two most important values for the protection of the ecosystem (Erdem, 2021). Access to clean air and clean water requires living in harmony with nature. In spite of the technological and scientific advances, we are still dependent on this natural life support system (Asraf and Hanafiaf, 2019). The decrease in green areas is directly related to the increasing trend of natural disasters (Khoshtaria and Chachava, 2017). Urban green space systems play important roles in improving the ecological environment and the diversity of the urban landscape. Also, it helps to prevent and reduce disasters (Jayakody et al., 2018). Green spaces have become an important component of the United Nations Development Program's (UNDP) efforts to develop comprehensive preparation plans and strategies for disaster preparedness and to promote disaster reduction activities in the context of development planning and implementation (Fan et al. 2012).

The present study presents examples of urban green areas realized for adaptation to climate change and disaster management on a global and local scale and aimed to provide ideas and contributions on how urban green areas should be handled in disaster management.

2. GREEN AREAS IN DISASTER MANAGEMENT

The geographical expansion of urban areas has resulted in the fragmentation and isolation of urban green spaces from rural green spaces. Also, land use and land cover changes have negatively affected the original biodiversity in urban areas (Niemala et al., 2010). All these negative effects of rapid urbanization, inadequate resource management, settlements developing in vulnerable areas, lack of capacity increase the risk of disasters in cities, making urban residents particularly vulnerable to rising sea levels, earthquakes, floods, drought, and very high air temperatures (Jayakody, et al., 2018; Baker, 2012). While green areas are normally designed to add aesthetic value to the urban environment, to meet the recreational needs of the city residents, and because of the benefits such as clean air, health and economic contribution, the planning of urban green areas has gained a novel aspect with the effects of global climate change that are being increasingly felt (Sancheza et al., 2018). The most common urban adaptation measures against the effects of climate change aim to reduce the risk of floods, landslides, extreme temperatures, urban drought, and urban heat island effect, and improve the water management of cities by addressing the link between the urban fabric and related environmental factors (Wamsler et al., 2013). It has been stated that green spaces are a cost-effective tool in adaptation to climate change (Govindarajulu, 2014). Accordingly, nature-based solutions that imitate nature and are compatible with nature are applied in the planning of green areas in the urban environment. Such applications can be applied at different scales and places in and around the city. Examples of applications of nature-based solution experiences in different geographies, different countries, different places, and scales have become increasingly popular.

Urban Forest: Urban forests are green textures found naturally in and around the city or artificially established and integrated with the city with their aesthetic and functional effects (Kiper and Öztürk, 2011). Most importantly, urban forests have great potential to reduce the urban heat island effect and air pollution and to retain rainwater. By controlling precipitation, it allows rainwater to pass into the soil and reduces the risk of flooding.

It also cleans the soil, stores carbon, regulates water cycles, improve air and water quality, and supports biodiversity (World Bank, 2021).

Rainforest rehabilitation project in Salvador, the first capital city of Brazil, is one of the projects implemented to adapt to the disasters caused by climate change. In this context, rainforest-specific plants were produced and distributed to the public to improve the fragmented and scattered rainforests in the city as a result of urbanization, and planting activities were carried out with the local government and the public. Also, information boards regarding the species living in these forests were placed in various public spaces in the city. With this project, a protected area of 19 km^2 was created in the city, corresponding to 30 m^2 of green space per person (WWF, 2021). The 2012-2022 Strategic Forest Management Plan of the Canadian city of Toronto, it is aimed to increase the tree-covered surface of the city by 40%. Since 2013, 100,000 trees have been planted annually in public spaces, and it was aimed to increase this number to 300,000 per year (World Bank, 2021). Planting trees on a large scale is one of the most effective and least expensive ways to reduce greenhouse gas emissions (URL 1).

Urban Wetlands: By their very nature, wetlands act as buffers against floods as they are overflow areas of rivers. However, urbanization and the resulting increased water use reduce the groundwater level, putting pressure on wetlands (URL 2).

Countries that are party to the Ramsar Convention adopted Wetland City Accreditation in 2015, a voluntary program to encourage cities to protect urban wetlands (URL 3). This accreditation aims to protect, restore and wisely use wetlands in the urban and urban environment, as well as further promoting sustainable socio-economic benefits for the local population (URL 4).

Floods in the Czech city of Pilsen are one of the most important threats to the city related to climate change. There were seven major floods between 2002 and 2014. To find a solution to this problem, a small-scale nature-based application was carried out in the city. The project, which was carried out in the idle areas near the river, aimed to reduce the flood flow rates with a nature-based measure, to increase the aesthetic value of the area, and to create a recreation area. Four wetlands with water retention potential were created in the area. The park, which is open to the residents for daily use, offers flood prevention, education, and recreation functions (Macháč and Louda, 2019). The Australian city of Orange provides a new urban habitat, and, at the same time, several treatment wetlands have been built in the city to slow the runoff and treat stormwater. Treated rainwater also supplies 29% of the city's drinking water demand (Stefanakis, 2019).

Urban Agricultural Areas: Although the concept of urban agriculture is defined as the type of agricultural activity carried out by the people in the city, in fact, a type of economic activity which is carried out in and around the city, providing high productivity and employment, and ensuring that the residents of the city reach healthy food reliably and uninterruptedly, and contrary to the popular belief, the economic return is very high (Kapan and Öztoprak, 2020). Urban agriculture also contributes to the formation of clean air, moisture loss from the soil, and balancing the urban climate by enabling the greening of unused and idle lands for production purposes. Also, thanks to the livestock activities that will develop with urban agriculture, it will be possible to form integrated ecosystems that can work with the city or at least will not threaten the existence of the city. The green areas that will develop accordingly will be combined with the continuity of the agricultural area outside the city and will help the urban-rural integration through green and blue corridors (Kayasü et al., 2020). In recent years, there has been an increasing interest in roof gardens in urban agriculture. Roof gardens are widely adopted in North America, while it is also spreading in Europe and Asia (Buehler and Junge, 2016).

In 2017, Boston Medical Center started operating a 2658-m^2-farm on the roof terrace to provide fresh and healthy products to the hospital kitchen. The product variety is over 25 and produces honey in two hives. This roof garden additionally reduces the hospital's carbon footprint (URL 5). Roof farming is also a climate change response. Because insulation reduces the electricity needed to heat or cool the building (URL 6).

Another example of urban agriculture can be given from Dortmund, Germany. An area of approximately 3000 m^2 of the St. Urbanus Church was used very little, left neglected, and became unusable over time. Then, it was aimed to create a food forest consisting of edible plants in this area. In addition to the contribution of food production and biodiversity, the garden where permaculture practices are carried out has allowed solidarity and communication between people. Also, it has the potential to lead to behavioral changes aimed to protect the environment and reduce the effects of climate change. The environmental contributions of this project include controlling precipitation and improving water quality by filtering and storing water, reducing wind speed, improving air quality, and reducing the risk of droughts (URL 7).

3. PARKS, GREEN ROOFS AND FACADES

Green spaces differ in terms of their spatial extent and features. It can range from a small pocket park to an urban park (World Bank, 2021). Nature-based solutions such as green roofs, green walls, rain gardens, street trees, and other urban green infrastructure provide a wide range of benefits when designed in an integrative and inclusive way (Enzi et al., 2017).

A new sustainable drainage park was established in July 2020 in Manchester, England. Unlike typical parks that stand out with their recreational and aesthetic functions, the park primarily aims to combat the effects of climate change and reduce floods caused by rainwater. The Park was particularly designed to manage rain runoffs. Roads and hard surfaces are covered with permeable pavement that allows rainwater to infiltrate. Also, this design allows the rainwater to fill the pools and absorb the water, and the remaining excess water to be directed to the rain gardens where natural vegetation is used. During very severe storms, the water that cannot be absorbed by the soil and vegetation is retained through a "v" shaped channel and then used to irrigate trees and plants. This project also provides measurable evidence on how green infrastructure can combat the effects of climate change. The University of Manchester will examine how effective the park is in mitigating flooding and how people use the space over the next five years (URL 8).

Green roofs and facades capture and store rainwater, thereby controlling the amount and velocity of runoffs and reducing the load on sewer systems. It also supports urban biodiversity, reduces air pollution, and reduces the effects of drought by promoting the reuse of water stored on rooftops. Two 80- and 112-meter-high buildings in Milan, Italy, are covered with dense vegetation. These designs aim to reduce the effects of climate change with a different nature-based solution by covering this 84 ha area with green tissue. With this project, the urban heat island effect has been reduced. Also, there is a 3 ^{o}C-decrease in the building during the summer months, a 7.5% reduction in annual energy consumption. It has also contributed to a 30% reduction in urban pollution (WWF, 2021).

Switzerland, Austria, and Germany have the highest number of green roofs. Considering that they are the first countries to adopt policies regarding green roofs, this is an expected outcome (Grant and Gedge, 2019). The Swiss city of Basel has the title of the city with the greenest roofs per capita (5.71 m^2/person) in the world. Initiatives to create green roofs in Basel were initially carried out with the aim of energy saving, then these initiatives were aimed to form to support biodiversity. In 2010, a regulation was enacted that obliges all flat-roofed buildings to be restored and newly constructed flat-roofed buildings to have roof gardens. These roof gardens are also expected to reduce the effects of climate change (URL 9).

Green Corridors: Green corridors in cities are linear areas covered with trees and plants that connect other green and open spaces to form a green urban network. Although a significant part of these areas is for recreation or nature protection, some of them were planned to cover both. It provides recreational green roads, walking, cycling paths, organized sports fields, and areas for group activities. Also, it follows natural corridors such as green roads, rivers, lakesides, and ridges that can interact with each other, as well as connect with historical and cultural objects (Arslan, 2017).

Passeig de Sant Joan', completed in 2015 in Barcelona, Spain, is a 1.2 km-long green corridor connecting the area to another park. It aims to increase ecological and social connections within the city. With the new version of the area, vehicle usage has been reduced and an increase has been provided to bicycle and pedestrian access. Also, shopping venues in the vicinity has both vitalized trade and turned into a place that attracts local people and tourists. The semi-permeable slabs used in the area allow water to infiltrate into the ground and support the prevention of floods by providing precipitation control. On the other hand, double-row road afforestation in addition to the monumental trees in the area is expected to contribute to reducing the carbon storage and urban heat island effect (URL 10). Green belts also act as a buffer that prevents the increase of urban area by strategically connecting the areas around the city with high ecological and landscape value with ecological-recreational corridors.

An example of such a practice can be given from Spain. The Vitoria-Gasteiz Green Belt is a 731-hectare semi-natural area located around the city. This green belt is of importance with its contribution to the protection and improvement of biodiversity and landscape, as well as the prevention of floods in the city center and the regulation of the hydrological cycle. Also, its other contributions are that it allows recreational use and environmental education, which brings the citizens together with nature (Environmental Studies Center Vitoria-Gasteiz City Council, 2014).

4. EXAMPLES FROM TURKEY

There are not many examples of nature-based applications on large scales in Turkey, however, the applications realized in some cities are promising. On the other hand, Arslantas et al. (2020) presented the Eskişehir Porsuk Stream Rehabilitation project, a green corridor from Turkey, and the Gaziantep Allaben Class Green corridor as examples in their study, which included good practices for green infrastructure and nature-based solutions in cities. İzmir Green Infrastructure Strategy and Implementation Process is among the good examples in urban applications. While the neighborhood garden in Çankaya District of Ankara sets an example for urban agricultural practices, İsmet İnönü Park in Ankara is a prominent example of good practices as an Open Green area.

The Porsuk River in Eskişehir divides the city into two. Porsuk River, which was also used as a recreational area by the citizens in the first half of the 20th century, has been heavily polluted due to the increase in industrial activities, the discharge of untreated wastewater into the river, rapid urbanization, the transport of fertilizers and pesticides from agricultural practices to the groundwater (upstream of the Porsuk River) and its ecosystem had been severely degraded. The Organization for Security and Co-operation in Europe (OSCE) defines the river as one of the extremely dangerous rivers in terms of pollution and health, where no living things other than viruses can live. Within the scope of the 'Eskişehir Urban Development Project', a project for ecological restoration of the river was implemented between 2003 and 2009 aiming at the improvement of water quality and increasing the city's resistance to natural disasters (URL 11). As a result of the project, green areas were created almost uninterruptedly with the efforts of protecting, repairing, and recreating the existing vegetation on both sides along the coast of approximately 10 km length of the river, and the continuity of the green corridor was ensured (Arslantaş et al., 2020). Today, the Porsuk River has become a place that the people of the city use recreationally. Also, the river hosts aquatic life and wildlife again (URL 12).

İzmir Green Infrastructure Strategy is a project supported under the Horizon 2020 program of the European Union. Horizon 2020 aims to reduce the effects of climate change, improve air quality, improve water management, as well as increase the sustainability of cities through innovative nature-based solutions (URL 13). The project, which started in 2017, is ongoing. Solution proposals have been developed for environmental struggle areas such as the heat island effect, flood-overflow risk, air pollution caused by heavy urban traffic, and loss of natural areas (Arslantaş et al., 2020).

5. CONCLUSION

Green spaces are integral elements of urban planning as they regulate the relationship between other area uses and built areas (Semeraro et al., 2021). However, considering the effects of climate change, both the quantitative values of the existing green areas in many cities and their ability to resist the effects of climate change remain insufficient. In Turkey, the definition of open and green areas in the Spatial Plans Construction Regulation dated 14.06.2014 and numbered 29030 is defined as areas where only recreation needs are met. This definition also reveals the perspective of the urban open and green space concept in Turkey (Demiroğlu et al., 2019). It is necessary to leave the understanding which supports that the urban green areas meet the recreational needs of the citizens and are considered as an ornamental element of the city, and adopt designing such areas considering the climate change and disaster risks as soon as possible.

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MODELLING CARBON STORAGE SERVICE WITH INVEST IN URBAN DYNAMICS: BURSA/YILDIRIM

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Abstract

The green areas where be located in urban dynamics show not only a place for recreational activities but also has the hubs for ecosystem services. Ecosystem service is “the direct and indirect contributions of the benefit of the ecosystem to human wellbeing”, and provides a framework to describe the multiple relations between humans and nature. The ecosystem services measures and assessment in urban landscapes have been of critical importance. Because it focuses on to benefit of humans and urbans are in the most populated system. Urban ecosystem service-associated benefits are linked to many challenges. Urban may occupy a small percent of the global land area, but they contain the majority of the world’s population and are concentrated center of activity. Mitigating and adapting to climate change, promoting citizen's heath, enhancing social inclusion, and reducing the environmental footprint of cities, to name just a few, all have a direct relation with the provision of urban ecosystem services. In his study, the carbon services in the green areas were modelled in the Yıldırım district where is one’s most crowded of Bursa with InVEST model.

Keywords*:* Ecosystem service, carbon storage, urban dynamic, Bursa, Yıldırım

1.Introduction

Driving ecosystem models at local, regional and global scales using Earth observation data are becoming increasingly common. Remotely sensed-data, Geographic Information Systems (GIS) and process-based simulation models have provided the capability to assess ecosystem change at broad spatio-temporal scales.

A good understanding of the regional/local carbon (C) budget, the magnitude of carbon storage, and its vulnerability to change, is vitally important for overcome negative effects of climate change (Nabuurs et al., 2015; Bustamante et al., 2016; Akujärvi et al., 2019; Hutchins et al., 2020; Forsius, 2021). Estimation of carbon budgets for different Land Use/Land Cover (LULC) classes is one of the critical issue for predicting responses and potential feedbacks to a changing climate regime, and for regional and national public policies linked to climate change mitigation (Forsius, 2021; Buffam et al., 2011; Morecroft et al., 2019). Comprehensive models, which explicitly incorporate the functional roles of vegetation dynamics and LULC change, are especially needed for quantifying carbon stocks and sequestration (Crossman et al. 2011). Green structure is one of the most important parts of urban ecosystems and the largest carbon pool, occupying an integral position in local carbon cycle of urban ecosystems.

Urban growth is a complex dynamical process associated with driving forces of landscape change such as the environment, politics, geography, and other factors that affect a city on multiple spatial and temporal scales. Correlatively, land use/land cover degradation is a primary environmental problem resulting in landscape fragmentation, habitat loss and climate change (Claggett et al. 2004). Globally, LULC change in the 1980s and 1990s contributed 1.4^{-1} and $1.6 PgCyr^{-1}$ to the atmosphere and represented approximately 30% of anthropogenic efflux of carbon to the atmosphere (Dixon et al., 1994). Conversely, mid-to-high latitude forest expansion driven by reduced agricultural land use in the 1990s (Gower, 2003) contributed to a net carbon sink by land-use within these regions (Fan et al., 1998; Caspersen et al., 2000; Robinson et al., 2009). So, monitoring the urban ecosystem, quantifying the urban landscape change and analysing the C storage is a key factor managing the climate change. C storage is an affective indicator of ecosystems services related with climate change. The term “nature's services” was firstly as economically mentioned in 1997 in a paper in Science by Walter Westman called “How much are Nature´s services Worth?” (Costanza, 2017; Jancovic, 2017). Ecosystem services are the benefits that people obtain from ecosystems, including food, natural fibers, a steady supply of clean water, regulation of pests and diseases, medicinal substances, recreation, and protection from natural hazards such as floods and directly related with human well-being and human resilience (Carabine et al., 2015; McMichael and Scholes, 2005) and must evaluated from local to global scale for every region.

Nowadays varying data sources, different estimation methods and different scales of study area have led to significant differences in the estimation of carbon storage (Sun and Liu, 2020). InVEST model was preferred for carbon storage estimation including above ground biomass (AGB), below ground biomass (BGB), soil organic carbon, dead litter matter and social cost of carbon by considering LULC data for the years of 1985 and 2020. Study area has under pressure of rapid urban growth and land use degredation in terms of green structure including forest, urban greens and agriculture is one of the main problems of the district.

2. Metarial and Method

2.1. Study Area

The study area is located in the northwest of Turkey, Bursa, Yıldırım district (Figure 1), which has a population of 657 176 and covers an area of 67 km^2. Study area is covered Uludağ National Park in the south; Kestel and Gürsu districts in the east, and Osmangazi distict in the west. Also the northern side covered with productive agricultural lands. Yıldırım district has considerably small settlement area but intensively high population.

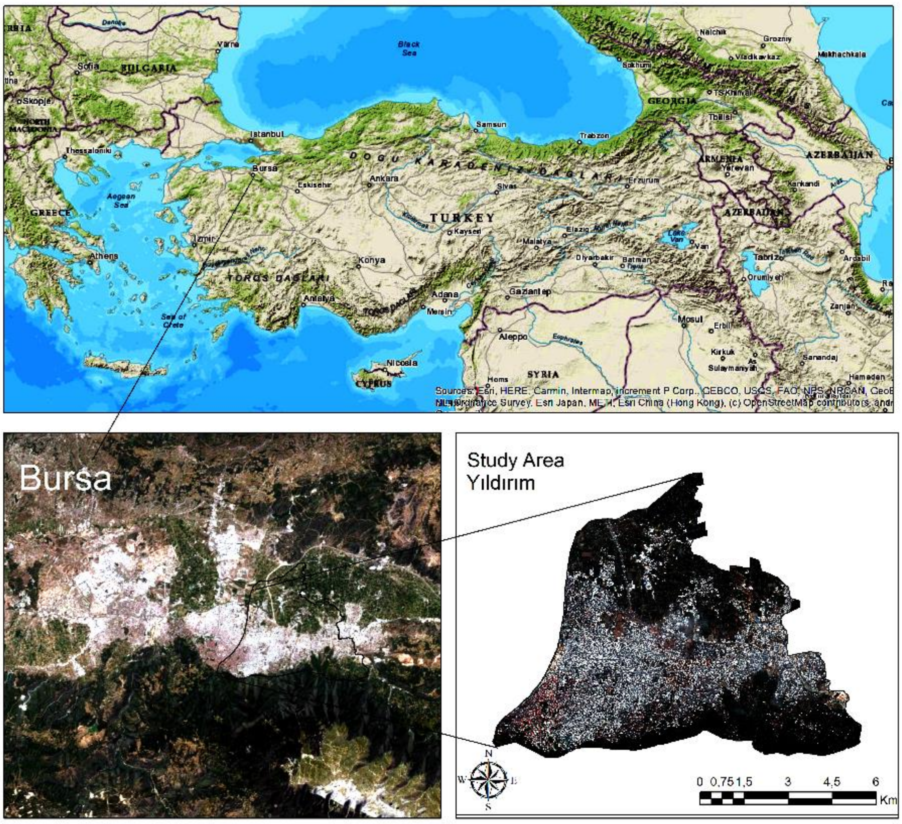

Figure 1. Study area.

2.2. Data Set

Main data set and the sources was given in the table 1. Besides LULC cover data with object based classification was considered for the carbon storage and sequestration estimation.

Table 1. Data of study

Data	Source
Landsat 5 TM (1985)	USGS Earth Explorer
Landsat 8 OLI TIRS (2020)	USGS Earth Explorer
Above ground biomass (AGB)	Aaron and Gibbs (2008)
Below ground biomass (BGB)	Aaron and Gibbs (2008)
Soil organic carbon	Aydın et al. (2016)
Dead litter matter	Berberoğlu et al. (2006)
Social cost of carbon	Ersoy Mirici (2017)

The above ground and below ground carbon map calculated by Auron and Gibbs (2008), International Panel on Climate Change (IPCC) Good Practice Guidance, that predicts the vegetation biomass in global scale was used for the study (Fig.2).

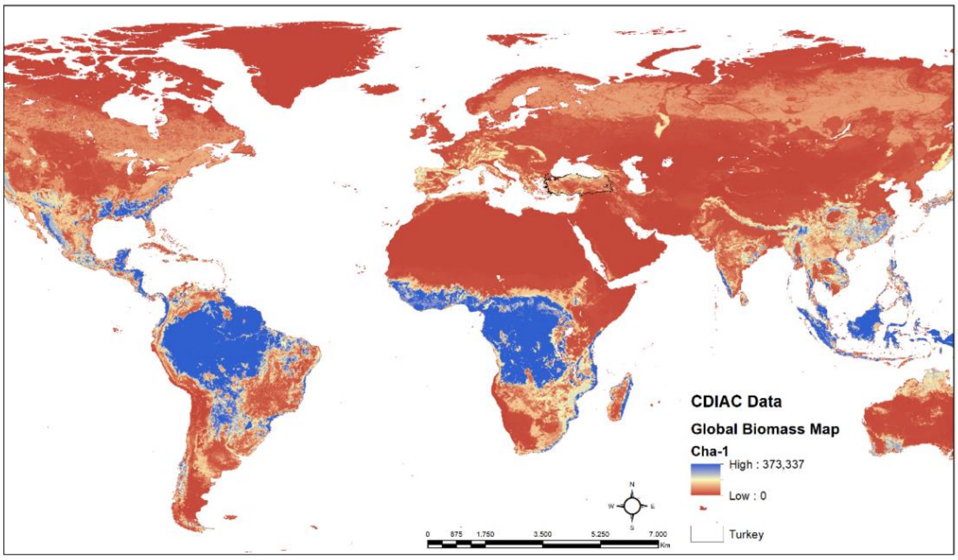

Figure 2. Above ground and below ground carbon map (Auron and Gibbs, 2008)

2.3. Method

The basic dataset for the study is LULC map and terrestrial carbon pools. LULC map classified with object based classification method. Object-based classification approach involves the integration of vector and raster data within a GIS environment and this approach enables the extraction of image object in the form of polygons representing spatial details in various scales, this process is called multi-resolution segmentation. (Bian and Walsh 1992).

Segmentation process is the most critical part of the process and affects the accuracy of classification. The size of the segments can be arranged by aim of the study, scale and the study area characteristic. Also, texture, shape and reflectance properties of image objects is decisive on the segmentation (Walter, 2004; Wells, 2010). With object based approach, classification mistakes can be corrected effectively by considering ground truth data.

The Invest (Integrated Valuation of Ecosystem Services and Tradeoffs) model was preferred for the modelling of ecosystems goods and services. InVEST is a suite of models used to map and value the goods and services from nature that sustain and full fill human life and one of common and widely used models developed at Stanford University in California (www.naturalcapitalproject.org). The model helps to identify how ecosystem changes lead to changes in the flows of many different benefits to people. Invest contains several models for ecosystem services evaluation. Each model has developed for specific ecosystem service assessment (Cancovic, 2017). The InVEST tool is a flexible and efficient computer-based model that (1) focuses on ecosystem goods and services; (2) is spatially explicit; (3) provide biophysical and monetary and nonmonetary outputs; (4) is scenario based; (5) highlights the relationships among multiple services; and (6) accommodates a range of data availability and the state of system knowledge (Tallis et al., 2012; Kareiva et al. 2011; Tallis et al., 2012; Ricketts, et al. 2012). The Flowchart of the model was given in the Fig.3.

In order to map carbon sequestration related with ecosystem services and calculate the economic value, the change in carbon pools in time 1-time 2 is considered. For the study, 1985 and 2020 LULC classes were used in terms of carbon pools. Additionally, (i) above ground biomass carbon,

(ii) below ground biomass carbon, (iii) soil organic carbon, (iv) dead litter matter carbon and (v) carbon economic value (social cost carbon) were integrated.

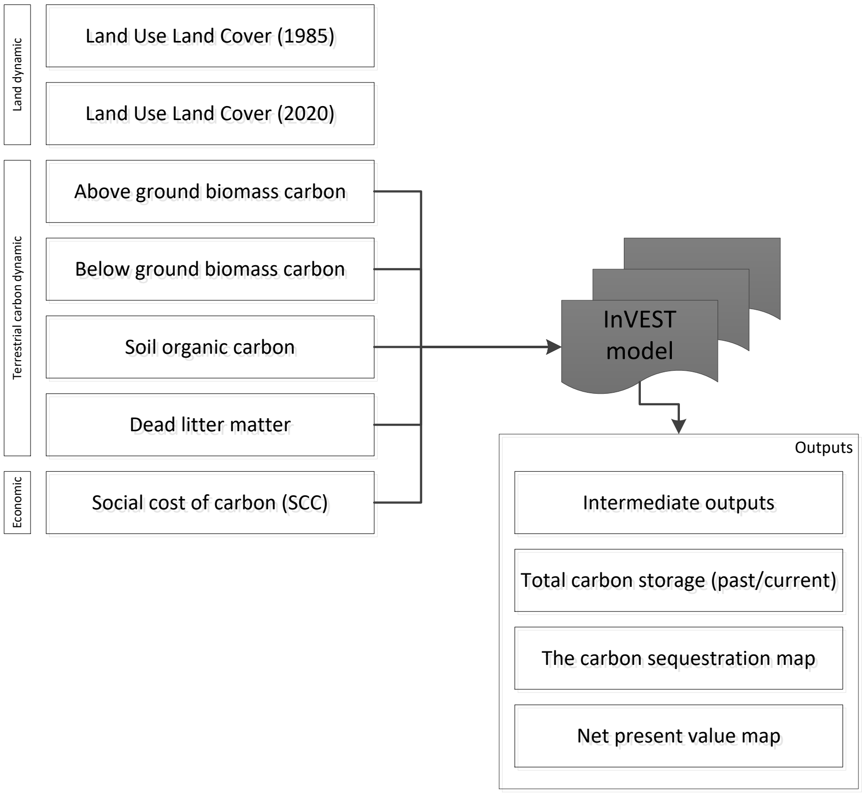

Fig 3. Method of study

The study aims to model carbon storage with high level of accuracy and evaluate the different landscape characteristics with high accuracy land use/land cover maps. Carbon storage was predicted by using carbon capacity change in per unit area ($MgCha^{-1}$) for different time periods. Accordingly, the relationship between carbon storage and sequestration was presented in the Fig.4.

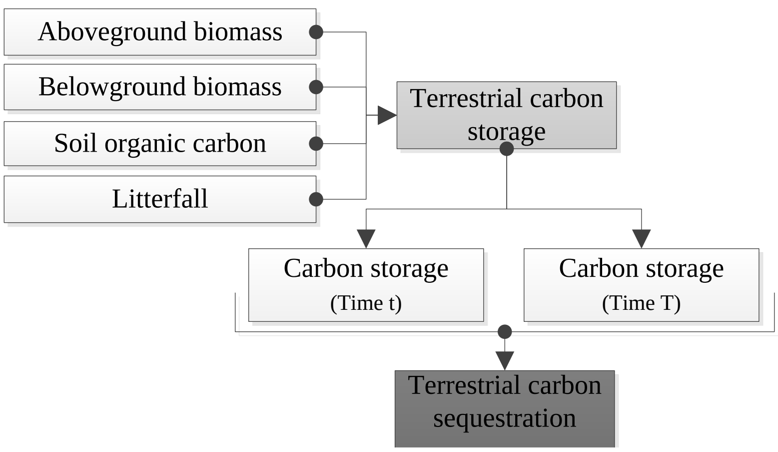

Fig 4. Carbon sequestration process in InVEST (Sharp et al, 2016; Ersoy Mirici, 2017).

3. Results

3.1. Land use/Land cover classification

Object based classification approach was used for LULC classification for the years 1985 and 2020. Each image object was assigned to road, urban, agriculture, bare ground, green area and streams (Fig. 2). The LULC classification map of the study area was corrected manually using field survey records and high resolution Google Earth image (Akın, 2007). As these images were corrected manually, using the data sets mentioned above, the entire image was used as ground truth data to create the land cover map for each date.

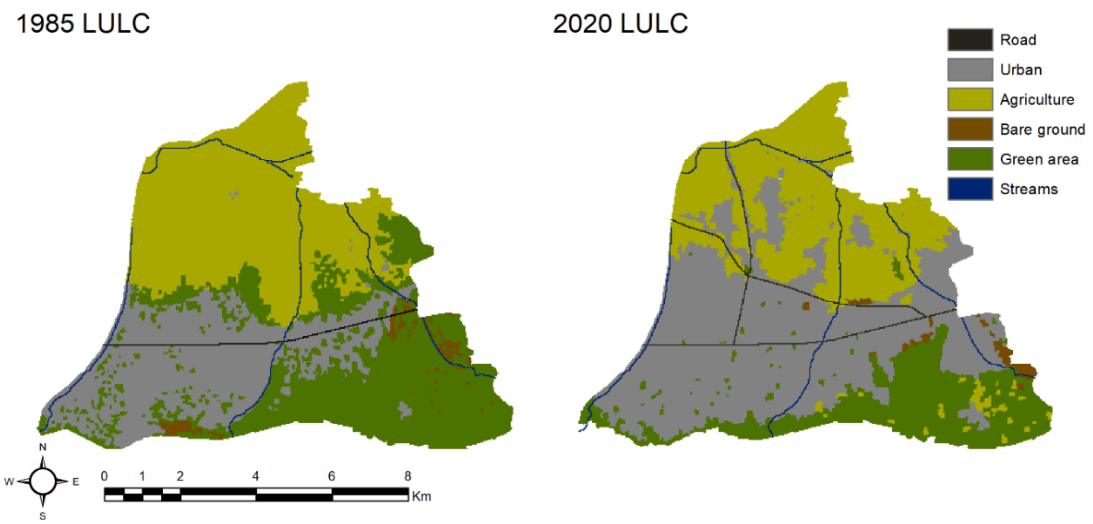

Fig 5. LULC maps (1985/2020)

The most considerable change was observed in the urban area. For the last 35 years, 1441 ha new urban area was gained due to rapidly population increase. This is especially true for the last 10 years. Besides, transportation systems in terms of highway and rail systems were developed. Transportation is one of the main reason of urban sprawl and has accelerated the urban change for the defined time period. The urbanization process of the Bursa city tended to occur outward from the seed area and along the main transportation. The city has linear urban macroform shaped near the main transportation line and study area shows a more compact structure due to the high topography and limited spread for potential urban areas. So, new urban area was gained mainly from conversion of the agriculture and green area. The topography of the Uludağ Mountain (protected by the "National Park" status) is another restrictive factor which supplies a natural protection zone for future urban sprawl for the south part of the city. So, the city expanded on the productive agricultural lands on the northern side. As a result, decrease in agriculture and green area has negatively affected the urban ecosystems services in the Yıldırım district. The change in bare ground is mostly due to planting and urbanization (Table 2).

Table 2. LULC classes change

LULC class	Area ha. (1985)	Area ha. (2020)	Change (ha) (2020-1985)
Urban	1774,35	3215,61	1441,26
Agriculture	2455,11	2047,68	-407,43
Green area	2180,43	1124,73	-1055,7
Bare ground	96,3	71,19	-25,11

Road	27,72	74,97	47,25
Stream	98,73	98,46	-0,27

3.2. InVEST modet outputs

InVEST model predicts present and future carbon storage maps by considering LULC maps. The C component for each LULC class is calculated with the MgCha^{-1} unit. The storage data belongs to carbon components integrated to future LULC map and carbon storage difference is calculated for the present and future. Finally, carbon storage values belong to specific LULC classes are transformed to future LULC maps linearly (Conte et al. 2011). InVEST model intermediate outputs were given in the Fig.6.

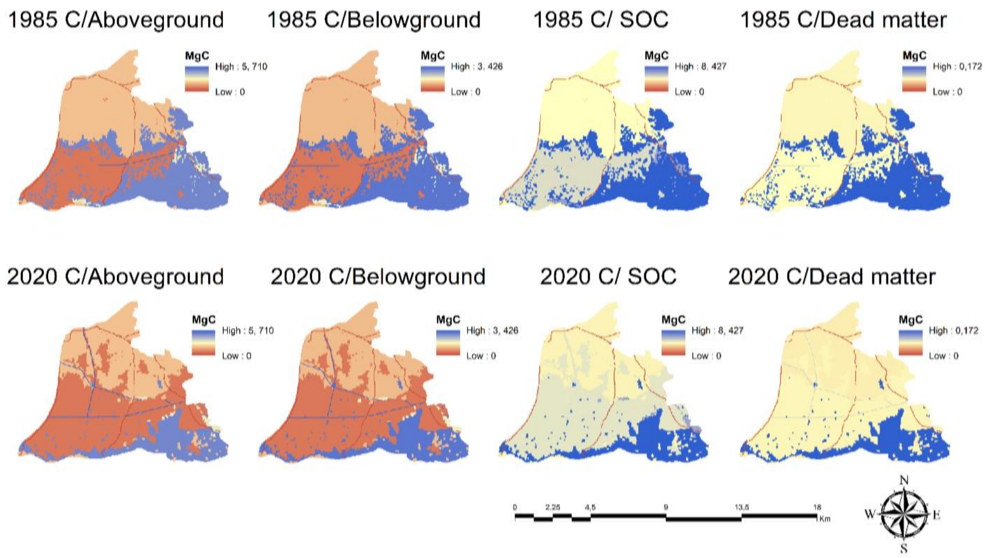

Fig 6. Intermediate outputs in InVEST model

In order to determine carbon sequestration, the difference between 1985-2020 were calculated. This difference is presented with ΔC in InVEST model. ΔC shows the change in carbon pools spatially in the Fig.7.

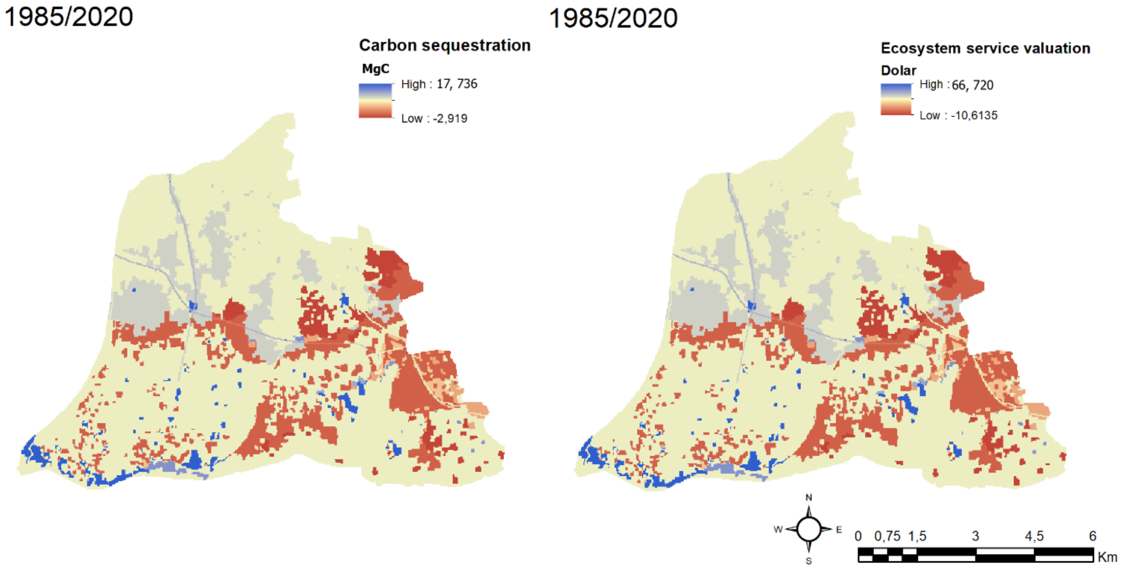

Fig 7. Carbon sequestration and ecosystem service valuation map (2020-1985)

Spatial heterogeneity and the variability is very significant determinant for the ecosystem services. The output of the study evaluates the carbon sequestration map and ecosystem service valuation in dollar money unit. As seen in the fig.7, red colour presents the areas which have higher carbon emission. For this reason, the InVEST model produced negative carbon sequestration results. Negative carbon sequestration was especially observed in near environment of Uludağ Mountain due to intensive urbanization movement which has valuable forest land. Also considerable decrease in economic benefit was identified. Local economic losses also effect regional benefits in the long term. Negative values in ecosystem valuation in Fig.7 shows losses of economic benefit due to decrease in ecosystem services. Whereas, total economic loss in ecosystem services were calculated as 915 115. 59 USD for the study area. For the last 35 years, urban growth as a macroform has doubled itself and caused almost 1 million dollar economic loss which is a indicator that in the near future, expected benefit from the ecosystem services will considerable decrease.

4. Conclusions

Nowadays, analysing the change trend of ecosystem goods and products, identification of the driving factors and expose the effect of LULC change on the ecosystems are the key concerns in sustainable environmental planning. Therefore, this study aims to predict the carbon storage on historical and present LULC by considering green areas and its adaptation to landscape planning strategies. Within this scope, the study focusing not only on whether an area possesses forest cover, but also focusing closely on soil, soil surface, below-ground biomass, above-ground biomass, forest type, and the quantitative characteristics of LULC classes, which constitute the other layers, can pave the way for the creation of more sustainable planning strategies.

Immigration is a major driving factor for LULC change in Bursa. The city plays an important role in the national economy ever since the first industrialization movement began in the nineteenth century. After the seventies, the city was come forward with the industrial identity which was ended up with the agricultural lost due to infrastructure investments for the industry. Accordingly, growing industry and commerce, increased job opportunities attracted immigration to the region. Despite the spatial planning decisions and Plain Protection Protocol in 1977, one third of the agricultural land was lost around the city. Yıldırım was recognized as one the central district at 1987 and the population has doubled for the last 35 years. Especially for the last ten years, the region is under rapid population growth due to immigration process which ended up increasing building stock and landscape degradation. Additionally, the weak land use policies were unable to cope with rapid development which led to urban sprawl. So the study focused on carbon storages by considering different dated LULC data. Besides, economic value of carbon storage and related ecosystem service valuation was calculated for the study. Hardly any studies related to ecosystem products and services in Turkey place emphasis on economic outputs. It can be stated that this study not only brings an economic dimension to landscape planning studies, but also presents a new perspective for the incomplete economic framework within the scope of ecosystem products and services in our country. Besides, effective modelling results with InVEST, it has some restrictions such as lack of real ground sample data integration. The model makes a coarse generalization of AGB, BGB, SOC and dead litter matter data in the ha^{-1} unit. It will be useful to consider spatial variability in order to acquire more sensible modelling results.

The study area is face to decreasing ecosystem services and increasing economic loss. Especially the northern side of the district has valuable forest cover and threatened by the rapid urban growth. Also the urban structure of the region is unavailable for creating new green structure. This situation necessitates protection of agriculture and forest land in order to provide carbon storage sustainability. It is predicted that if the linear change trend is not change than the loss of the ecological economic value will continue to decrease in the future.

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