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DOÇ. DR. GÜLDEN SANDAL ERZURUMLU

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CONTENTS

CHAPTER 1

ECOLOGICAL EXTERIOR DESIGN AND PLANNING FOR BIOCLIMATIC COMFORT OF URBAN PEOPLE

Ahmet Erkan METİN[1]

1 .Lecturer Dr., Uşak University, Banaz Vocational School Forestry Department
erkan.metin@usak.edu.tr Orcid ID: https://orcid.org/0000-0002-1016-0927

INTRODUCTION

Cities are the centers of economic and social developments. Due to this location, rapidly increase urbanization movements increasing the population density in cities. The increase in urbanization in parallel with the population density seen in the cities causes unplanned urbanization, an increase in impermeable surfaces, and the formation of multi-storey gray structures in cities and their immediate surroundings. As a result of these formations, natural and green areas (parks, plains, agricultural fields, forest areas etc.), which are called the areas where cities breathe, are destroyed, decreased or disappeared. The aforementioned activities originating from anthropogenic cause changes in the urban climate.

Studies reveal that the climate characteristics of cities are negatively affected due to dense construction in cities, and the decrease in green areas and soil-covered surfaces (Barış, 2005; Çiçek and Doğan, 2005; Şimşek and Şengezer, 2012; White and Kimm, 2015). With the density of construction, heat islands are formed in the cities and changes occur in the micro-climatic structures of the cities. The cumulative effects of micro-climatic changes on each other negatively affect the lives of humans and other living things on a global scale.

The situation in which people are not warned against climatic conditions or stressed in their environment is defined as "Bioclimatic Comfort" (Toy, 2010; Çağlak, 2021). Studies show that the bioclimatic comfort of densely built urban areas is lower than rural areas (Svensson and Eliason 2002; Bonacquisti et al. 2006; Bulgan et al., 2014; Vitt et al., 2015; Blażejczyk et al, 2016). It is known that unsuitable conditions in terms of bioclimatic comfort in cities cause negative effects on people's physical and psychological health.

Cities should be equally important in terms of economic, social and ecological sustainability. However, in some cases, the ecological sustainability aspect is ignored. It is predicted that bioclimatic comfort conditions can be maintained and improved in rapidly developing and concentrating cities with ecological design and climate-sensitive planning. In the study, ecological and climatic dimensions are discussed for the preservation of bioclimatic comfort in cities. Suggestions are made in the context of providing bioclimatic comfort in outdoor design and planning for healthy and livable cities.

Material and Method

In this study, the effects of bioclimatic comfort on human and urban health were evaluated. The thermal temperature differences between urban and rural areas were examined by evaluating the studies that we reached in which urban and rural climate comparisons were made. The aim of the study is to reveal the importance of urban planning and design in order to

provide bioclimatic comfort. For this purpose, the concepts of climate, climate change, urban climate, urban heat island, bioclimatic comfort, ecological design and climate-appropriate planning have been revealed through literature review. In accordance with this purpose, the consept of climate, climate change, urban climate, urban heat island, bioclimatic comfort, ecological design and climate-appropriate planning have been revealed through literature review. As a result of the study, suggestions have been made for the provision and sustainability of bioclimatic comfort in cities.

Climate and Climate change

Climate is known to affect human activities, health and well-being. It is known that human beings have been trying to adapt their vital needs (housing, nutrition, energy production etc.) according to climate and environmental conditions since their existence. As the world population increases, the tendency of people to use natural areas for residences, workplaces and similar purposes is increasing. This increase causes narrowing of agricultural and forest areas, decrease in soil fertility and many negative ecological developments depending on these basic factors.

Climate is defined as the combination of the average properties of all weather conditions observed in any part of the earth for a long time, as well as the temporal distributions of their occurrence frequencies, observed extreme values, severe events and all types of variability. Climate change is defined as statistically significant changes in the mean state of the climate or its variability over tens or more years (Türkeş, 2001). Climate change is known as the warming and cooling of the seasons outside of their normal course. It is seen that climate change has become a global threat in the form of extraordinary warming, especially in the last 30-40 years (Gülsoy, 2018; Tolunay et al., 2019).

Cities are in the position that affecting and is most affected by climate change. It is known that rapid and intense urbanization and climate change are in a relationship, and urban areas have an accelerating effect on climate change (Kahraman and Şenol, 2018). The reason for this is more fossil fuel use, more traffic, changes in land use, industrial facilities and wastes generated in cities compared to rural areas due to dense construction and population. The replacement of natural areas, especially in cities, with built areas causes microclimate change in cities. When changes in the urban climate reach extreme values, they can have negative effects on people's physical and psychological health (Aklanoğlu, 2019). In order to avoid the aforementioned negativities, the climate parameters in the cities must be within the "Bioclimatic Comfort" value ranges determined by the experts.

Urban heat island

Migration movements from rural to urban cause population density in cities. In parallel with this density, the increase in urbanization (buildings, roads, etc.) is an inevitable result. Microclimatic changes can be seen in cities that develop by neglecting ecological elements, and unhealthy climatic conditions can occur.

Meteorological parameters can change as a result of reasons such as decrease in green areas in cities, increase in impermeable surfaces such as concrete and asphalt, decrease in evaporation surfaces, and different climates unique to them can be seen in cities. These climatic variations in cities are defined as "urban heat island" (Yüksel and Yılmaz, 2008). The urban heat island is one of the most obvious forms of local anthropogenic climate change and can be defined as the temperature in the city being simultaneously higher than the surrounding rural area, depending on the changes in the land cover in the urban area (Streuker 2003).

In addition to the increase in impermeable surfaces in cities, the high temperature storage properties of building materials used in urban structures are also effective on urban heat island formations (Yüksel, 2005). In addition, in unplanned and densely built cities, air circulation is prevented. In addition, in unplanned and densely built cities, air circulation is prevented. The inability of the air to move in the horizontal direction and its high dust and moisture content are among the factors that cause unhealthy urban air (Krusche et al., 1982).

Considering all these factors, cities should be planned to provide bioclimatic comfort according to different climatic characteristics, the use of building materials suitable for the climate, and all ecological values should be taken into account in order for urban people to lead a healthy life.

Bioclimatic Comfort

The situation in which people are not disturbed by the climatic conditions in their environment, are not warned against the climatic conditions or are not stressed is defined as "Bioclimatic Comfort" (Toy, 2010; Çağlak, 2021). In other words Bioclimatic Comfort, between uncomfortable heat and uncomfortable cold is defined as a state of no thermal discomfort or neutral discomfort (Parsons, 2003). According to Olgyay (1973), it is possible to define bioclimatic comfort as a situation where environmental conditions such as temperature, humidity and wind are within certain value ranges, where people feel healthier and more dynamic (Güngör et al., 2019).

Today, there are more than 200 comfort indices in determining bioclimatic comfort conditions. Bibliographic studies have also been done on these (Epstein and Moran, 2006). Among these indices, the index common-

ly used in outdoor thermal conditions and especially in urban areas is the Physiological Equivalent Temperature (PET) index. The PET index was first created by Höppe, 1984. Pet index is calculated by energy balance based Rayman software (Höppe, 1999; Matzarakis et al., 2007; Kantor and Unger, 2010). The PET index takes into account the human heat balance against meteorological conditions. PET index calculates meteorological parameters (such as air temperature, mean radiant temperature, wind speed, humidity, cloudiness) and human factors (clothing, activity, age, weight, height, etc.) together (Höppe, 1999; Çağlak et al., 2018). Different degrees of thermal perception by humans and physiological stress ranges on humans are given in Table 1 (Matzarakis et al., 1999; Höppe, 1999).

Table 1. *Thermal sensing and stress ranges (Matzarakis et al. 1999; Höppe, 1999)*

PET (°C)	Thermal Sensation	Level of Thermal Stress	Colors
< -4	Extreme Cold	Freezing Cold Stress	
-3,9 – 4,0	VeryCold	Extreme ColdStress	
4,1–8,0	Cold	Strong Cold Stress	
8,1–13,0	Cool	Moderate Cold Stress	
13,1–18,0	SlightlyCool	Slightly Cold Stress	
18,1–23,0	**Comfortable**	**No Thermal Stress**	
23,1–29,0	SlightlyWarm	Slightly Heat Stress	
29,1–35,0	Warm	Moderate Heat Stress	
35,1–41,0	Hot	Strong Heat Stress	
>41,0	Very Hot	Extreme Heat Stress	

It has been revealed in many studies that the urban climate differs from the rural climate due to unplanned construction, increase in impermeable surfaces and similar factors in parallel with the population density in the cities.

When the results of the studies we reached through the literature review are examined;

-Oke (1973) determined the temperature difference between urban and rural areas as 0.27 -1.91 °C in his study in Lawrence Lowland

-Karl et al. (1988) determined the temperature difference between urban and rural areas as 0.1 °C in his study At 1219 station in continental ABD.

-Unger (1999) determined the temperature difference between urban and rural areas as 2.5 °C in his study in Szeged.

-Svensson and Eliason (2002) determined the temperature difference between urban and rural areas by 4.0-8.0 °C, in their study in Gothenburg.

-Hinkel et al. (2003) determined the temperature difference between urban and rural areas by 2.2 °C, in their study in Borrow.

-Bonacquisti et al. (2006) determined the temperature difference between urban and rural areas by 2.0 oC - 5.0 °C , in their study in Rome.

-Bulut et al. (2008) determined the temperature difference between urban and rural areas by 1.7 °C , in their study in Erzurum.

-Blażejczyk et al. (2016) determined the temperature difference between urban and rural areas by 1.5 - 2.5 oC, in their study in Warsaw.

-Bulgan and Yılmaz (2017) determined the temperature difference between urban and rural areas by 1.1 - 4.3 oC, in their study in Erzurum.

-Çağlak (2017) determined the temperature difference between urban and rural areas by 0.3- 1.7 oC in his study in Samsun.

The results obtained from the studies show that cities are warmer than rural areas.

Urban climate is one of the main factors for a healthy and comfortable life in the city. In order to reduce the negative effects of the changing urban climate on people in the face of anthropogenic effects, ecological approach and climate-appropriate planning are of great importance in urban planning.

Ecological Outdoor Design - Urban Climate - Bioclimatic Comfort Relationships

Ernst Haeckel defines the term ecology as "a comprehensive scientific discipline that studies the relationship of organisms to the environment" (Ovalı, 2018). The term ecology today describes the continuity of nature's ecosystem cycle. In addition, it is seen that it has become an area directly related to the protection of living spaces, the evaluation of natural potentials, and sustainable urban development (Özkeresteci, 2007). Today, ecological designs are needed in cities for a comfortable life, sustainable environment and energy saving. Harley Perloff first studied the impact of the urban environment on the quality of life in 1969. Harley Perloff argues that the quality of life of people gathered around the urban environment is determined by the interaction of the natural and man-made environment (Tekeli et al., 2004).

According to Ken Yeang (2008), ecological design is to develop the design by being aware of the fact that everything in the ecosystem in the world forms a chain and that the intervention in this chain affects the ecosystem both locally and globally (Aklanoğlu, 2019). Although "industrial design for a sustainable world" is commonly meant when it comes to ecological design, today it is applied in line with sustainability principles by all disciplines such as landscape architecture, interior architecture, engineering and city planning (Selamet, 2012).

The concept of sustainability should be focused on reducing environmental problems that arise as a result of technological and economic developments with the aim of protecting the ecosystem (Satterthwaite, 1997).

In order to provide bioclimatic comfort conditions in cities, the concepts of ecological design and ecological architecture should be considered as a whole. Ecological design is based on the continuous and balanced cycle between nature-human-environment and determines the application area and scale of ecological architecture. According to Tönük (2001) Ecological architecture;

-Creating living spaces that respect nature and people

-Sustainable use of air-water-soil resources

-Making designs compatible with climate, topography and environmental factors

-Increasing the use of inexhaustible energy resources

-Reducing energy consumption with the right insulation in buildings

-Protection of natural areas

-Use of recyclable building materials in buildings

-Reduction of waste adopts the principles (Ovalı, 2019)

In the current period, cities are growing and developing rapidly, as they contain a large part of the population, have importance in ensuring social and economic development at local and national level, in employment and service provision. Due to this growth and development, the city and its surroundings may be exposed to environmental degradation (Tosun, 2017). In parallel with environmental deterioration, changes can be seen in the urban climate. These changes may cause thermal comfort to move away from bioclimatic comfort ranges in cities.

Urban designs that are not suitable for the climate cause an increase in energy costs, an increase in greenhouse gases in the atmosphere, and poor living conditions in terms of bioclimatic comfort (Toy and Yılmaz, 2009). Uncomfortable conditions has affect people's physiological and psychological health, work efficiency, heat-related symptoms and mortality rates (Vanoz et al., 2010; Nastos and Matzarakis, 2011; Nastos et al., 2013; Błażejczyk et al., 2016; Schlegel et al., 2020).

Conclusion and Recommendations

Differences in climate change the frequency and severity of extreme weather conditions. These conditions are expected to be more intense in the future (IPC, 2013). The effects of climate change will be seen in all sectors such as farming, industry, transportation , as well as affecting bioclimatic comfort conditions. It is thought that this effect will be felt especially in cities where the majority of the population lives.

Nature is an important ecosystem that cleans water and air and makes the global and local climate comfortable through cooling, shading and wind protection. The natural environment and the artificial environment affect people physiologically and psychologically (Göksu, 2011). It is known that the climate differences seen in the cities are caused by anthropogenic activities. The basis of the principle of ecological design, which is based on the close relationship of humans with nature, is to meet the living needs of people by preserving the nature without disturbing the natural system. Ecological designs can have a positive effect on the climate of cities, since they include natural areas as well as using natural materials when designing built-up areas in cities.

Due to different location characteristics such as topography and altitude, the settlement areas on the world have different climatic conditions from each other. It is known that many factors are effective on bioclimatic comfort, which is related to climate parameters. A small change in one of these factors can greatly affect the overall result.

In order to provide bioclimatic comfort, urban designs should be planned according to the climatic conditions of the city. Today, the use of natural, renewable, energy-saving building materials and the use of natural-green areas alone may not be enough to create comfortable cities. In order to provide bioclimatic comfort in cities, design and planning should be done by considering climate criteria (temperature, wind, humidity etc.)as well as ecological designs. For this purpose;

In addition to using natural building materials with low heat stock capacity in hot climate regions;

➢Depending on the size of the area, fountains or pools can be placed and the air can be cooled thanks to the formation of moisture and steam.

➢Species with high height and large shade diameter can be used in afforestation studies to provide shading effect

➢In arid areas where the wind is high, wind fences can be created by using deep rooted tree species and woody plants that are resistant to the prevailing wind direction in order to be protected from the negative effects of the wind. In this way, both the intensity of the wind and the moisture loss of the soil can be reduced. This application may contribute to slowing down the flow rate of precipitation over the soil in winter. Thanks to the wind fences, the energy costs consumed for heating and cooling in buildings can also be reduced.

➢Wind catcher chimneys can be used outside the building to provide cooling inside the building.

➢In dense settlements, heat island formations can be prevented by creating gaps in the prevailing wind direction between the structures

➢Radiation (heat transfer) can be reduced by using grass or soil surfaces

➢Reflectivity can be increased by using light colors in buildings

In addition to using natural building materials with high heat storage capacity in cold climate regions;

➢Buildings can be built close together and small windows can be used in buildings.

➢Shading effect in winter can be reduced by using deciduous trees near the buildings.

➢Radiation and absorption capability can be increased by using dark colors in buildings.

In addition to using natural building materials suitable for humidity in climate regions where precipitation is high;

➢The effect of moisture can be reduced by building structures above ground level.

➢Buildings can be made towards the sun. In this way, harmful gas emissions from fossil fuel-based heating can be reduced. In addition, natural lighting and energy savings will be achieved in the aforementioned orientation.

Improvements can be made in the bioclimatic comfort conditions of the cities by increasing the green areas with vertical or horizontal planting works in the existing built urban areas, creating urban forests, creating water areas, making urban agriculture areas, and increasing the protected natural areas. It is suggested that design and planning should be done by considering the ecological factors as a whole in order to maintain bioclimatic comfort conditions in cities.

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CHAPTER 2

LANDSCAPE PLANNING RECOMMENDATION FOR THE CONSERVATION AND DEVELOPMENT OF HERSEK LAGOON

Aysun ÇELİK ÇANGA[1]
Pelin ÖZUÇAR[2]

1 Prof. Dr. Tokat GOP Üniversitesi, ORCID ID: 0000-0001-5289-2176
2 Bursa Uludağ Üniversitesi, ORCID ID: 0000-0002-2071-4866

INTRODUCTION

Due to the drought, which is one of the most important problems of our time, water resources are running out day by day. The developing economy and the growing population bring with it construction, which leads to the consumption of groundwater resources, the de-treeization of wetlands, and the unconscious use of streams by ignoring the natural balance. After all, the preference for a growth approach towards economic growth and urban development is causing great damage to water resources (Özdemir, 2005).

Wetlands are one of the water sources necessary for the continuity of natural balance. All waters, marshes and reeds, whose formation is natural or artificial, whose waters are stagnant or flowing, continuous or temporary, sweet, bitter or salty, covering depths that do not exceed six meters in the tide movement of the seas, are called wetlands. (Anonymous, 1994). Wetlands need to be protected, protected and managed in a sustainable manner due to natural and cultural landscape values. Today, many factors such as rapidly increasing population, misuse of areas, industrialization, increase of urban settlements damage wetland ecosystems and put wetlands and living species in danger of extinction (Demir et al., 2011).

Wetlands ensure the continuity of natural processes in urban areas, create water reserves, and create a healthy and sustainable ecosystem (Erduran Nemutlu and Yılmaz 2018; Erduran Nemutlu, 2021). Wetlands, which are one of the most valuable ecosystems in the world with their biological diversity and vital functions, have been used for many reasons such as settlement, agriculture and nutrition since ancient times. Today, apart from the social and economic values it offers, it has a vital importance that cannot be compared with other ecosystems in its habitats, as it hosts primarily waterfowl and globally endangered species, and has a rich diversity of fauna and flora (Başara,1998; Özdemir,2005). In this and similar areas, it is very important to carry out landscape planning studies aiming at the sustainable use of natural resources and the protection of the ecosystem and to develop legal protection attitudes (Erduran et al., 2012; Uzun et al., 2011).

In today's conditions, where globalization and technology are advancing rapidly, tourism and recreational activities have started to turn to natural areas as individuals under intense stress and work begin to devote their leisure and vacation days to exploring nature. Being in natural areas contributes to people's love of the environment they live in, to be happy, peaceful and to get to know nature (Çelik Çanga and Polat Üzümcü, 2020). In order to meet various tourism and recreational needs, individuals prefer wetlands that have a spiritually relaxing effect and are an open-air studio with the beauty of the landscape it offers. Wetlands offer favorable conditions for various ecologically based tourism activities such as wildlife watching, flora tourism, flora and fauna photography, hiking, cycling tourism.

Lagoons located between wetlands are defined as “coastal lakes” on wide coasts, partially connected with the sea (Newton and Mudge, 2003; Hisli, 2019). Lagoons are formed by the accumulation of various materials such as sand or gravel carried by sea waves in stagnant areas (Hisli, 2019). Lagoons are among the habitats of vital importance, which are used for many recreational and economic purposes such as drinking water supply, fishing, reed farming, swimming, surfing, skiing and contributing to the country’s economy, as well as hosting many living species with its ecosystem diversity (Atalay et al., 2008).

The lagoons, which are very rich in economic, natural and cultural values, are home to many endemic and endangered species and different ecosystems, and they are unique and protected habitats with their landscape values. Although protected areas were areas where human activities were restricted in the past, they are now protected and allowed to be used (Çelik Çanga, 2020). Hersek Lagoon, which is located in the Marmara Region and also known as a bird hotel, is a coastal lagoon connected to the Marmara Sea. Hersek Lagoon, located in Altınova District of Yalova Province, is between 400 41’- 400 44’ north latitudes and 290 26’- 290 33’ east longitudes (Uzun,2014). The location of this area is given in figure 1.

Figure 1. *Location of Lagoon of Hersek*

With its species diversity, the Lagoon of Hersek offers rich opportunities for various recreation and tourism activities such as bird watching and nature photography, which also puts the Lagoon of Hersek under pressure from many activities such as industry, agriculture, greenhouses and coastal tourism. The aim of this study is to; By examining their interactions with the existing uses around the Lagoon of Hersek, which is now under pressure

from various activities, it is to create landscape planning decisions that will positively change the negative interactions and ensure the sustainable protection and conservation of the natural landscape.

HERSEK LAGOON FEATURES

Transportation-Property Status-Current Protected Status

In its current condition, the Lagoon of Hersek can be easily reached by various means of transportation such as cars, public transport, bicycles, etc. As a distance, the lagoon is 1,5 km from Altınova district, 27 km from Yalova province and 69 km from Bursa province. The Marmara bridge of the Istanbul-Izmir Highway passes through the western part of the lagoon.

Since the Lagoon of Hersek is designated as an internationally important wetland ecosystem and is home to four seasons of bird species, 1. The degree is registered as a natural site. Land hunting activities in and around the lagoon are prohibited (Anonymous, 2012). Finally, on 07.10.2020, it was placed under state protection and declared as a sensitive area to be protected. Archaeological sites are also located in the immediate vicinity of the lagoon.

Hersek Lagoon as property has the distinction of being Turkey's first and only lake with title deed (URL-1). Hersek lagoon was first bought by Hıfzı Bey and later by Ahmet Refik Bey. Today, it has been rented by Altınova Municipality for 10 years (Dalkıran and Baki, 2011).

Current Land Use Status

Various agricultural and greenhouse activities are carried out in the immediate vicinity of the lagoon, and there are military zones in the North and Southeast. Coastal tourism is carried out in the North of the Lagoon. Izmit-Yalova-Bursa highway to the south of the work area and Izmit Gulf Crossing Bridge to the north start from Cape Hersek and pass the highway around the lagoon (Dalkıran and Baki, 2011). The current area usage methods of the Lagoon of Hersek and its immediate surroundings are given in Figure 2.

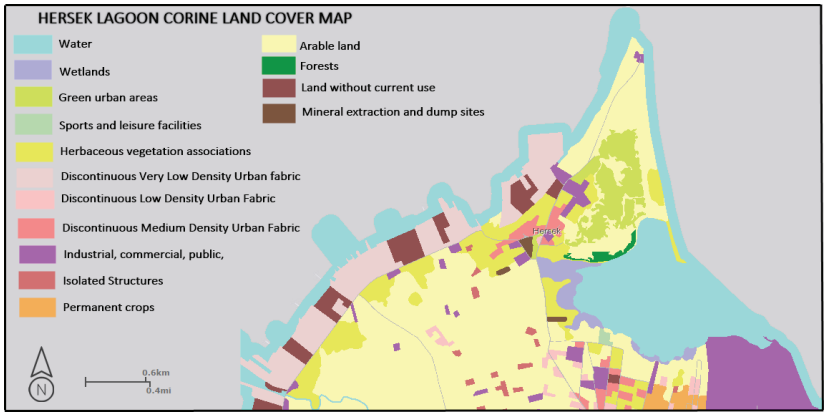

Figure 2. *Current Area Use of The Lagoon and Its Immediate Surroundings*

There is no commercial reed cutting and fishing activities in the lagoon and its waters cannot be used due to its high salinity rate (Anonymous, 2012). Apart from agricultural and greenhouse activities, the industrial sector also operates in a variety of activities around the lagoon. There are 6 organized industrial zones and 38 factories in Yalova province, which is 27 kilometers from the lagoon (Hisli, 2019).

Natural Landscape Features of The Lagoon and Its Surroundings

The surface area of Hersek Lagoon, which is formed by the alluvium carried by Yalakdere filling the Marmara Sea, is approximately 152 hectares and its depth is 50-60 cm. its deepest point is 90 cm(URL-2). Yalakdere is the only stream that feeds the lagoon in its natural form, but today it is no longer connected to the lagoon (Uzun, 2014; Hisli, 2019). The coastline of the Lagoon of Hersek, which is separated by coastline from the Marmara Sea, is an important region for the varieties of birds breeding in colonies and the only breeding point for some species (Anonim, 2012). The land around the lagoon consists of allvial lands (Dalkıran and Baki, 2011). The climate of the study area, as a macro-air conditioner type, is a transition between the Mediterranean and Black Sea climates. In some periods, it reflects terrestrial climate characteristics (URL-3).

Hersek Lagoon hosts many bird species in summer and winter months. It has an important position in the Marmara region with the number of Flamingos it hosts, especially during the winter months. There are many species of birds that reproduce as colonies in the lagoon. Black-billed Tern, which breeds only in Hersek Lagoon after Gediz Delta, gives Hersek Lagoon an important bird area.(URL-2). There are 276 animal species in the Lagoon of Hersek and its immediate vicinity, including 3 two-life, 6 reptiles, 189 birds, 7 mammals, 70 invertebrates and 1 reptile in the VU (sensitive) category (Anonymous, 2016). These types are given in Schedule 1.

Chart 1. *Lagoon Fauna Features of Hersek (Prepared using Anonymous,2016)*

Amphibians
Pelophylax ridibundus, *Bufotes variabilis,Hyla arborea*
Reptiles
Testudo graeca (VU), *Pseudopus apodus, Lacerta trilineata, Lacerta viridis*, *Podarcis siculus, Dolichophis caspius, Natrix natrix*
Birds
Tachybaptus ruficollis, *Podiceps cristatus*, *Podiceps nigricollis*, *Puffinnus yelkouan*, *Phalacrocorax carbo*, *Phalacrocorax aristotelis*, *Phalacrocorax pygmeus*, *Pelecanus onocrotalus*, *Ixobrychus minutus*, *Ardeola ralloides Egretta garzetta*, *Ardea alba*, *Ardea cinerea*, *Ciconia nigra*, *Ciconia ciconia*, *Plegadis falcinellus*, *Platalea leucorodia*, *Phoenicopterus ruber*, *Cygnus olor*, *Cygnus cygnus*, *Anser albifrons*, *Tadorna tadorna*, *Tadorna ferruginea*, *Anas platyrhynchos*, *Anas strepera*, *Anas acuta*, *Anas clypeata*, *Anas penelope*, *Anas crecca*, *Anas querquedula*, *Aythya ferina*, *Netta rufina*, *Aythya nyroca*, *Aythya fuligula*, *Bucephala clangula*, *Mergellus albellus*, *Mergus serrator*, *Pandion haliaetus*, *Aquila pomarina*, *Circaetus gallicus*, *Circus aeruginosus*, *Circus cyaneus*, *Circus pygargus*, *Buteo rufinus*, *Buteo buteo*, *Pernis apivorus*, *Accipiter nisus*, *Falco tinnunculus*, *Falco subbuteo*, *Falco peregrinus*, *Coturnix coturnix*, *Gallinula chloropus*, *Fulica atra*, *Grus grus*, *Haematopus ostralegus*, *Recurvirostra avosetta*, *Himantopus himantopus*, *Glareola pratincola*, *Charadrius dubius*, *Charadrius hiaticula*, *Charadrius alexandrinus*, *Pluvialis apricaria*, *Vanellus vanellus*, *Calidris canutus*, *Calidris alba*, *Calidris minuta*, *Tringa glareola*, *Actitis hypoleucos*, *Tringa ochropus*, *Tringa erythropus*, *Tringa totanus*, *Tringa nebularia*, *Limosa limosa*, *Numenius arquata*, *Gallinago gallinago*, *Philomachus pugnax*, *Larus ridibundus*, *Larus genei*, *Larus canus*, *Larus melanocephalus*, *Larus michahellis*, *Larus cachinnans*, *Larus fuscus*, *Sterna albifrons*, *Sterna sandvicensis*, *Gelochelidon nilotica*, *Sterna hirundo*, *Chlidonias niger*, *Chlidonias leucopterus*, *Chlidonias hybrida*, *Columba livia, Columba oenas*, *Columba palumbus*, *Streptopelia decaocto*, *Streptopelia turtur*, *Spilopelia senegalensis*, *Cuculus canorus*, *Asio flammeus*, *Athene noctua*, *Otus scops, Apus apus*, *Apus pallidus*, *Tachymarptis melba*, *Upupa epops*, *Alcedo atthis*, *Merops apiaster*, *Alauda arvensis*, *Galerida cristata*, *Calandrella brachydactyla*, *Hirundo rustica*, *Hirundo daurica*, *Delichon urbicum*, *Anthus campestris*, *Anthus spinoletta*, *Anthus trivialis*, *Anthus pratensis*, *Anthus cervinus*, *Motacilla cinerea*, *Motacilla alba*, *Motacilla flava*, *Erithacus rubecula*, *Luscinia megarhynchos*, *Luscinia svecica*, *Phoenicurus ochruros*, *Phoenicurus phoenicurus*, *Saxicola rubetra*, *Saxicola torquata*, *Oenanthe isabellina*, *Oenanthe oenanthe*, *Turdus philomelos*, *Turdus iliacus*, *Turdus viscivorus*, *Turdus pilaris*, *Turdus merula*, *Sylvia atricapilla*, *Sylvia communis*, *Sylvia melanocephala*, *Sylvia cantillans*, *Acrocephalus scirpaceus*, *Cettia cetti*, *Hippolais pallida*, *Phylloscopus trochilus*, *Phylloscupus collybita*, *Regulus regulus,Troglodytes troglodytes*, *Aegithalos caudatus*, *Parus caeruleus*, *Parus majör,Lanius collurio*, *Lanius senator*, *Lanius minör,Garrulus glandarius*, *Pica pica*, *Corvus monedula*, *Corvus cornix*, *Corvus corax*, *Corvus frugilegus*, *Sturnus vulgaris*, *Oriolus oriolus*, *Passer domesticus*, *Passer hispaniolensis*, *Passer montanus*, *Fringilla coelebs*, *Fringilla montifringilla*, *Carduelis cannabina*, *Carduelis chloris*, *Carduelis carduelis*, *Carduelis spinus*, *Serinus serinus*, *Coccothraustes coccothraustes*, *Emberiza schoeniclus*, *Emberiza cirlus*, *Emberiza melanocephala*, *Calidris alpina*, *Calidris ferruginea*, *Miliaria calandra*, *Pluvialis squatarola*, *Buteo lagopus*, *Tringa stagnatilis*, *Motacilla citreola*, *Arenaria interpres*, *Lymnocryptes minimus*, *Larus ichthyaetus*, *Numenius phaeopus*, *Luscinia luscinia, Caprimulgus europaeus*

Mammals
Crocidura leucodon, *Pipistrellus pipistrellus*, *Mus musculus*, *Spalax nehringi*, *Rattus norvegicus*, *Rattus rattus*, *Martes foina*
Invertebrates
Argynnis pandora, *Argynnis paphia*, *Vanessa cardui*, *Issoria lathonia*, *Limenitis reducta*, *Melitaea phoebe*, *Melitaea trivia*, *Lycaena tityrus*, *Lycaena phlaeas*, *Polyommatus icarus*, *Pontia edusa*, *Pyrgus malvae*, *Pieris rapae*, *Pieris brassicae*, *Papilio machaon* , *Coenonympha pamphilus*, *Glaucopsyche alexis*, *Lasiommata megera*, *Colias crocea*, *Stictoleptura cordigera cordigera, Stenurella bifasciata bifasciata Stenurella septempunctata latenigra, Clytus rhamni temesiensis, Stenopterus rufus geniculatus, Paracorymbia tonsa, Stenurella nigra, Aphodius fimetarius, Gymnopleurus geoffroyi, Euoniticellus fulvus, Caccobius schreberi, Euonthophagus gibbosus, Onthophagus furcatus, Onthophagus taurus, Onthophagus fissicornis, Onthophagus vacca, Acrossus luridus, Colobopterus erraticus, Onthophagus coenobita, Onthophagus ruficapillus, Melolontha melolantha, Tropinota hirta, Oxythyrea cinctella, Protaetia ungarica, Eulasia arctos, Netocia hungarica, Pezotettix giornae, Aiolopus strepens strepens, Chorthippus loratus, Platycleis (Incertana) incerta, Ruspolia nitidula, Decticus albifrons, Decticus verrucivorus, Platycleis intermedia intermedia, Platycleis escalerai escalerai, Rhacocleis germanica, Pezotettix giornae, Calliptamus barbarus, Acrida bicolor, Chorthippus loratus, Oedipoda caerulescens, Melanogryllus desertus, Gryllotalpa gryllotalpa, Hyles euphorbiae, Epiphanes senta, Keratella tropica, Synchaeta sp., Daphnia hyalina, Diaphanosoma brachyurum, Mesochra sp., Coccinella septempunctata*

As flora characteristics, the area around the Lagoon of Hersek is not interesting, there are no critical plant species. Herbaceous plants form the flora of the region, and shrub species are also rarely found (Anonymous, 2016). The most important finding obtained in the Biodiversity Research Project completed in 2012 is the detection of the *Rumex bithynicus* species, which until now is known to exist only in Iznik Lake, at two points north of the Lagoon of Hersek (Anonymous,2012). However, in 2016, this species was not found in the land studies carried out within the scope of ecologically based scientific research project of Natural Sites of Bursa and Yalova Provinces. This is an indication that the species is extinct in the field. In the studies carried out within the scope of the same project, 169 species and sub-species of 40 families were identified in this field. All species are in the LC (Low Risk) category (Anonymous, 2016). These types are given in Schedule 2.

Chart 2. *Lagoon Flora Features of Hersek (Prepared using Anonymous, 2016)*

Plants
Pinus pinea, Pinus brutia Ten. var. *brutia, Atriplex tatarica* L. Chenopodium chenopodioides (L.) Aellen , *Chenopodium murale* L. *Halimione portulacoides* (L.) *Aellen, Salicornia europaea* L. *Salsola ruthenica, Suaeda altissima* Pall. *Allium paniculatum* L. subsp. *paniculatum Ammi majus* L. *Anthriscus nemorosa* (M.Bieb.) Spreng. *Conium maculatum* L. *Daucus carota* L. *Echinophora tenuifolia* L. subsp. sibthorpiana (Guss.) Tutin *Oenanthe fistulosa* L. *Scandix pecten veneris* L. *Torilis arvensis* (Huds.) Link subsp. *arvensis Asparagus officinalis* L. *Muscari neglectum* Guss. Ex Ten *Ornithogalum narbonense* L. *Anthemis cretica Arctium minus* (Hill) Bernh. *Artemisia vulgaris* L. *Bellis perennis* L. *Bidens tripartita* L. *Calendula arvensis* (Vaill.) L. *Cardopatium corymbosum* (L.) Pers. *Carduus pycnocephalus* L. subsp. *Pycnocephalus Carthamus dentatus* (Forssk.) Vahl *Centaurea iberica* Trevir. ex Spreng. *Centaurea virgata* Lam. *Chondrilla juncea* L. var. *Juncea Cichorium inthybus* L. *Cirsium creticum* d'Urv. subsp. *Creticum Cirsium vulgare* (Savi) Ten. *Conyza canadensis* (L.) Cronquist *Crepis sancta* (L.) Babc. *Crepis zacintha* (L.) Babe. *Crupina crupinastrum* (Moris) Vis. *Echinops ritro* L. *Filago germanica* (L.) Huds. *Hedypnois rhagadioloides* (L.) F.W.Schmidt *subsp. cretica*(L.) Hayek *Inula oculus christi* L. *Lapsana communis L. subsp. intermedia (M.Bieb.) Hayek var. İntermediaMatricaria chamomilla* L. var. *Chamomilla Onopordum tauricum* Willd. *Picnomon acarna* (L.) Cass. *Picris hieracioides*L. *Senecio vulgaris* L. *Silybum marianum* (L.) Gaertn. *Sonchus asper* (L.) Hill *Taraxacum minimum* Heldr. ex Nyman *Tripleurospermum tenuifolium* (Kit.) Freyn *Xanthium orientale* L. subsp. *italicum*(Moretti) Greuter *Xeranthemum annuum* L. *Anchusa azurea* Mill. var. *azurea Cynoglossum creticum* Mill. *Echium italicum* L. *Heliotropium suaveolens*M.Bieb. *Arabidopsis thaliana* (L.) Heynh. *Arabis sagittata* (Bertol.) DC. *Calepina irregularis* (Asso) Thell. *Capsella bursa pastoris* (L.) Medik. *Draba verna* L. *Lepidium campestre* (L.) Aiton *Legousia speculum veneris* (L.) Durande ex Vill. *Knautia orientalis* L. *Sambucus ebulus* L. *Agrostemma githago* L. *Cerastium glomeratum* Thuill. *Minuartia mesogitana* (Boiss.) Hand Mazz. subsp. *kotschyana*(Boiss.) McNeill *Silene vulgaris* (Moench) Garcke var. *commutata*(Guss.) Coode & Cullen *Stellaria media* (L.) Vill. *Convolvulus arvensis* L. *Ecballium elaterium* (L.) A.Rich. *Carex pallascens* L. var. *Pallascens Dioscorea communis* (L.) Caddick & Wilkin *Mercurialis annua* L. Astragalus hamosus L. *Coronilla scorpioides* (L.) W.D.J.Koch*Securigera varia (L.) Lassen Glycyrrhiza echinata* L. subsp. *echinata Lathyrus aureus* (Steven) D.Brândză *Lotus corniculatus* L. var. *Corniculatus Medicago lupilina* L. *Medicago sativa* L. subsp. *sativa Melilotus officinalis* (L.) Desr. *Onobrychis caput galli* (L.) Lam. *Pisum sativum* L. *Bituminaria bituminosa* (L.) C.H.Stirt. *Trifolium arvense* L. var. *arvense Trifolium pratense* L. var. *pratense Vicia sativa* L. subsp. *sativa Centaurium erythraea* Rafn. *subsp. turcicum (Velen.) Melderis Erodium cicutarium* (L.) L'Herit. subsp. *cicutarium Geranium molle* L. subsp. *molle Malva neglecta* Wallr. *Malva sylvestris* L. *Hypericum perforatum*L. *Ballota nigra* L. subsp. *nigra Clinopodium vulgare* L. subsp. *vulgare Lamium amplexicaule* L. *Marrubium vulgare* L. *Prunella vulgaris* L. *Stachysannua* L. subsp. *annua* var. *Annua Salvia sclarea* L. *Salvia virgata* Jacq. *Linum bienne* Mill *Alcea biennis* Winterl *Althaea cannabina* L. *Malva neglecta* Wallr. *Eucalyptus camaldulensis* Dehnh. *Epilobium parviflorum* Schreb. *Fumaria officinalis* L. *Papaver rhoeas* L. *Linaria pelisseriana* (L.) Mill. *Plantago lanceolata* L. *Plantago maritima* L. *Veronica anagallis aquatica* L. *Platanus orientalis* L. *Limonium gmelinii* (Willd.) Kuntze *Aegilops triuncialis* L. subsp. *triuncialisAgrostis castellana* Boiss. & Reut. subsp. *byzantina*(Boiss.) Hackel *Aira elegantissima* Schur subsp. *ambigua* (Arcang.) Doğan *Avena barbata* Pott ex Link subsp. *barbataBrachiaria eruciformis* (Sm.) Griseb *Bromus intermedius* Guss. *Bromus tectorum* L. *Cynodon dactylon* Pers. var. *villosus*Regel *Cynosurus echinatus* L. *Dactylis glomerata* L. subsp. *glomerata Hordeum geniculatum* All. *Lolium perenne* L. *Oryzopsis miliaceae* (L.) Asch. & Schweinf. subsp. *thomasii* (Dudy) K.Richt. *Poa angustifolia* L. *Poa annua* L. *Phragmites australis* (Cav.) Trin. ex Steud. *Polypogon viridis* (Gouan) Breistr. *Setaria viridis* (L.) P.Beauv. *Brachypodium distachyon* (L.) P.Beauv. *Vulpia bromoides* (L.) Gray *Polygonum arenastrum* Bor. *Polygonum bistorta* L. subsp. *bistorta Rumex crispus* L. *Rumex sanguineus* L. *Adonis flammea* Jacq. *Clematis vitalba* L. *Nigella arvensis* L. var. *glauca*Boiss. *Ranunculus arvensis* L. *Ranunculus ficaria*L. *Ranunculus neapolitanus* Ten. *Potentilla reptans* L. *Rosa canina* L. *Rubus sanctus* Schreb. *Asperula arvensis* L. *Salix alba* L. *Melampyrum arvense* L. var. *arvense Verbascum blattaria* L. *Ailanthus altissima* (Miller) Swingle *Datura stramonium* L. *Hyoscyamus niger* L. *Solanum niger Tamarix smyrnensis* Bunge *Urtica dioica* L. *Verbena officinalis* L. var. *officinalisPhyla canescens* (Kunth) Greene*Vitex agnus castus* L.

Cultural Landscape Characteristics of Hersek Lagoon and Its Environment

The village of Hersek, where the lagoon is located, has the Hersekzada Ahmet Pasha Mosque (UR L-4), which was registered by the decision of the Bursa Council for the Protection of Cultural and Natural Assets. Ahmet Pasha's tomb and centuries-old gum trees are located in the mosque garden. Centuries-old trees are not registered. Altınova is a settlement of great importance in the production of fruits, flowers and ornamental plants. Nearly 60% of outdoor and ornamental plants in Turkey are produced in Altınova district (URL-1). Founded in Altınova, Helenopolis is one of the most important settlements of the Roman period. The building where Mustafa Kemal Ataturk was found and rested on the shoreline of the lagoon is one of the important works (Anonymous, 2012). There are also artifacts from Ottoman times by the lake.

In 2020, turkey's first accessible bird watching tower and Medical Aromatic Plants Garden were built by the ministry at a height of 21 meters in the Lagoon of Hersek within the scope of wetland development project (URL-5). There are Visual Greenhouses, R&D Building, Botanical Restaurant, Endemic plant greenhouse, Cafeteria. In addition, there are three beaches in the region: Women's Beach of Hersek, Public Beach of Hersekand Private Beach of Hersek. The lagoon of Hersek and its immediate surroundings are given in Figure 3 of the touristic and recreational areas.

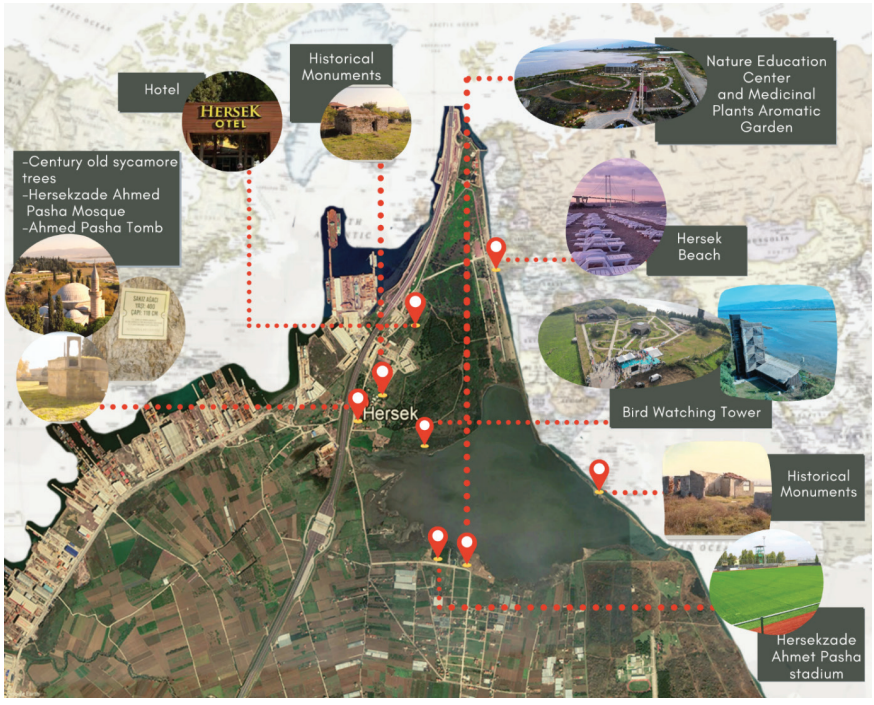

Figure 3: *Touristic and recreational areas in and around the Lagoon of Hersek*

Hersek Lagoon Visual Landscape Quality

The Lagoon of Hersek is a typical and unique area that has gained identity with its existing elements in terms of hosting species in different danger categories on a global and national scale and having unspoiled natural ecosystems. In addition, the fact that the region is an area where two different types of ecosystems meet and form integrity, the relationship of fauna-flora elements with each other in this area increases the visual landscape value. Historical structures, centuries-old trees, archaeological sites, objects and traditional life, as well as cultural landscape values, have high visual landscape value. This area offers unique views for photographers and visitors in four seasons with its existing landscape features.

INTERACTIONS OF LAND USES IN AND AROUND HERSEK LAGOON

Airport-Lagoon İnteraction

The Lagoon of Hersek is located between Bursa Yenisehir Airport and Sabiha Gokcen Airport. Bird migration route passes through the same route. The airports, which are located without taking into account the migration routes of the birds, cause noise pollution and negatively affect the birds by destroying the living areas of the birds.(Özkazanç and Özay, 2019).

Wolfenden (2017) investigated the physiological stress of airplane noise on birds at airports and reported that airplane noise causes hearing loss in bird species. Due to the fact that many airports are located on bird migration routes, birds may appear in flocks in these regions during their annual migration. This situation creates bird-plane collision accidents (Özkazanç and Özay, 2019). It is inevitable that migratory birds that stay in the lagoon every year during the migration period will be affected by all these negativities.

Highways- Lagoon İnteraction

Roadsway have direct negative effects on birds such as habitat loss, fragmentation of habitats, deaths from vehicles, pollution and poisoning. There are also indirect negative effects such as noise, artificial light, movement barriers. All these effects cause a decrease in population density and species diversity(Kociolek et al., 2011; Özkazanç and Özay, 2019). Many species of animals are destroyed by vehicle impact on roadways. Birds are also one of these species. The collision of migrating birds with speeding vehicles in traffic is among the accidents that resulted in death (Anonymous,2006).

It is inevitable that the passing of the highway in and around the lagoon will damage the natural structure. Deaths, noise and exhaust pollution from vehicle impacts that will occur with the crossing of the highway will negatively affect other species, especially migratory birds. In addition, another

cause of pollution caused by the passage of highways around the lagoon is solid waste left by visitors from their vehicles. These wastes pollute the lagoon and its surroundings.

As a positive interaction of the roadways and the lagoon, the number of visitors to the region increases thanks to the fact that it is easily accessible by the highway passing near the area. In this way, visitors can be encouraged to take various ecologically based tourism and recreational activities such as bird watching, nature photography, landscape watching.

Bridge-Lagoon İntreraction

Since the Delta of Hersek is the most important ledge to the north, the southern part of oOman Gazi bridge is located here (URL-6). This part of the lagoon is an important feeding and habitat for coastal birds. Since there is a close distance in between, birds are directly in the domain from noise and exhaust. At the same time, the natural structure of the lagoon is in danger of being damaged due to pollution caused by bridge traffic in the region.

Farming Areas-Lagoon İntreraction

Pollution from agricultural activities causes serious damage to wetlands. Intensively used pesticides reach wetlands by mixing with canals or groundwater, harming aquatic creatures (Sönmez and Somuncu, 2016; Yıldız Karakoç,2019). Agricultural medicines are one of the most important factors that threaten birds (Özkazanç and Özay, 2019). Excessive and widespread use of pesticides increases yields on the obtained products, while poisoning and death in all living things, especially birds (Anonymous, 2006). Apart from pesticides, barbed wire surrounding agricultural areas also poses a threat to birds. It was determined that 95% of bird deaths occurred in barbed wire at standard height around agricultural areas (Reitan and Thingstad, 1999; Özkazanç and Özay, 2019).

Due to the fact that there are first-class absolute agricultural lands around the Lagoon of Hersek, intensive agricultural and greenhouse activities are carried out in the region. “Drainage problems may occur due to the allervy nature of the land of agricultural land and the sea level of its jeans.” The fact that pesticides used in agricultural activities can be transported to the lagoon with drainage waters can cause pollution of the lagoon and damage to flora and fauna (Dalkıran and Baki, 2011).

Industry-Lagoon İntreraction

The most common air pollution problems that occur from different sources, which have different effects on birds of all kinds, are air pollution caused by the burning of substances such as gasoline, coal and oil as a result of industrial activities. Carbon monoxide gas causes breathing problems in

birds. Air pollution does not only affect the health of birds; it also negatively affects their habitat (URL-7). Apart from air pollution as a result of industrial activities, another factor that negatively affects birds is oil spills that cause the death of thousands of birds. (Özkazanç and Özay, 2019).

The Lagoon of Hersek has also been adversely affected in the past years as a result of fuel leaking from the port, and the birds living in the lagoon have perished. 439 seabirds were damaged in the environmental disaster (URL-8). Many industrial activities take place in the immediate vicinity of the lagoon, as in the disaster of the past years as a result of these activities, living things are affected by pollution caused by industrial activities.

Residential Areas-Lagoon İntreraction

With the increasing population in the region, highway crossing and coastal tourism prevailing in the region, secondary housing is increasing and residential areas are increasing towards the perimeter of the lagoon. The increasing population and the accompanying construction cause habitat loss for birds. In the immediate vicinity of the lagoon, settlements have been identified in areas that are important for birds.

Recreational Use-Lagoon İntreraction

Hunting activities are still seen as recreational activities today and are one of the factors that threaten migratory birds. Hunting activities in the lagoon and its immediate vicinity are prohibited by the relevant institutions and organizations.

Coastal tourism dominates the Kaytazdere area in the east and on the north side of the lagoon. Increasingly, the expansion of the beach section to the lagoon side can pose a threat to waterfowl and their habitat.

There is a stadium created by filling 50 meters from the lagoon. It is inevitable that the creatures in the lagoon will be affected by the noise here. In addition, the coastal filling is harmful to the natural structure. There are no planned observation and photography points in the area except for a planned walking route for visitors and a bird watching tower. Considering the presence of the garden near the lagoon and the visitors coming here, the creatures living in the lagoon may be affected by the noise that will occur.

Yalova Green-Blue Tourism Cruising Road project starts from the Village of Hersek (URL-9). In terms of recognizing the touristic and recreational values of the region, this project is a very important value for the Village of Hersek and Altınova District.

Cultural Landscape Value-Lagoon İntreraction

The Lagoon of Hersek and its surroundings are a very valuable region in terms of cultural landscape values besides rich natural landscape values.

The historical monuments starting from the coastline of the lagoon visited by Mustafa Kemal Ataturk continue in the village of Hersek and Altınova district, increasing the cultural landscape value of the region. Altınova has historical monuments from the Roman and Ottoman periods (URL-10). All this information indicates that the region is an important settlement in history and is the center of cultural attention and is very valuable in terms of concentrating visitors on the area.

RESULT

The Lagoon of Hersek, which is registered as a sensitive area to be protected, is one of the essential wetlands, combining various ecosystems with the endemic species it hosts, having a feeding and living environment for most creatures and protecting it with its rich tourism and recreational facilities. According to researches carried out in the field, the Lagoon of Hersek has faced various pressures such as increased construction, intensive agricultural and greenhouse activities, industrial activities, roads and bridge presence. Demircan (2000) and Özdemir (2005) stated; In the past 40 years in Turkey, approximately 1,300,000 hectares of wetlands have been destroyed by deteriorating their ecological structures in drying, belting, polluting, reclamation, etc. Necessary protection measures should be taken to prevent the Lagoon of Hersek from being added to this category. In this context, some proposals have been introduced to protect the lagoon and to benefit from the tourism and recreation opportunities it offers:

Recommendations for Lagoon Protection

- Important areas should be determined and divided into zones for the protection of natural landscape values and water birds in the Hersek lagoon, and no construction should be allowed in these areas

- We need to protect our wetlands, which are vital to a livable world. The protection and transfer of wetlands to future generations should be an integral part of environmental protection activities (Özdemir,2005).

- Hunting activities are prohibited in the area, but there are many species of fauna that are endangered and visit the lagoon every year. In order to ensure the continuity of the generation of living things in the region, the necessary controls should be carried out meticulously.

- In order to prevent pollution and poaching in and around the lagoon, vehicles entering and leaving the area should be monitored with cameras and guards should be strengthened. In case of garbage dumping in the area, relevant institutions and organizations should impose penal sanctions.

- Relevant segments of the community, local people, local governments, sectors operating economically around the lagoon and visitors to the

area should be aware of the natural and cultural values of the lagoon.

- The pollution load of agricultural areas and greenhouses around the Lagoon of Hersek should be calculated, and excessive consumption of fertilizers and pesticides should be prevented in order to prevent pollution and to prevent damage to the creatures living in the lagoon.

- Wind power plants should not be built in any way in the immediate vicinity of the lagoon and on the route of the bird migration route.

- In order to minimize damage to the living creatures in the lagoon from industrial facilities operating in the region, appropriate filters to reduce flue gas emissions should be used by all facilities and necessary inspections should be carried out regularly.

- There are filling areas around the lagoon, which are sensitive areas for coastal birds. Important areas for habitats in the immediate vicinity of the lagoon should be prevented from being used for further economic activities.

- Conscious practices should be made in agricultural activities around the lagoon and these practices should be audited. For example, producers can be directed to drip irrigation methods in agricultural activities. In this way, the problem of drought can be avoided a little.

- On nights when the weather conditions are cloudy or foggy, migrating birds turn to light sources, causing changes in direction and crashing into buildings, causing deaths (Anonymous, 2006). For this reason, night lighting of buildings and facilities near the lagoon should be minimal.

- The use of areas necessary for the needs of waterfowl in the region, such as shelter and feeding, should be limited.

- Wetland management plan should be established. Local participation should also be included when creating a management plan.

Recommendations for Tourism and Recreation Activities

- The Hersek lagoon hosts beautiful landscapes, especially during the periods when migratory birds visit, and this situation increases the visual landscape value of the area considerably. In order for this activity to spread to large masses, tours should be organized in cooperation with photography and travel clubs.

- A walking route should be planned in the area so that visitors do not harm the natural structure and important areas for living things, and can act consciously, sensitive areas on the planned route should be afforested by creating curtains with plants.

- The contact of the highway with the lagoon should be cut off by reforestation. In this way, noise pollution can be prevented.

- Information boards promoting the natural and cultural landscape values of the lagoon and its immediate surroundings should be included during transportation to the area and on the walking paths.

- Bird Watching Festivities can be held regularly in the area every year. Thus, both the natural and cultural values of the region are introduced and the local people can benefit economically.

- Since the coastline is an important area for birds, no touristic and recreational activities should be allowed in this region.

- Registration of centuries-old trees in the area should be carried out so that the cultural landscape and touristic value of the region will increase.

- Hiking can be arranged in the area and these activities can be supported by picnic activities.

- Ottoman-era artefacts should be protected and promoted around the lagoon.

- Informative signs should be positioned along the road and around the wetlands in accordance with the natural structure that introduces the natural and cultural landscape values and important species of the area.

- All reinforcement elements to be positioned in the field should be designed in accordance with the natural structure.

- During the visits to the region, no waste should be left to the environment and noise, etc. Should be avoided, especially in sensitive areas with endangered animals. Care should be taken not to create pollution.

The Lagoon of Hersek and its immediate surroundings allow for many recreational activities, especially bird watching, camping, picnicking, hiking and relaxation. Ecologically based tourism activities that will not only harm nature should be allowed in the region, which is also very valuable in terms of natural landscape values. In this context, observations, literature studies, natural and cultural landscape values in the area are evaluated together and ecologically based tourism activities for the Lagoon of Hersek and its immediate surroundings; bird watching tourism, trekking, photo safari nature and wildlife photography, landscape course are designated.

The Lagoon of Hersek is one of our precious wetlands that needs to be protected in a sustainable way with its species diversity and rich ecosystem structure. In this context, extensive facilities should not be built for tourism activities in the region, which is currently under pressure from various sectors, but tourism and recreational activities should be allowed in the area that will not only harm the natural structure.

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CHAPTER 3

THE EFFECT OF THE CAMPUS OPEN-GREEN AREAS DESIGNED AS AN EDUCATIONAL ENVIRONMENT ON VISUAL QUALITY AND BOOK READING HABIT: "RTEU CAMPUS OPEN-GREEN AREA STREET LIBRARIES EXAMPLE"

Deryanur DİNÇER[1]
Banu BEKCİ[2]
Fatih BEKİRYAZICI[3]
Nagihan KAYNAK[4]

1 Assistant Prof. Dr., Recep Tayyip Erdogan University, Faculty of Engineering and Architecture, Department of Landscape Architecture Orcid:0000-0002-1737-3124
2 Prof. Dr. Recep Tayyip Erdogan University, Faculty of Engineering and Architecture, Department of Landscape Architecture Orcid:0000-0003-1789-535X
3 Research Assistant Recep Tayyip Erdogan University, Faculty of Engineering and Architecture, Department of Landscape Architecture Orcid:0000-0003-2662-2310
4 Recep Tayyip Erdogan University, Library Department Head of Library Department, Orcid: 0000-0003-4756-1481

1. INTRODUCTION

Today, when the importance of nature and natural resources is better understood due to the increasing environmental problems and decreasing green areas, the fact that landscapes are not only economically but also aesthetically evaluated. In this context, determining, evaluating, and maintaining the visual quality of landscapes primarily has been one of the indispensable working subjects in ecosystem management (Erdönmez et. al., 2008). According to Özgüç (l999), how attractive or pleasurable a place is gives the visual quality of that source. These enriched environments can provide restorative and inspiring environments as well as provide a positive aesthetic experience and thus contribute to mental and physical health. In aesthetic experience, including touch, smell, and sounds, the visual component is important and often dominant (Ode and Fry, 2002). Yılmaz et al. (2017) stated that green spaces create positive feelings in users and positively affect their quality of life, green areas help reduce the stress of individuals by affecting the environmental quality, increase the possibilities for social interaction, and relieve mental fatigue. In addition, they said that the effects of naturalness such as peace, happiness and getting rid of negative emotions are also effective on mental wellbeing.

Roger Ulrich, who works on environmental psychology, conducted a series of experiments to test the validity of the hypothesis that viewing nature and natural landscapes has positive effects on people's psychological health. In the first of these (Ulrich, 1979), he investigated the effects on the emotional states of stressed students who passed the final exam of the visual landscape class. As a result of the research, it was observed that the stress of the students watching the nature landscapes decreased, while the students watching the built urban landscapes became more stressed. Likewise, Lau et al. (2009) stated that natural areas in university campuses are physical environments that have positive effects on human mental health. In similar studies, landscapes containing natural elements have been defined as distinctly healing spaces, as they provide emotional relief on individuals (Hartig et al., 1991; Kaplan & Talbot, 1983; Kaplan, 1995). The effects of watching nature landscapes were re-investigated by Ulrich (1981) in another study conducted in Sweden and it was found that the psychological benefits of natural landscapes also appeared in non-stressful individuals. Honeyman (1990) then repeated the same study by adding another category of mixed urban and natural areas, and the results showed that urban landscapes mixed with nature provide greater improvement than nature-deprived urban landscapes. Considering the undeniable effects of nature on human psychology, it is seen that campus open green spaces have many important contributions to the users, especially students. Yilmaz (2015) provides the users of the campus landscape design with many activities such as eating and drinking,

reading, chatting, sitting, listening to music, being rehabilitated, contacting nature, just like in a city park, while at the same time, different conceptual and she states that he should have a spatial fiction. In addition, she says the designers do not forget the fact that the environment will change the individual, and that the relationship between human and nature and the effect of the physical environment on learning should not be ignored, and that well-designed campus open spaces will improve the quality of life of the university students, while the interaction with natural elements will reduce the stress factor and create positive mental and physical effects on individuals. Yıldız and Şener (2006) stated in their study that the campuses, which are a part of the urban landscape, also change the city silhouette and life. In order to achieve functionality and aesthetics with an approach that supports the natural landscape and campus landscape in the campus open areas, it will be important to select the fittings chosen within the campus in accordance with the campus landscape, and to undertake the functions that will contribute to the campus being a learning environment. In this context, the equipments such as the library-bookshelf in the open areas of the campus will be effective. As a matter of fact, Odabaş et al (2008) say that lifelong learning skill starts with having a reading habit.

Universities, which are science nests, are among the places where the habit of reading books should be the most today (Arslan et al., 2009). Individuals and societies that focus their lives on reading and thinking become more successful with a creative awareness that produces more valid and realistic solutions to problems (Gündüzcü O., et al., 2012). Bamberger (1990) states that reading books is a habit and that the environmental factor is important in this habit and that habits are one of the most important consequences of socialization. (Odabaş et al. (2008) states that lifelong learning skill starts with having a reading habit.

Universities are the highest schools where all kinds of science are learned and taught, and young intellectuals, who are the guarantee of tomorrow, are raised. It is essential for university students to read a lot, research, question and use the information correctly and appropriately. It is the young generations that should direct societies in all matters as well as in this matter (URL-1). In researches conducted in different universities and different departments, university students show that the books are expensive, the course intensity, and the use of technological products such as internet and computers for reasons of not reading and not developing the habit of reading books (Odabaş et al., 2008; Arıcı, 2008; Altay et al.,2011).

In this project, which was prepared for the design of Recep Tayyip Erdoğan University campus open spaces as a learning environment and to improve the reading habit in order to contribute positively to the quality of education and training of the campus landscape, the library was inspired

by the street libraries project, which was previously implemented in Berlin, Germany (URL-1). The reason for the inspiration from this project is that it contributes to the culture of the city of Rize, which stands out with its nature, while at the same time supporting its natural landscape and contributing to the visual quality. In addition, it has been considered that the positive effect of nature on human psychology and thus on physical health can be effective in creating a suitable environment for reading books.

In this context, the subject of this project, which is prepared to develop reading habits in Recep Tayyip Erdogan University campus open areas, is the transformation of trees that have fallen from the storm or the rain into a bookshelf by carving their trunks and to street libraries created by putting books into three different campuses of Recep Tayyip Erdogan University for people to gain the habit of reading. In addition, it is aimed that these libraries contribute positively to the visual quality, human psychology and the design of campus open spaces as a learning environment, and the quality of education and training in the campus landscape.

2. MATERIAL AND METHOD

2.1. Material

In this study, tree trunks of 180-200 cm in height were used in groups of three. Various sizes of electric and non-electric saws, screws for assembly, polyethylene material for insulation and wood protective varnish were used in carving the shelves. Books collected by donation method were placed in the created libraries. Wooden material was used for the shelves placed in the hollows, the shelf covers and to write the name of the university, and some construction equipment was used for their transportation.

2.1.1. Description of the Study Area

Three different campuses of Recep Tayyip Erdogan University were determined as the study area, one being the central campus (the most crowded campus) and the others being the medical faculty and education faculty campus The locations of these areas selected within the university campuses are in different places from each other, and each unit placed is within walking distance of the education units (Figure 1).

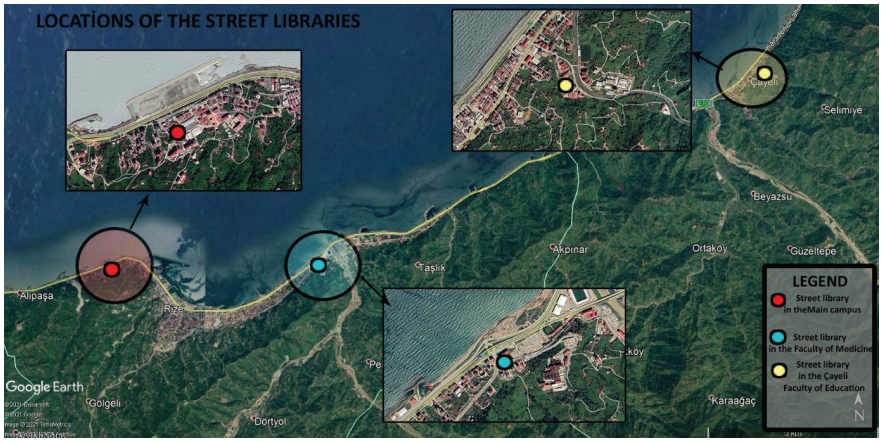

Figure 1 Locations of the Street libraries (Scan the QR code to see the bigger version of the photo.)

2.1.2. Spatial settlement Characters of Library Equipments

The spatial character of the place where the libraries are placed is also very important, as well as creating easily accessible and up-to-date books by users. Spatial settlements increase the quality of service offered to users, as well as providing functionality to Street library equipment. By increasing the organic bond between the built environment and the natural environment of the equipment, it also contributes to the character of the space. For this reason, the characters of the spaces designed to meet the personal and social needs of the inhabitants have a very important place. The spatial settlement characters of the areas subject to the study are included in Table 1.

Table 1. Spatial settlement Characters of Library Equipments

		
Main Campus (Street Library I): Created from natural materials, the unit is supported by the surrounding planting design. It is located in the outdoor of cultural center for student, which is frequently used by	**Çayeli Faculty of Education (Street Library II):** It is located at the point where recreational activities are held and the circulation network is used most intensively, and the natural elements in the space support the Street library equiment. It is in the region with the highest user density.	**Faculty of Medicine (Street Library III):** It is placed in a zone at the end of the circulation points. Due to the high density of the hard surfaces, the natural appearance of the material cannot be perceived by the users.

2.2. Method

2.2.1. Construction of Street Library Equipment

In this study, tree trunks that were overdue, overturned for various reasons or cut for other reasons were researched and found and used in the study. (Table 2). No living trees were cut within the scope of this study. In this way, it is aimed to draw attention to recycling and to contribute to environmental quality with accessories made of natural materials in natural areas.

Table 2. Construction of Street Library Equipment (*Scan the QR code to see the bigger version of the photo***)**

	In this study, tree trunks that were overdue, overturned for various reasons or cut for some reasons were found and used in the study.
	After the trees were provided, they were moved to the warehouse environment and the shelves were determined first, then the shelves were created with electric cutters and from time to time with hand saws.
	Shelves made of wood were mounted in the slots created by carving the shelf places. After the shelves were assembled, the covers consisting of glass part consisting of wood and polyethylene were prepared and attached to the front of the shelves.

	After the shelves were assembled, the covers consisting of glass part consisting of wood and polyethylene were prepared and attached to the front of the shelves.
	After the covers were prepared, the name of the university was written on wood and prepared to be mounted on the bookshelves placed in their places.
	Completed libraries have been transported to three different campuses with the help of construction equipment. Libraries brought to the designated locations were placed by positioning them appropriately.
	The books provided by donation are placed in the libraries placed in three different campuses of the university.

2.2.2. Data Collection and Evaluation

In the study, the photographs taken in the field studies were used to determine the demands of the users for the concept of open space library. The effective parameters in defining the libraries placed in different faculties of Recep Tayyip University (Main Campus (Street Library I), Çayeli Faculty of Education (Street Library II), Faculty of Medicine (Street Library III)); The availability of libraries was evaluated using a questionnaire method by collecting under 4 main headings: book donation by users, book preferences and aesthetics of libraries. Voordt. D.J.M van der (2005) spatial quality criteria (functional quality, aesthetic quality, technical quality, ecological quality

and economic quality) are examined using expert opinion forms.

In the expert opinion evaluation, each space quality criteria were evaluated between 0-1 points in Table 3. The quality criteria in the areas where the libraries are placed were evaluated one by one by 4 different expert groups (landscape architecture faculty members, public institution staff, university students and library staff) and interpreted over a total of 20 points.

The results obtained from the questionnaire forms prepared for open space libraries were evaluated according to user preferences. The relationship between the socio-demographic status of the users and the user preferences was determined by correlation analysis, and the SPSS 16.01 package program was used for the statistical analysis.

3. RESULTS AND DISCUSSION

The findings (i) of the study include the relationships (ii) between the quality analysis of street libraries and the evaluation of street libraries in terms of recreational and user preferences.

3.1. Evaluation of Library Accessories Placed in Different Campus Open Areas According to Quality Criteria

The information obtained by evaluating the space quality criteria, which consists of four main headings developed by Van der Voort, by different user segments (Landscape architecture students and faculty members, Public employees, University students and Library staff) are given in Table 3 (Kearney, 2008).

Table 3. *Examination of street libraries located in different areas according to Van der Voort quality criteria*

Quality criterias	Desciptions	Expert opinions					
			LAAS	PE	S	LS	Total
Functional Quality	In the places where the units are placed, it was aimed to contribute to the design of these areas as a learning environment by enabling the users to spend their leisure time with better quality and to gain the habit of reading.	**I**	4,4	2,7	0,8	4,6	12,5
		II	4,4	3,8	3,4	5	16,6
		III	2,3	1,5	0,8	2,2	6,8

Aesthatical Quality	Care has been taken to place the units in natural spaces as much as possible, and care has been taken to ensure that the units installed have features suitable for natural spaces.	**I**	4,3	4,0	2,1	3,3	13,7
		II	3,9	3,4	2,1	4,9	14,3
		III	2,5	1,9	0,1	3,0	7,5
Technical Quality	In addition to paying attention to keeping the interventions on the materials used in the libraries low and maintenance costs low, only screws and polyethylene materials were used.	**I**	4,0	3,7	2,8	3,1	13,6
		II	4,1	3,6	2,7	3,5	13,9
		III	3,0	3,6	2,8	2,8	12,2
Ecological Quality	Ecological balance has been paid attention to in the created unit. Care has been taken to ensure that the logs used are obtained as a result of falling over and collapse in natural disasters. These used units are placed in a way that is completely environmentally friendly and harmless.	**I**	4,7	4,6	4,3	4,9	18,5
		II	4,3	4,6	4,3	4,9	18,1
		III	3,5	4,6	4,3	4,8	17,2
Economic Quality	As in the construction and maintenance of the libraries, the minimum budget possible is used in the supply and continuity of the books. Thanks to the exchange of the books used, an economic contribution will be made to the users.	**I**	4,5	4,5	4,9	5	18,9
		II	4,5	4,4	4,9	4,7	18,5
		III	3,9	4,3	4,9	4,4	17,5

LAAS: Landscape architecture department academic staff, **PE:** Public employees, **S:** Students,
LS: Library Staff, I: Main Kampüs, II: Çayeli Faculty of Education, III: Faculty of Medicine

Looking at the Functional Quality criteria in the places where the street libraries are placed, it is seen that Library II gets the highest score with 16.6 points, while Library III is the lowest in terms of Functional Quality with 6.8 points. Besides being close to the green areas where recreational activities are held, Library II is located at the point where the circulation network is

used most. This situation has shown that the spatial layout characteristics of the library equipments are very effective in the usability of these equipment. Because although their functional qualities show similar features, their spatial settlement characteristics differ. As a matter of fact, Sullivan (2004) and Brook (2010) stated in their study that individuals living close to green areas use these areas more and participate in social activities more. Library III is not available on the circulation network. In this case, it reinforces that the spatial layout characters of the library equipments are very effective in the usability of these equipments, especially in terms of accessibility. Similarly, Nielsen and Hansen (2007) and Peschardt and Stigsdotter (2013) revealed that the further away individuals live from green areas, the less they use these areas.

When looking at the aesthetic quality criteria, it is seen that Library I and Library II have close values, while Library III has a lower value than these two areas. This is explained by the fact that the materials used in the library units consist of natural materials and complement the spatial layout character. Because while the libraries in the two areas were placed almost intertwined with the planted areas, Library III could not provide visual integrity with its surroundings positioned in a more artificially perceived area. This situation coincides with the statement of Ode and Fry (2002) that the visual component is important and generally dominant in the aesthetic experience, which includes touch, smell and sounds.

Since the materials used in the library units are made of natural materials and contain few interventions, the Technical Quality criteria are similar in themselves.

Because the units consist of natural materials and contain little intervention, the Economic Quality criterion and the contribution to the green area perception where they are placed, the Ecological Quality criterion is parallel with each other and has the best results. Özhancı and Yılmaz (2017) stated that university campuses, which are an urban landscape, also form the nature-oriented, ecological face of urban areas. The results obtained in this study, too, have been seen to emphasize the reinforcements made of natural materials by contributing to the ecological face of university campuses.

3.2. Evaluation of the Contribution of Library equipments to Reading Habits in Terms of User Preferences

While evaluating the preferences of the Recep Tayyip Erdoğan University campus area users (Zihni Derin (Main) Campus, Medical Faculty Campus and Faculty of Education Campus) towards the open area libraries, the socio-demographic structures of the users participating in the survey were also taken into consideration. Correlation analysis results for this purpose

are given in Table 1 and accordingly 51.25% female and 48.75% male users participated in the survey.

Table 4. Relationship between users' socio-demographic characteristics and their demands for street library concepts

	1b	1c	1d	1e	2a	2b	2c	2d	2e	2f	2g	2h	2j	2k	2l	2m
1. Socio-demographic status of users																
1a.Gender (1:Female,2:Male)	,163	,004	,199	-,206	,165	,198	-,100	,020	,203	-,074	,128	,281*	,262*	,035	,006	,032
1b.Age (1:16-18, 2:19-20, 3:21-22, 4:23-24, 5:25-30, 6:30-40, 7:40-50, 8:50-above)		,008	,449**	-,595**	,003	-,087	-,017	-,046	-,062	,164	-,179	,068	-,074	,084	-,006	,000
1c.Education Status (1: Bachelor degree, 2: Master's degree, 3: Doctorate)			,288**		,135	,085			,018			-,074	-,032	,013	-,002	-,150
1d. Your role at the university (1:Student, 2:Staff, 3:Academic member)				,113	-,095	,070	-,057	,004	,143	-,056	,093	,189	,086	-,139	-,106	-,258*
1e.If you are Student (1: I'm getting a scholarship, 2: I'm getting financial support from my family, 3:I am Working, 4: I am both working and getting financial support from my family.)				-,500**	,102	,094	-,078	-,076	-,025	,099	,120	-,181	,029	,062	,152	-,015
					-,092		,089	-,053		,022	,001				-,202	
2a. Would you prefer such a street library? (1:Yes, 2: No)						,257*	-,182	,162	,365**	-,069	,203	,318**	,305**	,306**	,014	,199
2b. Do you donate books to the street library? (1:Yes, 2:Maybe, 3:No)							-,334**	,197	,439**		,081	,311**	,100	,128		,261*
2c. What kind of books do you prefer in such libraries? (1:Scientific book, 2:Magazne, 3: Newspaper, 4:Novel)								-,154	-,041	-,324**	-,113	-,089	,129	-,209	,090	-,097
2d. What do you think about street libraries being in city parks? (1: Increases the habit of reading books, 2: It contributes to the evaluation of idle books., 3:It develops awareness of social responsibility through barter method.)							4	,220*		,108	,108	,207	*	,171	,052	,255*
										-,123					-,078	
2e. Would you like to donate your books to such libraries? (1: Yes, 2: No)											,100	,496**	,316**	,051		,230*
2f. If your answer is Yes ;? (1: I want everyone to benefit from my books, 2: To make room for my new books, 3: To contribute to this project)													,005	-,007		
											-,015	-,189			,172	-,178
2 g. Does the appearance of the library have an aesthetic contribution to the place where it is placed? (1:Yes, 2:No)										-,498**		-,240*	-,001	,110	-,036	-,108
2h. Does easy accessibility of books increase reading habits? (1: Yes, 2: No)													,252*	,168		
2j. Would you bring back the books you bought after reading them? (1:Yes, 2:No)														-,009	,054	,191
2k. Will the format of the book swap object be effective in purchasing books? (1:Yes, 2: No)																,081
2l. Should the book swap object be compatible with the surrounding equipment?(1: Yes, 2: No)															,265**	,294**
2m. Do you trust users to swap books? (1: Yes, 2: No)															,032	,094
															,261*	-

** Correlation significance % 99
* Correlation significance % 95

In Table 1, there is a positive significant relationship between gender and variables 2h and 2j at 95% confidence level ($p < 0.05$) ($r = 0.281$ *, $r = 0.262$ *). It is observed that the number of female users who stated that they will return the books they bought from the open space libraries is higher than the male users, while they also think that being easily accessible increases the reading habit. This situation coincides with the studies by Sullivan (2004), Brook (2010), Nielsen, and Hansen (2007), and Peschardt and Stigsdotter (2013) that they show that easy accessibility is effective in using these areas in open green areas.

According to the correlations between the age of the users and 1d and 1e (r=0.449**, r=-0.595**), it is seen that as the age of the users increases, they make an academic career, and if they are students, they prefer to work in addition to family support. In addition, the university students participating in the evaluation, who are working and getting support from their families (r=-0.500**), namely the young people, rely more on the users in exchanging books (r=-0.288*).

There is a significant positive relationship (r=0.257*, r=0.365**, r=0.318**, r=0.305** ve r=0.306**) between the users who prefer the street library and 2b, 2e, 2h, 2j and 2k. It has been determined that users who prefer open space libraries can donate to libraries, give their own books, increase their reading habits, leave the books they borrowed back after reading, and think that the street library format is effective in buying books. This situation is in line with Hodson and Sander (2017)'s studies that campuses covered with vegetation increase the reading performance of students and there is a significant relationship between them. In addition, it has been observed that users who do not intend to donate (r=0.439**) to the street library prefer (r=-0.3n34**) scientific books and do not want to donate their books. While users who want to donate books want everyone to benefit from their books (r=-0.324**), they stated that the fact that they are easily accessible will not increase the habit of reading books (r=0.311**) and even do not trust users to exchange books (r=0.261*). The users who find the open space libraries suitable to be in city parks think that the barter method will increase the awareness of social responsibility. However, they stated that they do not want to donate to open space libraries (r=0.220*), the purchased books will not be returned after they are read (r=0.268*), and they do not trust users to exchange books (r=0.255*). The answers given by users who do not want to donate books correspond to other comments(r=-0.498**,r=0.496**, r=0.316**, r=0.230*). Similarly, users stated that the aesthetic value of open space libraries is not related to reading habits (r=0.240*).

As a result of this study, which was carried out in order to contribute to the design of university campus open spaces as an educational environment, to gain the habit of reading books and to create an awareness about solidarity, the visual quality of the spatial settlement characters, especially the accessibility of the open space libraries, which are very important in terms of accessibility, It has been seen to support. In addition, it has been tried to show that it is possible to create a library for street libraries, whose main purpose is to gain the habit of reading books, without making too much expense.

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CHAPTER 4

URBAN GREEN SPACES AND COOL ISLAND EFFECT: THE CASE OF KONAK DISTRICT, İZMIR MUNICIPALITY

Ebru Ersoy Tonyaloğlu[1]
Birsen KESGİN ATAK[2]

1 Doç. Dr. Aydın Adnan Menderes Üniversitesi, Ziraat Fakültesi, Peyzaj Mimarlığı Bölümü, 0000-0002-2945-3885
2 Doç. Dr. İzmir Demokrasi Üniversitesi, Mimarlık Fakültesi, Peyzaj Mimarlığı Bölümü, 0000-0003-4786-0801

Introduction

Cities and their surroundings are the places where dramatic changes occur based on the population growth and increase in the demand for different land uses. In general, human related changes may result in devastating ecological consequences in cities and those often occur without being noticed or measured in the short term. However, some ecological consequences of urbanisation, deforestation and industrialisation can be clearly noticed and measured quickly, such as the accumulation of greenhouse gases in the atmosphere and the creation of urban heat islands (UHI).

Recently, the negative influences of urbanisation on atmospheric parameters have been the subject of research in many cities of the world. Plenty of research proves that the surface and air temperature in urban environments is generally higher than the rural ones (Oke, 1973; Lee et al., 2009; Montávez et al., 2000). This effect is called as the urban heat island (UHI) effect, was first identified and introduced to the literature by Luke Howard in London in 1820 (Streutker, 2003). The UHI is generally associated with increasing energy consumption, health risks as well as decreasing air and water quality (Frumkin and McMichael, 2008; Tomlinson et al., 2011; Berger et al., 2017). But, the presence of healthy and dense vegetation cover in urban environments can mitigate the UHI effect by creating a shaded environment and absorbing the radiation energy through photosynthesis and transpiration (Yao et al., 2021). The cooling effect provided by vegetation cover in urban green spaces is called Green Space Cool Island (GCI) (Du et al., 2017; Wang et al., 2019).

GCI effect is well-studied for different green space types i.e. parks, gardens, green roofs, green walls and vertical gardens (Yu and Hien, 2006; Klein and Coffman, 2015). Accordingly, the contribution of urban green spaces into healthy urban environments, together with the GCI effect, have been invaluable both for effective landscape planning strategies and practice. So, two main methods have been widely used in the UHI and GCI research as an attempt to understand their formation processes. The first approach is the traditional way of methods for UHI and UCI, and employs meteorological observations. This approach yields in more accurate results, however, such approaches are generally requires longer time periods and can be applied to the only a small scale of land depending on the availability and distribution of meteorological stations (Magee et al., 1999; Unger et al., 2001; Du et al., 2017). The second approach is based on thermal remote sensing retrieval (land surface temperature-LST) which can be applied to larger areas and can provide simultaneous and continuous data (Cao et al., 2010; Saaroni and Ziv, 2003; Streutker, 2003; Chudnovsky et al., 2004).

Previous research on LST and UHI underline the existence of healthy

vegetation, in particular its density, as the key elements to reduce the adverse impacts of UHI and form GCI effects in urban environments (Weng et al., 2004; Chen et al., 2006). In this regard, urban green spaces (UGSs) are assumed to be crucial elements of urban environments mitigating the UHI effect and providing cooler areas. However, the formation and magnitude of GCI effects are generally depended on the type, size, shape, and distance to other green spaces. Also different of land cover types inside and outside of UGSs are important factors for GCI effect (Du et al., 2017). As emphasised by several studies, the relationship among the size, shape and LST of UGSs is not linear, and there is a strong interrelation among the spatial arrangement/configuration of UGSs (Du et al., 2017). Besides, the characteristics and content of urban green spaces is another important factor for the formation and magnitude of GCI- such as the percentage of vegetation cover and the type of vegetation - i.e. tree, shrub or grass (Wong et al., 2007; Li et al., 2012). But, as noted by Du et al. (2017), much of the current literature on the relationship between UHI and GCI has been conducted within UGSs but not included the surrounding landscape and its content. In this study, we evaluated the role of the green spaces, their content and outer environments on the formation of GCI effect in the case of Konak district as one of the most populous district of Izmir province.

Materials and Methods

Study area

Konak, central and administrative district of Izmir province, is located in the eastern coastal part of the Izmir bay (Figure 1). Historically, Konak district has been the administrative and economic centre of the Izmir metropolitan area depending on its socio-economic and socio-cultural diversity. So, Konak is one of the most populous districts in the province of Izmir. It has a total area of 2,438 ha with a population of 344,678 by the end of 2020. Konak district has a very compact and dense built-up area with mostly administrative, cultural, and commercial buildings and road networks. Konak district had the largest UGSs among the all central districts of the Izmir metropolitan area, but with a very fragmented and dispersed pattern.

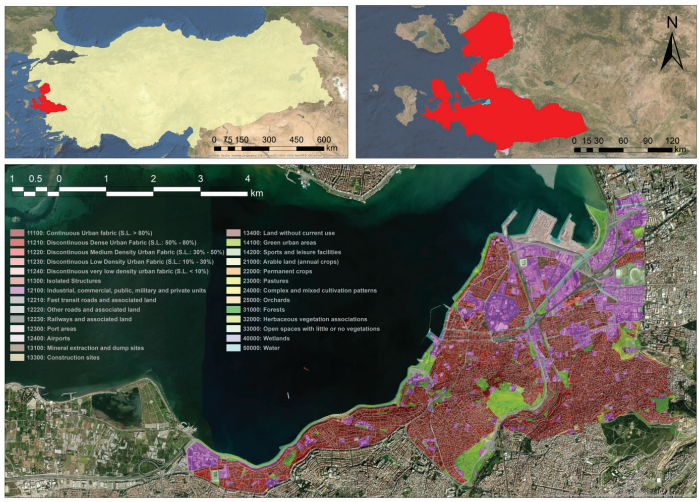

Figure 1. Study area and its LULC types

Data sources

This study used two main data sources: the Urban Atlas 2018 data and Landsat 8 OLI satellite images. The land use/land cover (LULC) map and urban green spaces information of Konak district was obtained and extracted from the European Urban Atlas data (CLMS, 2021). For this study, we have selected and used 45 urban green spaces larger than 1ha as case study areas. The second dataset, Landsat 8 OLI satellite images, used for LST retrieval. Since the GCI effect is generally stronger during summer periods, pre-processed satellite images of three different dates (12 July 2018, 20 August 2018 and 21 September 2018) from the hottest months of Izmir province were downloaded from Landsat archive of EarthExplorer website of the United States Geological Survey (USGS, 2021).

Descriptors of urban green spaces and the surrounding areas

We reclassified the 19 subclasses of the Urban Atlas 2018 (UA2018) into 6 LULC broader types, namely green urban areas, grasslands, impervious buildings, impervious other, impervious roads, and water. Urban green spaces with an area greater than 1ha (totally 45 urban green spaces) were extracted from UA2018, and different land cover types inside of them were mapped using the high resolution Google Earth data.

This study used the descriptors urban green spaces and the surrounding areas defined by Du et al (2017) in addition with two descriptors for the areas covered by grass.

- GSA: Total urban green space area,

- LSI: Landscape Shape Index of the urban green space,
- PG_in: % of grass cover inside the urban green space,
- PV_in: % of vegetation cover inside the urban green space,
- PI_in: % of impervious surface cover inside the urban green space,
- PG_out: % of grass cover outside the urban green space,
- PV_out: % of vegetation cover outside the urban green space,
- PI_out: %of impervious surface cover outside the urban green space.

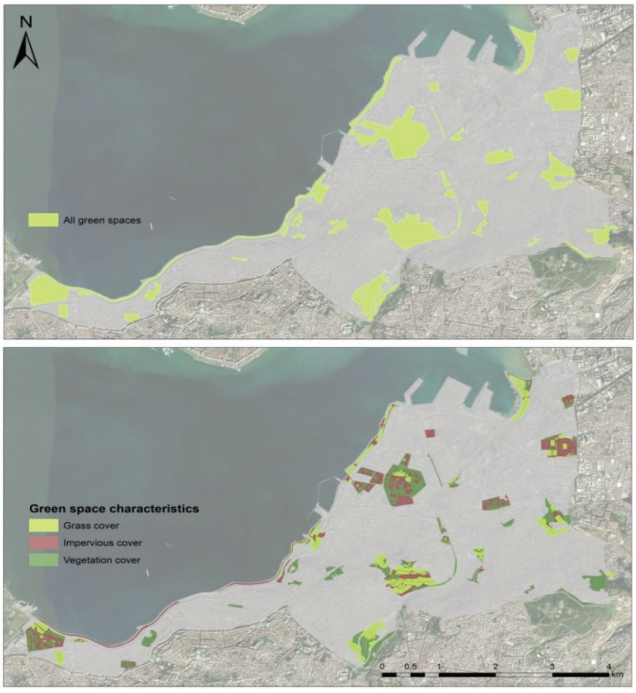

Figure 2. Distribution of green spaces and their characteristics

Whilst the LSI was calculated in FRAGSTATS 4.2.1 using class level metrics, other descriptors were calculated using ArcGIS 10.5.1.

Calculation of Land Surface Temperature (LST) and Green Space Cool Island (GCI) indicators

The GCI effect was retrieved from the difference of the LST values between different urban green spaces as well as their surrounding areas. The LST has been calculated using Landsat 8 OLI satellite images according to

the LST retrieval method previously applied by Chen et al. (2014) and Du et al. (2017). For the LST calculation, the red and infrared bands (30 m resolution) and thermal bands (10 and 11 with 100 m resolution) were used. The research method consists of 4 main stages:

- Calculation of the Top of Atmospheric Radiance (TOA),
- Transformation of Spectral Radiance to Blackbody Temperature (BT),
- Determination of Land Surface Emissivity (LSE),
- Determination of land Surface Temperature (LST).

In order to identify and assess the GCI effect in our case study area, we have followed the method used by Du et al. (2017). Initially, we have created buffers from the outer edge of each urban green space with a fixed interval of 5 m (covering a total of 200 m along 40 zones). Then, the average LST value within each buffer slice was calculated and the relationship between the distance and the LST was plotted to find out the GCI effect of each urban green space on the surrounding areas. Afterwards, the following indices were calculated to have a complete picture of the GCI effect in our case study area (based on Du et al., 2016a,b and 2017):

- GCI Range (GR): Defines the distance between the edge of the urban green space and the point where the LST drop is seen (m).

Results

The general characteristics of urban green spaces and the GCI effect

In Konak district, urban green spaces cover a total area of 358.15 ha (14.70% of the whole study area). Whilst green spaces are well-distributed throughout the district, the percentage of vegetation cover and the type of vegetation in them differs from each other. Our LST calculations showed that the mean LST inside the selected 45 green spaces is 30.69 °C which is lower than their surroundings (34.41 °C) (Figure 3). On the other hand, the maximum, minimum and mean LST values in Konak district are 40.39 °C, 22.02 °C, and 30.35 °C, respectively.

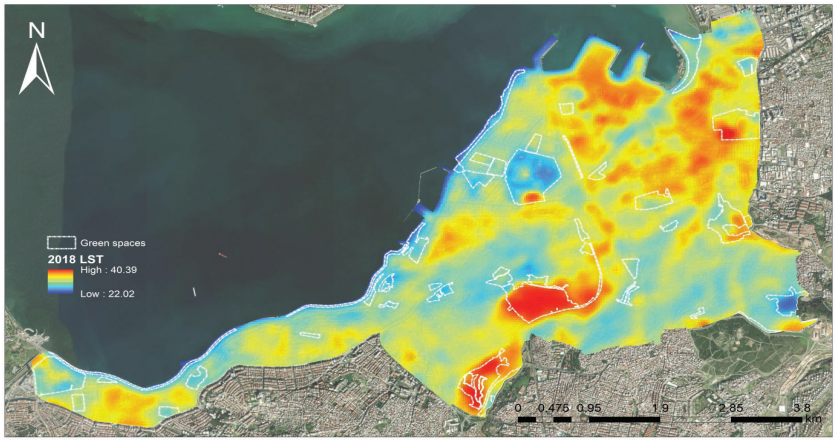

Figure 3. LST of the study area (mean of July, August and September)

Table 1 and 2 give the summary and general results of characteristics of urban green spaces and the GCI effect.

Table 1. General characteristics of green spaces and their GCI effect

	GSA (ha)	LSI	GCI (LST °C)	GR (m)	TA (°C)	TG (°C/ km)
Minimum value	1.01	1.10	22.02	10.00	-1.68	-0.17
Maximum value	44.56	5.12	40.39	185.00	2.83	0.28
Mean value	7.02	1.89	30.69	49.00	0.30	0.001

Table 2. Characteristics of individual green spaces and GCI effects

Green space	GSA	LSI	GCI	GR	TA	TG
1	3.40	1.19	30.26	175	1.36	7.76
2	3.77	1.17	30.88	75	0.26	3.46
3	1.29	1.52	30.17	10	-0.10	-10.37
4	4.74	1.92	34.72	10	-0.76	-76.08
5	1.53	1.19	33.38	10	0.14	14.14
6	6.09	2.57	31.50	60	0.42	7.00
7	4.87	1.45	29.76	50	0.54	10.87
8	28.43	1.23	30.33	15	-0.38	-25.46
9	15.78	2.99	34.05	10	-0.53	-53.00
10	1.13	1.61	30.50	185	0.66	3.54

11	2.06	2.68	30.39	40	0.22	5.41
12	1.01	1.90	30.54	45	0.23	5.11
13	1.25	1.71	29.97	100	0.63	6.28
14	1.64	1.77	29.29	25	0.24	9.73
15	9.87	1.86	28.26	130	2.20	16.91
16	1.23	2.19	29.83	120	0.74	6.19
17	1.01	1.29	29.44	20	0.14	7.10
18	1.82	1.40	28.96	100	1.00	10.03
19	36.65	1.71	34.98	10	-1.68	-167.84
20	1.16	2.46	29.78	125	0.96	7.69
21	3.56	2.29	31.58	15	0.58	38.63
22	1.75	2.48	29.65	15	-0.35	-23.16
23	2.40	2.39	28.99	75	0.55	7.39
24	3.77	1.34	30.00	10	-0.25	-24.82
25	1.82	1.31	30.33	10	-0.13	-12.87
26	3.71	1.29	30.35	70	0.31	4.38
27	1.41	4.15	32.76	10	-0.11	-10.64
28	1.92	1.20	31.76	10	0.03	2.83
29	14.07	5.12	28.44	10	-0.42	-42.46
30	1.72	1.44	30.11	50	0.49	9.87
31	2.16	1.64	31.11	115	0.36	3.13
32	1.51	1.19	32.24	15	0.03	2.11
33	16.92	2.12	31.61	20	-0.06	-2.89
34	9.78	1.45	31.43	30	0.50	16.63
35	6.10	1.35	29.39	40	0.45	11.37
36	2.56	1.63	31.38	70	0.40	5.78
37	4.68	1.13	30.25	10	-0.18	-18.40
38	3.50	1.22	30.69	10	-0.26	-25.81
39	44.56	1.10	29.24	150	1.80	12.00
40	1.16	3.86	31.74	10	0.00	-0.35
41	3.62	1.22	30.56	15	-0.34	-22.83
42	23.84	1.25	32.54	10	-0.30	-29.50
43	11.09	3.42	27.82	10	2.83	283.30
44	4.90	1.50	30.34	100	0.31	3.06
45	14.51	2.02	29.90	10	0.75	75.21

Amongst 45 green spaces, the GSA ranged from 1.01 ha to 44.56 ha with a mean GSA of 7.02 ha. Whilst the mean LSI value of green spaces is 1.89, the difference between the maximum and minimum is 4.02 indicating the heterogeneity in the shape of green spaces that are considered (max

and min value of 5.12 and 1.10, respectively). The mean LST outside of the selected 45 green spaces increases as the distance from green spaces gets longer until the GR is reached. Besides, the values for GR lie between 10 m and 185 m with an average value of 49 m, and the mean TA value is 0.30 °C with minimum and maximum values of -1.68 °C and 2.83 °C. The TG values are between -0.17 °C/m and 0.28 °C/m.

Relationships between the GCI effect and the impact factors

Figure 4 represents the relationship between LST (°C) and LSI. We have found that the LST of green spaces is negatively correlated with LSI, meaning that a green space with more complicated shape results in a lower inside LST.

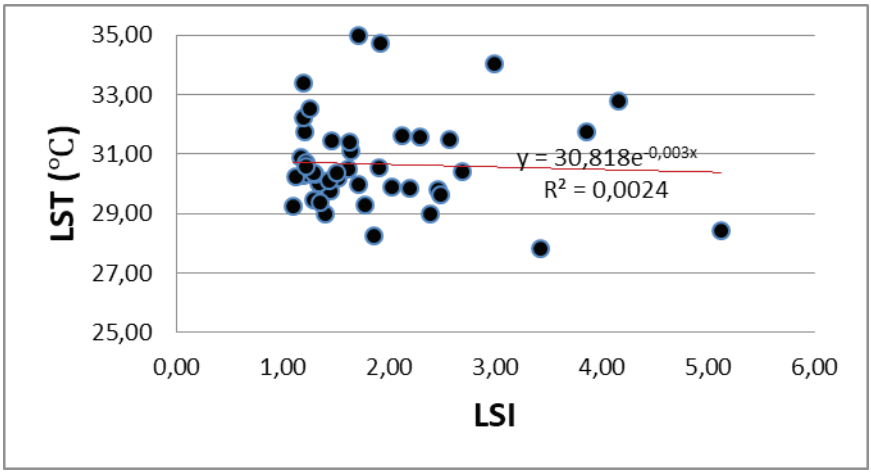

Figure 4. Relationship between LST (°C) and LSI

Figure 5 shows the relationships between LST of all UGSs and the distance (m) from green spaces. Around 90 m outside the all greenspaces, LST remains almost the same. But then, up to 120 m, LST around green space increases as the distance from green spaces increase. Finally, between 120 m and 200 m, the LST increase slows down, indicating that the GR is reached.

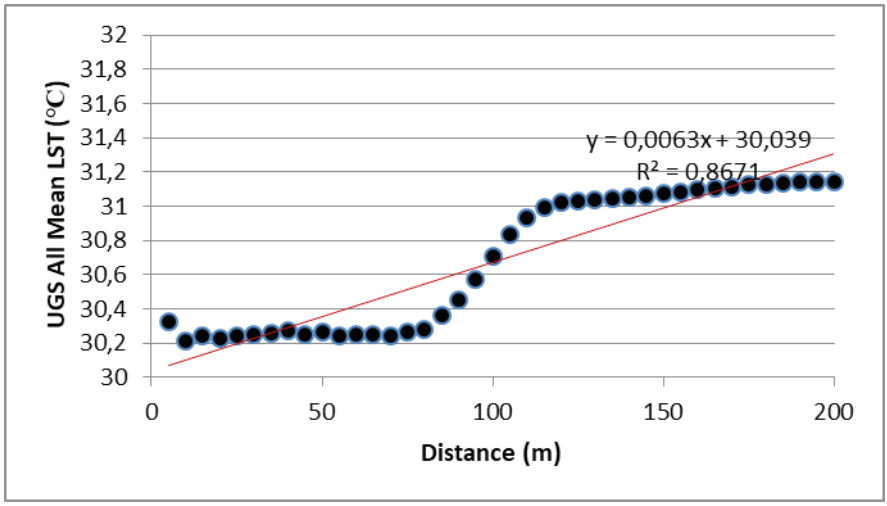

Figure 5. Relationship among LST of all UGSs and the Distance (m)

Our results indicate that the GSA is positively correlated with the LST (Figure 6). This is a surprising result, as previous studies confirmed that the larger green space area is the smaller LST value. But, as we look at the green space characteristics, these results become meaningful. When a green scape includes larger impervious and grass surfaces than vegetation cover, LST of the green space increases. However, if the green space is mostly consisting of vegetation cover, GSA negatively correlates with its LST.

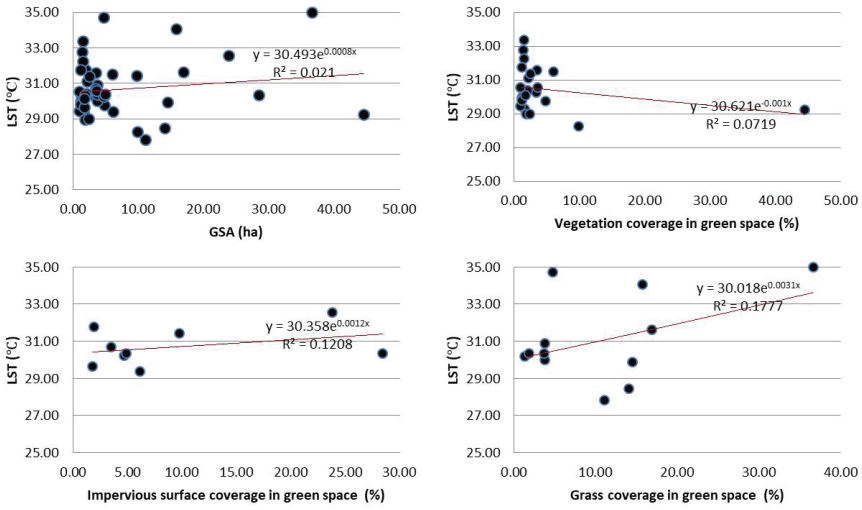

Figure 6. Relationship among LST and GSA, vegetation, impervious surface and grass coverage

Figure 7 shows the relationships among the percentage of grass cover outside the urban green space (PG_out), percentage of vegetation outside the urban green space (PV_out), and percentage of impervious surfaces outside the urban green space (PI_out).

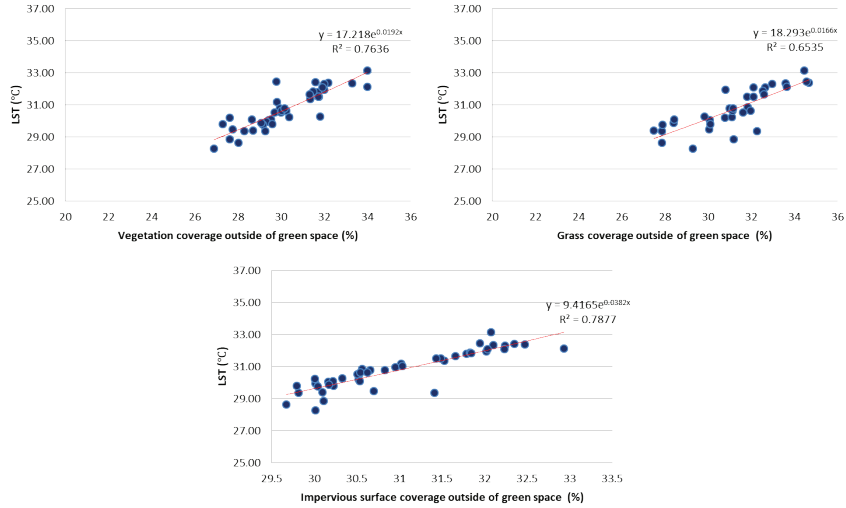

Figure 7. Relationship among LST and PG_out, PV_out and PI_out

The value of LST around green spaces increase as the distance from green spaces increase, so as expected, there is a positive correlation among the percentage of grass cover outside the urban green space (PG_out), percentage of vegetation outside the urban green space (PV_out), and percentage of impervious surfaces outside the urban green space (PI_out). PI_out and PG_out contribute an increase in LST more than PV_out, because vegetation cover around greenspaces can help to compensate the temperature increase compared to PI_out and PG_out. So, larger portions of PV_Out help to increase the distance between the edge of the urban green space and the point where the LST drop is seen.

Discussion and Conclusion

This study we evaluated the role of the green space characteristics and its surrounding environment on the formation of Green Space Cool Island (GCI) effect in the case of Konak in Izmir province. Our results confirmed that high LSI and vegetation cover inside a green space is an important factor for decreasing LST values and creating Green Space Cool Islands in urban environments. However, even though larger areas have a positive impact on Green Space Cool Islands, our results represented the other way. This was simply because of the spatial characteristics of our green spaces, where the

larger proportions of green spaces are covered by impervious surfaces and grass areas. Normally, it is expected a larger green space to include more vegetation, and accordingly to create lower LST values and create Green Space Cool Islands through high photosynthesis and transpiration processes (Lu et al., 2012; Chen et al., 2014; Du et al., 2017). But, in our case study area, larger surfaces of impervious and grass cover impairs the GCI effect of existing vegetation cover.

On the other hand, higher proportions of impervious surfaces (Yang et al., 2011; Kaplan et al., 2018). In order to reverse this negative impact of impervious surfaces and grass areas, we need to increase the amount of actual green areas in green spaces. Such an approach should include the use of dense and healthy woody plant species, i.e. deciduous and coniferous trees and shrubs (Dimoudi and Nikolopoulou, 2003; Amiri et al., 2009; Kong et al., 2014). As previously indicated different forms of vegetation can effects the magnitude of LST and create different local microclimate conditions in urban environments, i.e. grass, shrub and trees (Shiflett et al., 2017). Grass and tree / shrub cover in a green space generally provide contrasting Green Space Cooling Islands effects. Many researchers suggest that tree / shrub and water surfaces are better optıons to reduce the adverse effects of urban heat islands and creating Green Space Cooling Islands for the urban areas with warm and humid climates as in İzmir province (Chen et al., 2014).

Our results are significant in at least two major respects. First of all, each urban environment shows unique characteristics in terms of GCI effects depending on the structure and size of green spaces and their own content. Our findings provide further support for the conceptual premise that a green space with the larger vegetation surface can support the stronger GCI effects. The density and efficacy of urban green spaces are shaped on the basis of the physical characteristics and morphology of a green space, as well as land cover and land use forms and other cultural and socio-economic characteristics associated with them. However, it is obvious that the increase in the built-up and impervious areas and the decrease in the vegetation cover are important factors in the decrease of GCI effects. In this context, increasing the variety, density and amount of plants on green spaces and plant surfaces in their surroundings, and reducing the use of impermeable hard floor materials in these areas are among the simple but very effective measures. Secondly, our study highlights the importance of creating an urban thermal monitoring system, using remote sensing and geographic information systems. Such tools have become very important in landscape planning studies as they provide up-to-date information on urban thermal environments and determine the areas with urgent need for interventions to reduce urban heat island effects and increase urban thermal comfort for people.

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CHAPTER 5

ENERGY EFFICIENT EQUIPMENTS IN URBAN OPEN AREAS

Elif BAYRAMOĞLU[1]
Ali YURDUSEVER[2]

1 Assoc. Prof. Karadeniz Technical University, Forestry Faculty, Department of Landscape Architecture, Trabzon, Turkey, ORCID ID: 0000-0002-6757-7766.
2 Graduate Student, Karadeniz Technical University, Department of Forestry Faculty, Department of Landscape Architecture, ORCID ID: 0000-0002-3632-3309

INTRODUCTION

Cities are constantly changing, developing and growing areas with residential areas, production and consumption, and dynamism. Cities that are shaped according to the lives and needs of the users and that "keep them alive" are also kept alive by the users (Aydemir, 1999). City; it is a set of systems in which it is integrated with the political, economic and social framework and urban benefits are provided. Cities are not only large-scale, but also meeting centers where people live, work and have fun, providing the most suitable conditions for commerce and transportation that organize urban life (Gardner, 2016). The city, all the elements that exist naturally or that are created afterwards, create an imaginary perception. With the increase in the urban population over time, the needs of the citizens have also increased over time. With the efforts to meet the needs, cities have developed physically. It separates people from the environment to a certain extent. the emptiness in which it is conducive to continuing its actions; It is the concept of urban space that emerges with the limitation of the space (Aslan, 2018).

Urban open green spaces create a long-term balance system for uses in different areas of the urban structure. at the same time, it is a variable phenomenon that offers different opportunities in many ways, keeps it alive and lives (Yeşil, 2006). Urban green spaces have played a role in preventing ecosystem destruction and reducing the negative effects of rapid urbanization for centuries. makes positive contributions to human life (Jim & Chen, 2006). Urban space and its user have many functions in terms of needs and organization. Urban furniture is needed to provide these functions and activities. Urban equipment provides opportunities for recreational uses of space in urban areas surrounded by multi-storey structures, commercial centers, and parking lots (Ümütlü, 2020). The urban space should form a whole with its furnishings and provide a pleasant urban environment. In this context, urban equipment design should have an aesthetic, functional, comfortable, ergonomic and universal design (Yücel, 2006).

Sustainable cities provide today's user needs and needs. at the same time, it should adapt to new lifestyles and technological developments. For this reason, energy resources, which have been decreasing due to recent intense construction and population growth, have been taken under protection, especially in urban areas. In sustainable cities, existing natural resources are used effectively. Cities are the most intense usage areas of our lives. With the increase in the density of the cities and their unbalanced and uncontrolled growth, the importance of open spaces in the cities has increased. Planning these areas for efficient and balanced use and ensuring the production-consumption balance of energy and resources are of great importance for cities.

The decrease or even disappearance of renewable and natural resources

with the effect of urbanization is among the important issues on the agenda. For this purpose, the necessity of approaches in which renewable energy sources are included in the designs has emerged. Using energy effectively is the most basic component of sustainable planning and design approaches today.

With the increasing population and urbanization, the need for space has increased. This situation has led to the narrowing of the space of nature and animals living in nature, and the pollution of the air we live in. As a result of all these, a resource problem has emerged as a result of excess consumption. As a result of the depletion of resources, the problem of insufficient resources for future generations will arise (Kurt Konakoğlu, Kurdoğlu 2019). Reinforcement elements, which are one of the most important components of urban usage areas, are expected to have energy efficient landscape design features. Because, while the reinforcement elements have aesthetic features such as form, texture, shape and color in a space, they should also be functional such as material, ergonomics, durability and safety. While designing the reinforcement elements, landscape equipment elements should be designed by using renewable energy sources (heat, water, light, wind, etc.)

Urban Equipment concept

The most important element that provides the contact of the urban open spaces with the user is the urban equipment. They are service tools that meet the responsibilities of the space for use in accordance with the needs and wishes of the users in spaces (Chiesura, 2004). It has taken its place in our lives with the concept of the city. In urban open spaces, it has certain functions that do not belong to a particular user. equipment and structures (Akyol 2006). It must be in harmony with the other elements in the whole of the design. when used correctly, they increase the visual quality of landscape design. landscape architecture designs the spaces by determining the socio-cultural structure of the society in the space to be used and what their aesthetic, psychological and natural needs are. While designing healthier, aesthetic and orderly environments on the one hand, the main goal is to design the sustainable use of these spaces on the other hand (Akpınar Külekçi, 2018). Urban furniture; They are unique design products that are in healthy and functional environments, in general or private areas of recreational use, with roads, streets, pedestrian paths, parking lots, squares and terraces around us (Başal, 2002).

Urban equipment is defined as mostly fixed service equipment and structures for various open space functions (Düzenli et. al., 2017) in all open spaces of the city, the user of which is uncertain. Together with the concept of the city, it consists of products aimed at meeting the developing elders of the users as a result of certain processes (Yaylalı, 1998). It ensures that urban

furniture meets the needs of the place where they are located. According to the usage values that urban furniture adds to the areas; They are classified as seating units, sign and information signs, lighting elements, limiters, cover elements, water elements, sales units, floor coverings, artistic nail polishes, playground elements and other elements (Yıldızcı, 2001).

• **Lighting Elements:** Lighting elements, which always have a very important place in the use of urban open spaces, also highlight the aesthetic features of the spaces. In addition, it plays a major role in ensuring the security of the spaces and facilitating their perception (Ünver 2001). Considering the effectiveness of the spaces, there is no need for them to be illuminated much, in this case, less intense and lower lighting elements should be selected in these spaces. On the contrary, some places need to be very bright in terms of visual or security.

• **Signs and Information Signs:** One of the remarkable features of urban furniture is that they contribute to the urban order. Urban spaces are spaces used by different users for different purposes. Certain rules must be applied in order for the order to function in the cities and to serve the citizens (Bayazıt, 2018).

• **Sitting units:** One of the most common activities of people in urban open spaces is the sit-in. People prefer to sit during activities such as watching, resting, eating, waiting, chatting at a daily pace. Seating furniture has an important place in our lives (Akyol, 2006).

Figure 1. Urban Equipment Elements (URL,1; URL,2)

• **Information, Communication and Sales Equipment:** Cities need tools that will guide both their users and visitors correctly. Accessibility and accessibility in the city has become one of the greatest requirements of our age. The user needs to obtain accurate information as well as to reach certain units in the city.

• **Cover Elements:** Cover elements are used in urban areas for sitting,

eating and resting purposes to eliminate the negative effects of wind and sun (Hacıhasanoğlu, 1991). Cover elements that meet the needs such as protection from rain and sun add value to urban open spaces in terms of ecological and aesthetics.

• **Waste bin:** Trash cans are reinforcement items brought in different materials and shapes, used to prevent pollution in outdoor areas. The task of the garbage cans, which is one of the urban equipment elements, is to collect the garbage produced by people and to protect it until the time when it is transported with the necessary vehicles. Garbage bins should be located within the urban reinforcement strip on the sidewalks and should not be placed in squares and pedestrianized areas. They should be positioned especially at the ramp crossings so as not to hinder the passage of disabled individuals (Durmuş, 2008).

• **Artistic Objects:** Artistic items that are frequently used in urban areas have a very important place for the citizens. Artistic elements add visual and aesthetic value to cities (Tanriverdi, 1987). Sculpture is defined as a three-dimensional work of art, sculpture or plastic object created by carving, molding or kneading and firing from materials such as stone, bronze, clay, iron, plaster, wood, ivory (Feyizoğlu, 2008).

• **Bus stops:** Bus stops can be defined as a transit element where buses take passengers off and on, and which passengers use while waiting for the bus. The purpose of bus stops is to indicate the location of the stop and to protect passengers from the effects they will be exposed to while waiting. Stops are transit points, not destinations in a city (Zülfikar, 1998)

Urban Furniture Design - Design Criteria

The success of urban furniture is directly proportional to the value it adds to the city and its inhabitants. The design of urban furniture should vary according to different cultures and countries and should appeal to those spaces. For this reason, creativity should be at the forefront in a good furniture design (Önlü, 2010). The design of positive and negative elements in urban environments determines the quality of urban environment. Because urban environments; they consist of positive and negative elements, including the buildings and the outer spaces surrounding these building blocks (Cerver, 2003). With the combination of values such as plant materials and water elements, the macro form of the city and the silhouette of the city are formed. On the micro scale, the concept of urban aesthetics and the beautiful/attractive environment emerges. certain basic principles were repeated depending on the cultural characteristics and the characteristics of the period. These repetitive practices in the process turned into planning-design principles (Grosenick and Rienschneider, 2005).

Aesthetics includes not only the beauty in art, that is, not only the philosophy of art, but also the beauty in nature. Therefore, it is the science of perception, which is the doctrine of perceptions used in the evaluation of both natural and artificial elements (Bozkurt, 2000). The design studies that start at the spatial scale create a variety of activities in the city at the planning stage. The meaning of public outdoor spaces will depend on their arrangement, design and detail characteristics (Moughtin, 1999). It is important to consider urban furniture as a design product and to ensure that they establish the right relationships with each other and the urban spaces they are located in. Materials, texture and color elements, accessories, promotional elements, natural balances and many similar elements and features that give peace and happiness to people in psychological and biological terms increase the quality of spaces (Suher et al., 1996). It is appropriate to design urban furniture in line with the "functional, form, material, color, texture, form, sustainable, aesthetic, modern" design principles (Aksu, 2014).

Functionality: Function; usefulness means usefulness or expediency. In its simplest definition, it is the product that serves a purpose. The first thing to consider in design is what it will be used for, what its function will be (Ghorab, 2015). Since animate and inanimate objects are used together, the function of each should be considered separately. In order for a building element to be functional, some technical principles, dimensions and forms must be taken into account.

Figure 2. Functional Urban Equipment Elements (URL,3; URL,4; URL,5)

Aesthetics: A certain perception of beauty is sought in places. The place should evoke pleasure and excitement in terms of aesthetics. in this way, it increases the livability of that place. Aesthetics, function and form are in a close relationship (Aksu, 2014).

Form: Form is the dimensional appearance of the object in three dimensions, produced from the word form. By associating concepts such as space and mass, it creates continuity, covering, resemblance and containment. Format; determines the size, material and function. The form of an object derives from the service requested from it and the function attached to that object.

Figure 2. Functional Urban Equipment Elements (URL,6; URL,7)

Texture: It is one of the important design elements that gives character to a product and makes a difference. In addition to texture, physical and visual properties, both the structure of the product and the material used make a great contribution to the operability of the product (Kın, 2007). There are many effective factors in the perception of the texture: The light intensity, the angle of incidence of the light and even the shadow it creates provide the perception of the tissue. Texture is one of the most important elements that give character to the product and make a difference in the product.

Sustainable: Not depleting natural resources has become a necessity. The needs of future generations should be planned from today and activities should be carried out with these concerns. Sustainability, which is a very important factor in many design products, is also one of the most basic factors of urban furniture. The continuity of the function, aesthetic perception and material strengths are of great importance for an urban furniture (Şatır, 2015). In sustainable furniture designs, renewable, economical, easy to recycle, less harmful to nature and ecological materials obtained with less energy are used. Objectives of sustainable urban furniture; minimizing the consumption of natural resources, protecting the health of the urban population, being economical and accessible, maintaining the cultural diversity specific to the region (Kılıç and Sungurlu, 2021).

Material: In the selection of materials at the design stage, in addition to the function of the product, the visual effect desired to be created in the designed product should also be taken into account. The variety of materials increases the visual quality of the products, creates different forms and enriches the design (Ertaş and Bayazıt, 2004). Recently, products that are sustainable with climate change, economical in production and protecting natural resources are preferred. Simple designs, modular productions, multifunctional and flexible uses come to the fore in the use and design of these materials (Mackenzie, 1991).

Equipment That Produces Own Energy

Energy is a fundamental resource required for the survival and well-being of all living beings. Energy is the power to do work. For this reason, ecol-

ogist and environmentalist groups consider energy from a global and holistic perspective, as in other environmental problems (Gürsoy, 1999). Between 1960 and 1975, the environmentalist movement, which the public objected to the current situation, rose. It is stated that Ian Mcharg, who wrote "Silent Spring", in terms of landscape planning technique, considers natural and cultural resources for landscape. In the book "Design with Nature" (1969), the first open and systematic resource in which the environmental perspective comes to the fore (Mcharg, 1969) is the pie-layers approach to define the landscape. It has been the years when green roof technology in the modern sense was developed that this methodology laid the foundation for the later developed "GIS" systems that perform land use analysis.

Figure 3. Urban Equipment Elements Using Solar Energy (URL,8; URL,9; URL,10)

With the development of technology and the increase in population, the need for energy also increases in direct proportion. It is used in different sectors such as industry, housing and transportation sector. energy is of great importance in terms of life sustainability. Large-scale energy production and conversion strategies are created. It greatly affects the ecological balance. The aim in energy efficient design is to produce the needed energy within its own body. In addition, the source of the energy produced should be renewable. A reference LEED standards for energy efficient lighting design in the landscape

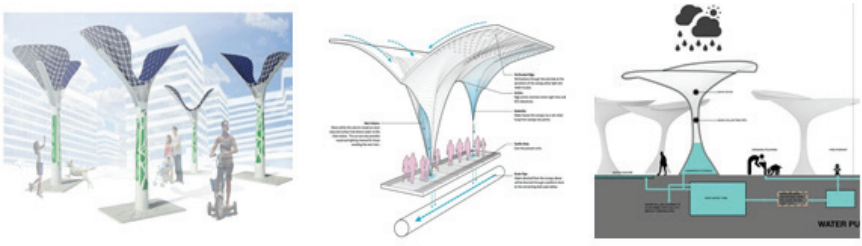

Figure 4. Equipment Elements Using Rain Water (URL,11; URL,12)

Energy efficiency also has an important place in the design of urban furniture. The basis of energy efficient design starts with energy. The efficient use of renewable energy sources is of great importance in today's conditions. It is essential to use energy effectively in everything designed and applied, from the smallest unit to the largest unit of the environment we live in. Energy resources are generally classified according to their use and being convertible. According to the classification made according to their use, energy sources are renewable and non-renewable; they are classified as primary and secondary energy sources according to their recyclability (Koç and Kaya, 2015).

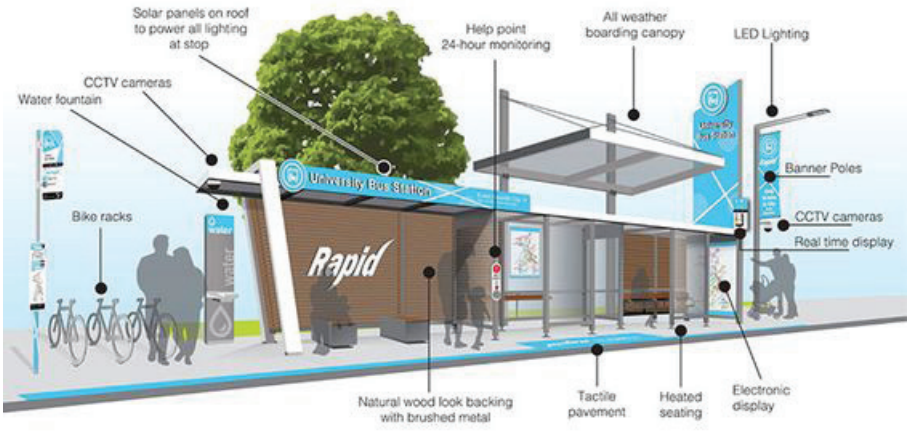

Figure 5. energy efficient furniture (URL,13)

CONCLUSION

Incorporating different disciplines such as urban environment and architectural landscape design, primarily. It is a place that strives to create livable quality environments for people. Buildings, roads and green areas are components of the urban environment. The increasing population and needs of people in cities have also increased the need for energy. Population growth was insufficient to meet the energy needs of cities. This energy need has necessitated restrictions in the use of energy in cities. In addition, there has been the use of energy efficient and renewable energy sources. In this context, sustainability should be a principle when making all kinds of planning and design decisions in cities. The concept of sustainability is a concept that should also be taken into account for future generations. It is all those who give priority to the use of renewable energy sources, are sensitive to the environment, and use energy, water, materials and the area they are located in efficiently.

It has gained importance to deal with urban equipment, which is one of the most important components of cities, with the principle of sustainability. If urban furniture is designed integrated with urban design, it creates a sense of identity and increases the sense of commitment to the place. The function of urban furniture is not just to be an object of use, art or communication. Urban furniture, in addition to beautifying the user's environment in any urban space, meets functions such as comfort, transportation, rest, entertainment and protection from external influences. For this purpose, first of all, reinforcement elements should be designed with criteria that use and evaluate their energy effectively. Design criteria should not be handled individually, but with an interdisciplinary approach, taking into account social concerns. Urban equipment should be designed in accordance with the climatic conditions of the region where it is located. Designs that use wind, sun and rain water suitable for the climate of the region should be created.

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CHAPTER 6

THE ECONOMIC DIMENSION OF WATER-SENSITIVE URBAN DESIGN

Seyhan SEYHAN[1]
Elif BAYRAMOĞLU[2]

1 Res.Assist, Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, Trabzon / Turkey, seyhanseyhan2@gmail.com, ORCID ID: 0000-0002-6046-5024
2 Assoc. Prof. Dr., Karadeniz Technical University, Faculty of Forestry, Department of Landscape Architecture, Trabzon / Turkey, elifsol_@hotmail.com, ORCID ID: 0000-0002-6757-7766

1.INTRODUCTION

Cities where natural and people-made elements coexist have a dynamic structure. In cities, both natural elements and people-made elements shape the structure of cities over time and affect the behavior of the individuals living in them. This reveals unplanned urbanization in cities and reduces the interaction between natural and people-made elements. As a result, natural elements (soil, water, plants, etc.) begin to lose their effect in cities over time. The water element, which is especially important for both natural elements and human elements, causes many threats such as drainage problems in the urban environment and urban water cycle, weather events as a result of heavy rainfall (Karlı & Artar, 2020).

One of the most important natural elements necessary for the protection of the ecosystem, natural habitats and the health, development and well-being of people is water (Caparrós-Martínez et al., 2020). For many years, water was used for drinking and irrigation purposes. With the industrial revolution, new developments began to be experienced, and it began to be used for different purposes. Today, water resources are used in many areas such as meeting basic needs, industry, agriculture, mining, transportation, tourism, fishing and energy production (Pektezel, 2015).

Figure 1. Usage areas of water (Url-1)

Water for cities is an important resource that always offers different experiences to its users thanks to its potential to create a microclimate in the city (Oktay et al., 2015). Changes in the use of fossil fuels, transportation, agricultural activities, urbanization and land use, which started with the industrialization that took place and continues to occur in different regions of the world and continue to occur (Küçükbekir & Bayramoğlu, 2021) caus-

es degradation (Caparrós-Martínez et al., 2020). This brings along many problems by combining with natural disasters such as droughts, floods and floods, low water quality, and negative effects of groundwater, which have recently occurred due to climate changes. While this has an impact on social and economic lives in urban areas, it reduces the water quality in cities, and the permanent water body is polluted with mixed rain water and wastewater. To ensure the continuity of the water cycle in urban areas and to reduce the water footprint, the quality and source of water resources in the cities must be managed effectively (Karlı & Artar, 2020).

All cities in the world are dealing with practices that can prepare water services in their cities in a way that is sensitive to water. Since the existing processes and structures generally support traditional practices, it becomes very difficult to keep up with new changes and guidelines. As cities transition from traditional practices to water-sensitive practices, decision lenses that provide water management and management need tailor-made approaches to address existing institutional and infrastructure challenges and support local efforts (Ferguson et al., 2013a; Ferguson et al., 2013b; Rogers, 2020. One of them is the "Water Sensitive Urban Design" approach. This approach is an approach to land planning and engineering design that adopts the development of aesthetic and recreational approaches, minimizing environmental degradation by combining the urban water cycle (rainwater, wastewater, groundwater) with urban design. It is an approach for the planning and design of urban environments in this respect that support ecosystems, life and livelihoods by intelligent management of all water resources (Pala et al., 2021).

Adopting water-sensitive urban design in cities offers benefits for three basic groups: social, environmental and economic. These; to improve human well-being, improve microclimate, mitigate climate change, improve air quality, restore the water cycle, improve soil and biodiversity, protect vegetation, provide increased comfort and improvements in commercial viability, and enhance ecosystem systems. At the same time, it increases people's awareness of this issue and promotes economic, environmental and social benefits arising from the sustainable and efficient use of water resources (Rashetnia, 2022).

2.WATER SENSITIVE CITY

Surface features are generally impermeable in urban areas where rapid population growth and construction are intense. This causes floods and flood disasters in cities as it turns into surface flow by preventing rain water from reaching the soil by natural means in cities. At the same time, since the groundwater resources cannot be fed adequately, it reduces the surface water quality and increases the amount of pollutants carried by the surface flow

(Karpuzcu, 2019). In this direction, the concept of "water sensitive city" and urban design approaches have emerged in order to solve such problems in cities.

2.1. Water Sensitive Urban Design

While the water sensitive urban design expresses a process, the water sensitive city is the result. Water-sensitive urban design is an approach developed for the design and planning of urban environments that are sensitive to water sustainability and environmental protection issues (Wong et al., 2012). This approach was first used terminatically in Australia in the 1990s. Its origination in Australia is part of a broader international movement towards the concept of unified land and water management. It includes all aspects of managing the integrated urban water cycle, including collecting and/or treating stormwater and wastewater to contribute to water resources that individuals cannot drink Lloyd, 2001). The first known reference to this approach was made by Mouritz (1992) and was subsequently used by Whelans et al. in a report for the Government of Western Australia (Fletcher et. al., 2012).

Water-sensitive urban design refers to urban design that can adapt to large-scale change and is considered resilient. Here, water management should be done by planning various and flexible water resources (Gersonius et.al., 2016). At the same time, it is necessary to address the importance of urban water services on a global scale in order to increase the resilience, sustainability, livability and productivity of the city. Many negative consequences such as experiencing climate change, accelerating urbanization, deterioration of ecosystems and obsolete infrastructure systems are common today, and it is necessary to make arrangements in the form of redesign, planning and delivery of urban water services (Rogers, 2020). Traditional approaches to water management, planning and design in cities remain complex and inadequate due to the solutions and advances that have emerged in the twenty-first century (Wong et.al., 2020). In this respect, water sensitive urban design is an environmentally preferred alternative to traditional urban water management systems (Url-2). And in this direction, the components of water-sensitive urban design and their place in flood resistance, the interactions emphasizing other aspects" are explained in Figure 2 below.

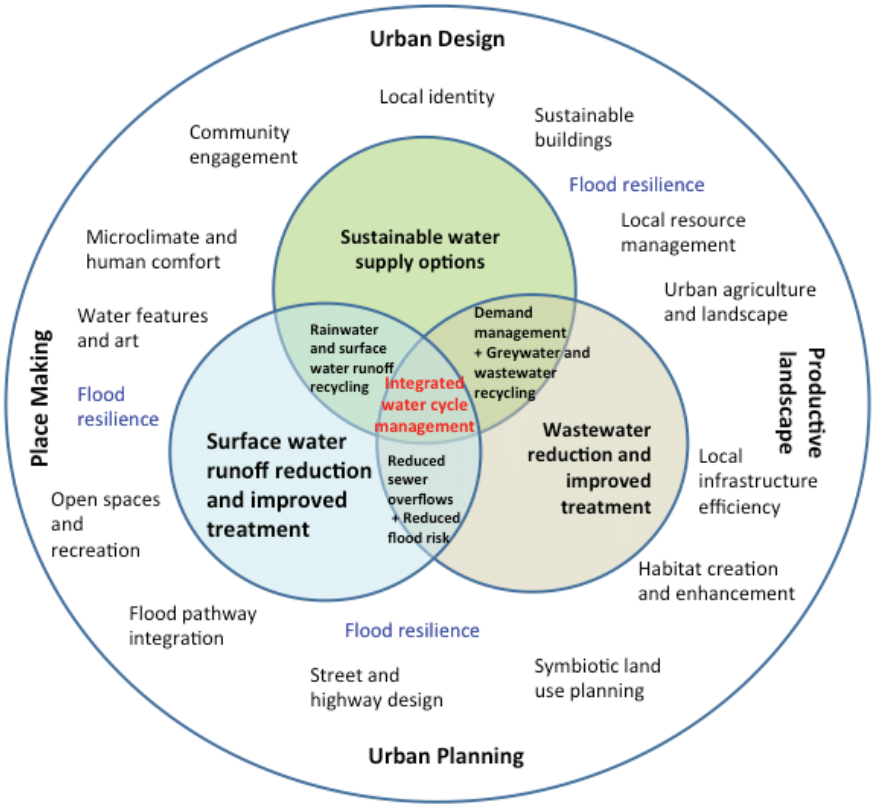


Figure 2. Components of Water-Sensitive Urban Design and Their Place in Flood Resilience, Interactions Highlighting Other Aspects (Cited By Gersonius et.al., 2016)

A key element of water-sensitive urban design is social development and sustainable management of urban water environments. Its purpose is to protect water resources and urban water cycles while providing flexibility to the ecological environment within the city (Zhang et. al., 2021). At the same time, another aim is to minimize the impact of urbanization on the natural water cycle. Its principles can be applied to the design of a single building or to an entire subdivision (Lloyd, 2001). In this respect, water-sensitive urban design has important targets when considering population growth, rapid urbanization, water scarcity and climate change on urban water resources and temperature. These are to reduce freshwater pollution, provide additional water for human use, reduce flood potential, protect ecosystems and improve urban comfort (Rashetnia, 2022). In line with these, Melbourne Water briefly explained the objectives of water sensitive urban design as follows (Melbourne Water, 2009).

- To protect and improve natural water systems in urban environments,

● Combining rainwater treatment with landscaping by maximizing the visual and recreational opportunities of developments,

● To increase the quality of water flowing from urban developments to receiving environments,

● Reducing runoff and peak runoff from urban developments by increasing local retention times and minimizing impermeable areas,

● Minimizing drainage infrastructure development costs due to reduced runoff and peak flows.

In the study of the National Water Commission in 2010, twelve items explained the targets of water sensitive cities (Hoban, 2019).

1. Minimizing the effects on existing natural features and ecological processes,

2. To minimize the effects on the natural hydrological behavior of the basins,

3. To protect the water quality of surface and underground waters,

4. To minimize the demand on the reticulated water supply system,

5. To increase and minimize the quality of the discharge of polluted water to the natural environment,

6. Include collection treatment and/or reuse of runoff, including roof water and other storm water;

7. Reducing runoff and peak flows from urban development,

8. Reusing treated wastewater and minimizing wastewater generation,

9. To increase social opportunities in urban areas by integrating water into multi-purpose green space, landscaping and landscape in order to develop visual, social, cultural and ecological values,

10. Adding value while minimizing development costs (eg drainage infrastructure costs),

11. Explain the link between water use and broader social and resource issues.

12. Align water cycle practices among and within institutions responsible for waterway health, flood management, pollution prevention and social welfare protection.

The aims of water sensitive urban design are discussed in the study prepared by Whelans et al., in 1994, as follows (Fletcher et. al., 2012);

● *Managing the water balance (taking into account flood damage and*

waterway erosion, as well as groundwater and stream flows),

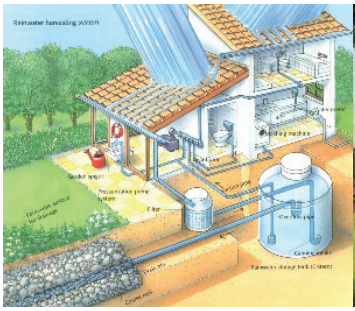
● *Maintain and, where possible, improve water quality (including preservation of sediment, riparian vegetation, and minimizing the export of pollutants to surface and groundwater),*

● *Promoting water conservation (minimizing imports of drinking water by collecting rainwater and recycling wastewater and reducing irrigation requirements)*

● *Maintaining water-related environmental and recreational opportunities.*

Considering the aims and objectives of water-sensitive urban design, water-sensitive urban approaches are being developed in cities. These approaches are explained with the following examples (Rashetnia, 2022).

Rain Water Tank: It is one of the solutions considered to reduce the runoff of rainwater and support the supply of mains water to homes. This system includes capturing, screening and storing non-potable water, such as clothes washing, toilet flushing, and garden irrigation, in the tank for later reuse. In case of excessive overflows, it is directed to other systems (Hoban, 2019). In this respect, these reservoirs, which are an alternative water source, reduce the demand for central mains water sources and minimize the total volume of storm water flow (Sharma et., 2015).

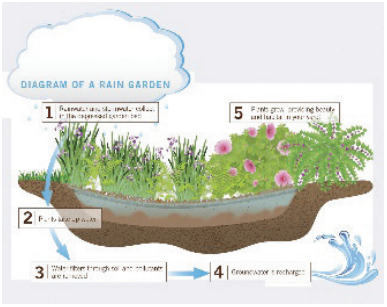


(Url-3)

(Url-4)

Rain Garden: It is a garden consisting of pits with a shallow depth, on which the rain water is directed directly without any processing, and on which plants can be grown. Improving the collected runoff and improving quality water for the immediate environment is the main function of this gardening approach. After taking the dirty rain water from impermeable surfaces and bringing it together with the soil, it cleans the pollutants in it and feeds the groundwater. Thus, it can prevent natural events such as floods, floods and erosion. Thanks to the plants it shelters in, it creates a new living space

for creatures such as butterflies and bees. In line with its system, it prevents rain water from flowing from the ground surface and infiltrates from where it falls to the lower plates. It is a strategic and easy application (Müftüoğlu & Perçin, 2015).



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Green Roof: Basically, they are roofs on which different plants are planted in the growth medium. It is designed to provide environmental, social and economic benefits on buildings. It consists of various components, including vegetation, substrate, filter layer, drainage material, insulation, root barrier, and swu-proof membranes(Shafique et.al.,2018). It is very important to use the most suitable components to get the best results from green roofs. The components are equally important and play an important role in the good performance of the green roof (Vijayaraghavan, & Joshi, 2015).

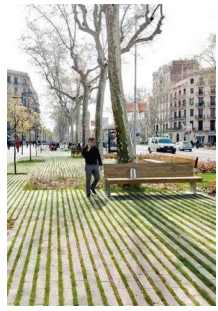
(Url-7)

(Url-8)

Permeable Pavements: This system, which is used in a wide variety of areas, is used to refill groundwater, reduce surface water runoff, prevent rainwater reuse and rainwater pollution (Gravenberch, 2022). They are systems on the surface of which water and air can pass. It ensures that the water reaches the bottom plates by filtering. It reduces the flow rate of surface water and removes urban pollutants. It allows precipitation waters to reach

groundwater. It is suitable for use in areas with limited vehicle load due to the voids on its surface. While meeting the need for hard ground in the urban area, it also supports rainwater management (Konyalı Dereli, 2020).

(Url-9)



(Url-10)

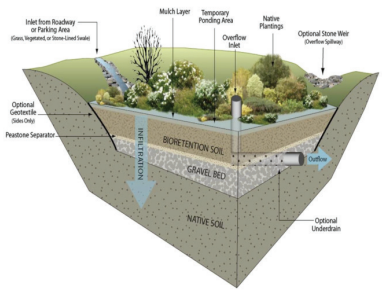
Gross Pollutant Traps: Leaves and other forms of organic material account for most of the major pollutants in urban rainwater. Gross pollutant traps are installed to prevent anthropogenic litter from entering waterways. These are often specialized devices and come in a wide variety of styles and configurations, including general collections, garbage racks, and floating garbage traps (Hoban, 2019).

(Url-11)

(Url-12)

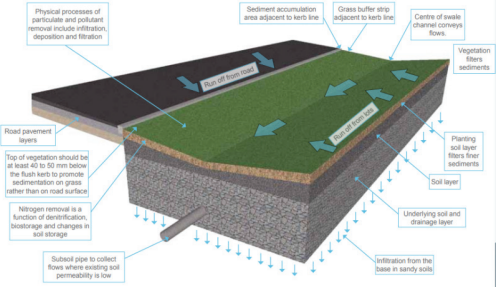
Bioretentions: They are areas that allow the water obtained from the large urban scale to be both held and used until the next precipitation period. While these areas contain a lot of water, they also filter and clean this water. It contributes to the aesthetics of the city, public health, living needs, and the creatures living on water and land as a living space. After the dirty rain water reaches this area, it precipitates and decomposes in the system and is filtered by plants and natural elements. It is a flexible rainwater method approach

that can be combined with various urban landscapes using different shapes, sizes, materials and plants. It is used to manage and filter the runoff caused by frequent precipitation (Tunçay, 2021).



(Url-13) *(Url-14)*

Swales and Buffer Strips: It is used to carry rain water through the trench created with plants using the function of pipes. It provides the desired buffer between the waters it reaches (for example, a stream or wetland) and the impermeable areas of a basin. It slowly transmits water downwards using land flows and gentle slopes. Thanks to its interaction with the vegetation, it causes the flows to be evenly distributed and slowed down. This ensures that coarse sediments are retained. Urban design can contribute to the aesthetic character of a space by including it (Water, 2005).



(Url-15) *(Url-16)*

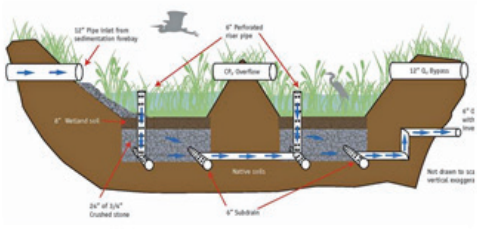
Sedimentation Basins: It is used to protect coarse sediments from runoff and is typically the first element in a treatment sequence. They are important in preventing downstream elements from being overloaded or suffocated by sediments. It works by reducing flow rates and encouraging sediments to settle out of the water column. It is used to hold the sediments that are frequently used in construction areas and to pre-treat elements such

as wetlands. When there is no precipitation, the sections are evacuated and can be designed as a permanent pool or by filling when there are flow events. They are typically fuzzy and maintenance often requires significant system disruption (Water, 2005).

(Url-17)

(Url-18)

Constructed wetlands: It is an excavation filled with organic and inorganic particulate media in which cane plants were planted. Because it contains contaminated water, it is covered with rubber or plastic material to protect groundwater and adjacent subsoil. Clay-based materials provide a natural alternative to cover these areas. Wastes can be given to the system continuously or in controlled batches. It can move up or down horizontally or vertically through the medium depending on the treatment requirements. It offers many different mechanisms of action, from physical, biological, biochemical and chemical processes to built wetland treatment systems (Global Wetland Technology, 2022).



(Url-19)

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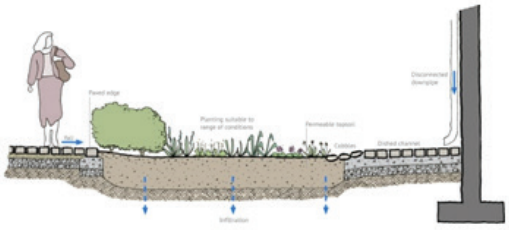
Infiltration Systems: These systems, which are rainwater drainage methods, are made to reduce flood and overflow risks, to provide pollution control, to contribute to the renewal of the ground water layer and to create an alternative water source. This system, which is an ground storage area, is

filled with pebbles and stones. It is built in medium and high soils in order to ensure that heavy rains are mixed with the subsoil and stored (Konyalı Dereli, 2020).



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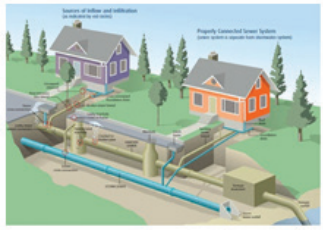

(Url-22)

3.THE ECONOMIC DIMENSION OF WATER SENSITIVE URBAN DESIGN

Implementing water-sensitive urban design in cities provides a cost-effective means of reducing the impact of development on waterways, creating cooler and greener spaces, and bringing together healthy and connected communities (Url-23). Water sensitive urban design also provides economic and social benefits to cities (Url-2). These;

• To provide lower capital cost and construction cost,

• Reducing the cost of dirty water treatment,

• Increasing the value of new subdivisions by improving views and the amount of public open spaces,

• To give our neighborhoods a more natural look.

During the implementation of the economic benefits of water-sensitive urban design, the cash-escape needs of the costs can be tracked more easily and more flexible financing is provided. Equipment and its installation are more capital intensive in land acquisition, repairs, maintenance and infrastructure changes. The cost of water treatment is less due to the filtering and natural processing of precipitation waters. Energy and chemical costs are reduced, as it reduces the need for water treatment in the case of concealing surface flows and using them in irrigation systems. In landscape care, it reduces irrigation and maintenance costs by using rainwater storage systems and xeric plants. Since there are approaches that reduce landscape irrigation, it reduces water demand and consumption (Karlı & Artar, 2020).

3.1. Examples of Water Sensitive Urban Design Approaches To The Economic Dimensions

Given the economic dimension of water-sensitive urban design, investments are very often implemented to meet regulatory requirements for stormwater management or water quality management. Many approaches, such as providing a source of water (such as stormwater reservoirs or rainwater harvesting/reuse projects) or reducing drinking water use (such as urban street tree pits passively irrigated by road flow), support cities in the economic dimension of water-sensitive urban design (Whiteoak, 2019).

Rain Water Tanks; Since rain water has no cost, this system costs water collection and storage materials. The system also requires very little maintenance. Many studies conducted in this direction suggest that this system is very cost-effective (Erten, 2021). Choosing the appropriate warehouse and storage methods for the system at the design and planning stage of the system reduces the cost to be made. And since this system will reduce water consumption in buildings by 40%, it provides an economic contribution to its users. Conditions such as the size and shape of the tank or tanks to be used for storage, mounting under, on or partially under the soil, and the type of material used increase the installation and construction costs of the system (Temizkan & Kayılı, 2020).

In addition to the three types of institutions, rain water tanks, ground water tanks or above-ground storage solutions, expenses are incurred only when installing for the first time. Once installed, great savings in cost and resources are achieved. Therefore, investment and operating expenses are very low (Url-24).

Green Roof: When this system is compared to traditional roof systems, the initial installation cost is higher. In addition, operating costs decrease compared to the installation cost. Demand for these systems is increasing as productivity increases in production with technological developments. Since it is a long-lasting system, it provides benefits to both individuals and the public economy. In the case of using green roof systems, the life of the roofs is extended. By providing efficiency from energy and fuel, the life of waterproofing is also extended. This provides economic convenience (Url-25).

The high environmental and economic benefits make green roof systems useful. Thanks to this system, the areas that can be used in the buildings increase, the idle roofs are brought to the economy, and the investment features keep the buildings cool in summer and warm in winter, minimizing the cost in heating and cooling expenses (Yalçınalp et al., 2018).

Rain Gardens: If the application of this system is done by the individual and the plant will be produced by himself, the cost is almost non-existent.

On the other hand, the factors to be calculated economically are multiplying. This also increases the cost. Choosing local species in plant selection reduces the cost (Rain Garden Application Guide, 2018).

CONCLUSION

One of the most important parts of living and non-living beings that sustain life on Earth is water resources. Thanks to the potential of water, it is one of the indispensable elements of life. As with natural and man-made elements, water resources encounter negativities as a result of developments and changes over time. These negativities, which are faced by many countries of the world, are due to climate change, which has been taking effect recently. As a result of climate change, the quality of water resources decreases, events such as floods and floods occur, and water resources are polluted with mixed rain water and wastewater. In this direction, it is necessary to make cities livable, to ensure their sustainability, and to manage the indispensable water resources effectively.

Urban areas, in this case, institutions and organizations, local and international administrations are in search of solutions. As a result of this search, a water-sensitive urban design approach has emerged. This search for a solution suggests approaches to increase the water cycle, water quality and water use in urban areas and to ensure its sustainability. Stormwater storage, green roof, rain gardens, permeable pavements, bioretention areas, pits and buffer strips, sedimentation basins, constructed wetlands, and seepage systems are approaches to water-sensitive urban design. These approaches are very important in order to solve the various water problems we face in urban areas. Thanks to the social, economic and environmental benefits they provide, the city can develop away from the negativities it is in.

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CHAPTER 7

ECOCULTURAL DESIGN MODEL FOR HISTORICAL SETTLEMENTS: CASE STUDY OF MUSTAFAPASA

Leila Akbarishahabi[1]

1 Asst. Prof., Cappadocia University, Faculty of Architecture, Design and Fine Arts, Department of City and Regional Planning, Nevşehir, Turkey, ORCID: 0000-0002-0547-7874, E-mail: leila.akbarishahabi@kapadokya.edu.tr

Introduction

Sustainability is a complex concept with environmental, social, and financial dimensions (Soufiane et al., 2015; Yalçıner Ercoşkun, 2018). Natural and cultural assets are the two main components of the environmental dimension. In the case of natural assets, the ecological aspect of the ecosystem comes to the fore. On the other hand, in the case of cultural assets, the environment's identity comes to the fore. Nowadays, many environmental designs are primarily concerned with eco-housing and eco-objects, and just a few sustainable environmental design models take a holistic approach and offer practical guidance. This study aims to develop a holistic ecocultural design model to increase the historic settlements' functionality, vitality, and livability while preserving their natural and cultural identity. First, the ecovillage and the cultural village concepts are defined as two fundamental terms in the study. Then, as a holistic design model, ecocultural principles are defined by syncretising these two concepts. Finally, as a case study, the SWOT analysis of Mustafapasa village, selected as the best tourism village in 2021 and is a natural and culturally rich settlement, is made, and the principles of proposed the ecocultural design model were concretely evaluated for the village. Figure 1 illustrates the study structure.

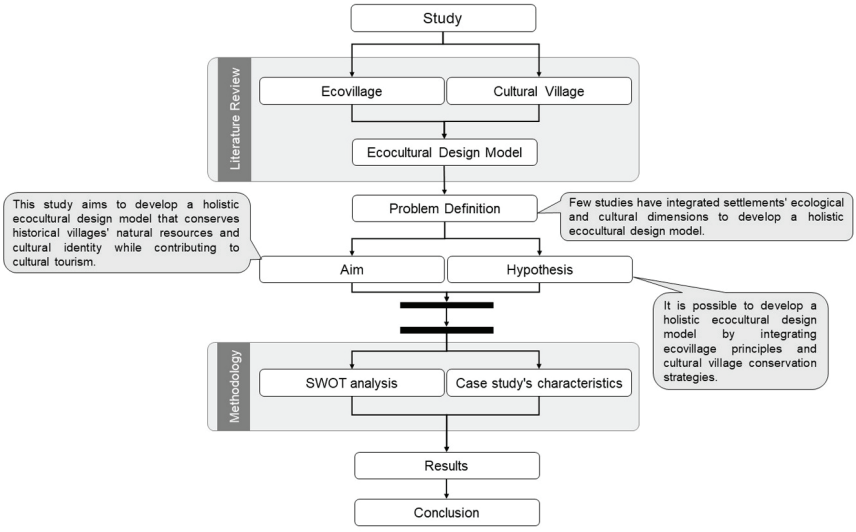

Figure 1. Study structure

Ecovillage Principles

An ecovillage is a functionally self-sufficient ecosystem that is ecologically healthy, energy-efficient, low-carbon, and intelligent (Szabó et al., 2021). Therefore, a holistic and systematic approach to spatial design and planning is required to preserve natural resources for future generations while reaping the benefits of ecological systems and, at the same time, increasing the well-being

of the community (Moravčíková & Fürjészová, 2018). According to Gilman & Gilman (1991), Ecovillages are human-scale and fully functional settlements that are safely integrated into the natural world to encourage healthy development and can be effectively sustained indefinitely (Gilman & Gilman, 1991). An ecovillage is a community of several hundred people that satisfies its residents' material, economic, social, emotional, cultural, and spiritual requirements while remaining in peace with the natural environment (Hollick & Connelly, 1999). Ecovillages strive to achieve economic and social security by fostering self-sufficient, participatory communities and local living. An ecovillage is a pleasant township where people help improve natural, social, and economic growth to enjoy these resources. Residents in ecovillages consume less energy per capita as a result of their well-organised efforts to restore the natural landscape and protect green spaces, take public transportation, and shop at local stores (Sizemore, 1997). Ecovillages are small communities with a strong social structure joined by shared ecological, spiritual or social beliefs. Depending on circumstance and conviction, these societies may be urban or rural, technologically advanced or backward. What they have in common is a strong reverence for nature, with humans playing an important role in natural cycles. Ecovillages incorporate the social, economic, and environmental aspects of sustainability, treating human communities as part of, rather than separate from, healthy ecosystems. For achieving an eco-settlement design, it is necessary to focus on five elements: (1) Water; Developing solutions that prevent water waste, and providing a clean water source for everyone. (2) Energy; Using economic and renewable energy sources and prioritising hydro, biomass, cogeneration, wind, and solar energy. (3) Food; Providing local food, protecting farmland, prioritising high-yield greenhouses, and vertical farming. (4) Waste; public behaviour and awareness (appropriate handling of garbage and recycling), recycling and composting of residential, public, and industrial waste. (5) Transportation; Easy accessibility, improving bike trails and walking paths, using zero-emission vehicles (Yegang Wu et al., 2020). Ecovillage is a term used to describe residential settlements that have been designed with environmental principles, as well as economic and social concerns in consideration. The primary goal of establishing or developing this new village form is to set an example of sustainable development in a small rural. This settlement is a minor sustainable development area where human and environmental values are considered appropriate (Mahlabani et al., 2016). People and nature must be permitted to coexist in a healthy, mutually beneficial relationship in order for a project to be sustainable. This method also acknowledges the relatively short lives of humans and their constructed environments in the natural environment; for a place to last for generations, it must take into account man's impact on the environment. A successful town plan, like historical examples, establishes these principles from the start, creating fundamental relationships to the land as well as a framework that can adapt organically over time to

modifications, renovations, changing occupants and uses, and the occasional replacement of building components. A successful town plan should evolve over time to incorporate a vision of efficient land use and natural resource conservation, as well as an emphasis on the value of the open spaces, to express a timeless and sustainable sense of place.

Cultural Villages

Cultural villages are defined as purpose-built complexes intended, with the support of cultural experts, to simulate parts of a cultural grouping's way of life as it was at a certain time or throughout numerous periods (Jansen Van Veuren, 2001). Culture Village is a rural area that represents the uniqueness of the countryside in terms of daily life, sociocultural traditions, traditional architecture, and the village's spatial structure, as well as the potential to develop various tourism components (Dewi et al., 2018; Marschall, 2003; Ndlovu, 2018). Cultural Villages are rural areas that provide an atmosphere that reflects the countryside's authenticity in terms of social culture, traditions, daily life, traditional architecture, village spatial configuration, and the opportunity to develop different tourism aspects. The cultural village is a type of integration that combines attractions, accommodation, and support services into a community living structure that adheres to the local customs and traditions. Accommodation and attractions are the two key themes of the cultural village's components. The accommodation is a part of the locals' residences and units that grow from the residence's concept (Dewi et al., 2018).

The cultural village definition and development, in general, includes social, economic, and political goals in the context of cultural tourism growth. As a result, many cultural villages around the world have developed an emphasis on the history and legacy of the nations concerned while also attempting to authentically reflect the sociocultural contexts of the regions where they are located in the hopes of garnering tourism revenue. A village should contain some of the following criteria to be classified as a cultural village (Syafi & Suwandono, 2015).

- Accessibility and easy transportation: offering a variety of transport options for tourists
- Local identity: The most attractive characteristics, such as natural and cultural assets, traditions, and local foods, should be presented and identified in the best possible way.
- Services: Various opportunities and facilities should be provided during the visit for the tourists and visitors coming to the village by the village administrators.
- Security: Peace and security in the village should be ensured in every aspect.

- Communication: Adequate accommodation, telecommunications, and human resources should be available in the village.

- Climatic conditions: Opportunities should be provided according to the climatic conditions in every period of the year.

Ecocultural Design Model

The ecological dimension comes to the fore when it comes to environmental sustainability in general. However, the environment's identity and cultural dimension are equally significant. Cultural sustainability, in this context, can be defined as an important component of environmental sustainability. This research aims to provide a holistic ecocultural design approach for ensuring settlements' ecological and cultural sustainability. The Table summarises the model's principles developed from synthesising the ecovillage and cultural village concepts.

Table 1. Principles of the ecocultural design model (Source: The Author)

Principle	Description
Stability	This principle encompasses acts such as stabilizing the anthropogenic load and ameliorating and minimizing its negative environmental effects, as well as observing the conditions for equitable ecological balance among all ecosystem elements. As a result, it aspires to produce a self-regulating ecosystem while also preserving natural air, water, soil, plants, and animals.
Ecological	This principle applies to engineering and technological decisions based on renewable energy sources such as sunshine, geothermal, wind, and tides, as well as their appropriate location on the land. This principle also strives to use energy-saving passive technologies and bioclimatic building techniques that make the most of microclimate regulation and effective heat-insulating materials.
Cultural	This principle includes objectives such as protecting the movable and immovable cultural heritage in the region, developing appropriate restoration projects, preventing unnecessary constructions, emphasising social and historical values, eliminating cultural conflicts, and creating a sociocultural unity under the title of cultural identity.
Functional	This principle aims to increase the functionality of the region by increasing the landscape area and minimising the construction area with the right location selection and mixed uses.
Social	This principle includes objectives such as educating local people on ecological principles and sustainable development goals, raising awareness of the identity and characteristics of the region, encouraging people to have a healthy lifestyle, eliminating cultural and ethnic conflicts and forming a tolerant society, developing ecotourism, cultural tourism and permaculture.
Local	This principle aims to use ecological and local materials to construct or restore buildings, taking into account the development region’s spiritual, cultural, social, and national traditions and characteristics.
Perceptual	It aims to increase the visual quality and perceptibility of the region with principles such as human scale, legibility, diversity, safety, and walkability, with the condition of preserving the region’s original texture.

Data and Methodology

In this section of the study, the history, natural and cultural characteristics of Mustafapasa village located in the Cappadocia region of Turkey, in the Nevşehir province Urgup district, were defined, and the "Best Tourism Village" title it received in 2021 was explained. Then, the current situation of the village was examined, and a SWOT analysis was made.

Cappadocia-Mustafapasa

In Turkey's Central Anatolian Volcanic Province, the Cappadocia region is an intriguing phenomenon that has evolved over tuffs due to physical and chemical weathering processes. In terms of including geomorphological aspects, it's a fascinating place. Its topography formed on the high and sloping hillsides has poor vegetation, high drainage density, and high erosion rate (Topal & Doyuran, 1998). Today, the main centre of the area defined as the Cappadocia region is the province of Nevşehir, but some of the provinces of Kırşehir, Aksaray, Niğde, and Kayseri are also included. From the ancient ages to the present times, the region's borders have changed many times for various reasons throughout history under the Persian, Hellenistic, and Roman Empires. First, with the acceptance of Christianity, several churches and monasteries were established in the region, which became critical religious centres; later, with the acceptance of Islam and the domination of Turks in the region, Cappadocia's religious, political, and sociocultural structure began to change (Hakman, 2019). Mustafapasa is a village in the Urgup district of Nevşehir province in the Cappadocia region. Unfortunately, there is limited information on the early periods of Mustafapasa, which was predominantly a Christian-Muslim village founded by the Greeks during the Ottoman period. According to historical sources, there was a settlement known as "Asuna", "Sasima" or "Sasuma" in the Middle Ages, where today's Mustafapasa is located (Hild & Restle, 1981). In 1071, after the Battle of Manzikert, Turks started the process of Islamisation of the Orthodox-Christian people. The Battle of Manzikert was between the Great Seljuk Ruler Alparslan and the Byzantine Emperor Roman Diogenes on August 26 1071, near Manzikert (Malazgirt in Muş Province, Turkey), resulting in the victory of Alparslan (Nicolle & Hook, 2013).

However, the transformation process has not been the same all over Anatolia. While the inner parts of Anatolia passed to the Muslim-Turkish identity in a short time, few settlements, such as Mustafapasa, did not lose the cultural characteristics of the Greek-Orthodox community. The main reason for this situation was the close relations established with Istanbul's Orthodox since the 15th century. After the conquest of Istanbul in the 15th century, due to the settlement policy implemented during this period and the immigration of Greeks to trade centres, besides economic development, cultural relations

also strengthened (Frazee & Augustinos, 1993). Religion is one of the most critical cultural components in Mustafapasa. People of different religions have lived here peacefully and have created magnificent settlements that exhibit their religion and culture. The Christians living here have built many churches, chapels, monasteries, and places of worship carved into the rock in the village. At the same time, there are three mosques, a madrasah, and a few fountains built by the Muslims in the settlement texture. Stone was used on buildings' facades; wooden beams and ornaments were used in buildings' interiors. It is also seen in many rock-carved houses in this region. Mustafapasa gained notoriety in Cappadocia in the 19th century due to works in education and religion conducted in the village. The 19th century was Mustafapasa's golden age in terms of architecture, and it is well known that this was due to the local people's economic power. In 1924, after the Turkish War of Independence, Christians in Mustafapasa left the village (Stamatopoulos, 1985). The settlement had 600 Greek and 150 Turkish families until the population exchange in 1924. Immigration of Muslims living outside of Turkey and Orthodox living in Turkey became mandatory on January 30, 1923, due to an agreement negotiated between Turkey and Greece in Lausanne-Switzerland. Although the exact number of persons who migrated to another country is unknown, about two million people left the countries where they were born and raised. The exchangers who took enough items to carry with them had to leave their immovable properties behind. Muslims coming from the villages of Greece settled in the house of the Greeks who went (Augustinos, 1992; Cleveland, 1985).

Figure 2. Mustafapasa in the 20th century (Balta, 2009)

Natural and Cultural Identity of Mustafapasa

Mustafapasa is a village in Central Anatolia, Turkey, located in the Urgup district of the Nevşehir province, 26 kilometres southeast of the province's centre. The settlement is located between 38° 34' and 38° 35' north latitudes and 34° 53' and 34° 54' east longitudes and enters the middle Kızılırmak basin. The village's geographical location, which has an altitude of 1273 meters and an area of 3,5 km2 approximately, is illustrated in Figure 3.

Figure 3. Mustafapasa's location (Source: The Author)

According to the census of 2021, the total population of the village is 1256, with 630 men and 626 females. Mustafapasa, located in the Central Anatolian climate zone, has a continental climate, with cold and harsh winters and dry and hot summers. It is rainy in the spring and fall, although the precipitation is less because it is in the central Anatolian region. Due to the harshness of the winter months, precipitation is frequently in the form of snow. The mountain ranges and basins are mostly closed to northern and southern Anatolia's coastal impacts. The average annual precipitation in the province is 388,7 millimetres, and the average temperature is 10,9 degrees. North winds dominate the region. The strongest winds are north-westerly and northeasterly. The strongest winds are in the northwest and northeast directions (Temren and Ilbars, 2003).

The volcanic tuff on the Mustafapasa plateau is higher than 300 meters and includes flow tuff characteristics, so the settlement is mainly made up of high plateaus. The region's shape was formed by compressions that happened during the formation of volcanic tuffs and North-South Anatolian mountain folds. As a result of the formation of lava and tuff plateaus by streams, Mustafapasa found a unique natural structure. Mustafapasa is characterised by the fact that it is a valley-based settlement. Significant valleys in and around the village are depicted in Figure 4.

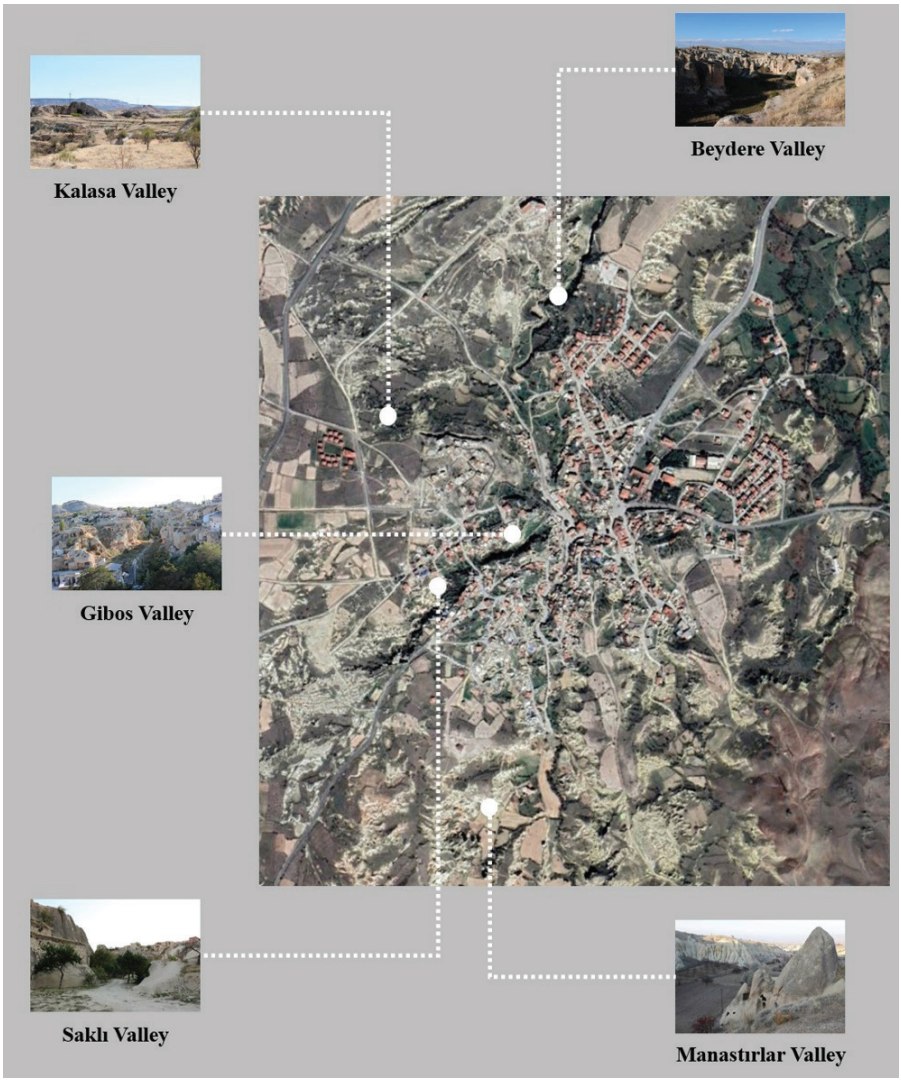

Figure 4. Valleys of Mustafapasa (Source: The Author)

Table 2. Description of valleys (Source: The Author)

Valley	Description
Beydere Valley	The valley is located approximately 1 km north of Mustafapasa, and a river used to flow through the valley and flow into Kızılırmak. Today, this river has dried up. There are many fairy chimneys consisting of volcanic tuffs in the valley. Basilios Church, one of the most important churches of Mustafpaşa, built during the Ottoman Empire, is located on the valley's eastern slope.
Kalasa Valley	The valley, before named as Galasa and is now known as Kalasa, has no documented initial name or date. In the valley, there are rock-cut churches. The churches of Paraskevi and Panteleiomon, Eustathios, Poterida, and St. Haralambos are mentioned in this valley.
Gibos Valley	Gibos, one of the settlement's deepest valleys, is about a kilometre long and is a continuation of Beydere Valley to the village's north. There are houses carved into the rocks in the valley. The Gibos valley, mostly made up of damaged rocks and abandoned houses, was formerly one of the village's busiest districts. This area, which had houses with gardens, was home to only Christians.
Saklı Valley	Saklı Valley is actually the continuation of Gibos Valley. The area, which has the characteristics of a large garden with rock cavities and greenery, is privately owned. The valley hosted artistic, cultural, and social events for a while. There is a rock-carved church dedicated to St. Gregorios on the left corner of the entrance to the valley.
Manastirlar Valley	Manastirlar Valley, located to the south of Mustafapasa, draws attention with its churches and monasteries as well as its natural formations. The valley is located on rocky terrain with many conical rocks. St. Stefanos Church is located on the right at the valley entrance. At the end of the road is the monastery of St. Nicholas, the most remarkable structure of the valley. It is said that the Greeks in the region have a tradition of leaving some of their belongings in the St. Nicholas Monastery before they die. Saint Prodromos Monastery, formerly known as Sinasos Monastery, is another important religious building in the valley.

Mustafapasa's cultural identity, in addition to its original natural identity, has taken on a unique quality as a result of several factors. These factors can be classified into three main categories:

1. The rocks formed due to the volcanic tuff were exposed to surface softening due to warming, drying, and temperature changes. This village's natural characteristics were influential in the architecture, and new spaces and rock-carved houses were built by carving these rocks.

2. Non-Muslim citizens in the Ottoman Empire benefited from the political atmosphere that began in the 18th century, and they created remarkable civil and architectural successes. Since the 19th century, citizens with Greek and Armenian majorities in various Anatolian cities, particularly Istanbul, worked to strengthen their communities. At this time, the Greeks in Mustafapasa played an important role in building outstanding architectural works. The fact that some Greeks in the village worked in the caviar trade in Istanbul and were thus financially strong led to the construction of magnificent and ostentatious houses in the village (Özbay, 2004).

3. Religion is one of the most critical cultural components of Mustafa-

pasa. People of different religions have lived here in peace and have succeeded in creating magnificent spaces that showcase their religion and culture. The Christians living here built many churches and chapels, monasteries, and places of worship carved into the rock in the village, and the murals they painted in the houses' walls are noteworthy. However, the 'Mehmet Sakir Pasha Madrasa', built-in 1900, is the only Ottoman and Islamic building with a different typology in the village.

Most of the buildings in Mustafapasa have stone facades, wooden beams, and decorations in the interior. Most houses are two floors buildings made of cut stone with open courtyards. The entrance to the courtyard is made through double-wing, ornamented, and wooden doors. The roofs are in the form of a gable or hipped roof and are covered with tiles. At the entrance of some houses, there is an inscription indicating the date of construction. On the interior walls of the buildings, wall paintings with mythological themes attract attention. In addition, some buildings have chapels and icon rooms. Since the Hittites, the Mustafapasa society has used rocks to create living spaces by carving rocks as a settlement for protection and dwelling. Even recently, the village's living spaces have been combined with rock constructions. This phenomenon is influenced by Mustafapasa's natural characteristics and shapes its cultural identity. For example, rock-cut units are chilly in the summer and warm in the winter. The locations of some historical buildings in Mustafapasa are given in Figure 5, and their information in Table 3.

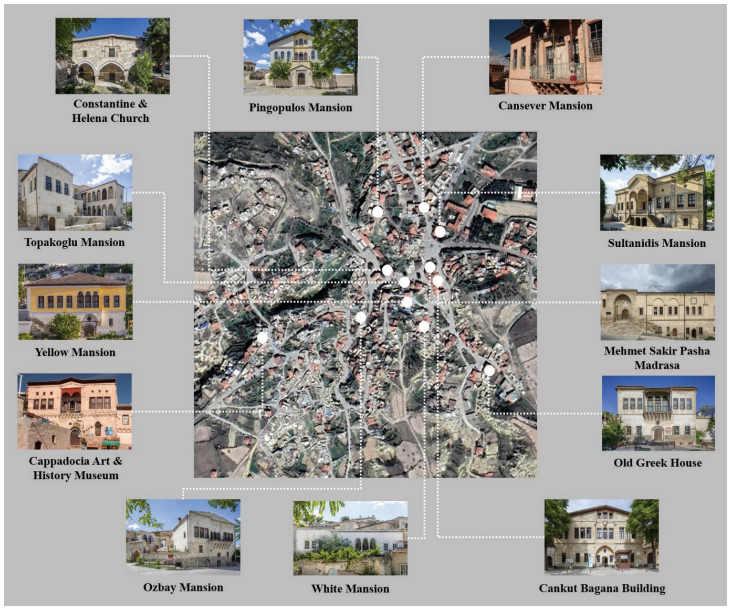

Figure 5. Mustafapasa's historic buildings (Source: The Author)

Table 3. Description of historic buildings (Source: The Author)

Buildings	Description
Sultanidis Mansion	According to the inscription on the entrance door, the mansion was built in 1892 and is one of the region's most magnificent examples of civil architecture. The building is accessed via two symmetrical stairways built adjacent to the building. The building has two floors, a rectangular plan, and a central sofa surrounded by eight rooms. An interesting mural on the theme of "Assassination of the Russian Prince" is above the entrance door to the hall. Kostis Meletiadis, one of the village's most important painters, painted the artwork. The Ottoman emblem is depicted on the opposite wall. Today, the mansion is used as an education building by Cappadocia University.
Cankut Bagana Building	According to its inscription, the owner of the building, which was built in 1900, was an important caviar merchant in Istanbul. The historical part of the building has two floors and a rectangular plan. A vaulted and closed courtyard is entered from the main entrance door on the southwest side of the building. The murals in the mansion originally existed have not survived. This may have been because the fire severely damaged part of the building. In the 1950s, for an unknown reason, the mansion's attic burned down, and this section was completely destroyed. The building was restored in the 1990s. Today, the mansion is used as an education building by Cappadocia University.
Pingopulos Mansion	Before the population exchange, the village headman built the mansion in the early 20th century. The three floors building, which is in a position overlooking the village, is located in the garden and rectangular plan. The hipped roof building has a cantilevered façade. The mansion's courtyard is entered through a profile decorated door on the east and through a double-wing wooden door on the south. There are many rooms, large halls, a wine vault, and a chapel inside the building.
White Mansion	The mansion, built between 1880 and 1881, is known as the "white mansion" by the villagers because of its exterior colour. The privately-owned mansion has two floors, a flat roof, and a rectangular plan. An open courtyard is accessed through the door on the eastern façade. On the courtyard's northwest façade is a well-preserved chapel with a relief of a cross above its door. On the upper floor of the building, the "veranda", which is one of the most important and characteristic places of traditional Ottoman house architecture, draws attention. Notably, the structure across the mansion's entrance door was built in the style of a "pavilion", and it is guessed that it was used as a music hall.
Ozbay Mansion	The mansion, which is estimated to have been built in the second half of the 19th century, is made of cut stone has two floors and a square plan. Through a low-arched wooden door on the south façade, a stone-paved open courtyard is accessed. Seven stone columns support a rectangular planned balcony on the upper floor. A vase and a flower are depicted in a niche in one of the rooms. There is a domed and niche chapel on the ground floor of the building, as in many of the other Greek mansions. The small church with a barrel vault on the upper floor of the building is a striking feature of the mansion.

Table 3 (continuation). Description of historic buildings (Source: The Author)

Old Greek House	According to its inscription, the mansion, built-in 1876, serves as a hotel and restaurant under the name "Old Greek House". The two floors building with a hipped roof has a rectangular plan. There are murals in different mansion rooms; the most striking mural is the male and female figures swinging on a swing set in a tree in a rural landscape. There is the letter "EAP" which means spring in Greek, and 1887 is under it. Below the picture, the name of Georgios Iordanidis, one of the important painters of the village, is read. In addition, there are two human figures in another room and an inscribed medallion picture between them. The medallion has inscribed the phrase, "Everything is empty, it is possible to be happy, fate offers people things in common". The date under this medallion is 1879.
Cappadocia Art & History Museum	According to the 1860 inscription on the wall painting on the upper floor, the mansion, which is understood to have been built before this date, now hosts cultural and artistic activities under the name of Cappadocia Art and History Museum. The two floors building with a hipped roof has a polygonal plan. The main entrance door is located in a deep niche with a pointed arch on the southeast façade of the building. A closed hall is entered through this door. In the main room of the mansion, a mural of a flower in a basket can be seen. In the lower right corner of the mural, it is written that it was depicted in 1860 by the painter Kostis Meletiades. At the same time, a historical tambourine in the mansion draws attention. On the tambourine, handwriting in Ottoman Turkish meaning "Vasil, Son of Lazaros" and 1820 were read.
Buildings	Description
Yellow Mansion	According to the 1896 inscription on the mural on the upper floor of the mansion, it is understood that it was built before this date. The building, known as the "Yellow Mansion" by the villagers due to its façade colour, is a two floors building with a hipped roof and a rectangular plan. The mansion has two entrance doors on the northwest and northeast facades. Just to the left of the entrance, there is a covered pool opposite a chapel, whose walls are painted dark orange. There is an open courtyard on the south of the building, consisting of many rectangular rooms. On the wall of the stair landing on the upper floor of the two floors building, which is connected to the lower floor, two large figures of armed soldiers in dialogue with each other are depicted. On the same wall is a dome; around the dome, there is a strip of the inscription written in Greek, which means "We are all immigrants and travellers in this world/We gladly obey the rules of hospitality." In the room at the southeast corner of this floor, there is a landscape painting with figures. It is understood from the inscription that Kostis Meletiades painted it in 1896.

Table 3 (continuation). Description of historic buildings (Source: The Author)

Constantine & Helena Church	The church, whose exact date of construction is unknown, has a basilica plan, barrel vault, three naves and three apses, and an open courtyard on the west. There is an eight-line inscription written on the marble stone in Greek letters on the inscription above the entrance door on the northwest façade of the church. Besides the yellow and blue plant and fruit motifs seen around the inscription, the geometric ornaments have added mobility to the entrance. On the other facades, the inscriptions of 1850 and 1851 are seen as reliefs. The interior southeast façade of the building is carved into the rock and opens to a space with a low ceiling. It is thought that this place may have been used as a place where people spent the night and prayed for healing: the church, which is open to visitors today, hosts various cultural and artistic events.
Mehmet Sakir Pasha Madrasa	The building, the most important and magnificent Ottoman work of Mustafapasa, was built in 1899 according to its inscription and was used for religious education. Today, the building continues its original educational function by serving as the education building of Cappadocia University. The two floors building has an asymmetrical plan with an open courtyard. The courtyard is surrounded by six arched porticoes running along the north and east façades. Madrasa rooms are open to this area. The top of the monumental crown door on the west façade of the madrasa is decorated with vegetal reliefs and geometric motifs. There are rotating columns on both sides of the door, and the fact that these columns are rotating gives information about the balance and strength of the building.
Cansever Mansion	Although the exact construction date of the building is not known, it is understood that it was built before 1884 according to the inscription on the mural in the upper room. The building, which was expropriated as an example of Civil Architecture by the Ministry of Culture and Tourism, now serves as the education building of Cappadocia University. The mansion is a two-storey building with a polygonal plan and a central courtyard. There are two entrance doors on the west and southeast sides of the mansion. The open courtyard and the garden are accessed from the two-winged arched main entrance door. In the main room of the mansion, there is a mural with a mythological theme. At the top of the mural is the Greek phrase “Slander According to Apelles of Ephesus”. In the lower right corner of the mural, it is written that the depiction was made by the painter Georgios Iordanidis in 1884.
Topakoglu Mansion	The mansion, which is estimated to have been built in the second half of the 19th century, has now been expropriated by the Ministry of Culture and Tourism. It consists of two floors and two buildings. In the basement and ground floor of the mansion, there are various places carved into the rock, such as the winery and bezirhane. The mansion has an open courtyard and has entrance doors on its northern façade, which can be reached by passing through a two-storey portico arrangement. Stonework consisting of vegetal ornaments and oyster motifs on the floor mouldings of the western building draws attention. Murals of old-style guns, rifles and daggers are striking at the upper floor entrance of the mansion. In the main room of the mansion, a view of a European city whose exact location is unknown is depicted. The other mural is the coastal view.

The buildings built by the Christian Greeks were magnificent in terms of art and architecture, but they could not be maintained by the people that settled in the village following the population exchange due to poverty and cultural differences, and many of them were demolished. With the government's protection and development programs, and the new expectations established by tourism, it is apparent that this scenario has come to an end today, and a new growth process has begun. Within the scope of the Environmental Plan made for Mustafapasa in 1985, a Conservation Plan was prepared in 2004 for the village declared as a protected area. Figure 6 shows the Conservation Plan.

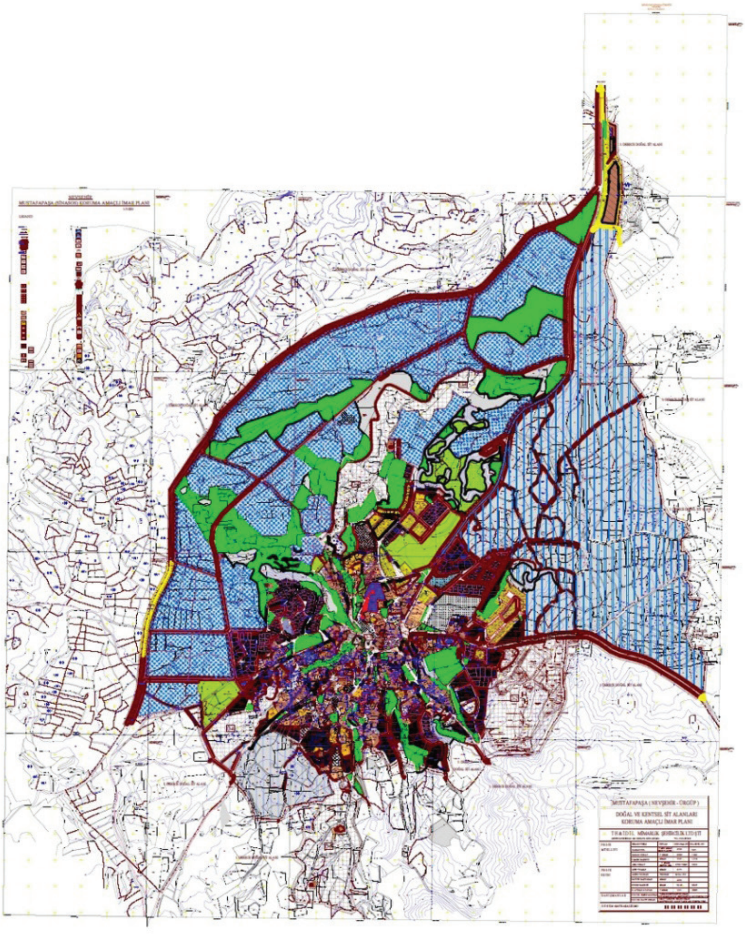

Figure 6. Mustafapasa's Conservation Plan (Özbay, 2005)

As a result of the Conservation Plan, the cultural and natural assets of Mustafapasa were taken under protection, and new construction and development activities were limited.

Best Tourism Village

The United Nations defined sustainable development in 1987 as "development that meets current demands without compromising future generations' ability to meet their own needs." The United Nations General Assembly established the 2030 Agenda for Sustainable Development and the Sustainable Development Goals in 2015. The United Nations World Tourism Organization (UNWTO) launched a program in May 2021 as part of the Sustainable Development Goals to identify the best tourism villages to conserve local identity and cultural heritage while reaping the benefits of tourism. The group aims to identify tourism communities worldwide that are implementing new tourism approaches in rural areas while adhering to the United Nations' Sustainable Development Goals. The United Nations World Tourism Organization's "Best Tourism Villages" program supports rural tourism development and community well-being. According to this organisation's announcement on 02.12.2021, an independent and international review board awards Mustafapasa as the best tourism village along with 43 other nominees out of 174 candidates from 75 countries. Mustafapasa has achieved 9 of the Sustainable Development Goals out of a total of 17 (UNWTO, 2021). Table 4 lists the goals that Mustafapasa achieved.

Table 4. Mustafapasa as the Best Tourism Village (Source: The Author)

Sustainable Development Goals	**The goals that Mustafapasa achieved**
No Poverty	Due to its cultural and natural assets, tourism activities have developed, providing economic benefits to the local people.
Zero Hunger	-
Good Health and Well-being	The village is part of the national health network. There is a health centre, a family doctor, and a pharmacy in the village.
Quality Education	The fact that the main campus of Cappadocia University is in Mustafapasa caused the village to gain qualifications in terms of education.
Gender Equality	The fact that the villagers are against all kinds of discrimination against women and girls ensures gender equality.
Clean Water and Sanitation	The fact that the village has rich water resources and a thermal hot water source meets this goal.
Affordable and Clean Energy	-
Decent Work and Economic Growth	The fact that rural tourism, agriculture, and animal husbandry are the main economic resources of the village causes it to develop economically.
Industry, Innovation, and Infrastructure	-
Reduced Inequality	-

Sustainable Cities and Communities	The existing transportation network, developed internet infrastructure with fibre optic lines, cafes, restaurants, shops, and accommodation facilities in the village provide sustainable city life.
Responsible Consumption and Production	-
Climate Action	This criterion is met due to actions, including implementing environmental sustainability programs, encouraging people to conserve water and energy, preventing food waste, being sensitive to waste separation, and providing electricity from solar energy to reduce carbon footprint.
Life Below Water	-
Life On Land	-
Peace, Justice, and Strong Institutions	-
Partnerships for the Goals	The cooperation of the Cappadocia Area Authority, Cappadocia University, Cappadocia Tourism Infrastructure Service Union, Ahiler Development Agency, Mustafapasa Village Administration, Mustafapasa Culture, Tourism, and Promotion Association meets this criterion.

Mustafapasa surpassed its competition by meeting nine Sustainable Development Goals, while most of the other 43 villages that received awards only met three, four, or at most five. Today, some projects, including preserving Mustafapasa's cultural heritage through restoration, landscaping, facade designs, renewable energy, waste management program, local employment opportunities, learning opportunities, and regional education scholarships, provide services for regional development in various fields.

SWOT Analysis

In this section of the study, a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) was made by examining the characteristics and current status of the village. Table 5 illustrates the results obtained.

Table 5. SWOT analysis (Source: The Author)

Strengths	Weaknesses
− Having a historical background − Rich cultural infrastructure (Different communities) − Having many registered historic buildings − The unique architectural features of the buildings and the mythological and narrative wall paintings inside the buildings − The existence of rock-carved buildings made with a special technique originated from the region's natural structure − Unique geomorphological and natural formation of the settlement − Having a strong identity both naturally and culturally − Being a protected area − Pumpkin seeds and grapes are two important agricultural products of the village	− Different ethnic and religious groups − Insufficient facilities for public transportation − Lack of natural gas infrastructure − Lack of functional diversity − Lack of plant diversity – Insufficient pedestrian and bicycle paths – Inadequate waste management and recycling − Lack of ecological integration − Not enough support from the government economically − Limited park and green area − In terms of security, the lighting system is insufficient at night − No souvenirs highlighting the identity of her village
Opportunities	**Threats**
− Having a university in the village − Receiving the title of the "Best Tourism Village" − Having a steppe and sunny climate − Strong winds at different times − Having accommodation facilities	− Allowing constructions that damage the original texture of the settlement − Restoration projects that damage the identity of buildings − Having a steppe and sunny climate − Low awareness of local people about the ecocultural village − Poorly managed tourism flows − Today, local people do not provide adequate protection for places belonging to the Greek and Christian groups due to ethnic and cultural conflicts. − Air and environmental pollution caused by the increase in visitors − There are few expropriated buildings, and many registered buildings are privately owned.

Results

The strategies summarised in Table 6 are developed within the scope of the ecocultural design model for the revival of Mustafapasa in terms of tourism and development of socio-economic, as well as the protection of its natural and cultural assets, based on the results obtained.

Table 6. Strategies for Mustafapasa (Source: The Author)

Principle	Description
Stability	– Stabilising the village's natural capacity and the uses by the local public – Stabilising the village's natural capacity and the uses by tourists
Ecological	– Using renewable energy such as solar and wind energy – Promoting the use of zero-emission vehicles in transportation – Developing pedestrian and bicycle paths – Conserving of local vegetation and developing the cultural landscape – Designing green recreation areas – Developing of vertical and horizontal agriculture – Using rainwater for agriculture effectively – Recycling and waste management – Preserving and restoring fairy chimneys – Ecological restoration – Ensuring ecological integration with surrounding settlements
Cultural	– Architectural restoration with appropriate approaches – Preventing new constructions that damage the historical texture of the village – Designing spaces where the movable cultural heritage of the village is exhibited – Expropriation
Functional	– Ensuring functional diversity – Adding functions to meet all the needs of the local people – Adding functions to meet all the needs of the tourists – Appropriate positioning of the shops selling souvenirs displaying the natural and cultural identity of the village – Cooperating with touristic activities and operators in the Cappadocia region
Social	– Protecting and promoting the sociocultural identity of the village – Educating the local people and increasing their awareness about the "Best Tourism Village" title – Reducing cultural conflicts and ethnic prejudices – Increasing the tolerance of locals towards tourists
Local	– Using local materials in the restoration works – Conserving and introducing the local identity such as gastronomy – Cultivating and evaluating pumpkin seeds and grapes, two important agricultural products of the village, effectively
Perceptual	– Eliminating visual pollution such as unnecessary signage – Arranging of buildings' facades – Increasing pedestrian safety with applications such as smart lighting – Ensuring visual diversity – Expanding green spaces for psychological relaxation

Conclusion

Sustainable design and planning approaches that include livability, natural and cultural heritage protection, green infrastructure, and clean energy

have risen to prominence in recent years. Sustainability, initially established in 1972, is widely recognised as a significant conceptual framework for determining urban policy and development, as well as providing context for a wide range of literature on planning, urban design, and architecture (Williams et al., 2000). The environmental dimension is composed of two basic components: natural and cultural assets. The ecological aspect of the ecosystem takes centre stage when it comes to natural assets. In the case of cultural assets, on the other hand, the environment's identity takes centre stage. Many environmental designs nowadays are solely focused on eco-housing and eco-object works, and only a few sustainable environmental design models take a comprehensive approach and provide practical recommendations. This study aimed to create an ecocultural design model that combines ecovillage principles with conservation criteria for cultural villages. Mustafapasa village, a historical and tourism village in Turkey's Cappadocia region, was analysed to examine the suggested model's concepts. The natural and cultural elements of the village were introduced in the first step, and the village was subjected to a SWOT analysis. Then, the suggestions developed for the village, in the scope of the proposed theoretical ecocultural design model in this study. The study emphasised that protecting the regions' natural resources and cultural identities should be considered an essential issue in projects aimed at developing the region and increasing tourism activities.

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