URBAN GREENWAYS AND THEIR ROLE IN SUSTAINABLE URBAN LANDSCAPE: A CASE FROM TUZLA, ISTANBUL

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URBAN GREENWAYS AND THEIR ROLE IN SUSTAINABLE URBAN LANDSCAPE: A CASE FROM TUZLA, ISTANBUL

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ABSTRACT

URBAN GREENWAYS AND THEIR ROLE IN SUSTAINABLE URBAN LANDSCAPE: A CASE FROM TUZLA, ISTANBUL

Cities, which coexist with the physical and natural environment, are going through a painful change process with changing needs and technological interventions in our world. With urbanization, social and cultural benefits arise for people, and on the other hand, the necessity of living in an artificial and unhealthy environment occurs. With the high urbanization rate in our country in recent years, healthy ecological balances have started to disappear completely. Considering the economic and social problems, green space losses occur with inadequate environmental policies and the disruption of unsustainable construction and ecological protection studies. At this point, it should be remembered that sustainable cities will only be possible with sustainable green space planning approaches. To improve the quality of urban life significantly, creating green spaces throughout the city is very important to ensure sustainability. The aim of this thesis, which was prepared in light of all this information, is to analyze urban greenways and their role in sustainable urban landscape. In this context, it is evaluated whether the sustainability of healthy natural life, local landscape diversity, and biodiversity are ensured in a case from Tuzla, Istanbul, which was selected for the field study. It was mentioned whether the areas and materials used during the designs were sufficient for sustainability, and the maintenance of the sites was examined. When the scope of the studies in the literature is evaluated, the prepared study will significantly benefit the field literature.

Keywords: Sustainable Urban Landscape, Greenways, Sustainability, Sustainable Urban Life

ÖZET

KENTSEL YEŞİL YOLLAR VE SÜRDÜRÜLEBİLİR KENTSEL PEYZAJDAKİ ROLÜ: TUZLA, İSTANBUL ÖRNEĞİ

Dünyada meydana gelen değişimler ve teknolojik ilerlemelerle birlikte doğal bir çevreye sahip olan kentler de değişim sürecinden geçmektedir. Kentleşme ile birlikte bir taraftan insanlar için sosyal ve kültürel faydalar ortaya çıkarken, diğer taraftan yapay ve sağlıksız bir çevrede yaşama zorunluluğu ortaya çıkmaktadır. Ülkemizde özellikle son yıllarda meydana gelen yüksek şehirleşme oranı ile birlikte sağlıklı ekolojik dengelerin tamamen ortadan kaybolmaya başladığı görülmektedir. Ekonomik ve sosyal sorunlar göz önünde bulundurulduğunda yetersiz çevre politikaları, sürdürülemez yapılaşma ve ekolojik koruma çalışmalarının sekteye uğraması ile yeşil alan kayıpları meydana gelmektedir. Bu noktada sürdürülebilir şehirlerin ancak sürdürülebilir yeşil alan planlama yaklaşımlarıyla mümkün olabileceği unutulmamalıdır. Bu bağlamda, kentsel yaşam kalitesini önemli ölçüde artırmak için kent genelinde yeşil alanlar oluşturmak sürdürülebilirliği sağlamak için çok önemlidir. Tüm bu bilgiler ışığında hazırlanan bu tezin amacı, kentsel yeşil yolları ve sürdürülebilir kentsel peyzajdaki rolünü analiz etmektir. Bu kapsamda alan çalışması için seçilen Tuzla, İstanbul'da bir örnek alan üzerinde, sağlıklı doğal yaşamın, yerel peyzaj çeşitliliğinin ve biyoçeşitliliğin sürdürülebilirliğinin sağlanıp sağlanmadığının değerlendirilmesi yapılmaktadır. Çalışmada, tasarımlar sırasında kullanılan alanların ve malzemelerin sürdürülebilirlik için yeterli olup olmadığına değinilmiş, alanların bakımı incelenmiştir. Literatürdeki çalışmaların kapsamı değerlendirildiğinde, hazırlanan çalışma alan literatürüne önemli ölçüde fayda sağlayacaktır.

Anahtar Kelimeler: Sürdürülebilir Kentsel Peyzaj, Yeşil Yollar, Sürdürülebilirlik, Sürdürülebilir Kentsel Yaşam

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS/ABBREVIATIONS

%:	Percentage
°C:	Degrees Celsius
İBB:	Istanbul Metropolitan Municipality
Kg:	Kilogram
Km:	Kilometer

1. INTRODUCTION

The concept of sustainability, in short, means ensuring that the productivity provided under optimum conditions can be sustained for many years. Sustainability has taken its place in daily life for the first time by being used with the concept of development and has drawn a general framework about what needs to be maintained. Considering that for the whole to be sustainable, the elements that make up the whole must be individually sustainable, the framework of the concept of sustainability has been reduced, and sustainability in local structures and even sustainability based on objects has become sought after [1].

Sustainable cities are one of the main issues of sustainability today. In particular, pressures such as population living in cities, consumption, and production have been the areas where environmental problems are most concentrated. In the 21st century, it can be said that cities are faced with not only population growth but also in terms of ongoing environmental problems such as soil pollution, inadequate sanitary conditions, water pollution, unhealthy housing, and air pollution [2].

Cities can be defined as more dense settlements in terms of population compared to rural areas, where the vital needs of communities such as settlement, work, shelter, and similar are met, and very few are engaged in agricultural activities [78]. The wasteful use of natural resources as if they will never be exhausted has caused these resources to become non-renewable despite their natural regeneration feature [1].

Urban landscapes are an essential social-ecological system in which natural and social processes shape the ecosystem together. All societies have accepted the necessity of developing natural areas in our fragmented world. People living in cities lead a separate life from the natural world, which leads to the differentiation of lives in residential areas [3].

When an evaluation is made at the urban landscape's scale, the terrain's spatial heterogeneity causes a significant change. Therefore, a good understanding of the ecological studies to be carried out in this area and the development of the green infrastructure system in this axis have become a necessity, not a choice [4].

1.1. PROBLEM STATEMENT

Adverse effects in cities with population growth, like deterioration of soils, rapid construction, deforestation, and similar unsustainable conditions, negatively affect the quality of life. With the increase in migration from rural areas to urban areas with better financial opportunities and the desire for a better life, individuals living in the city turn to nature for a better quality of life.

Inadequate green space in cities, excessive time spent on transportation, high cost of human needs such as access to clean water and shelter, air and water pollution, difficulty in finding a job, and the stress of all factors caused people living in cities to leave their establishment and move to rural areas has become a trend. The number of researchers working on sustainability is increasing considerably today, and many applications are being carried out. Greenways, one of these applications, is an undeniable public movement. Still, it is a green space construction that aims to get people out of the limited area and into the landscape and integrates cities into towns. This movement will make it easier for people to integrate into nature. Greenways are a phenomenon that makes spaces more effective and more liveable.

1.2. AIM OF THE STUDY

This study is based on the fact that cities are a vast ecosystem besides their economic and social importance. Sustainable urban developments examine some basic principles based on the preservation and holistic development of the ecosystems of cities. This study aims to reveal the extent of greenways in terms of the scope of ecological life and sustainable urban development. In addition, the sustainability of a city with an environmental approach has been evaluated through greenways as part of a sustainable urban landscape.

1.3. SCOPE AND METHOD OF THE STUDY

The greenways to be created throughout Istanbul will be the most effective structure despite the rapidly increasing population. Especially in the recent period, the greenways designed under "Valley of Life" have an essential quality for Istanbul. In this context,

Tuzla Valley of Life was chosen as the study area. In addition to all these, the fact that there is much ecological diversity in the region, the realization of the project along the Umur Creek, the presence of a vegetative texture consisting of various trees, and the re-evaluation of an idle area have created the most important limitations in choosing this area.

The most important reason for choosing this area is that it is designed considering sustainable ecological elements. When we look at past projects, it is noteworthy that sustainability is not considered, but it can be said that the value given to sustainability and green has increased today. Therefore, it is essential to reveal the ecological importance of these newly designed areas and to put forward various proposals for the betterment of these areas.

The first part of the study was carried out as a literature review, and many sources on the sustainability of landscape elements were examined. Then, in light of the information obtained, a field study was carried out, and it was discussed how much attention was paid to these elements in the region. The existing structure was evaluated with the photographs taken within the scope of the observation studies in the area, and the necessary suggestions were presented for forming a better greenway. This study, which has been prepared because the valleys of life that have started to be implemented throughout Istanbul are entirely new projects, is an essential source.

2. LITERATURE REVIEW

2.1. URBAN GREENWAYS

Over the centuries, people's land and land use have changed according to technical conditions. The lands, evaluated quite steadily until the second half of the 19th century, began to lose their old charm with the start of the industrial revolution in 1850. The industrial revolution was not only a revolution in production but also caused the change of mechanization and various elements such as fertilizer or fences in rural areas [6]. Especially after the industrial revolution, the excessive production and consumption balance that people have realized has led to the deterioration of the world's ecological system. Along with this issue, there have been great negativities with the excessive use of fossil fuels and artificial fertilizers [7].

After the industrial revolution, semi-natural areas were transformed into agricultural land, and the ratio of farming enterprises increased. People started to make arrangements in various natural areas in the same period. The process of nature conservation and the creation of urban ecological networks occurred in response to the industrial revolution [6]. Open and green regions of developed cities increase that city's living standard and reveal the town's environmental aesthetics. The combination of all these is one of the critical factors that improve the quality of life of both the city and the people living in that city [8].

The urban landscape is an essential system in which social and natural processes shape the ecosystem. For this reason, urban landscaping is generally a mixture of artificial and semi-natural habitats. Parks, home gardens, or water habitats are various examples of the urban landscape. However, with intensive urbanization activities at the global level, many social, economic, environmental, and cultural problems are caused [4].

Each city has its history, culture, and identity. The culture and identity of towns show changes that will go down in history over time. With the migration of people from rural areas to cities to reach better conditions for the future, the social and economic structure is also changing [9]. The concept of sustainability is a concept that can be realized with changes in the way of thinking without decreasing the quality of life of the person. The

essence of this change is to isolate from the idea of being a consumer society and to exhibit universal solidarity, ensure environmental management, and fulfill social responsibilities [10]. Different models and approaches have been analyzed to solve the ecological and social problems that arise with the increase in urbanization, and other movements have been developed according to the structure and conditions of the cities [11].

In particular, the introduction of various studies on the development of the environment and public services makes life in cities more facilitative. The biggest reason for this is that cities and urban areas are highly complex social ecosystems. Sustainable development and good quality of life are among the most critical concerns for a developed city. However, global economic crises bring cuts in the city budget and determine city priorities [9].

The urban landscape, an essential ecological system in which nature and social life unite the ecosystem, usually combines semi-natural and artificial habitats. The gardens of houses, the afforestation of roads, canals, and pools or parks are examples of urban landscaping. It can be said that intensive urbanization activities at the global level cause many environmental, cultural, social, and economic problems [4]. Greenways are one of the essential components of the urban landscape.

2.1.1. Greenway Concept

Greenways are defined in very different ways in terms of scope and concept. Since it is carried out for many other purposes, its contents are also revealed differently. Two words may need to be dealt with individually to clarify the definition of a greenway. The world is described as 'Greenway,' and 'Green' refers to natural areas such as riverbanks, forests, or wildlife. The word 'way' refers to an axis or route. When these two words come together, they mean a greenway or an axle that integrates with the landscape [5].

Greenways are linear corridors connecting natural corridors such as valleys, ridges, and river lengths, or landscape paths, canals, or parks that have been converted for recreational use on railway routes to residential areas. At the same time, linear corridors in which natural reserve areas, cultural objects, or historical settlements are connected to their areas can also be expressed as greenways [12].

In addition to recreational activities, greenways are greenways created for the use of protective or non-motorized vehicles. When an evaluation is made in general terms, it can be said that greenways are formed along areas with aesthetic and geographical features [13].

There are many definitions of greenways. Ahern (1995) defined greenways as networks that are sustainably planned and designed in terms of cultural, ecological, recreational, and aesthetic sense. It is known that greenways are carried out for various purposes following sustainable land use [14]. Fabos (1995) defines greenways of different widths that connect each other, such as railways and highways, as greenways [15]. The Italian Association of Greenways defines greenways as living centers that are well designed in an environmental sense and realized for non-motorized traffic, connect nature and people, and are located in both urban and rural areas [16].

When defining greenways, the issue of connecting natural landscape areas and cities is emphasized. All these features used qualify for a very different usage alternative to greenways. Generally, there are situations where there is an alternative to physically and visually enabling people to reach greenways, but in some cases, access to these areas cannot be provided. For example, providing access to the migration areas in the wildlife and places where the protection element is at the forefront is difficult. Such particular status areas are zones closed to human use [13]. Greenways lost due to many reasons, such as rapid population growth and industrialization, are a central concept in terms of losing the green texture of cities. While the continuity of the most important cultural and ecological areas in and around the towns is ensured by greenways, various alternatives are created regarding recreational areas limited to those living in the city [16].

Public spaces such as urban greenways, sea routes, pedestrian zones, stream axes, roof gardens, or highways form parts of the whole. The contribution of all these parts to the function and aesthetics of the city, alone or collectively, is significant. The fact that these areas are perfect in terms of process and aesthetics also helps the individuals living in that city to connect to the place where they live [8]. Therefore, greenways, an essential part of green infrastructure planning, help preserve the regional image, urban identity, local differences, and connectedness. At the same time, it allows the spaces to become more exciting and original in the aesthetic sense, making it the most crucial element in creating a complete understanding of place and social interaction [17].

Urban planning, carried out sustainably in the current century, is a phenomenon that has gained significant importance in realizing construction on the axis of a specific plan, using the existing resources correctly, and protecting immovable natural and cultural assets. To direct the design philosophies of societies after industry, it is emphasized that human beings should be the essential product of the ecosystem, considering the indivisibility of human and environmental unity [19].

Greenways have a vital role in making the city structure better. Greenways are one of the essential tools in the fight against land degradation, uncontrolled land use, deterioration of integrity, or excessive urban growth for sustainable landscapes. It is observed that the vegetative fences in agricultural areas and the greenways that occur on the river banks prevent erosion and provide nutrient recycling [16].

Developed cities continue to exist with interconnected urban areas, and the rural regions are home to significant natural resources. For this reason, it is noteworthy that the sustainability of the green network plans to be created in the cities is very important. The sustainability of the green network plan is possible with the continuity of the applications to be realized within the scope of green infrastructure [18].

2.1.2. Concepts Linked to Greenways

Greenways are concepts linked to green networks, infrastructure, and corridors in the literature. For this reason, to understand the greenways correctly, it is necessary to know the related concepts in Table 2.1.

A green network is a system of ecological or physical connections between core and core areas. Three different components can be mentioned in green networks, which are a very effective method to create functional and physical connections between fragmented habitats and regain the ecological and biological characteristics of these areas damaged during degradation [32]. These are buffer zones, core zones, and corridors, as shown in Figure 2.1 [31].

Table 2.1. Concepts linked to Greenways [31]

	ECOLOGICAL NETWORKS	GREEN INFRASTRUCTURE	GREENWAY
Origin	**1970s, Netherlands**	**1990s, USA**	**Early 1900's, USA**
Definition	They are protection, management, and restoration systems that create habitats for flora and fauna, while also taking care of recreational benefits for humans.	They are systems that integrate sustainable ecological functions and cultural values together.	It is a green corridor system that includes urban green belts, which mainly include natural life-supportive, and recreational uses.
Purpose	Conserving sustainable natural resources with a focus on functional connectivity. 	As a natural and cultural resource conservation approach, it is to create green spaces with structural and functional connections. 	Structural connection Oriented, protecting natural heritage and cultural values and offering passive recreation. 

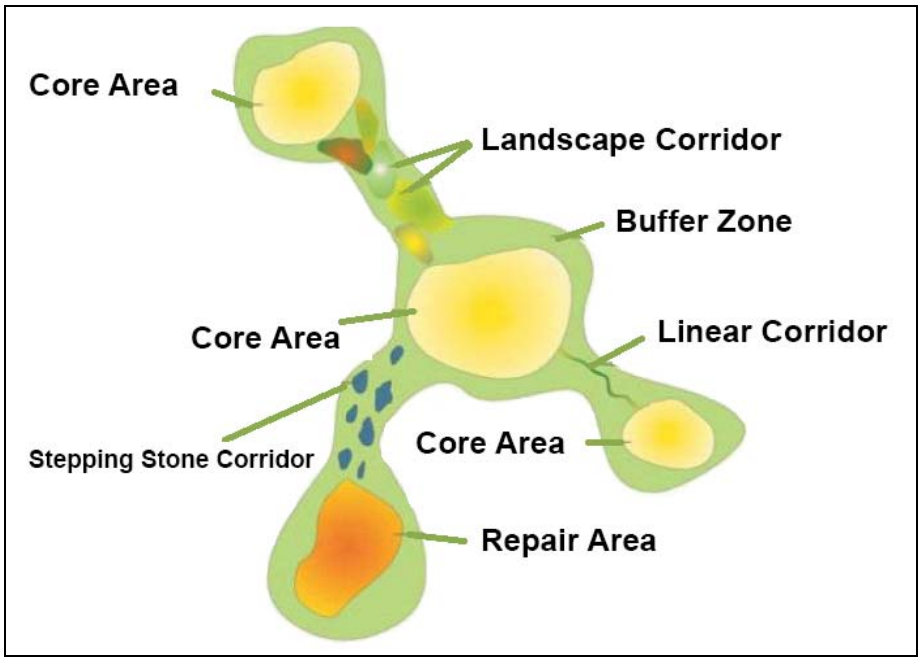

Figure 2.1. Critical components of green networks [33].

These core regions are the hinterland regions that protect essential species, ecosystems, and habitats. These living habitats consist of natural areas that are ecologically important in the landscape. Core areas in ecological networks are included in semi-natural areas that are degraded but can be restored to nature with landscape repair strategies. These areas can also be referred to as repair zones [31]. Core areas cover the unique landscape types of countries or regions and need more protection ecologically than other regions. It can be said that core areas have the qualities and dimensions to embrace populations that have the slightest possibility of living with threatened species [32]. When the standards in the world are examined, it is seen that the core areas are not defined within a specific standard [34].

The areas referred to as greenways and connections are the lines that connect the core regions and help establish communication and communication. Core areas are connected by greenways [31]. Greenways are areas that connect core linear regions and regions. These greenways provide facilities for preserving water quality, creating habitat for terrestrial or aquatic creatures, preventing river erosion, providing stabilization, creating ease of migration for living things, and recreation [4].

There are greenways located linearly between habitats, as well as greenways in the form of curved greenways. Stepstones comprise one or more loose pieces of habitat that occur for species. The habitat fragments mentioned are ecologically isolated areas. The ecological greenways, consisting of a seamless mosaic of habitats, create a good closure for a safe journey from one core area to another [32].

Greenways, which form the connection between open-green areas that linearly show continuity, are also a general term that aims to develop into the urban texture. The greenway includes wildlife greenways, bicycle paths, streams far from the city, rehabilitated water shores, or pedestrian axes along the bay [5].

Greenways are crucial links that connect parks, natural areas, and historical sites along valley lines, river banks, abandoned railway routes or canals, and other transport greenways. All these events in the greenways are uniquely presented within the region and reflect the community’s needs [5].

The ecological greenways and connection areas owned by cities are integrative zones of the urban and rural green fabric. When greenways and greenway connections are

considered as a whole, it is seen that a very healthy ecological integrity that complements each other is expressed [17].

When ecological systems are examined, buffer zones are considered one of the most critical components within these systems. The buffer zones surrounding the greenways in the core regions protect the ecological bond against external factors and support the continuity of the living system inside. All areas need to be protected from the core parts of environmental networks. These parts preserve ecological networks against harmful influences from outside [31].

Green infrastructure is a network of green spaces formed by semi-natural and cultural areas that protect the functions and value of the ecosystem and are designed and managed to provide ecosystem services simultaneously. In addition to being made up of interconnected rooms, the old infrastructure is an effective tool for eliminating the adverse effects of climate change [85].

Green spaces, an essential indicator of the quality of life in cities, have become necessary for human life and reveal the character of cities. Green areas have a significant role in the formation of the identity of cities. However, system integrity must be ensured throughout the city to meet the function expected from green areas. The green infrastructure system, which is based on the understanding of connecting urban green regions with other open spaces and natural systems through greenways, has a critical mission. In particular, greenways that enable the aesthetic, recreational, ecological, and economic functions of green areas to be fulfilled are of great importance for the urban fabric [35].

2.2. GENERAL FEATURES OF GREENWAYS

The general features of greenways are listed below [79, 4]:

1- First of all, it can be said that the spatial distribution of greenways is generally linear. The linear systems formed by greenways are based on the ability of species to move and the nutrient cycle.

2- Another of the main features of greenways is connectedness. Connectivity provides a relationship between landscapes spread over large areas.

3- Since greenways serve many purposes, it is necessary to determine for which purpose they are prepared when planning. Greenways are designed for social, cultural, and environmental goals.

4- Greenways are related to the sustainable development approach. Therefore, greenways serve to protect nature and promote sustainable development.

5- Greenways often have an integrative role related to physical planning and landscaping work.

6- Greenways contribute to the continuity of the landscape functions of the urban areas in which they are located. The tasks specified here as landscape function are the improvement of the hydrological structure, the provision of energy and nutrient cycle, the benefit of biological diversity, and the prevention of erosion.

However, in terms of application, some different features stand out;

Linearity: It can be said that greenways have linear characteristics in terms of form. When greenways are considered a linear system, it can be noted that different materials, foods, and living species circulate and support reactive actions such as cycling and walking [13].

Binding: The binding feature that forms the basis of the greenway concept helps connect human beings to nature and different environments of nature to each other by establishing a relationship with landscapes with various characteristics [80].

Multifunctionality: Greenways have many processes for the functional and regional conditions of the units with different characteristics. Multi-functional features allow for goal setting during the planning of greenways. The overlap between recreational needs and variations in wildlife conservation is a situation that requires territorial separation or alternative management. With a wide variety of administrations, alternative administrations can be put forward [13, 12].

Sustainability: The basic principles considered in the planning of greenways and the concept of sustainability are closely related. The purpose of the emergence of greenways is to protect and observe nature and ensure that natural areas are opened to human use. Supporting the sustainability of greenways, in this context, enables the formation of

environments where the correct use of resources and the use of resources are balanced [80, 12, 13].

Contribution to landscape planning: Greenways allow for various space alternatives within the characteristics and possibilities of systematized linear open green spaces. Conceptually, greenways should not be considered an alternative to physical and landscape planning but should be perceived as a system that complements or integrates the abovementioned planning [12, 13].

2.2.1. Typology of Greenways

Some typological features of greenways are listed below [4, 36].

1. Scale: Greens are classified depending on the landscape features and spatial scale in which they are located. The size of the roads is determined by paying attention to their spatial scale. While the widest streets include countries and continents as application areas, the smallest greenways have small landscape applications in the axis of certain natural and cultural features. In addition to the physical size of the site above, differences are also noticeable in its political units. While more comprehensive policies are a priority in managing greenways spreading over large areas, the management of the site and application is also a priority in small-scale greenways.

2. Objectives: Greenways are planned for purposes such as biodiversity, control of urban expansion, and recreation. The objectives of the planning should be clearly defined. In this respect, greenways are classified into four categories: habitat protection, protection of water resources, recreation, and security of historical and cultural resources.

3. Landscape features: Greenways are evaluated within categories such as typical landscape features, i.e., area uses or land cover dominating the region.

4. Planning strategies: The planning strategies put forward for greenways evaluate the elements within the scope of a particular landscape and ensure their harmonious use in functional and spatial terms. Applications carried out in such a way provide very different benefits.

Greenway types were examined by Little (1995) in 5 different categories. These are urban riverside greenways, recreational greenways, ecologically significant natural greenways, scenic and historical routes, and comprehensive greenway systems or networks [89].

2.2.1.1. Urban Riverside Greenways

It covers inner-city water banks that have been irrelevant for many years or have been evaluated to reorganize part of them [13]. A study by Ahern (1995) revealed that resources related to waters other than river edges should also be handled within greenways. These greenways ensure water resource improvement, management, and protection [21]. Greenways, connected to water resources, generally occur along stream greenways, wetlands, flood plains, and similar water sources. However, creating these ways includes improving, conserving, and managing resources. A relevant example is the Willamette River Greenway in Oregon in Figure 2.2 below [86].

Figure 2.2. Willamette River Greenway, Oregon [86].

2.2.1.2. Recreational Greenways

Recreational greenways are generally trails and paths with promenades that run along a long line and have different characteristics [13]. Greenways created for recreational purposes are frequently used roads. Compared to different types of greenways, these greenways have longer distances. Recreational greenways can consist of natural areas, transportation axes, and other open green areas that are not usually used. An example of a recreational greenway is the Whittier Greenway Trail in Figure 2.3 below [21]

Figure 2.3. Whittier Greenway Trail, Los Angeles [21].

2.2.1.3. Scenic and Historic Routes

Routes with a strategic or aesthetic character have cultural, historical, or natural significance and simultaneously allow navigation on foot and by vehicle, which can be expressed as scenic and historic routes [13]. It is similar to greenways for recreational purposes because it allows recreational activities. However, it will likely attract tourist attention and natural formations, historical resources, and cultural elements worth watching [21]. Figure 2.4 below is an example of an ecologically significant natural greenway.

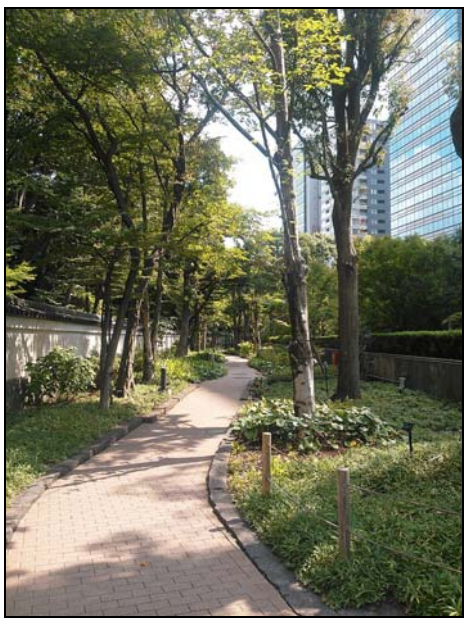

Figure 2.4. Toyota Settlement Greenway, Tokyo [91].

2.2.1.4. Ecologically Significant Natural Routes

Unlike greenways established for recreational purposes, ecologically significant natural greenways emerge to protect diversity and wildlife. However, it continues to exist in a way that serves the purpose of protection rather than the purpose of use. Such greenways occur in all areas where natural resource formations such as valleys, slopes, streams, and rivers are located, which are worth protecting. Greenways, which have ecological importance, is not only the protection of natural resources but also a fundamental structure that provides vital inputs to the area where it is established and serves all living things on micro and macro scales needed by the region. Ecologically significant natural greenways are essential for maintaining biodiversity [21]. In addition, ecologically substantial natural passages can also be expressed as greenways connected to biodiversity. An example of such a path is the Oconee River Greenway in Georgia in Figure 2.5 below [86].

Figure 2.5. Oconee River Greenway, Georgia [86].

2.2.1.5. Comprehensive Greenway Systems or Networks

Comprehensive greenway systems or networks follow traces of natural landscapes such as ridges and valleys. At the same time, these greenway systems provide connections to greenways that are different from the city scale or the regional scale. Figure 2.6 below shows comprehensive greenway systems or networks [89].

In addition to all these greenway types, there are different types of greenways. These greenways are waterfront, urban buffers, and greenway networks. The classification was carried out according to the purposes of the greenways. However, not all types of greenways are likely to serve only one goal. An example of a topic is recreational greenways. When recreational and ecologically significant natural greenways follow a waterway, they can also be described as waterfront greenways. Put differently, a waterfront greenway can create a habitat similar to an ecologically significant natural route. The

greenway has many functions, consisting of specific functional uses that can be compatible with each other [87].

Figure 2.6. Comprehensive greenway systems or networks [89].

2.2.2. Functions of Greenways

When the functions of greenways are examined, it is seen that they have ecological, social, and economic functions. These functions are also divided into classes within themselves.

2.2.2.1. Ecological Functions of Greenways

- *Nature Conservation Functions*

All ecosystems on Earth face a significant threat with excessive and incorrect use, disproportionate population increase, and social income level. Foremost among these threats is the degradation of the natural habitat and the decline of biodiversity. At the same time, the inability to ensure the sustainability of biological life is among the current problems. Many studies have revealed that living species are in danger of disappearing much faster than in the past [37].

Greenways are the primary habitat for many plant and animal species, creating a crucial alternative for conserving valuable forests and wetlands [46, 47]. Greenways and other

vegetation areas, helpful with their biological, geological, ecological, cultural, and natural features, have features such as defense and improvement. In this way, all damage in nature will be repaired instantly [41].

The urban ecosystem in the 21st century causes many environmental problems, such as urban heat islands, biodiversity loss, pollution, and so on. Urban green spaces, which emerge as parks and greenways, are indispensable to green network systems and create potential urban textures [38]. Green areas covered with vegetation improve air quality by filtering the pollutants in the atmosphere depending on the plants' ecological characteristics, the environment, and climatic conditions. On the other hand, trees improve the air quality of their territory by absorbing pollutant molecules in the stomata in their leaves during respiration. At the same time, trees can retain pollutants in the atmosphere with their leaves. This dirt, kept on the leaf surface, remains on the plant until the tree abscission or until a possible rainfall washes the leaves. Trees' mission to improve air quality is higher when they move closer to the source of the pollutant [39].

- *Climate Protection Functions*

Greenways are areas that protect recreational facilities, settlements, and agricultural regions from the damages that occur with climatic conditions and try to improve the climate of the place where they are located. Climate protection includes forming cold air and cutting the wind speed, but it also allows the air to be cleaned by changing the airflow. In addition, forests reduce the effect of greenhouse gases by showing a reducing impact on the rate of carbon dioxide in the atmosphere [41]. In cities built with green networks, the components that make up the physical infrastructure are connected physically. The fact that green areas create functional connections with each other and have high ecological qualities ensures that climate change is minimized. The ecosystem conditions provided by the infrastructure systems designed this way help preserve the existing biological tissues [42].

Green spaces in cities provide a cooling effect through improved evaporation and shading, reducing the heat island effect in many cities. Green spaces are generally threatened by the expansion of city structures that create small green spaces between roads and buildings that are tearing up natural areas. The forested regions of the city are usually separated from each other [43].

- *Erosion Prevention Functions*

Erosion, that is, soil erosion, is the process of moving the soil from one place to another with the disappearance of vegetation that prevents soil erosion. With the disappearance of vegetation, the soil, which is deprived of protective cover, faces the effect of wind and water [44]. Greenways help minimize the adverse effects of erosion thanks to their vegetation feature. Vegetation reduces the amount of precipitation reaching the soil with interception. With the greenway system, landslides are prevented. By cutting the wind's speed, erosion prevents the ground from being transported and going to unwanted places [41]. As in the rest of the world, erosion is Turkey's most important cause of soil loss. In addition to the natural erosion that occurs with the combination of climate, vegetation, and soil characteristics in the land, many artificial factors based on human intervention in nature cause erosion. These erosions also turn into natural disasters [44].

- *Hydrological Functions*

Greenways ensure that the water in the vegetation areas' streams, ponds, or dams, which serve as a hydrological function, is kept clean. At the same time, these greenways ensure that water resources are available continuously and regularly [41].
Greenways are areas that protect wooded open spaces along streams and streams that absorb floodwaters and filter out pollutants found in rainwater. Greenways serve as primary storage for flood control [46, 47].

Hydrology is very important in the planning decision stage in terms of the capacity of the planned area, water sets, water quality, possible flood status, drainage status, and underground or above-ground water situation. The existing rivers and streams are drainage channels suitable for greenways. For this reason, the first designated greenway and whether there is a water source near this greenway are investigated [12].

2.2.2.2. Social Functions of Greenways

- *Community Health Functions*

The cities of the current century aim to provide economic and social prosperity within sustainability. The fact that green cities, which try to ensure ecological protection and development with the principles they put forward about sustainability, are much more preferable and popular than other cities is related to the globalization of the understanding of sustainability. In addition, evaluating environmental protection within the framework of becoming a brand city increases this demand. Today, all cities have to create ecological, green, and innovative urban areas to integrate global capital on the one hand and to take part in the competition among themselves on the other hand [45].

Greenways reduce the effects of toxic gases and wastes, noise, industrial residues, and environmental pollution thanks to vegetation areas and help prevent the negativities caused by these effects in humans. At the same time, due to the airflow provided, air quality improves, noise decreases, and toxic gases in the soil are absorbed [41]. In megacities such as Istanbul, which have a very high population and a very high building density, urban greenways consisting of open and green areas to protect public spaces and adapt to climate change have a crucial role in ensuring the continuity of the urban ecosystem and natural structure [45].

Greenways encourage people to walk or cycle in short-distance places and improve people's health. Research shows that a daily 9-minute short and medium-intensity exercise is essential for physical and mental health. When opportunities are provided for participation in outdoor activities in places where people live, it is seen that a healthy lifestyle is also encouraged [46, 47]. Greenways provide alternative transportation between villages and cities while allowing short walks between parks, shopping malls, and schools in the city. In humans, increasing activity areas such as running, cycling, or walking helps reduce stress and weight loss. At the same time, it can be said that greenways are effective in reducing the risks of diseases such as cancer, heart or diabetes in an indirect way [80].

- *Aesthetic Functions*

The aesthetic functions of greenways often define historical roads and routes with visual landscape value. Roads and areas that usually extend along a highway or highway and where spaces that allow various activities of individuals at specific points are designed and multiple facilities are utilized are defined as greenways [48]. Greenways with aesthetic function hide marble quarries, brick, tile factories, stone quarries, factories, or facilities that disrupt the current image of the environment and nature and create a disturbing environment with its appearance. However, it makes pretty pleasant images [41].

- *Recreational Functions*

The recreational function of greenways stems from the fact that they serve individuals' mental and physical health, instilling a love of nature or happiness [41]. The greenways created for recreational purposes usually consist of areas such as paths along a very long line. Natural greenways, as well as abandoned or new routes, are areas that can be used for this purpose [48]. Greenways focus on providing an alternative option to get rid of highways and congested streets but also focus on various projects to plan future transportation and to be a more comfortable travel alternative for residents. Greenways serve as extensions of the road network, offering workable connections between starting and destination points such as libraries, shopping areas, tourist attractions, restaurants, and schools. According to the Federal Highway Administration, two-thirds of all vehicle journeys are sustained over a distance of 8 km or less. Surveys have shown that a citizen in the United States is willing to walk about 3.2 km and bike up to 8 km until they reach their destination [46, 47].

Streams, one of the most essential landscape elements, have a vital greenway and ecosystem feature. A landscape mosaic emerges when many large and small ecosystem parts that comprise landscapes come together [74]. However, the coastal areas, which can be defined as sensitive ecosystems where the sea and land meet, allow various recreational uses with their economic, microclimatic, and natural features, making the coasts very attractive in meeting the multiple needs of people [75].

- *Educational and Scientific Functions*

Some of the greenways are places where scientific studies can be done. Such greenways are used as nature laboratories based on examination in terms of sciences such as geology, zoology, archaeology, or natural history, keeping all living or inanimate beings in the foreground of animal or vegetable elements in the ecosystem of forests [41]. Greenways are a precious open-air class. Students in various age groups benefit from greenways to study nature, animals, and plant life. However, greenways offer the opportunity to interpret natural but also historical, and cultural resources [46, 47]. All visitors, young and old, can have information about historical and natural resources thanks to the greenways. The areas above can be considered open-air classrooms that provide direct information about surviving biological systems [80].

2.2.2.3. Economic Functions of Greenways

Green spaces encourage a wide range of economic activity and investment. Communities are attracted to businesses and residents by parks and other green spaces, which promote economic growth, tax income, and tourism. Tourism is quickly becoming the primary economic activity in many regions. Green spaces are now recognized as an essential component of a sustainable economy. They are also a low-cost way to protect the environment while directly benefiting humans. These advantageous functions include flood protection, water storage and purification, air cleaning, organic waste degradation, and urban heat island effects reduction. These economic benefits apply to all types of protected land, like greenways [6].

Implementing greenways offers economic benefits, including increased tourism and cost savings related to recreation areas. It also increases the value of the properties adjacent to them by 5% to 20%. Many home buyers are interested in real estate that provides direct access to greenway systems. Greenways also play a very influential role in tourism [46, 47, 49].

2.2.3. Greenway Examples

2.2.3.1. Greenway Implementations in the World

The greenway concept has emerged for the first time with the definition of "Green Belt." This concept, used by Ebenezer Howard to eliminate haphazard structuring in industrialized cities, emerged to bring together rural and urban life. Then, in the 1860s, Frederick Law Olmsted introduced the concept of the so-called "greenway," for the first time connecting parks and connecting roads were established in original areas [20]. Olmsted, who argued that a single park does not offer people the necessary facilities and that the existing gardens should be maintained somehow, raised the issue that the connection of the city's green spaces will have positive results. As a result, this idea led to the potential of linear roads and pioneered the design of greenways. The greenway movement has developed around this idea [21].

When the loss of open spaces in the United States in 1970 began to reveal evident traces throughout the country, planning studies for the protection of green areas were born. In the axis of these studies, greenways have gained importance. Organizations for environmental protection, which foresee the easy association and system creation of green areas with different qualities, have received much support. With the Open Air Commission's proposal in 1987 to adopt and expand greenways as a national system, greenways have become much more critical. At the same time, with 80% of the population living in cities in America, it is possible to say that greenways, which are defined as the connection of natural, cultural, and structured environments and where people can be intertwined with nature, have been very important since 1989 [12].

The greenway concept emerged in Europe in the late 1980s and became more popular in 1990. In the countries of the European Union, greenways have begun to refer to the greenway devoted to recreation, tourism, and non-motorized transportation. Greenways are designed separately from motorized traffic routes along historic trails, disused roads, and natural greenways. Greenways in Europe has been achieved to promote an active lifestyle, nature protection, and safe access for individuals. A crucial step was taken with the establishment of the European Greenways Association in Belgium in 1997. The European Greenways Association develops and contributes to European Union policies such as development, employment promotion, and nature conservation [22].

From past to present, it is seen that ecologically-based policies and plans have been implemented at many different scales in many countries. However, when we look at the plans produced and the policies put forward, it is observed that a joint decision cannot be made. However, there are also confusions in the conceptual sense. The plans in American and European cities are called ecological infrastructure, habitat networks, environmental and greenways, or green belts. In this respect, considering that the working area has become suitable for the scale of the city part and continues along a linear line, all these projects have been combined under the concept of greenway [21].

At a meeting held in 2020, the European Commission discussed the "European Green Deal" to guide the climate policy strategy to be realized by 2025. The ultimate goal of this agreement is to achieve targeted climate neutrality by 2050 [23].

Although greenways have been implemented for the first time in Europe and America, these practices differ in concept and scope. The work carried out in Europe has generally been carried out to protect the species' ecological infrastructure and habitat requirements [24]. In the United States, conservation studies are usually carried out for the use of individuals. These applications carried out with the principle of sustainable use of landscape, are expressed in terms such as landscape connection, environmental corridors, and greenways [5].

The longest greenway known in America is a 51.4-kilometer-long greenway on the Manhattan Waterfront Greenway around the island of Manhattan (Figure 2.7). Filled with flowers, trees, shrubs, walkways, and bike lanes, this area has dramatically improved the quality of life for New Yorkers. The greenway has three distinct sections: the Hudson River, the East River, and the Harlem River [24].

Figure 2.7. Manhattan Waterfront greenway [24]

The Manhattan High Line Greenway is another greenway in Manhattan that covers an area of 33 km extended and is in high demand (Figure 2.8). In 2009, from Gansevoort Street to the West 20. The first section leading to the Avenue was opened. In 2011, the South was the 20th President of South 30 with Street. The second section between the street was put to use finally, South 34. The third and final section leading to the road was opened in 2014 [25].

Figure 2.8. Manhattan High Line greenway [26].

Some of the most successful examples of greenways in Europe are those in Spain. The Almanzora Greenway in Spain was a project by the Spanish Government in 1993 to protect the country's natural areas (Figure 2.9). This greenway, formed from railway lines abandoned for more than 20 years, covers 10,000 kilometers of nature trails. It is known that approximately 222 million Euros have been invested in the realization of this project. This greenway project has been carried out to benefit both human uses and to provide ecological benefits to an idle area [27].

Figure 2.9. Almanzora greenway in Spain [27].

Another of the most important examples of greenways in Spain is a long greenway that occurred in the area of the Manzanares River of the M-30 Ring Road in Madrid's Rio and emerged as a result of an underground route (Figure 2.10). This greenway runs for several kilometers from El Pardo to Getafe. It is known that 33,623 trees were planted at the end of its construction in 2011 [24].

Figure 2.10. Greenway in Madrid [24]

One of the most successful examples in Europe is the Promenade Plantée greenway in Paris, France (Figure 2.11). It is a space designed by Philippe Mathieux and Jacques Vergelely. Located in Paris, this greenway covers part of the sea route line. It is known that the approximate length of this line, the applications of which were completed in 1993, is 4.5 km [25].

Figure 2.11. Paris Promenade Plantée greenway [28].

2.2.3.2. Greenway Implementations in Turkey

The development of greenways in Turkey was realized after 1990 with similar usage-oriented practices as in America. Since 2008, it can be said that efforts to protect habitat

and green space have increased, as in Europe [5]. There are various projects planned to be carried out to ensure the continuity of biological diversity in Turkey. In a project in which many cities in the Central Black Sea and Central Anatolia have been selected as pilot cities, it is stated that the ecosystem will be supported so that the provinces partially enter their borders [29].

The Badger Creek Project was initiated to protect the city against natural disasters to reduce the effects of the earthquake disaster in 1999 (Figure 2.12). This project aims to minimize the flood damage caused by yew tea and to reduce the water entering the groundwater from the irrigation channels in a way that does not pose a danger. With the project, it is aimed that the city will regain its vitality with the recovery of Eskişehir from the flood threat. It can be said that this project, which is not carried out for the greenway, serves the greenway purpose of the ongoing arrangements and the benefits it provides to the city and urban health [13].

Figure 2.12. Eskişehir Porsuk Stream greenway [13]

The achievements of the greenway project on the banks of the Eskişehir Porsuk River are seen in Table 2.2 below.

Table 2.2. Porsuk Stream coast greenway gains [30]

		Achievements
Name	Porsuk Strem Coast Greenway	■ Cleaning the Porsuk Stream and reducing the disaster risk ■ Increase in green space accessibility and per capita green space ■ Increase in the sociocultural value of the city ■ Increase in recreational and sporting activities along the corridor ■ Transportation on Porsuk Stream ■ Urban ventilation ■ Reducing the urban heat island effect ■ Adaptation to climate change ■ Flood control ■ Increase in air, water, and soil quality ■ erosion control ■ Noise reduction ■ Pollination and providing habitat for living things ■ Increase in carbon sequestration ■ Reducing natural disaster damage
Location	Eskişehir, Türkiye	
Nature-based solution and green infrastructure used	■ Green Corridor ■ Creek Corridor ■ Water Canal ■ Street afforestation ■ City Park	
Application Scale	City	
Radius	City, Division	

The Allaben Creek Greenway, located in the Gaziantep region, consists of 18 theme parks and natural areas integrated along Allaben Creek (Figure 2.13). As mentioned above, the rooms have plant strips on the creek edge axis with rainwater regulations, flow control, leakage, and filtration functions [30].

Figure 2.13. Gaziantep Allaben Creek Greenway [30]

The achievements of the greenway project along the Gaziantep Allaben Creek are seen in Table 2.3 below.

Table 2.3. Greenway gains along Gaziantep Allaben Creek [30]

		Achievements
Name	Greenway gains along Gaziantep Allaben Creek	■ Increase in green space accessibility and per capita green space ■ Increase in the socio-cultural value of the city ■ Increase in recreational and sporting activities along the corridor ■ urban ventilation ■ Reducing the urban heat island effect ■ Adaptation to climate change ■ Flood control ■ Increase in air, water, and soil quality ■ Erosion control ■ Noise reduction ■ Pollination and providing habitat for living things ■ Increase in carbon sequestration
Location	Gaziantep, Türkiye	
Nature-based solution and green infrastructure used	■ Green Corridor ■ Creek Corridor ■ City Park ■ Botanic Park ■ Permeable flooring ■ Rainwater plant strip	
Application Scale	City	
Radius	City, Division	

Çiğdemim Garden, located in the Çankaya district of Ankara, is built on an area of 1,500 m^2. This area, which is adjacent to METU forest and Can Yücel Park, is aimed to increase living practices compatible with the city and nature. This project, which is carried out to draw attention to the relationship between town and country, local production, living practices suitable for wildlife, and accessible food technologies, closes a significant gap. In this project, which increases the basic knowledge and awareness of natural product cultivation, different production and consumption habits are gained [30]. The working area of the garden is shown in Figure 2.14. below. With this project, where local production was supported to a great extent, employment was also contributed. In addition, each of the areas used has been saved from being idle and thus the sustainability of the ecological structure in the region has been ensured.

Figure 2.14. Çiğdemim garden in Ankara [30]

The achievements of the Çiğdemim Neighborhood Garden are seen in Table 2.4 below.

Table 2.4. Çiğdemim neighborhood garden achievements [30]

		Achievements
Name	Çiğdemim neighborhood garden	■ Changing consumption habits with production opportunities in the neighborhood ■ Facilitating access to food ■ Contributing to the reduction of reliance on long-distance transport for food supply, thus reducing greenhouse gas emissions ■ Increasing biodiversity in their area ■ Contributing to the recycling of the waste with methods such as compost ■ Increasing the knowledge and awareness of citizens on issues such as responsible production and consumption, biodiversity, agricultural production, and climate change. ■ Developing healthy eating habits ■ Contributing to local development by supporting local producers ■ Providing cool areas to the environment in the city
Location	Ankara, Türkiye	
Nature-based solution and green infrastructure used	■ City Garden	
application scale	Neighborhood	
Radius	Neighborhood, City	

2.2.4. Green Infrastructure Elements within the Scope of Greenways

Green Infrastructure Systems refer to an ecological network that aims to ensure the interconnection of the ecosystem in open and green areas located in urban and rural landscapes. Green infrastructure systems can be planned at regional, local, or national scales.

The concept of green infrastructure, together with the greenways, core areas, and landscape systems consisting of nature parts between ecosystems, expresses a necessary procedure. Based on the project of landscape architects in North America, green infrastructure systems have been considered, especially in the mid-1800s. Frederick Law Olmsted, who first brought recreational services and green spaces to the agenda in North America, created urban projects in a connected way for the sustainability of natural services. The book Greenways for America emphasizes that the concept of green infrastructure, defined by Charles Little, dates back 130 years [50].

The issue of green infrastructure has also been the subject of scientific debates since the 2000s. This concept is a strategically planned and managed natural habitats, greenways, and protected areas system. Although green infrastructure is accepted as a network of interconnected green spaces, there are various benefits provided to society by the natural resource values of green infrastructure systems. In the studies carried out at the regional

and urban scale, green infrastructure has many benefits, such as protecting ecosystem health and contributing to the protection of biodiversity [51].

Green infrastructure mainly aims to connect cultural and natural landscapes physically. With the use of these systems, the social environment has changed, and the level of liveability in society has increased. With increased physical activity, social interaction in urban areas also increases. For this reason, it can be said that green infrastructure systems provide psychological health and welfare for all societies [52]. The plans implemented for green infrastructure are produced for many different purposes and provide many contributions. The studies carried out by the European Environment Agency on green infrastructure systems it is aimed to ensure the integration between landscape ecology and the networks formed by natural areas. In this way, the protection and development of green space at the city scale will be ensured. At the landscape scale, it is aimed to protect and develop the connection between ecological and significant habitats in the landscape [50].

Especially today, the term green infrastructure has started to be used in many areas. From green roofs to all nature-friendly systems, all approaches on an ecological basis are characterized as green infrastructure. All the approaches put forward in the existing diversity emphasize the interconnection of the artificial and environmental environments. When evaluated broadly, it can be expressed as the restoration and protection of natural landscape elements such as forests, wetlands, and stony plains, the most critical components of rainwater infrastructure. It is ensured that a wild habitat is created by protecting these landscapes, which are very sensitive in the ecological sense. In addition, recreational activities are also allowed to improve water quality [58].

Green infrastructure systems have many benefits. First, green infrastructure systems cover all applications related to protecting and creating green spaces. It also allows for creating a developed sense of community with the participation of communities in making these areas. In addition, these systems aim to improve water and air quality, reduce surface runoff, and improve the quality of life by providing flood control [52].

Green infrastructure benefits the fight against climate change and makes adapting possible. It also enables the protection of biodiversity by reducing the risk of natural disasters, combating erosion, and combating natural disasters such as flooding. For this reason, green infrastructure is not only qualified as green areas. Thanks to sustainable urban drainage

systems, wetlands such as streams, rivers, and the immediate surroundings of canals and other water elements are among the components that come to mind regarding green infrastructure [81].

Although many green and blue areas exist in cities, all these are part of the urban green infrastructure. Historical land use areas, derelict lands, forested areas, and extensive grasslands are all targets for the urban green infrastructure system. In addition, green and blue areas such as gardens, street trees, and parks, designed and managed by people, are also part of the green infrastructure. In addition, green building elements such as green roofs and green facades used in buildings can also be considered part of the green infrastructure as they can benefit various functions [52]. Examples of urban green infrastructure can be seen in Figure 2.15 below.

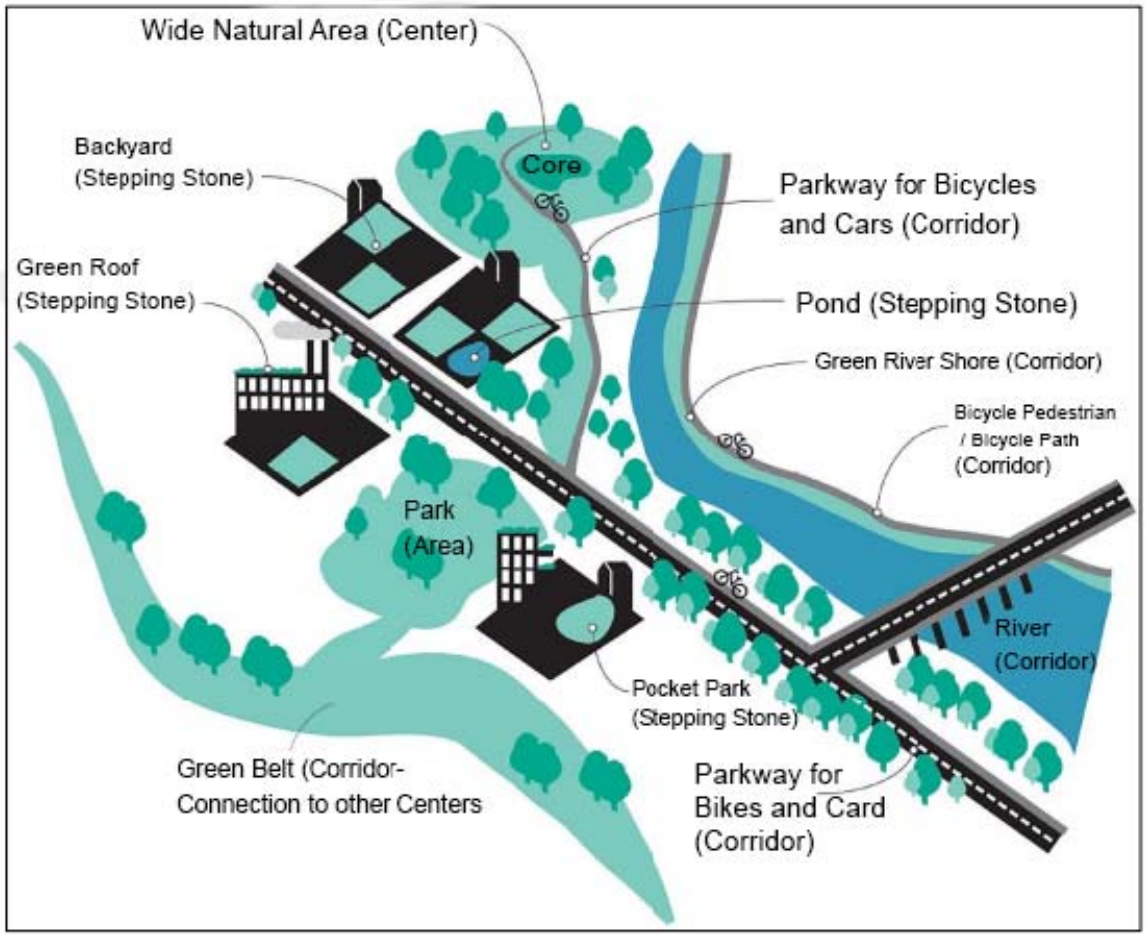

Figure 2.15. Examples of green infrastructure in cities – 1 [52].

The efforts made to create and develop green spaces in our country are among the priorities of local governments. However, green space reproduction practices are demonstrated by increasing the number of afforestation, ornamental plants, and especially trees. The beautification of cities is evaluated in a way that aims at afforestation with the concern of creating an aesthetic environment. In this regard, biodiversity can only partially be related to the urban landscape. Within the scope of the studies to increase the amount of green space, tree planting, seasonal garden flowers, refuge, and park arrangements are carried out for decoration. Although it is limited to shrub saplings and tree planting issues in increasing the amount of green space, a detailed strategic plan on field qualities and field typologies cannot be put forward [53].

Green infrastructure systems mainly include plant or soil systems, permeable pavements, rainwater harvesting, and rainwater reuse or storage of these waters. Green infrastructure elements benefit communities on many scales. Examples to be considered at the city scale include greening a street with trees or reusing rain by hiding. Neighborhood-scale green infrastructures include planting rain gardens in places outside the center of a city or building wetlands near residential complexes. On the scale of landscape or water basin, the greening of riverside areas or vertical slopes may be subject. Green infrastructure systems provide many benefits in the city or regional sense, creating green spaces for all habitats [77].

Green infrastructure solutions are implemented at many scales, from building to much broader landscape levels. These applications include rain gardens, permeable sidewalks, green roofs, rainwater collection systems, and many others. Figure 2.16 below shows some examples of these systems when examined [54].

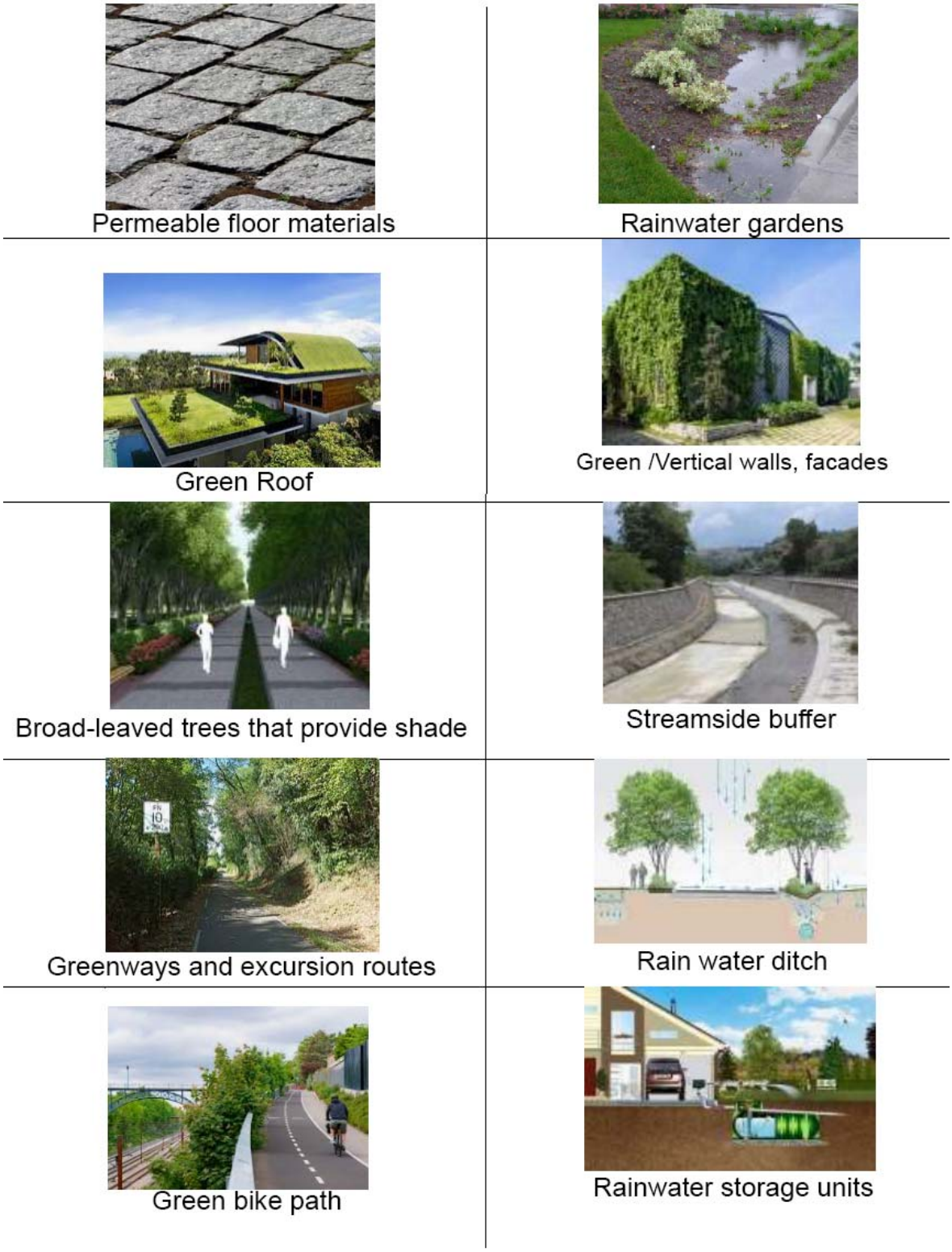

Figure 2.16. Examples of green infrastructure in cities – 2 [17].

The following examples of green infrastructure are often preferred applications.

In Figure 2.17., disconnecting the downspout directs the drainage pipes on the roof to drain the rainwater to the previously located governors, cisterns, or permeable areas rather than to the rain sewer. This practice is known to store rainwater or allow rainwater to seep into the soil [77, 55].

Figure 2.17. Downspout disconnect application [77]

The rainwater collection system is in Figure 2.18. is implemented by applying it to the architecture of the buildings and the environment. These systems slow down the flow and store rainwater for later use. The variety of designs ranges from rain barrels in the backyard to pits in the cistern of commercial buildings. It can be said that there are many systems implemented worldwide [77, 55].

Figure 2.18. Rainwater collection system [55]

Rain gardens are systems that look as beautiful to the eye as they are functional. These gardens are tiny, water-planting areas that collect rainwater from rooftops, sidewalks, and streets. These cells, also called biological retention cells, are designed to mimic the natural pathways in which water flows, and soil absorb to reduce rainwater pollution. Figure 2.19. provides an example of the system [77, 55].

Figure 2.19. Rain gardens application [77]

The planter boxes in Figure 2.20 are created to filter rainwater and reduce the flow to the sewage system. Sowing boxes are urban rain gardens with vertical walls and open bottoms.

Often found in city centers, these systems collect and absorb currents from sidewalks, streets, and parking lots. This system is also helpful for beautifying city streets [77, 55].

Figure 2.20. Planter boxes application [77]

Permeable sidewalks are an excellent example of keeping rain where it falls. These sidewalks filter and store rainwater where it falls. As can be seen in Figure 2.21., they can be made of impermeable concrete or porous asphalt. These applications can be considered cost-effective systems, especially when floods and icing are problematic [77].

Figure 2.21. Permeable pavement application [55]

Green parking lots are often ideal for installing green infrastructure that can capture rainwater flowing into the sewer system. Many elements of green infrastructure can be seamlessly integrated into parking space designs. Laying permeable sidewalks in the parts of the parcel or using rain gardens are among the methods that can be preferred around the parking lot. With the use of such systems in a parking lot like Figure 2.22., the effect of the room is reduced, thus helping to improve the climate in the region [77].

Figure 2.22. Green parking application [77]

The green roofs in Figure 2.23 are systems installed at the top of buildings and help manage rainwater. Green roof systems also help reduce the cost of energy for cooling. Green roofs are areas covered with vegetation that allow rain to seep, and the stored water evaporates. It is a cost-effective solution, especially in dense urban areas with high land value and large industrial buildings with high rainwater management costs [77, 55].

Figure 2.23. Green roof application [55]

The concept of green infrastructure is frequently used in land use and conservation planning, especially recently. Green infrastructures are strategically planned and managed natural habitats, parks, greenways, and protected areas. With nature conservation approaches that contribute to the quality of life and health of people, it is ensured that air quality and water resources become sustainable. Green space systems, which benefit and

are interconnected for the human population by protecting the ecosystem's natural values and natural functions, can be described as green infrastructure. The ecological framework is most necessary for economic, social, and environmental sustainability [56].

Plans for green infrastructure are carried out at the scale of regions, sub-regions, districts, and neighborhoods. Regional-scale examples include national parks, primarily protected areas, or large river greenways; The scale of the sub-region consists of small-scale protected areas, recreational halls, urban groves, coastal dunes, and stream greenways. Small stream and stream greenways, playgrounds, urban parks, wetlands, and forests are seen when the district scale is considered. The plan includes components such as home gardens, small streams, road trees, cemeteries, and agricultural areas on a neighborhood scale [57].

The planning carried out for green infrastructure provides the basic framework for meeting the projected population growth in the future and preventing the consumption of natural resources that develop due to population growth. Emphasizing the sustainability and continuity of sustainability from regional to local scale, the protection of natural values, the level of urban development, and the provision of urban renewal and, therefore, economic prosperity are supported by green infrastructure plans [56]. When Table 2.5 below is examined, traditional and green infrastructure-based development processes are seen.

Table 2.5. Traditional development and green infrastructure based development processes [56]

Traditional Development	Green Infrastructure Based Development
First of all, gray infrastructure plans are made (Roads, drainage channels, bridges, buildings, etc...)	First of all, the natural features and functions of the area to be planned are evaluated and protected.
Abandoned areas are considered open-green areas. For example, steep slopes, flood plains, medians, etc...	Before the buildings are located, the planning of parks, habitat connections, and ecological transitions is made.
Works within plot boundaries (ownership pattern, pocket parks, interior roads, transit systems)	It connects the land and water habitats in the region despite the ownership status of the land.

The green infrastructure strategies planned to prevent the destruction of the evaluation of existing green areas also aim to increase the diversity and quality of the green regions and ensure that green spaces are strategically interconnected. At the same time, when planning

green infrastructure, it is guaranteed that all green areas are taken into consideration regardless of their ownership [57]. Green infrastructure systems, which promote the diversity of socio-economic benefits from a functional point of view, take into account the ecological balance, create a framework for future development plans by natural means, and also benefit the protection of the ecosystem and recovery. The primary purpose of the approaches to green infrastructure is to protect diversity and ecosystems. There are many application methods in these systems. These methods take an active role in creating a green spine. All elements in green infrastructure systems contribute to cities' sustainability and ecological function. This helps to create habitable environments [82].

3. FIELD STUDY

The research area determined in this study related to greenways was Tuzla Valley of Life. The construction phase of the project, which was started by the Istanbul Metropolitan Municipality in 2019, was opened to users in 2022. One of the most important reasons for choosing this region as a research area is the ecological qualities of the region. It is planned to create a 4.3 km greenway along Umur Creek. If the rates arising in this area are utilized, it is foreseen that very effective greenway planning will be done. The fact that the green potential of the region is high and the project promises many ecological values is the most important reason for choosing this area for the study. In addition, the region's environmental and biological values were an essential factor in selecting this area (Figure 3.1.). At the same time, the project, which was prepared with the idea of restoring the idle areas around the Tuzla stream bed to the people of Istanbul, has many advantages in social and cultural terms as well as ecological sustainability. When all these factors are considered, this area, chosen as a greenway in Istanbul, will support the literature study.

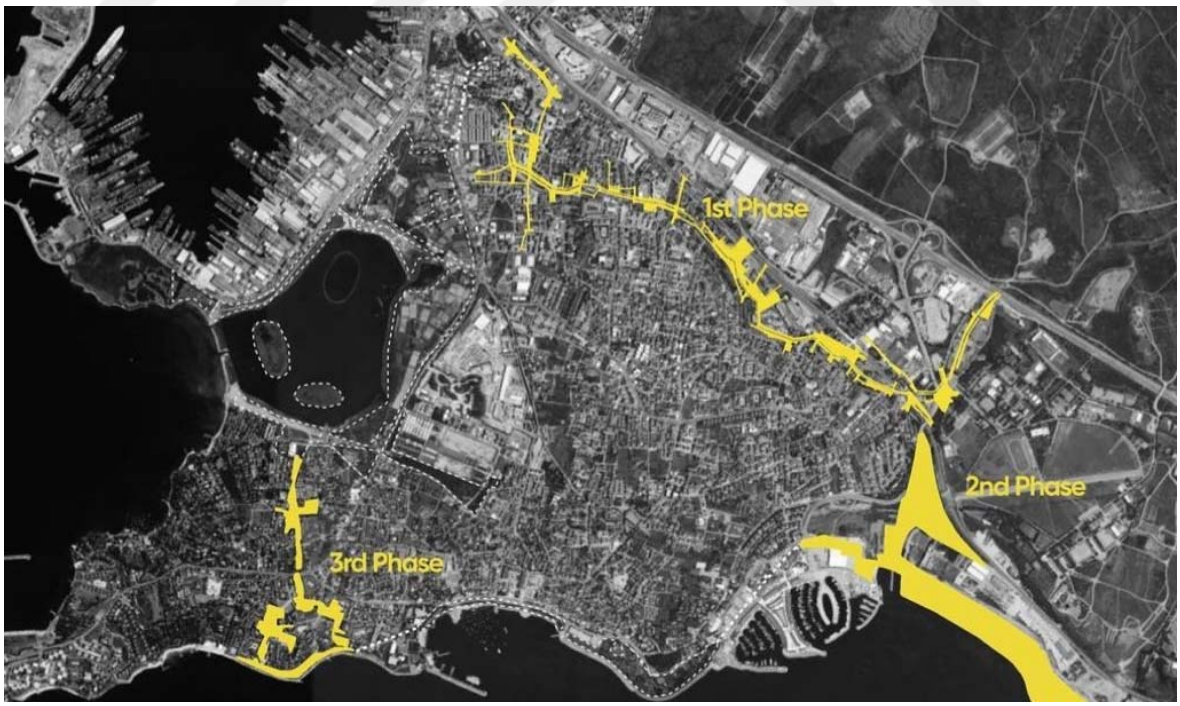

Figure 3.1. Tuzla Valley of Life stages [93].

Within the project's scope, the 1st stage has just been completed. Work is still underway for the remaining second and third stages.

3.1. GENERAL CHARACTERISTICS OF ISTANBUL-TUZLA REGION

To the east of Tuzla, located in the southernmost part of Istanbul, is the Çayırova district of Kocaeli. In the north and west is the section of Pendik. When we look south of Tuzla, the Marmara Sea is seen, and the Marmara Sea has a coastline of 13 km. The height of Tuzla above sea level is 25-30 meters in the central regions. The Tuzla cape in the south stands out as a large protrusion. The lands in Tuzla are generally flat lands as well as low hills. The height reaches 250-300 meters at the Akfırat and Orhanlı towns. Accordingly, it can be said that the highest region of Tuzla is Akfırat, with 300 meters [88]. Tuzla Valley of Life, the subject of the project, is located within the borders of the Tuzla district. It is known that the total area of the valley, which stretches along the D-100 highway in the Tuzla district and covers the area around Umur Creek in the south, is 181,562 square meters. The Tuzla Valley of Life project, determined as an application area, is carried out in an area of 4.3 km in the Umur Stream bed. A sustainability-oriented project has been designed by taking advantage of the advantages of the ecological structure along the stream. Figure 3.2 below shows the geographical location of the area within Istanbul.

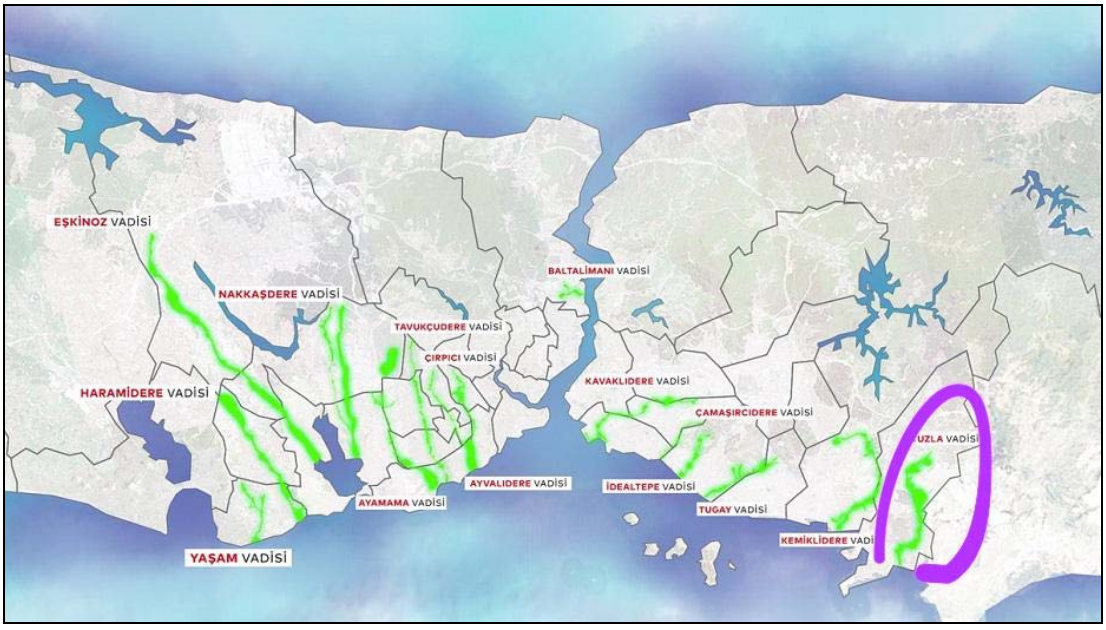

Figure 3.2. The author marks the location of the selected field [94].

Tuzla Lake (Kamil Abduş Lake), which is located on the coast of Tuzla district and is a lagoon lake, covers an area of about 300 hectares and is separated from the sea by natural and artificial barriers. Ömerli Dam and Pond, one of the most important drinking water sources of Istanbul, is located within the borders of the region and the area of the pond is 23.10 km². In addition, there is Samandıra Pond in the forested area of Sancaktepe district. The climate of the region is generally similar to the climate of Istanbul. It is seen that it has a transitional nature between the Mediterranean and Black Sea climates. The effects of the Marmara climate are completely seen in the region. In winter, the cold air of the Balkans and the rainy weather of the Black Sea show their effect, while the summers are hot and dry and the winters are warm. According to statistical studies from the data obtained from the meteorological stations for 2019, the annual rainfall value of the region is 611.21 kg / m². The lowest average temperature was recorded in February at 6.44 ° C and the highest average temperature was recorded in August at 24.02 ° C. The average annual temperature is 15.36°C. The winter season is sometimes warm and sometimes cold in the coastal area where the elevation is low. The summer months are usually hot and dry. In autumn, starting from mid-September, the temperature decreases. When seasonal humidity values are examined, winter values are higher than summer [40].

When looking at the vegetation, maquis is generally dominant and plants such as oak, stunted broom heather, common heather, spanish broom, strawberry tree, and laurel are the majority in these areas [40].

Tuzla, located in the southwest of the Kocaeli Peninsula of the Marmara Region, which is the fastest developing and most populated region of Turkey, has a very old history due to its geographical location in a convenient region. Tuzla, which was a small, rural settlement where agriculture and animal husbandry were carried out in the previous years, has maintained this feature for many years. It is also used as a summer resort for Istanbulites. The historical Tuzla İçmeler is frequented by daily visitors thanks to the restaurants and fishermen on the coast. The real development of Tuzla started with the relocation of shipyards to this region. Later, the relocation of the organized leather industry and other large industrial facilities accelerated this development. As a result of its rapid development, especially on the upper part of the E-5 Highway, neighborhoods with irregular construction and infrastructure problems have been formed. Today, rapid construction continues. As

you go inland from the coastal area, the number of floors of the buildings increases and the structures in the form of sites are seen [99].

3.2. EVALUATION OF TUZLA VALLEY OF LIFE IN TERMS OF SUSTAINABLE URBAN LANDSCAPE ELEMENTS

Tuzla Valley of Life has been implemented as a greenway that citizens can be used pleasantly in an area of approximately 4.3 km length along the Umur Creek, passing through the Istasyon, Yayla, and Evliyaçelebi Neighborhoods on the border of the Tuzla district. In this area, there is a 3773-meter bicycle path, an 8282-meter walking path, a total of 10 children's playgrounds, eight sports fields, seven sports, and exercise areas, sitting and resting places, activity settings, picnic areas, and a neighborhood garden next to all these.

The vitality of the natural life around the Umur Creek bed in Tuzla and the protection of this vitality is significant. Due to this importance, it is aimed to bring this area to the people of Istanbul with the necessity of using natural habitats correctly. In this context, creating an urban park area where recreation areas are developed is desired.

In addition to all these, as seen in Figure 3.3. below are many ecological elements such as eco-buffer vegetation, vegetative filtration, co-production habitat, multi-layered ecological landscape fiction, ecological doctrine area, co-production habitat, ecological wetland, high salt tolerance vegetation, urban park, and waterside vegetation.

Tuzla Valley of Life is not only an independent project but also has a wide-ranging recreation function. With this function, it has the quality of a tool to increase the functioning in the urban area. The reconstruction of the area's identity aims to contribute to the whole region in terms of ecological diversity. At the same time, this project aims at significant development regarding social life in public spaces. Figure 3.4 shows a bird's-eye view of a small part of the Tuzla Valley of Life. Like in this part, all project areas are intertwined with the city.

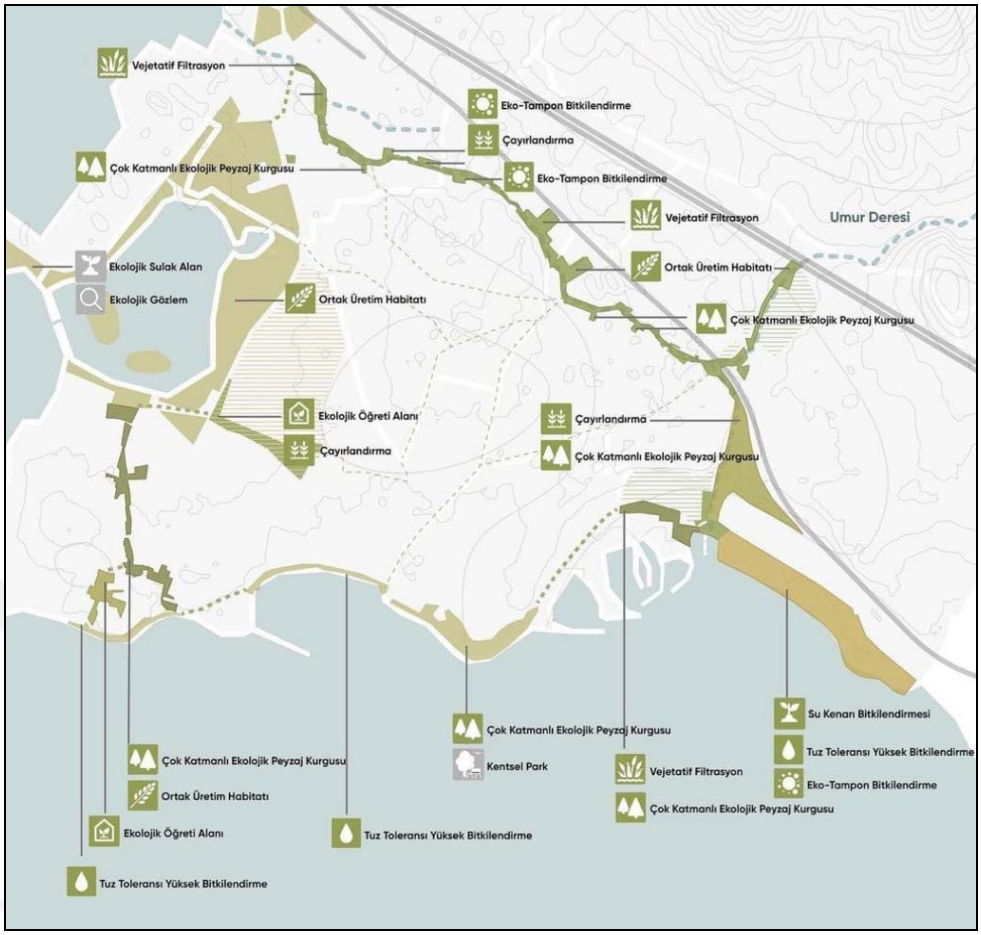

Figure 3.3. Ecological elements found in Tuzla Valley of Life [90].

Figure 3.4. Tuzla Valley of Life bird's eye view [90].

As with all the greenways created in Istanbul, creative solutions should be produced for the new areas to be made. The issue of the greenways to be structured here connecting the whole city is the most critical issue to be considered. To establish this connection, which surrounds the province of Istanbul and integrates all ecological life with the city, it is necessary to properly plan for the negativities that may occur due to the high population. However, it is essential to evaluate the extent to which the community will be involved in all greenway planning, both created and to be created. The main reason for this is resilience, to protect and strengthen the future of cultural and biological diversity.

Although most greenways are created for recreational or nature conservation purposes, some are planned to cover both. Greenways planned for recreational purposes are bicycle paths, walking paths, organized sports areas, or parts that allow group activities that individuals can use comfortably. Therefore, greenways that help these areas relate to each other should be planned to connect with cultural and historical objects by following natural greenways such as lake edges, rivers, and ridges. In today's societies, the pressure on open spaces is increasing daily, and the effects of these pressures are rapidly manifesting. All these pressures lead to the emergence of methods of economic planning and legal measures. For example, when we look at the problems that arise in terms of the sustainability principle in the settlement system, it is seen that it is accepted that this system should develop in a way that does not prevent the needs of future generations from being met. In other words, the settlement system should be designed by considering the problems that may occur in the future. In such a case, it becomes imperative not to destroy natural resources and, at the same time to protect the ecological balance. In this context, the main idea of the greenway proposal planned to be designed for the province of Istanbul is to create a structure that focuses on healthy natural life in all aspects, where there is local landscape diversity and biodiversity, and which will be transferred for generations without disturbing the natural balance with its sustainability feature. Achieving the balance between all the factors mentioned is one of the most important goals of the design.

When the current zoning plan of Tuzla Valley of Life, which is the subject of the study, is evaluated, several negativities related to the urban settlement outside the region attract attention. Although the surrounding regions are site regions, urban integrity cannot be achieved between them and natural areas. Accordingly, Tuzla Valley of Life is an essential part of urban integration. Many focal points surround the valley. Together with its

centrality and permeability features, it is a very decisive factor in urban integration. In this way, the central functions accumulated by the urban texture will be combined with the ecological structure, and urban integration will be encouraged.

When the physical morphology of the urban fabric around the valley is evaluated, it is noteworthy that there are no sustainable patterns. Residential areas were scattered throughout, and buildings and sites of different sizes were distributed discontinuously. The entire urban texture around the valley has formed a patchwork structure with pieces of different sizes and different models. The most significant sustainable asset in the area is the valley itself. The most crucial problem that arises here is that besides the diversity of patterns, there is a tendency to discontinuity.

During the survey and construction of the planned areas, special attention should be paid to preserving and improving the characteristics of the existing natural life and texture. It is essential to minimize the negativities of the footprint that will occur in these areas. The negative impact of roads and vehicle areas should be reduced, and planning should be carried out for at least five years. In addition, it is essential to benefit from landscape architecture and all necessary disciplines. The statements put forward by different authorities during the study should be examined well and put into practice during the application. With this planning carried out from different perspectives, the sustainability of all principles will be positively affected. While the valley is adjacent to the urban texture at three points, it directs to the green area in the central part and establishes a vertical connection. Thus, green integration can be embedded in the urban fabric. In Figure 3.5 below, the general lines of Tuzla Valley of Life can be seen.

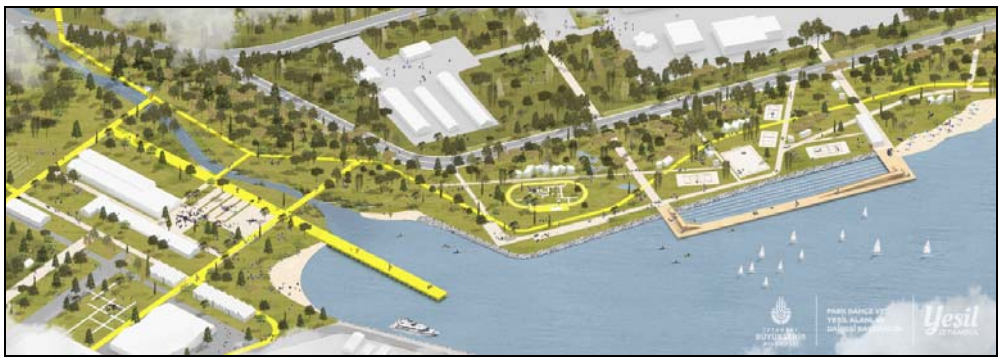

Figure 3.5. The general outline of Tuzla Valley of Life and bird's-eye view of the project area [98].

When an ecological evaluation is made, it is possible to say that each region of Istanbul has different textures, and these areas show themselves, especially in Tuzla. Due to the unplanned projects created near the project area, the occupation of the stream bed where the Tuzla Valley of Life is located has led to the complete disappearance of the ecological value. On the one hand, the area struggled with disproportionate construction; on the other hand, it was under the pressure of agricultural use. Figure 3.6 below shows the ecological texture of Tuzla Valley of Life.

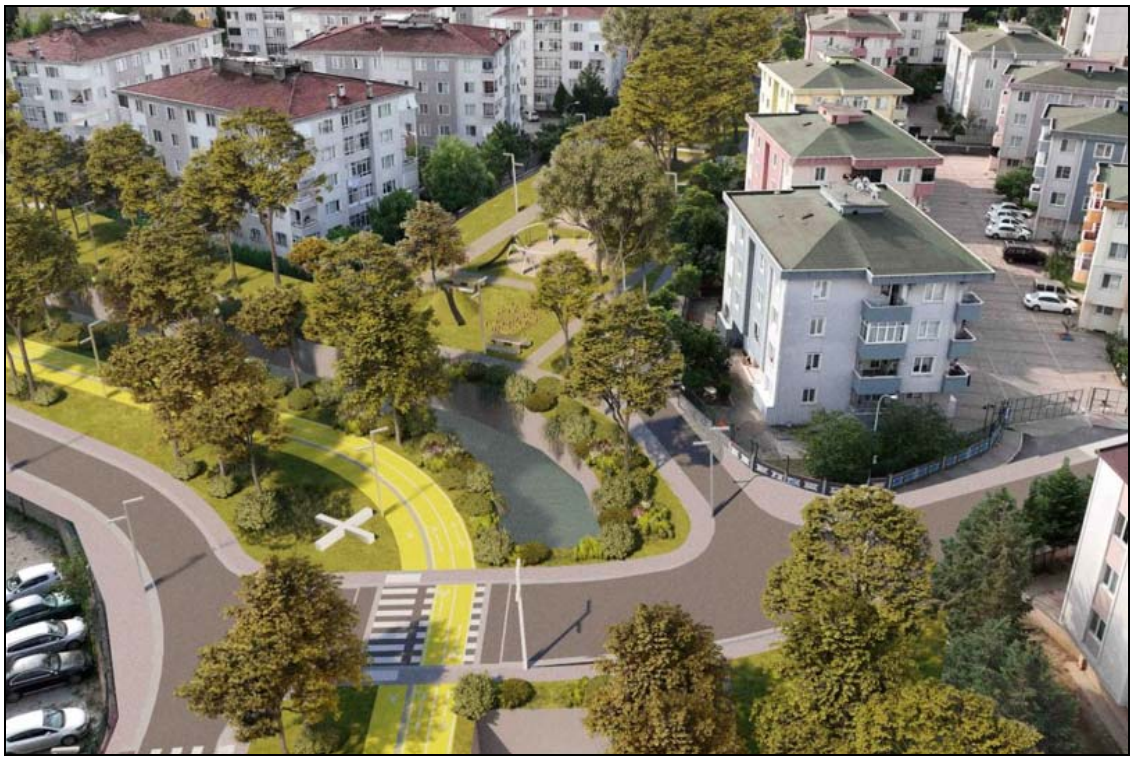

Figure 3.6. The ecological texture in the Tuzla Valley of Life [90].

Urban ecosystems, primarily caused by human influence, completely move away from nature. It creates an unnatural, artificial ecosystem in which rain droplets mix from asphalt to sewage without meeting the soil, toxic waste from factories changes entire stream compositions, soils are poisoned by acid rain, and even the gas composition of the air is changed. This emerging artificiality is still being tried to be maintained today. In the ecological layer, it is seen that natural life is primarily destroyed, and plant species that are not suitable for biological and challenging ground applications are maintained (Figure 3.7).

Due to the impermeable soils used in the walking paths in the project, the rainwater leaks into the ground, and the groundwater is prevented from feeding. This situation leads to

water mixing with surface drainage into the sewage system or streams. On the other hand, perceptible temperatures increase with impermeable surfaces, resulting in the urban heat island effect. In addition, this artificial field leads to the accumulation of pollutants derived from various sources, thus causing atmospheric changes.

Figure 3.7. Tuzla Valley of Life hiking areas [95].

The Figure 3.8. below shows an example of one of the playgrounds in the Tuzla Valley of Life. As seen in this example, the playground has a permeable surface covered with grass. Such porous surfaces feed the groundwater, allowing rainwater to seep underground. However, since it prevents the formation of excess water deposits on the surface, it also creates a positive effect for people who use the area.

Figure 3.8. Playground in Tuzla Valley of Life [92].

As seen in Figure 3.9 below, it is seen that the bottom of the picnic areas in the project is also permeable ground. The higher the proportion of porous surfaces in a room, the higher the ecological balance. Therefore, when an evaluation is made in terms of these criteria, it is possible to say that the preference for permeable surfaces has a positive effect.

Figure 3.9. Picnic area in Tuzla Valley of Life [92].

The heat island effect is reduced by keeping the walking paths in Tuzla Valley of Life at a minimum. However, increasing the shadow areas also minimizes the heat island effect. Here, the principle of correct planting comes to the fore. Considering that it is vital to correctly choose and position the plants in the planning to protect and improve air quality, the plants involved in the project are significant. These plants benefit not only visually but also ecologically.

Ecological greenways are generally areas used for recreational purposes, such as walking and bicycle paths, following the use of city residents. These areas, designed in line with the project, are also significant for the continuity of wildlife. The planned area along the line connected with landscape areas of all scales and fulfilled the task of connecting people to nature.

The location of Tuzla Life Valley is quite good for users who visit on foot, but there is insufficient parking for users who come by car. Besides, the points where the landscape and the usage areas meet are designed in a very aesthetic way. In this respect, it is possible to say that the space is user-friendly and appealing to its users, considering that the increase in complexity in places opened to public use will decrease the taste.

In many green spaces designed today, it is seen that the socio-cultural layer is wholly ignored. In the areas where planning is carried out, only a planning-based application is carried out without considering the population density, the ratio of the number of women and men, and the number of children or age groups. However, employee and retiree rates and disabled citizen information, which will significantly affect the use of space, are not analyzed. However, when planning is done by considering the demographic characteristics of the users in the areas to be designed, it is possible to create much more valuable and comfortable areas. The authorities who supposedly planned and supposedly implemented these areas persistently continue to make the same mistakes again. Therefore, at this point, it is seen that the same errors are persistently maintained in the newly planned areas. In this layer, it was even determining where the majority of the population was from, leading to a change in the shape of the planning. It is essential to plan in line with individual needs with the surveys to be carried out on the use of space. Very few of the parks in Istanbul have taken the measures in question. However, it can also be said that users are not included in the process during green space planning. However, with the inclusion of users in the process during planning, a great deal of awareness will be achieved, and at the same time, a consensus will be reached on how these areas should be used after implementation. In this way, it is possible to adopt issues such as the planned green areas adding meaning to users' lives. As a result, many more users will use the planned areas correctly. Figure 3.10 below shows the landscape elements in the area.

The protection of the fertility and health of the existing soil during planning is also among the most critical issues. In addition to maintaining this efficiency, it is also essential to improve it. Figure 3.11 and Figure 3.12 below show the use of soil during the project phase.

Figure 3.10. Tuzla Valley of Life landscape elements [96].

Figure 3.11. Utilization of the soil during the project phase – 1 [97].

Figure 3.12. Utilization of the soil during the project phase – 2 [97].

To maintain the fertility of the soil, the issue of soil treatment during application is critical. With the treatment of the ground during vegetation applications, a suitable environment for plant development and germination will be created. It is also essential to prepare a suitable seedbed for the development of the plant, to control weeds, and to create an appropriate soil structure for mixing plant residues and various chemicals into the soil. Figure 3.13 below shows the changes in the area after the addition of landscape elements.

Figure 3.13. Before and after the walking paths in the project [91].

Many different species were used during the vegetation works in Tuzla Valley of Life. Many species include lavender, rosemary, sage, thyme, lilac, hydrangea, a golden bowl, ash bush, and Berberis. In the area where 70,000 bushes were planted, a dense vegetative tissue was tried to be created. These emerging plant species are a crucial element in supporting wildlife. Since the Tuzla Valley of Life is an area with plant species supporting bird life in the region, supporting species diversity has also contributed to nature. There are

also eucalyptus, plane, and pine trees in the area. All this vegetative tissue supports bird life. Vegetative tissue is shown in Figure 3.14 below.

Figure 3.14. Vegetative elements in the project, photographed by the author.

In addition to all these, it is essential to make measurements and analyses that will help to understand the effect on the soil well and to evaluate the suitability of the findings to the environment, plants, and dirt. In addition to treating the ground, it is also necessary to prevent soil compaction. The use of endemic species in the density that will be most suitable for the earth's structure can ensure the protection and development of natural life. At the same time, many sustainable principles, such as climate control, will be positively affected. During the use of the plant, factors such as height, diameter, and size, as well as growth rate, growth rate, and maintenance costs, should be considered during planning.

Figure 3.15 below shows a water element in the Tuzla Valley of Life. Just like many public spaces in Istanbul, it is seen that there is a place in the water elements in Tuzla Valley of Life. The fountains in the urban open area, the ablution taps in the mosque courtyards, and the fountains in various places all constitute the culture of Istanbul. In addition, considering the ecological value of many streams that are rapidly disappearing with the pressure of urbanization and shrinking in size, the primary goal of the projects realized is to preserve these streams. From this point of view, it is possible to say that this work,

which helps to re-naturalize the valley, meets the desire of the owners of a highly urbanized architecture and keeps the flowing water alive.

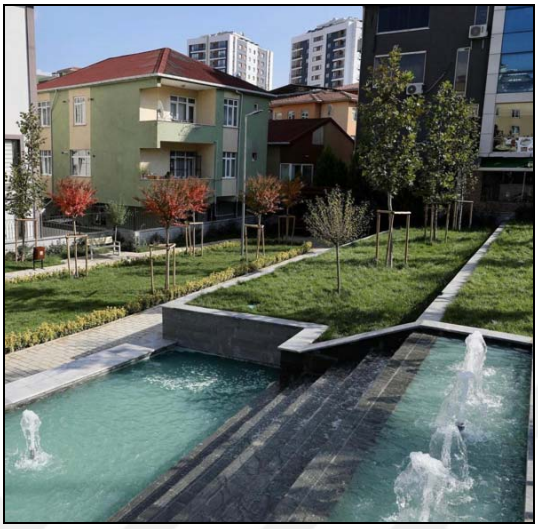

Figure 3.15. Tuzla Valley of Life water elements [95].

The water discharged into the stream due to unsustainable agricultural practices in the region damages the ecological balance. A very negative result occurs due to the wastewater added to the stream in this dirty and illegal way. This situation creates a severe potential for the project both ecologically and aesthetically. Figure 3.16 below shows the Umur Creek bed before the project.

Figure 3.16. The river bottom of Umur Creek before the project [95].

With the design project carried out, the creek's problems in terms of infrastructure have been solved, and serious studies have been carried out to repair the ecologically damaged

areas and create a sustainable stream design. It was also among the project's objectives to ensure that this greenway could fulfill its functions in the hydrological sense and simultaneously provide recreational opportunities. Figure 3.17 shows the Umur Creek bed after the project.

Figure 3.17. The post-project version of the Umur Creek bottom [90].

The lighting system used in the area indirectly affects the air and atmosphere quality. Selecting products from energy-efficient reinforcements helps to reduce the heat island effect. These reinforcement elements are also chosen by paying attention to energy efficiency. Therefore, in this way, air heating is also prevented. At the same time, the imbalance in climatic conditions is largely prevented. Figure 3.18 below shows the lighting fixtures of the Tuzla Valley of Life.

Figure 3.18. Tuzla Valley of Life lighting equipment [98].

The transportation issue to Tuzla Valley of Life causes individuals to spend extra energy. Tuzla, located in the southernmost part of Istanbul, is not centrally located. Therefore, the difficulty in reaching the Tuzla Valley of Life leads to extra energy expenditure. Factors such as fuel, time, and money spent to access this hard-to-reach area are unsustainable. However, it undeniably damages natural life and elements such as soil, climate, and people.

In addition to all these, the maintenance issue, which is the most critical issue before the application, must be observed. It is necessary to plan how to maintain these areas before the application. When this planning is carried out, the appropriate technical team and equipment for the whole area should be included. However, the site should be checked regularly. The principle of maintenance application in Istanbul is less critical than that of building and construction. Therefore, the continuity of living and inanimate materials in areas that comply with greenways is relatively short. As a result of this situation, bringing new products, one of the measures in which the economic burden increases significantly is preferred. The solution to introduce new products leads to the disregard of all these principles.

Based on all the information above, Tuzla Valley of Life is a significant project for the province of Istanbul. Increasing the number of greenways is very important, especially for a populated region like Istanbul. The project, which is quite efficient in many respects, has some shortcomings. The fact that the area is not accessible, the selected plant species require constant care, and the urban texture around the site does not have sustainable patterns shows that the project does not fully serve the desired purpose. More important than the planning and design of greenways is the ability of these regions to become sustainable. In other words, during planning, it is essential to make long-term plans, not short-term ones. Only in this way will a sustainable greenway project emerge.

Table 3.1., which is prepared in line with the findings obtained as the result of the field study conducted by considering the sustainable urban landscape characteristics of greenways, includes the benefits provided by the Tuzla Valley of Life.

Table 3.1. Benefits of Tuzla Valley of Life

Benefit Type	Benefits of Tuzla Valley of Life
Environmental	• Creates green space with healthy regional systems. • Protects the natural features of the area, its habitat and rehabilitates the degraded parts. • Protects and rehabilitates existing soil structure. • Preserves existing vegetation cover and endemic or climate-adapted plants are used. • Protects and conserves water resources. • Minimizes impact on air and atmosphere quality during space design and implementation. • Provides shelter and habitat for wildlife. This also contributes to the conservation and increase of biodiversity. • Supports the ecological balance by regulating the climate in the urban environment. • Creates a natural life effect within the urban environment.
Social	• Area protects and improves human health. • Complexity of the created site is minimal. • Contributes to the creation of qualified areas in terms of aesthetics and recreation. • Outdoor sports activities positively affect the physical health of the people of the city. • Provides reliable environments for the socialization of the community. • Strengthens its interaction with the local culture. In this way, it contributes to the formation of a sense of space. • Creates an environment for the activities to be organized by the people of the region.
Economic	• Material used in the created structures is at a minimum level and recyclable. • Energy efficiency is at the maximum level during and after the construction phase. • Planned green area contributes to the increase in the value of the land. • It is a center of attraction for visitors. • Contributes to the formation of the city identity.

4. CONCLUSION

In the current century, it is seen that the pressure on open spaces in all cities is increasing. The effects of this emerging pressure signal that the struggle with new methods and legal measures for ecological planning should be intensified. In particular, it is seen that a settlement system should develop to meet the needs of future generations. This is possible with scenarios where natural resources are not destroyed, and ecological balances are protected.

When performing landscape design studies, it is seen that the aesthetic rather than the ecological approach is considered a priority. As a result, it is seen that designs that do not comply with environmental and climatic conditions and are incompatible with natural structures have emerged. The cost and maintenance of these designs are also costly, but they need to be more sustainable. While the methods include larger grass surfaces, it is seen that there is room for flowers that have only one seasonal life. However, it is also seen that plant varieties of foreign origin and special care are used much more widely. Although it is seen that all these wrong choices lead to a lot of labor, material loss, energy loss, and time loss, it can also be said that they cause quite a lot of environmental pollution. To avoid all these problems, it should be remembered that various principles should be considered when carrying out urban landscape designs.

The greenways to ensure urban ecology create areas that will become an essential link between protected areas. Although no new tools or techniques are required to build the greenway, creating such regions with the right combination of existing parts is very easy. The primary purpose of correctly planning greenways is to protect the natural sites that are gradually fragmenting or isolated at the metropolitan scale and to ensure their continuity. At the same time, as the connection roads of the wild, cultural, and artificially created environment, it is among the objectives of greenway planning to create suitable places for various recreational activities and allow the whole public to reach comfortably. The participation of local people is of great importance in the planning to be created. In particular, in evaluating the obtained data, it is necessary to benefit from the innovations provided by technology and examine the successful examples available today. Success in planning is made possible by creating organizations that support preserving cultural and

natural landscape features and helping sustain many elements. When making decisions about planning related to the environment, it is not a choice but a necessity to examine the successful models developed in many cities from the past to the present and implement them. These practices can only be carried out by coordinating the politicians, planning, design experts, public officials, and city residents shaping the city. For Turkey, accepting and implementing such planning is a critical approach to prevent the pressure on natural areas. Greenway systems, which can be realized not only for urban areas but also for rural areas outside urban areas, natural areas connecting cities, or protected areas, are critical in safeguarding historical values and eliminating destruction.

When the economic expectations, egalitarian approaches, or psychological continuity demands of societies are considered, it can be said that living spaces are in the same anticipation. The aim here is to increase the quality of life and to ensure the continuity of this quality of life in the following generations. Current demands can only be met through strategic planning to be carried out when ecological structures are observed. Sustainable systems are the ones that have a safe environment that is not polluted, have a wide employment area, have a protected cultural texture, have a quality physical structure, have a healthy functioning of the circulatory systems, and allow recreational activities. The systems created with the abovementioned principles continue using them since the planning stage and their existing features.

The common point of the studies to create a greenway is to benefit sustainable development strategies for ensuring natural resources and landscape integrity, especially in countries where unplanned urbanization is experienced. With the countries' natural resources and morphological structure, many elements in cultural and recreational terms are together. Especially in countries with richer natural resources, species diversity, and biodiversity are also very important. With the greenways to be created in such regions to protect and evaluate the existing potential, the city's sustainability will be greatly benefited.

Alternative routes will be created with greenways where natural and constructive elements try to co-exist. This situation may cause some problems to occur. Therefore, decisions about these greenways must be made from a single center.

In addition, it is essential to raise awareness of the residents most affected by the ecological plan to be prepared to avoid reactions from the surrounding residents. In particular, raising public awareness is very important for maintaining greenways.

Creating a park of approximately 180 hectares can be considered an enormous undertaking. The primary purpose of Tuzla Valley of Life is to enrich nature, to create a habitat and ecological greenway for fauna and flora, and at the same time to create a public recreational space open to the use of the people living here. Given that more parks mean more people, more people mean more cities. Developing ecological areas that have arisen here still need to cover the main features a full-fledged park should have. First, it is necessary to convert the park and all its surrounding areas into ecological settlements. In such a case, the environmental development of a more significant part of the city can be achieved. This means that more people benefit from the Valley of Life and, at the same time, help to avoid infrastructure problems that arise environmentally. Although there are some areas for improvement in the project, the design also emphasizes the importance of the existing stream.

As a result of the project evaluation, some greenway principles should be had to create greenways and a sustainable system. These ecological criteria should be prepared in a way that provides infrastructure for urban greenway phenomena of all scales. For an area to acquire the greenway characteristic, it is necessary not only to have a green space connection but also to have green infrastructure, clean air, integration of urban and green spaces, and, most importantly, sustainability. In addition, it is essential to be open to small-scale decisions and to carry out planning in which all kinds of urban arrangements will be made at a lower scale. The primary purpose of designing such greenways is to produce meaningful areas, add value to the city and can become a symbol. In this context, it is necessary to proceed target-oriented from the first stage of the projects prepared.

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