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Futurism in landscape design: An experimental park design in Ankara, Mogan Lake

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Abstract

The futurism is an innovative design approach in art and architecture emerged at the beginning of 20th Century which is linked with science and new environmental/architectural technologies. Futurism was first discussed by Filippo Tommaso Marinetti in 1909 with a manifesto. Then, Antonio Sant'Elia carried futurism to urban scale by La Citta Nuova aiming to create a sustainable city for the benefit of humanity. The main characteristics of futurism are the dynamism and movement in design, speed, motion, dynamic structures built in modern cities by the use of technology and science. Afterward, futurism was redefined and gained further properties integrated the space age and new development in environmental and building technologies with dynamic and amazing forms, materials and high-tech architecture as well as urban and landscape design approaches. In this study, futurism was identified as a design trend and its developments throughout history was set. Then, the reflection of futurism in urban and landscape design was discussed and at the final stage an experimental futuristic landscape park design was offered after survey and site analysis studies for the selected area near Mogan Lake in Ankara. In the evaluation phase the 'weighted overlay' method was used by using ArcGIS software with reference to the suitability analysis studies. Then, the area was designed with an energy-efficient approach having solar and wind panels, urban furniture powered by solar and wind energy, and solar-powered roads at various levels and suitable locations in the urban park area according to the results of the analysis studies. Besides land use, hardscape and plantation design were all conducted due to the principles of the futuristic landscape design phenomenon.

Highlights

- This study is the first study in Turkey that examines the futurism movement within the scope of urban design and landscape design.
- Knowing its principles and design approach, the reflections of the futurism movement on landscape architecture are shown with landscape design.
- With the futuristic landscape design approaches of the 21st century, energy and water efficient design approaches can be put forward.

Keywords

Futurism; Landscape design; Design trends; Water and energy efficient design.

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Peyzaj tasarımında fütürizm: Ankara Mogan Gölü'nde deneysel bir park tasarımı

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Öz

Fütürizm, 20. Yüzyıl'ın başında ortaya çıkan, bilim ve yeni çevre/mimari teknolojilerle bağlantılı, sanat ve mimaride yenilikçi bir tasarım yaklaşımıdır. Fütürizm ilk kez 1909 yılında Filippo Tommaso Marinetti tarafından bir manifestoyla tartışıldı. Daha sonra Antonio Sant'Elia, insanlığın yararına sürdürülebilir bir şehir yaratmayı hedefleyerek La Citta Nuova ile fütürizmi kentsel ölçeğe taşımıştır. Fütürizmin temel özellikleri, teknoloji ve bilim kullanılarak modern şehirlerde inşa edilen tasarımdaki dinamizm hareket, hız ve dinamik yapılardır. Daha sonra fütürizm yeniden tanımlandı ve uzay çağı ile çevre ve yapı teknolojilerindeki yeni gelişmeleri, dinamik ve ilginç formlar, malzemeler ve yüksek teknoloji mimarisinin yanı sıra kentsel ve peyzaj tasarım yaklaşımlarıyla bütünleştirerek daha fazla nitelik kazanmıştır. Bu çalışmada fütürizm bir tasarım akımı olarak tespit edilmiş ve tarih boyunca gelişimi ortaya konmuştur. Daha sonra fütürizmin kentsel ve peyzaj tasarımına yansıması tartışılmış ve son aşamada Ankara'da Mogan Gölü yakınında seçilen alan için etüt ve arazi analizi çalışmalarının ardından deneysel bir fütüristik peyzaj park tasarımı önerilmiştir. Değerlendirme aşamasında uygunluk analizi çalışmaları referans alınarak ArcGIS yazılımı kullanılarak 'ağırlıklı çakıştırma' yöntemi kullanılmıştır. Daha sonra analiz çalışmalarının sonuçlarına göre güneş ve rüzgar panelleri, güneş ve rüzgar enerjisiyle çalışan kent mobilyaları ve çeşitli kotlarda güneş enerjili yollar ile kent park alanı içinde uygun lokasyonlara sahip enerji verimli bir yaklaşımla alan tasarlanmıştır. Arazi kullanımının yanı sıra yapısal peyzaj ve bitkilendirme tasarımları da fütüristik peyzaj tasarımı olgusunun ilkelerine göre yürütülmüştür.

Öne Çıkanlar

- Bu çalışma Türkiye'de fütürizm akımını kentsel tasarım ve peyzaj tasarımı kapsamında inceleyen ilk çalışmadır.
- İlkeleri ve tasarım yaklaşımı bilinerek fütürizm akımının peyzaj mimarlığına yansımaları peyzaj tasarımı ile gösterilmemiştir.
- 21. Yüzyıl'ın fütüristik peyzaj tasarım yaklaşımları ile enerji ve su verimli tasarım yaklaşımları ortaya konulabilir.

Anahtar Sözcükler

Fütürizm; Peyzaj tasarımı; Tasarım akımları; Su ve enerji tasarruflu tasarım.

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1. INTRODUCTION

After the industrialization that started with the Industrial Revolution, Europe has entered a period of rapid development. In this process, the most developed countries of Europe were England France and Belgium. On the other hand, Italy, it has maintained the old classical period design concept and in this sense, and has experienced this development process with a delay compared to other European countries. All these developments reveal the idea of a new Renaissance that is essential in Italy. This new initiative was first realized with the announcement of the futurism manifesto announced by Marinetti in Le Figaro Newspaper in 1909 (Seitz, 1961). The basic point of view of the design movement supported by Marinetti who is, the founder of futurism: " why should we look to the past instead of entering the mysterious door of the future? so is this impossible? Yesterday time and space died. We already live in speed, infinity and absoluteness that is always and everywhere." defined as and declared the futurist movement in 1909 (Sandeva and Despot, 2015. p. 23). Futurism is the notion of movement, flow, meaning triangles, domes, angles in many respects. The futurism movement reflecting the risk and excitement in Italy, which started with urbanization and industrialization in the 20th Century, it has taken on a distinctive intellectual and artistic color in countries such as France, England and Russia (Elder, 2018; Parer, 2002). Futurism highlights unique angles, oval forms, inclined surfaces, triangles, domes rather than cubic and prismatic forms. Guggenheim Museum in Bilbao, Spain, Cybertecture Egg in İndia, Graz Art Museum in Austria are some very well-known futuristic buildings in the World.

Futurism distinguishes itself from other historical movements with the concepts of dynamism, simultaneity, and interpenetration. The movement, which developed in 1909 with a focus on literature, By the 1910s, spread of politics, painting, sculpture, music, drama, set spaces, costume design, film, dance, architecture, urbanism, landscape design, typography, fashion and science spread, both in theory and in practice (Berghaus, 2011). Figure 1 summarizes the principles, pioneers' names, areas of influence and design approaches of the futurism movement.

In the 21st Century, the futurism movement has reached a different line than when it first emerged. The concept of "speed", which was advocated in the beginning of the movement, has left its place to the traditional. The Cittaslow movement which is one of the traditional way of living proposes a living space and model that is compatible with the natural structure of man and the resources of the Earth. This movement; it aimed to propose solutions to global problems such as development of environmental policies, encouraging local production, increasing green spaces and pedestrian zones, reducing noise pollution, traffic interruption, global climate change and reducing greenhouse gasses (Bengston et al., 2022). Considering the examples realized within the scope of the current futuristic architecture concept, while the "speed, dynamism and technology" phenomena that marked the 20th Century continue, whereas the concept of "sustainability" (Figure 1) is included in the futurist architectural understanding, unlike the futurism of the 20th Century. Within the scope of integrating sustainability and futurism, the effects of the movement have moved to a more prominent position in landscape architecture and landscape design studies. Futurism supporting the idea that lines, formal features and combinations of functions were changed and all boundaries were removed. Futuristic approaches in landscape architecture are a little bit more difficult to

define. However, when evaluated in detail and designed according to the resources for such specific locations; impressive designs are obtained for users (Sandeva and Despot, 2015). Futuristic landscape architecture also integrates futurism movement with sustainable and ecological design approaches. The futuristic feature of the area can be improved with energy and water-efficient landscape applications in urban green areas. For example, futuristic design suggestions can be developed with energy-efficient design approaches such as urban furniture, producing its own energy, plants producing light energy, pedestrian paths covered with solar energy and self-watering soil. Besides, water-efficient landscape design approaches can be developed with the use of natural plants, green roofs, vertical gardens and xeriscape applications (Figure 1).

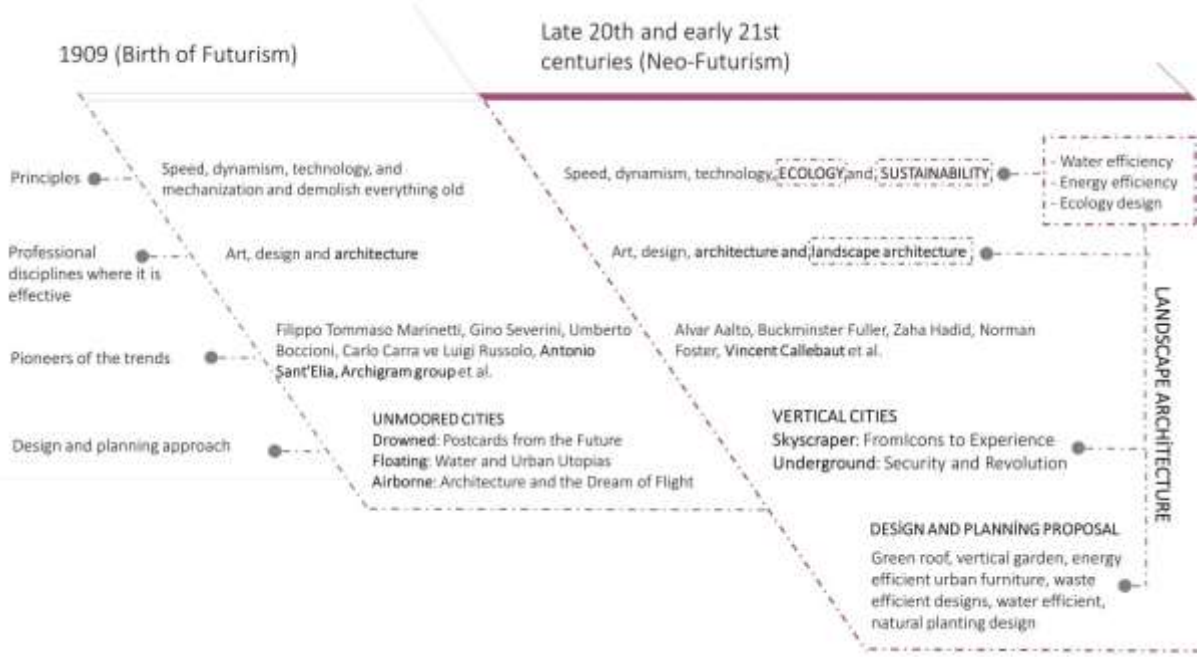


Figure 1. Historical development of futurism and its use in landscape architecture.

Considering the concepts of sustainability and ecology, which are important in 21st Century futurism, the fact that Lake Mogan in Ankara has many ecological statuses (Important Natural Asset, habitat, Important Plant Area and Specially Protected Area). So, all these criteria were the main determinants the selection of the study area. In addition, the study area is under threat due to anthropogenic effects that it has an important hydrological structure, which is intensively using by people for recreational purposes. Besides, the Mogan Lake is on bird migration routes and has endemic flora and fauna. This study aims to offer a futuristic design approach for Ankara, Mogan lakeshore which is energy and water-efficient for such a sustainable & ecological urban development besides it's avantgardist way of looking. This integration is possible with the right planning and site selection. So, suitability analysis studies were carried out on the research area and design proposals reflecting the 21st Century futurist approaches were developed. On the other hand, this study is one of the first studies examining the futurism movement of urban landscape design. The general principles and design approaches of the futurism, which are less used in planning and design studies compared to other design movements, have been tried in the field of landscape design.

1.1. Literature Review

After Tommaso Marinetti one of the other important futurist artists in the field of architecture is Antonio Sant'Elia and his architectural manifest, that the repertoires of the past are incompatible in the context of modern society; In this sense, he advocated that modern materials such as iron and concrete should be applied (Asensio, 2003; Rainey et al., 2009). Sant'Elia advocated that instead of taking inspiration from nature, architecture should be inspired by the new world of mechanics. Despite his limited participation during the movement Sant'Elia, posthumously became a central figure in the 1920s and 1930s (Gardini, 2014). So, different architects benefited from futuristic approaches in their works at the end of the 20 th Century. One of these architects is Krutikov who designed the "Flying City" (Figure 2) consisting of two main parts placed vertically on a horizontal, base as a production zone. The 5-storey building consisting three main parts which are a business center and shops, individual living spaces and a hotel section. The vertical block, consisting of a multi-layered honeycomb system, consists of short-term parking spaces at the bottom, accommodation areas in the intermediate and common areas at the top (Vronskaya, 2012).

Another group that is influenced by the futuristic approaches of Sant Elia and has a futuristic tendency is Archigram. Many futuristic design proposals have been developed by the Archigram group. For example, Plug in City; it is an example of design that considers parts of the city as a replaceable system and showing dynamism. In the Plug-in City project (Figure 2), working with the plug-in system, each construction completing its life is replaced with the help of the cranes on it (Steiner, 2009). Plug In City includes pods that can be defined as shops, homes and offices and mobile cranes along the horizon to lift, slide, stack and rack all add-on units (Steiner, 2009). Said by Sant Elia; It is the embodiment of the phrase "renewal will be continuous and our homes will last shorter than us". Because in Plug City, obsolete and expired units are removed, and new users shape their living spaces according to their wishes. These structures reflecting radical properties of futuristic buildings reflecting traditional, also benefit from the possibilities of technology seems like machine production rather than human.

Another futuristic work designed by Archigram is the 'Walking City' project offering a solution to the phenomenon of "mobility", which is one of the important problems of architecture, describes the tension that humanity has experienced between "place belonging" and "sense of going" since the transition to settled life (Sadler, 2005). Although it is a short-term and periodic movement, futurism has been the starting point and source of nourishment for various architecture and design movements such as Dadaism, surrealism and vorticism after the 20th Century (Rainey et al., 2009).

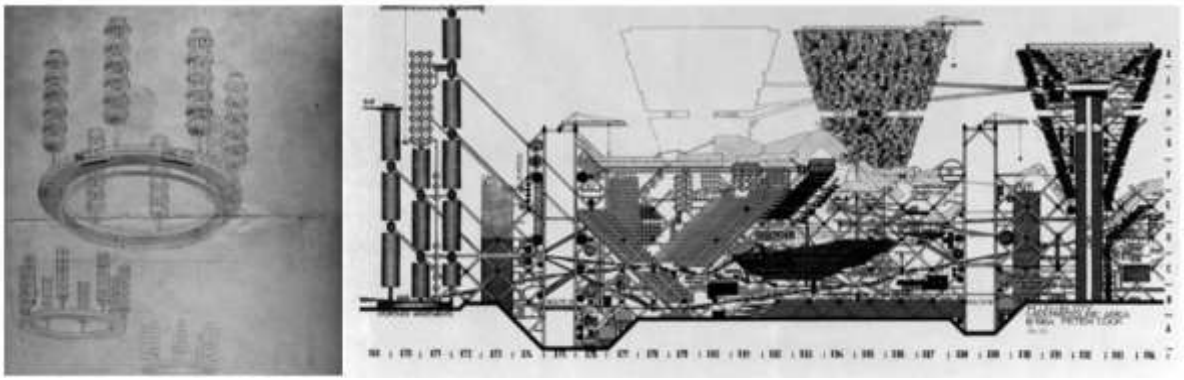


Figure 2. Communal residential blocks in the sky (Vronskaya, 2012) (left), Plug In City (Zuk, 2018) (right).

In the 21st Century, the futurism movement, offering solutions to global problems such as climate change, energy crisis, air pollution and water pollution both at building and landscape design scales offering suggestions such as energy-efficient building designs and rational use of water and other energy resources. 'Floating Park', which was built as a futuristic approach and designed as a leaf floating on water was completed by Diane von Fürstenberg in New York in 2016 in cooperation with the landscape company MNLA. The area is designed to transform the pier, to be used for many years in a park area. It was planned to build a large platform supported by hundreds of columns above the water and lay the soil layer on it. Another example of a futuristic park is the Gardens by the Bay. There are plants and trees brought from different regions and climates of the world in the park located in Singapore. The park was designed with a futuristic approach with vertical and horizontal gardens. There are various open and closed areas for different uses and the most striking plants are the trees in the area called 'supertrees' and artificially made in the form of trees (Figure 3). In fact, these trees, which are all artificial metal construction, are of great importance for the facility. These trees are called supertrees because they provide the necessary shade for orchids and other plants in the park, absorb sunlight for the photosynthesis of plants and collect rainwater to form the necessary wetland (Kısa and Özer, 2019). The "Manta Ray" project is another park designed by adopting a futuristic landscape design approach (Figure 3). The park was inspired from willow trees. The design belongs to the architect Vincent Callebaut. The main objective of the "Manta Ray" project is to enhance the site's natural irrigation by transforming the park into an ecological forest of willow trees. The "Manta Ray" project includes sustainable issues including 21st Century futuristic landscape designs such as saving energy, reducing carbon dioxide emissions and reducing waste. The project also includes waste reduction, reuse of resources and recycling of materials. Manta Ray uses renewable energies like wind, solar, biomass and wave energy to produce 100% of the energy needs so, the Italian pre-modernist utopian vision turned to more tangible architectural and urban projects changing the whole landscape by the help of the digital revolution (Singh, 2022).

Figure 3. Gardens by the Bay (Zappi and Ong, 2014) (left), Manta Ray (Singh, 2022) (right).

The futurism movement in cities and landscape architecture has begun to be effective, especially with the concepts of technology, machine, mobile, spaces, sustainability and ecology. Scarcity of energy and water resources, waste problems and habitat fragmentation have led landscape architects design work with new to work with a 21st century futurist approaches both in design and planning studies. For such an energy-efficient landscape design. The use of urban furniture using renewable energies such as wave, solar, wind or kinetic energy has become widespread. For example, the work themed 'Catching The Wave' (Figure 4) designed by Vannelli et al. (2016) in Canada converts wave energy into electricity. The system has the capacity to produce 6,000 MWh of energy per year. The facility consists of 60 buoys that capture wave energy (Özer, 2022; Vannelli et al., 2016). Another example is the 'Solar Wind bridge' (Figure 4) concept designed by Francesco Colarossi, Giovanna Saracino and Luisa Saracino, which is planned to serve Italy from Bagnera to Scilla. The road surface is planned to replace conventional asphalt with 20 km (12.4 mi) of "solar roads", consisting of a dense grid of solar cells covered with a transparent and durable plastic coating providing 11.2 million kWh of electricity per year. It is also said that this system, together with 26 wind turbines located under the bridge produces 36 million kWh per year, will provide enough electricity for approximately 15,000 houses (Özer, 2022; Quick, 2011).

Figure 4. Catching the wave (Vannelli et al., 2016) (left), 'Solar wind bridge' (Quick, 2011) (right).

On the other hand, it was seen that kite power energy is twice as efficient as wind energy that can be easily adapted to landscape studies. This is because they mix strong atmospheric winds than

winds close to the ground and the wind continuity is greater in this application. In this regard, the 'unwind' (Figure 5) concept designed by Donley and Cinalli is a project using high-altitude wind power with certain techniques. It is claimed that the project will produce energy with an annual capacity of 1,900 MWh electricity with 42 kites. In addition, a design that is a work of public art is aimed to make the ordinary exciting (Özer, 2022; Laylin, 2018). Another futuristic landscape design work is Mosspark (Figure 5), which was designed as a children's playground. Mosspark has a smart device that works as an energy store during the day time where as acting as mosquito repellent at during the night hours. The working principle is based on a system that stores energy while children jump with a rope attached to the Mosspark pole and uses this energy to illuminate the mosquito repellent at night time (Seth, 2014). Çorum Municipality has installed a smart bench in the National Garden and Culture Park in order to supply energy provide solutions to the of citizens. The smart bank includes a disabled charging station, free Wi-Fi access and mobile phone charging stations. In addition, Bornova Municipality has made 8 solar-powered benches available for the use of two citizens in Big Park. Smart benches are covered with water-resistant tempered glass providing illumination at night with the solar energy that they produced (Hırçın and Demir, 2023).

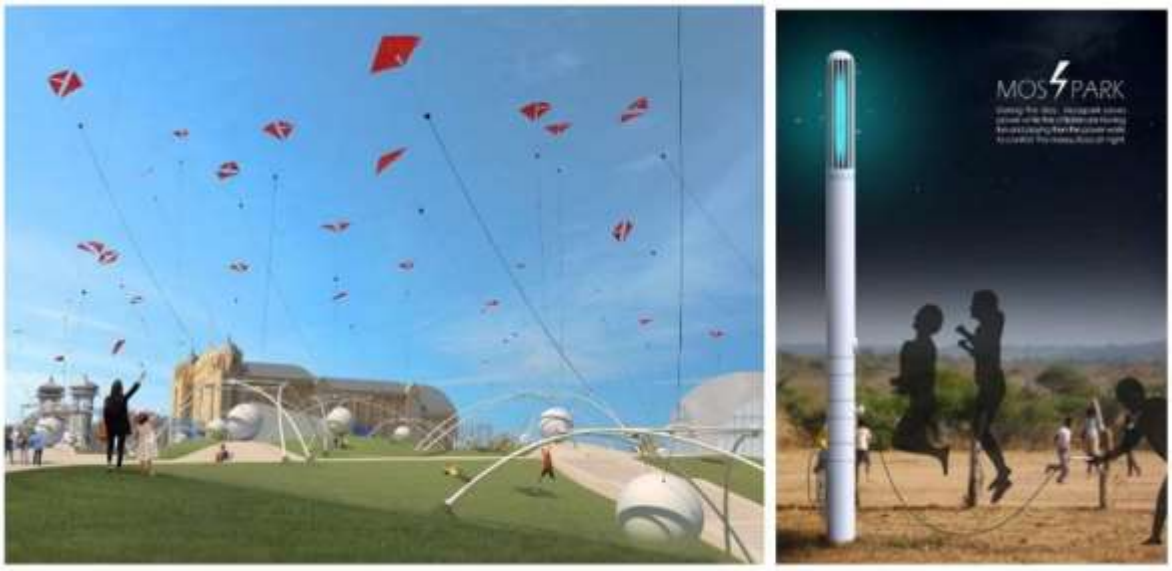


Figure 5. Unwind (Laylin, 2018) (left), Mosspark (Seth, 2014) (right).

Another equipment that produces its own energy is the fitness equipment (Figure 6). These devices are mixed urban lighting systems driven by two different sources which are manpower and electricity. The lamps used in the area are energy-saving LED lamps as light sources replacing traditional bulbs. The system is based on the principle of converting people's movement energy into kinetic energy (Heimbuch, 2018). Another example is the garbage bin known as 'Gaon'(Figure 6). In the Gaon concept, there is a garbage bin at the base of the lamppost where food items discarded by pedestrians and uses methane from manure to produce power for lighting (Yoneda, 2009). 'The 'Kidetic' concept design includes kinetic energy-based children's play elements. These elements convert mechanical energy into electrical energy with dynamos. Although the energy that is going to be obtained is not so much, it is sufficient to illuminate the whole area (Özer, 2022).

Figure 6. Fitness equipment that produces its own energy (Heimbuch, 2018) (left), Gaon (Yoneda, 2009) (right).

The use of natural plants for water-efficient landscapes the use of rainwater harvesting and water-saving irrigation systems were the main components of such a futuristic&sustainable landscape design. For example, the use of self-watering soil, which is an innovative approach in landscape architecture design studies is important both for reducing irrigation and ecological plant design studies. This application was tested by Karagöz and Yücel (2020) on the *Euonymus japonicus 'Aureomarginatus'* species. In this study reducing the amount of water consumption by using superabsorbent polymers is one of the main themes. As a result, water use was reduced by 45% and labor costs were also reduced by 48%. Such applications of green roofs and vertical gardens can be shown among these innovative landscape approaches. By the help of such applications, energy savings in the buildings can be achieved while water consumption is reduced.

In addition to all of these sustainable and ecological practices the use of technology that futurist artists have advocated since 1909 continues to be applied in landscape design studies. Art District's Boulder Plaza, an application that has been implemented in this context, is a park in Las Vegas (Figure 7). The park includes smart street lighting systems that generate energy from steps taken and solar panels. The energy obtained is used in lighting, charging mobile phones and wi-fi access applications (Özer, 2022; Balkan Green Energy News, 2016). Another example is the gaming arch created with the 'Yalp Sona' concept (Figure 7). This belt works intuitively and when you pass under the belt it will immediately prompt you to play a game. New games are constantly being developed by the system (Yalp Interactive, 2023).

Figure 7. Art District's Boulder Plaza (Balkan Green Energy News, 2016) (left), Yalp Sona (Yalp Interactive, 2023) (right).

When we look at the studies carried out within the scope of futurism, it is seen that different proposals are made based on literature research or applied study. In addition, the studies are generally carried out at a building scale or a single landscape element scale (urban furniture, plant material) or in the form of 'smart city' applications. This study proposes an experimental 21st Century futuristic park design for Ankara near Mogan Lake. Before the formation of the park area different suitability analysis studies were carried out to ensure maximum impact in the area.

2. MATERIAL & METHOD

2.1. Study area

The main material of research is an approximately 22.000 m^2 area situated in Gölbaşı district which is a sub-settlement of Ankara located 25 km away of the south on the northeast side of the Mogan Lake (Figure 8). The study area lies between the D260-D750 highways. Access to the area is provided by buses and minibusses. The main entrance of the area under urban pressure is located in the southeastern part. Mogan Lake increases the ecological and recreational value of the area. Mogan Lake and its environs has a lot of recreational potential for Ankara especially during the weekends besides it's ecological benefits. On the other hand, Mogan Lake and its near environs is a specially protected area besides it's natural habitat quality as a local point for bird's migration route. The verbal, numerical and visual data used in the inventory, analysis and evaluation phase of the study constitute the other materials of the study. These; All kinds of domestic and foreign articles, theses, books, reports and web databases related to literature research and research findings, Autocad program, satellite photographs obtained from Google Earth image, DEM data obtained from Landsat satellite image; Aspect, elevation and slope maps, Turkey soil data (2000), Map and numerical data created using Arcmap 10.7.1 program, Photoshop program where landscape design visuals are created. The altitude of the area from sea level is 969-995 m high. As a result of the slope analysis made by considering the DEM (Digital Elevation Model) map, it is observed that the area is almost flat and close to flat whereas, but the slope varies between 5-6% in northwest and southeast areas. With the aspect analysis created by taking into account the Turkey DEM map, it has been determined that the aspect potential of the area is predominantly southeast. There are four basic formations in the lake structure. The valley connecting the Mogan-Eymir Lakes and the İncesu Stream, the creeks feeding the valley; the wetlands at the beginning of the valley and along the valley and the underground waters and underground water supply basins feeding all of these water resources (Dostbil, 2010). The recharge area of the lake starts from the south of Mogan Lake and empties into Eymir Lake and then into the Imrahor Valley located in the north of Eymir Lake. There are only seasonally flowing streams in the recharge area of Morgan and Eymir lakes. The most important of these streams is the Çölova Stream, which flows from south to north and leaves large alluviums around it (Yedek, 2019). Gölbaşı region, which is the study area, has the continental climate conditions of Central Anatolia. Semi-arid reflects the general climatic characteristics of the region (Görgün, 1994). Reed (*Typha latifolia*) and sedge (*Phragmites communis*) are among the main plant groups on the lake shore. The Love Flower/Iridescent (*Centaurea tchihatcheffii*) is the most important endemic plant species in the area which flower is in the CR (Critically Endangered) category in terms of species conservation status. In addition to

verbal, numerical and visual data used in the inventory, analysis and evaluation stages made within the scope of the study consist of the other materials of the study.

Figure 8. The location of Morgan and its surroundings in Turkey (a,b), images from the study area(c) and the points where the images were taken(d).

2.2. Method

The method used in the study area has 4 main. In the first stage, the development of futurism movement throughout **history** and its effects on landscape architecture were examined which was based on detailed literature study. Then, futuristic design approaches used in landscape design studies were evaluated (Figure 9). Afterwards, site surveys and analysis studies were made to determine the exist natural and cultural value of the area and then problems and potential of the area were set. In the third stage of the research suitability analysis studies were made to set futuristic design criteria for the selected area in the frame of a futuristic park design approach. During the analysis phase, the structural data (road) and natural data of the area (slope, aspect, elevation, climate, hydrology, land use and soil maps) were digitized by using the ArcGIS/ArcMap 10.7.1 package program. The digitized maps were scored according to the suitability criteria on the hand and on the other hand. 'Weighted Overlay' analysis was made on the scored maps and suitable areas were determined for such as the futuristic landscape design project proposal. In addition to, within the scope of energy and water efficient design, soil, slope, elevation, hydrology and aspect maps were examined, in order to develop the most proper design proposal for the area. The concept of ecology which is important for the 21st Century futurists was also taken into consideration during the planting design phase. Finally, the hydrology map will be examined and suitable areas for urban

furniture in a futuristic context was offered. As a result of these analysis studies design proposals were developed for the area according to their suitability measured by suitability analysis studies. These design suggestions are all reflecting the 21st Century futurist approaches.

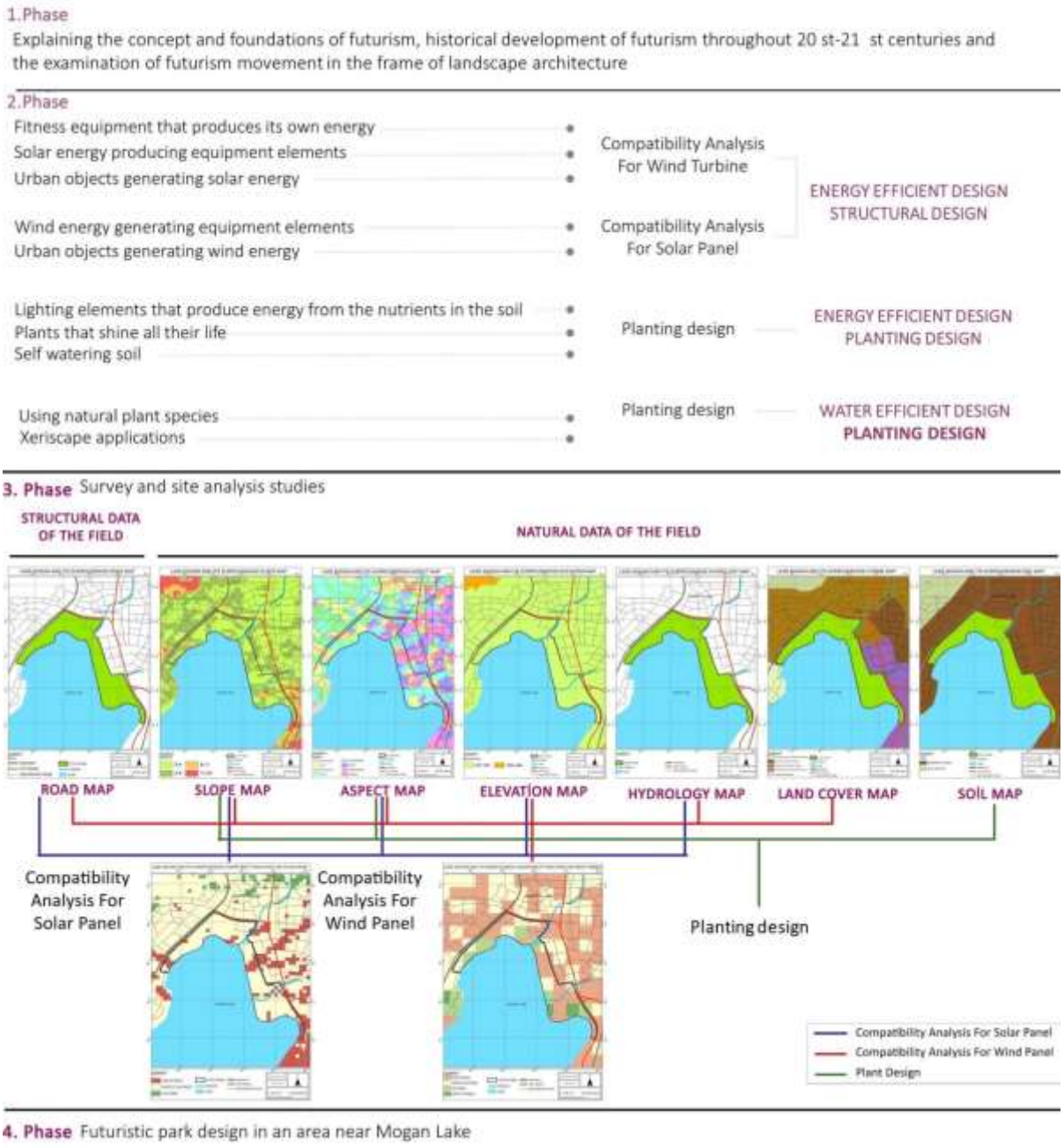


Figure 9. Method scheme.

2.2.1. Suitability analysis for solar-powered urban furniture, sidewalks and urban features

The suitability criteria for solar-operated urban furniture and urban objects that were offered the area are located in suitable areas to benefit from maximum solar energy and it was determined by considering the criteria in the studies conducted by Ibrahim et. (2021), Nebey, Taye and Workineh (2020), Uzar and Koca (2020) and Uyan (2017). These are the base values for Solar Energy Panel

(GES area selection). The weight values used in the study are the values based on the studies conducted by Uzar and Koca (2020). After the criteria were determined, the analysis map was created using by ArcGIS/ArcMap 10.7.1 package program. In this context, elevation, aspect and slope maps were produced by using Turkey DEM data. A 'buffer analysis' was also made for the rivers, lakes and roads in which the data was given in Table 1.

So, by the use of GIS it is possible to query the desired information within a certain geographical distance. The suitability values of all maps created were transferred to the Open Attribute Table as numerical data. Since the 'weighted overlay' analysis was used on the maps for which the score values are entered, vector maps (hydrology and road map) were converted to 'raster' data by making 'Polygon to Rater'. In raster data (aspect, elevation and slope) 'reclassifying' has been made. The weight scores obtained from weight overlay' analysis studies were given in Table 3.1. According to the analysis studies, it was evaluated that a scope of 1 point was not suitable, a scope of 2 points was moderately suitable and a scope of 3 points was showing suitable areas for solar urban furniture uses. As a result of this study carried out to determine suitable areas for solar urban furniture and urban features to be located in the area, it was concluded that there are moderately suitable areas in and around Mogan Lake and it has been determined that there are suitable areas for urban furniture and urban features were offered.

Table 1. Compliance values for solar panel installation (Uzar and Koca, 2020).

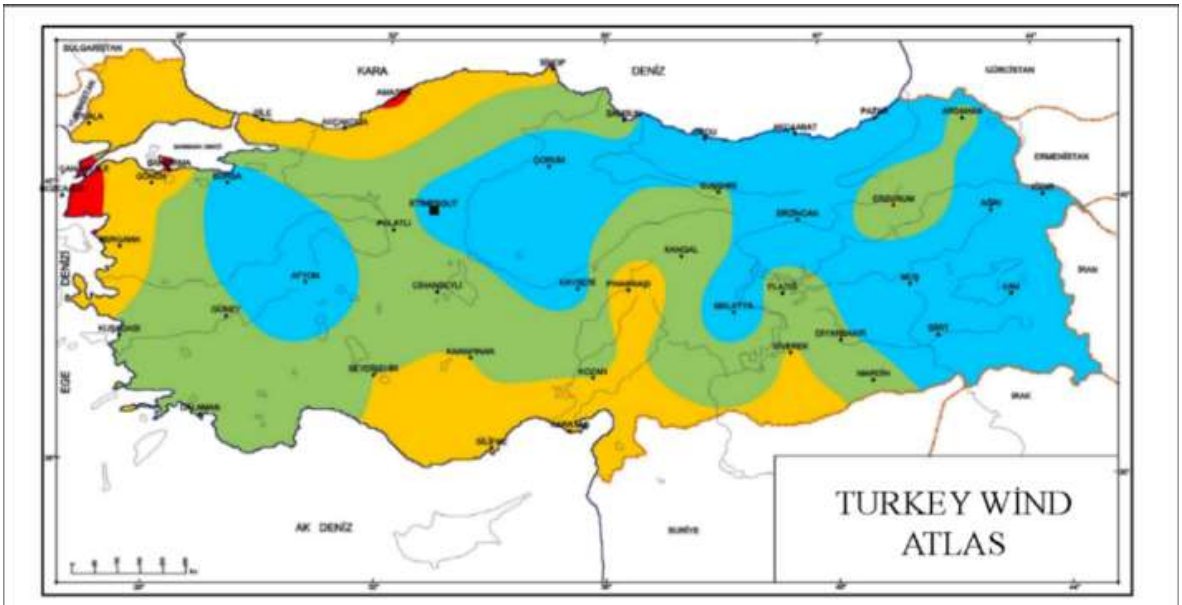
Criteria\ Suitability	Unsuitable (0)	Little(1)	Intermediate/Middle(2)	High(3)	Weight value(%)
Slope(%)	> 11	11-8	8-4	< 4	20
Elevation(m)	< 500	500-1000	1000-1500	> 1500	10
Distance to Stream (m)	< 400	400-800	800-1200	> 1200	10
Distance to Lake (m)	< 400	400-800	800-1200	> 1200	10
Distance to Roads (m)	< 100	100-200	200-300	> 300	10
Aspect		Northwest, Northeast, North	West, East	Flat, South Southwest, Southeast	40

2.2.2. Suitability analysis for wind-powered urban furniture and urban features

During the preparatory stage of the study, the criteria for the equipment and urban objects working with wind energy was searched for the selected study area so, in this context, Amarasinghe and Perera (2020), Karipoğlu et al. (2021) and Özşahin and Kaymaz (2013 were taken account ın the design phase. So, these criteria and the values taken are the basis for the Wind Power Plant (WPP) site selection. The weight values used in the study are the values based on the studies conducted by Özşahin and Kaymaz (2013). After this stage, ArcGIS/ArcMap 10.7.1 package program was used for the site and suitability analysis studies. Height, aspect and slope maps to be used in conformity analysis were formed from Turkey DEM data. The wind values were taken from the Turkish Wind Atlas (Figure 10) for a such healthy evaluation and digitize the suitability values in Table 2 were transferred to the Open Attribute Table. As the data in the wind atlas were evaluated,

the sections within the 100 m coverage area of the Mogan Lake were defined as coastal areas (Coastal law) and the wind speed is taken as <5m/s. The non-coastal lands outside 100 m were defined as open land areas considering the topography map and the wind value which was determined as <4.5m/s.

It is a general belief and well-known data that wind turbines kill birds or change their migration routes. However, only 0.003 percent of all bird deaths are caused by wind turbines and airplanes (Karipoğlu et al., 2021). The sun trees, which were proposed for the experimental park area not located on the bird migration routes of Turkey (Figure 11) which also do not have a heavy construction like ordinary wind turbines.



	Closed Lands		Open Lands		Shores		Offshore		Hills	
	m/s	W/m2	m/s	W/m2	m/s	W/m2	m/s	W/m2	m/s	W/m2
	>6	>250	>7.5	>500	>8.5	>700	>9.0	>800	>11.5	>1800
	5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800
	4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200
	3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0-8.5	400-700
	<3.5	<50	<4.5	<100	<5.0	<150	<5.5	<200	<7.0	<400

Figure 10. Turkey Wind Atlas (Akova, 2011; MGM,2022).

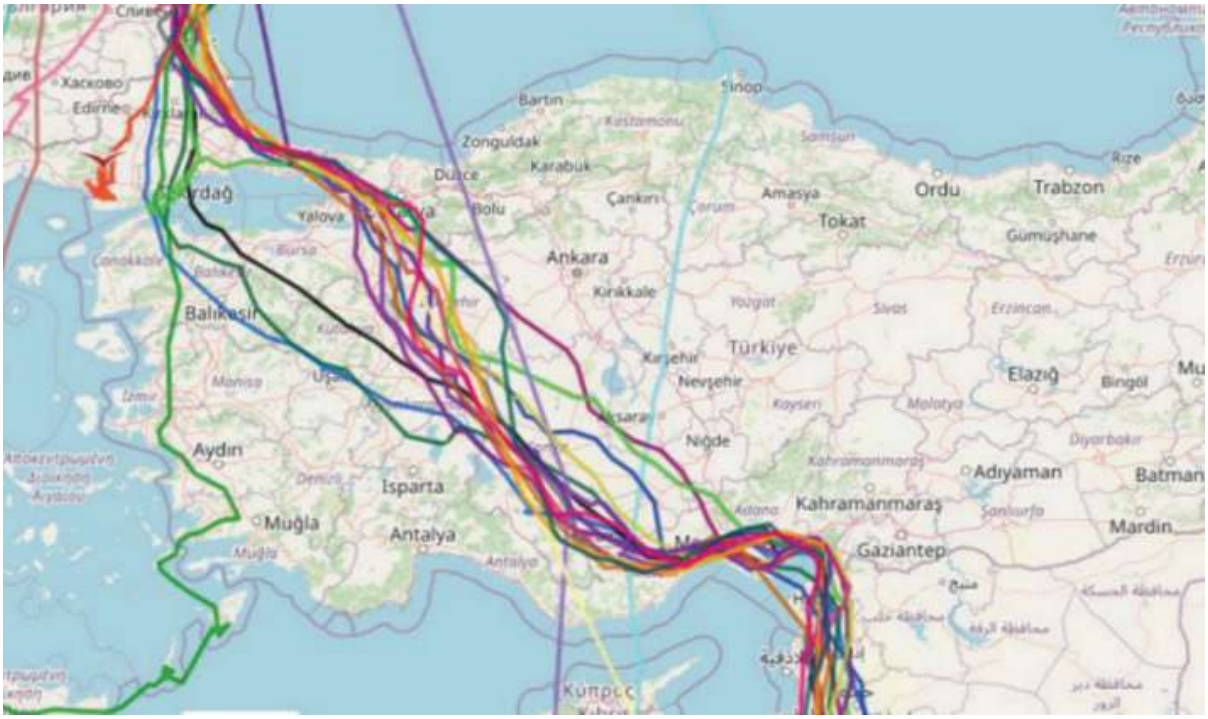


Figure 11. Bird migration routes ın Turkey (Karipoğlu et al., 2021).

Since the study area is close to the city center, distances to energy transmission lines and transformation centers are not included in the analysis studies. In addition, the geological map of the area obtained from the MTA (Mineral Technical Exploration) was examined (Figure 12) (MTA,2022), it was observed that there is no fault line crossing the area. A 'buffer analysis' was made for the streams and roads taking into account the values in Table 2. So, with GIS, it was possible to query the desired information within a certain geographical distance. The location of the land used in the study was obtained from the CORINE (2018) map, on which the values in Table 2 are based on the CORINE map. The suitable values of all maps created were transferred to the Open Attribute Table.

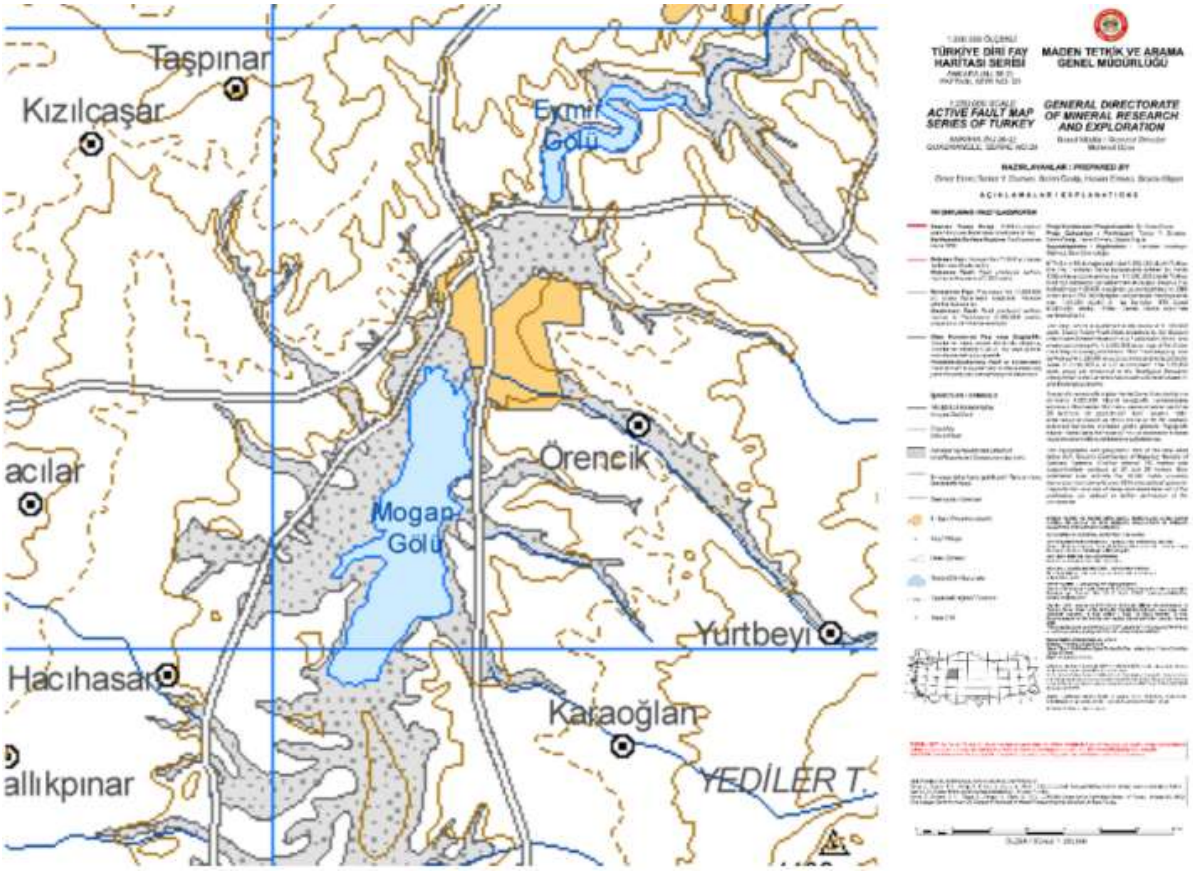


Figure 12. Turkey live fault map (MTA, 2022).

Since the 'Weighted Overlay' analysis was used in the formation of the maps for which the score values are identified, vector maps (hydrology and road) were converted to 'raster' data by using 'Polygon to Raster' method. In raster data analysis the aspect, elevation and slope values of the study area that is subject to futuristic design were reclassified. In the 'Weighted Overlay', the weighted point values given in Table 2 were taken into consideration. After the analysis studies of the area, the score value was identified as such: 1 point not suitable, 3 point less suitable, 5 point, moderately suitable, 7 point suitable, 9 point very suitable. As a result of suitability analysis done for the wind energy operated urban furniture and other landscape features, wind tribunes more offered for the most suitable location in the design area.

Table 2. Compliance values for wind panel installation (Özşahin and Kaymaz, 2013).

Criteria\ Suitability	Unsuitable(1)	Little(3)	Intermediate/middle(5)	Well(7)	High(10)	Weight value (%)
Wind speed distribution(m/s)	3-5	5-5,5	6-6,5	7-7,5	7,5-10	20
Aspect	Southeast, Northwest	North, East,West	South	Northeast	Southwest	15
Slope(%)	32>	16-32	8-16	1-8	0-1	10
Elevation(m)	0-150, 1050>	150-300	300-450	450-750	750-1050	15
Distance to Streams (m)	< 500	500-1000	1000-5000	> 5000		10
Land Use	Forest Residential Area	Shrubs Heathers, Garden	Meadows Pastures	Agricultural Field	Open Area	20
Distance to Roads (m)	> 1000	500-1000	250-500	100-250	< 100	10

2.2.3. Plant Design

The plant selection and their design was done carefully aiming to use energy and water effectively as well as their ecological and aesthetic values were concerned. In this context, self-watering soil, lighting elements converting glucose in the soil to light and plant species shining throughout their life were proposed for the area. In addition, plant species were selected according to the soil and slope properties of the land as well as the aspect analysis data. So, the plantation, selected plant species, and its design were all shaped due to site survey and overall analysis studies.

3. RESULTS

The study area, which has an important ecological, recreational and social value for Ankara is facing urban pressure. Sun, wind and vegetative suitability analysis were carried out for the study area, which is located between the D260-D750 highways and where access to the area is generally provided by buses and minibusses, and suitable areas for the futuristic landscape design to the area were determined. After making all the surveys, site analysis, suitability analysis and determining the problems and potential of the area; all the data obtained were synthesized to form the main design criteria for the area. According to the analysis studies given in detail in the "method" section of the research, solar panels were offered covering an area of 19.000 m^2, at an ıntermediate suitability level and in a 3 m^2 area of unsuitable part (Figure 13). On the other hand, solar-operated working elements were situated in moderately suitable areas. Besides, due to the suitability analysis for wind panels to produce electricity energy; there is an area of 1.000 m^2 that is very suitable, 5.000 m^2 area suitable, 4.000 m^2 less suitable and 12.000 m^2 unsuitable. Urban features and urban furniture working with the wind were be located in the very suitable and suitable park of the area.

Taking all these analyses into consideration, 21st Century futurist landscape design suggestions have been developed for the park area. According to the solar panel suitability analysis, suitable areas are urban furniture powered by solar panels, car parks covered with solar panels, urban objects powered by solar energy and pedestrian paths converting solar energy into electrical energy

were proposed. Urban objects powered by wind energy and urban furniture elements that produce wind energy were placed. In all these analyses, other futurist concept applications were suggested for areas that are not suitable.

Figure 13. Suitability analysis for solar powered urban furniture and urban features (left), suitability analysis for wind powered urban furniture and urban features (right).

Besides, plant species were selected and designed according to the soil quality, slope, elevation and aspect analysis studies as well as the natural flora of the central Anatolian region. Planting design of the area park was based on sustainability as well as ecological and water efficiency design criteria. Natural vegetation of the region and species needing less water and resistant environmental conditions were the main criteria. In addition, bus stops, security units and other service buildings proposed for various uses were arranged as green buildings either having roof gardens or green buildings with succulent species naturally found in Ankara province.

Finally, due to the hydrology map produced after certain analysis, lighting elements working with wave energy were recommended for the branches that feed Mogan Lake, where the flow rate is high in the area. All of the urban furniture were not to give so as not to harm the aquatic fauna and flora.

4. CONCLUSIONS & SUGGESTION

After a set of detailed survey and analysis studies and determinations synthesized with futuristic landscape design phenomenon, a landscape design project was proposed in the selected area situated near Mogan Lake in Ankara (Figure 14). The reflections of 21st Century futuristic approach is seen in the area as far as context, land use, energy and water efficiency, ecology of the area and

the landscape features are concerned. The proposed urban public spaces landscape elements, site furniture, plants and landscape structures were all reflecting the futuristic design theory and conceptual background of the idea. Futuristic approaches seen in to structural element and plant applications in the design proposal are valid for the sub-components of the landscape design as well as the general layout plan, land use and design components of the project.

Figure 14. Suggested landscape design within the scope of analyses.

Benches: The benches offered in the urban public space design of Mogan Lake transform solar energy into electricity (Figure 15). Solar energy is converted into electrical energy via solar panels placed on the benches and by the help of USB inputs, providing the users the opportunity to charge their electronic devices. This application is similar to the study conducted by (Hırçın and Demir,

2023). In Figure 14, these benches with solar panels were placed in the areas having intermediate suitability values.

Lighting elements: More than one energy-efficient lighting elements were offered due to the quality of the area and the lighting fixture. One of them is the lighting element which produces energy by utilizing the nutrients in the soil. This lighting element is activated by the energy stored in the soil containing the nutrients and microorganisms that plants secrete during their growth. In addition, in order to ensure the continuity of the nutrients in the soil, the tree pieces and grass residues in the park are going to be offered to be turned into compost and mixed with the soil in the form of nutrients. So, the whole park area is suitable for night use while saving electrical energy for due to night lighting. This recommendation is suggested in the southeastern parts of Figure 14. Another lighting element offered for the park area is the ability of converting wave energy into electrical energy. These lighting elements were placed on the coastal parts of the park area near Mogan Lake and through on the streams feeding the park (Figure 16). So, the electricity of the whole park and the lighting can be produced by the use of wave energy by the help of specially designed. The 'PowerBreaker Speculative Design Concept' is an example of a futuristic design converting tidal energy into electricity in the oceans based on the same design principle (Willis et al., 2021). Another lighting element is the fitness equipment producing their own energy. These devices convert the movement energy produced by the people while doing sports in the park to electrical energy. So, the necessary electrical energy for the park uses are going to be produced by the inhabitants and users of the park area. The futuristic application in the 'Mosspark' concept was also used in the children's playgrounds located on the southeast and northwest sides of the park area. A futuristic application with the 'Yalp Sona' concept has also been proposed in the children's playgrounds. One of the other features for the park area is wind-powered lighting elements. These lighting elements were placed in the areas suitable for the wind turbine in the park area.

Trash bins: With the sustainability concept of the 21st Century futurist approach, the issue of recycling also has to be solved. The garbage cans transform the food products thrown by the users into compost, which will support the fertilizer needs of the plants in the park area which is similar to my design by Yoneda (2009).

Parking lots: The parking areas located in the park were designed due to suitability analysis and the entire top of the parking lots was equipped with solar panels to produce energy which need minimum local zoning requirements. Solar panels have been proposed on the upper parts of the parking areas as far as ecological landscape design was concerned. The panels used in this application were selected from architectural devices with a solar reflectance index of at least 29. Solar-powered parking lots were designed and arranged according in 6 different points in the park area (Figure 14).

Urban features: There are three items designed within the scope of urban plastic objects in the area. These are the sun trees, wind trees and the shining forest. Solar trees (Figure 15) were placed in the northwest side of the park area (Figure 14) which was suitable for solar panels.

Figure 15. Urban features producing solar energy and benches powered by solar energy.

One of the other urban features is wind trees (Figure 16) generating wind energy. This feature was located in the windy north, northeast and northwest parts of the park area, due to the suitability analysis. Some of the energy requirement for irrigation and lighting of the park was supplied by means of these urban features. The glowing forest is a practice similar to the 'A Glowing Garden' park applied in Malaysia. However, there is a pine cone (150-200 cm) hanging on the coniferous trees by means of rods. These pine cones were shining in different colors at night lighting function as well as supplying visual and aesthetical value to the urban public space. Finally, a practice similar to the 'Unwind' proposal has been designed in the park area. These features were placed both in the south and southeast parts of the park area where the wind prevails most (Figure 14).

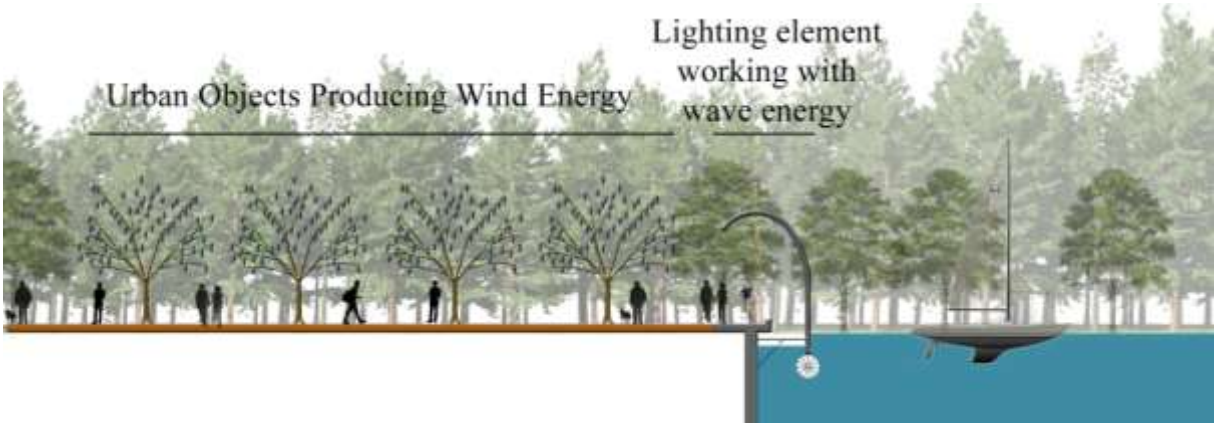


Figure 16. Urban features producing wind energy and lighting element producing energy by means of

Sidewalks: The walkways of the park area were designed to produce solar energy. It provides solar energy through solar panels laid on the ground. These paths were used on the shores of Mogan Lake and on the above-water walking paths, due to the data obtained from the suitability analysis. The sun reflection index was taken into account when designing the roads and they were designed so as not to disturb people while walking on the roads.

Self-watering soil: The amount of vegetative irrigation will be reduced with the self-irrigating soil that was proposed in the northwest part of the park. This application was planned and designed to act as super moisture-absorbing gels to attract water in the soil. This application was established on the mini golf area in the park, so that the soil and the grass used in the golf area also be irrigated. A similar application to this one was tried on *Euonymus japonicus* 'Aureomarginatus' species by

Karagöz and Yücel (2020). In this study, it was used to reduce the amount of water consumption by using super absorbent polymers. So, the water use was reduced by 45%, while labor costs were reduced by 48%.

Biyolamb: Some plant species can filter CO^2 from automobiles and factories in cities. But, in cities where industry is concentrated, the benefit of this afforestation may be somewhat less. 'Biolamb' designed by Peter Horvath aiming to filter CO^2 in urban areas (Figure 17). The designed tool can also be used as a lighting element. Inside the system is a liquid algae mixed with water that converts CO^2 into oxygen. The working principle of the system is as follows: The fan at the top of the lamp absorbs the smoke flowing into the algae liquid and this liquid is circulated in a spiral system that allows the algae to absorb carbon dioxide better. Then, carbon dioxide turns into oxygen thanks to the algae inside. Another function of the system is to convert water, sunlight and carbon dioxide into biomass energy. After the algal liquid is saturated with carbon dioxide it is directed to underground tubes. The biomass in the tubes directs it to the nearest landfill and algae in the system must be renewed periodically (Horvath and Tóth, 2005).

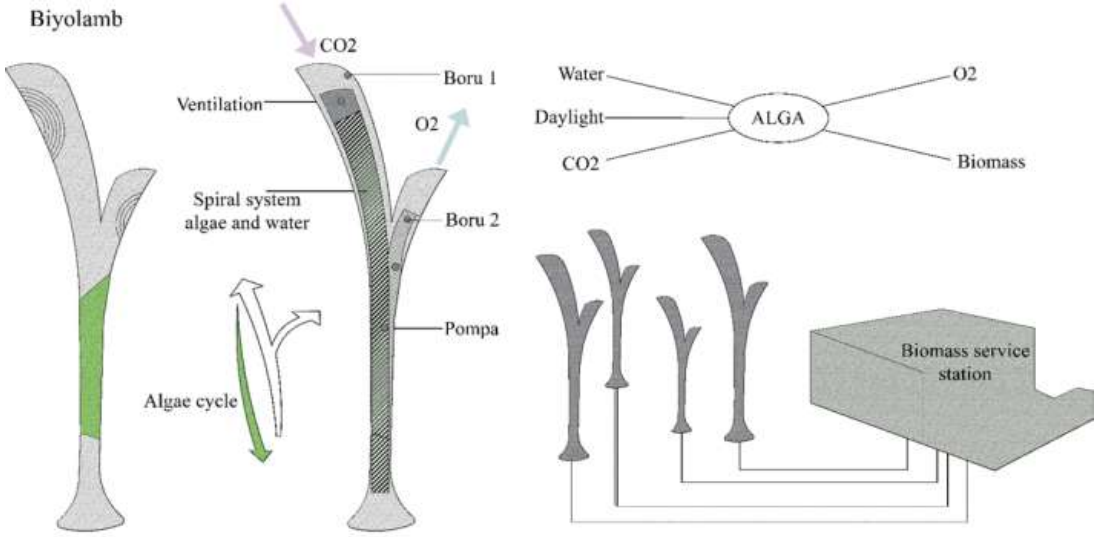


Figure 17. Working principle of the biolamb application (adapted from Horvath and Tóth, 2005')

Glowing herb garden: In different locations of the park area, plants were used having the property of glowing during the night hours. So, the park area is going to be illuminated partially in the evenings through night hours to save energy. Besides fungi bioluminescence system was also used in these plants.

Plants that glow at night: A team of Russian scientists has altered the genes of two tobacco plant species so that they emit a bright light throughout their life cycle. The main purpose of the researchers here is not just to make the plants shine but also wanted to learn how the metabolism of bacteria works and they tried to find out by looking at how they react to their external environment. The research team used the fungal bioluminescence system to make the plants glow. The fungal bioluminescence system is responsible for converting a common acid found in all plants into luciferin. So, the component in the organism can produce bioluminescence. This light produced by the plants is visible to the naked eye. However, it does not yet have a light strong enough to illuminate a park at night (Ardavani et al., 2020; Patel and Ashwini, 2022).

Plant species that produce their own energy: The lighting element, made by researchers in the Universidad de Ingeniería Tecnología (UTEC) group, offers an innovative alternative proposal and

generates electricity from the nutrients found in the soil. The plant lamp developed by UTEC can provide light for two hours a day with a low energy consumption, high illumination LED lamp. The system works with the energy stored in the soil, which contains the nutrients and microorganisms that plants secrete during their growth. This allows the use of free electrons from microorganisms and in this way the lamp to light (Murray et al., 2016). This type of application is an effective solution for the illumination of plants in pottery. So, it is possible to use this type of low-energy in parks and gardens.

Rain towers: The use of rainwater in irrigation was adopted from a similar practice namely 'Supertrees' used in the 'Garden By the Bay' area in Singapore in which water is stored in rainy weather. Then the stored water was used to irrigate the plants placed vertically in the form of towers.

Xeriscape and the use of succulent plants: According to Hilaire et al. (2008), with the correct application of xeriscaping, savings of up to 76% can be achieved in terms of outdoor water consumption. The decrease in water resources in the world has popularized the idea of plenty of use of water and xeriscape applications. In this context, plant species selection consuming less water is suitable for the ecology and the sustainability of the area. By the means of effective xeriscape applications, a large amount of consumption can be supplied. This application was offered for the areas that are not easily accessible and are exposed to sunlight in order to reduce maintenance costs and save water. In addition, drought-resistant plant species were used in the rain towers. The amount of irrigation in the park area was reduced by the use of natural succulent species and xeriscape landscape design in various parts of the park area.

Green roofs: Green designed for the roof of the bus stops in the park area. Heat island effect formed in urban areas and the water flowing amounts can be reduced by the help of green roofs. The plant species used on the green roofs were selected from the naturally grown succulent species in the region. In this context; *Saxifraga cymbalaria* var. *cymbalaria*, *Saxifraga tridactylites, Sedum steudelii*, *Sedum subulatum* and *Sempervivum armenum* var. *insigne* species were used.

Natural plant use: By means of using natural species in plantation, the amount of water consumption and maintenance costs can be reduced (Dunnett and Clayden, 2007; Wolf, 2004). Plant, species were selected by considering the natural vegetation of Ankara province. Thus, the amount of irrigation was reduced. The natural species offered for the designed park area are given in Table 3.

Table 3. Several natural plant species used in the area

Trees	Bushes	Groundcovers and Vines	
Pinus nigra	*Malva sylvestris*	*Cistus laurifolius*	*Campanula argaea*
Tamarix parviflora	*Hypericum perforatum*	*Silene compacta*	*Stipa pontica*
Acer campestre	*Rhus coriaria*	*Sedum steudelii*	*Lysimachia vulgaris*
Acer tataricum	*Rosa canina*	*Sempervivum armenum*	*Solanum luteum*
Amygdalus orientalis	*Pyracantha coccinea*	*Saxifraga tridactylites*	*Ajuga salicifolia*
Sorbus domestica	*Viburnum opulus*	*Hedera helix*	*Nepeta cataria*
Fraxinus angustifolia	*Viburnum lantana*	*Anthemis cretica*	*Thymus longicaulis*
Ulmus glabra	*Lonicera caprifolium*	*Artemisia austriaca*	*Salvia viridis*
Carpinus betulus	*Jasminum fruticans*	*Centaurea tchihatcheffii*	*Muscari comosum*
Quercus pubescens	*Ligustrum vulgare*	*Canna indica*	*Typha latifolia*
Salix alba	*Berberis crataegina*	*Iris orientalis*	*Cyperus fuscus*

Within the scope of the study, the natural and structural design components in the designed park area were examined and analyzed. After the evaluation of the analyzed data, suitability analysis studies were made for such an effective futuristic park design for Ankara Gölbaşı near Mogan Lake, shaped due to the futuristic theory of design. The suitability analysis studies combined with the theoretical background of futuristic landscape design give way to the design principles of the area. In the light of these studies, it has been concluded that:

- It is possible to realize energy and water-efficient, ecological and sustainable design approaches with futuristic landscape design concepts in order to create sustainable and creative living environments healthy.
- Futurism and its design theory which is commonly used in the field of architecture can easily be adapted to the field of landscape design and planning as it is has a comprehensive way of looking as far as the environment is concerned.
- Futuristic landscape design is a must due to the changing environmental conditions and threats.

As a result, with this research, futurism is evaluated in the frame of landscape architecture which is important to present a futuristic park design example for further practice. Futuristic landscape design examples are the pioneer practices for creating better living environments supporting the ecology due to changing lifestyles offering solutions and using the environmental resources effectively as the result of inevitable pressure coming from environmental concerns such as climate change, air quality and water resources. Futuristic landscape design emphasizes the effective use of environmental resources and sustainability as well as dynamism, technology, speed, youth and different design ideas linked with technology and science founded by nature. Futuristic landscape design evaluated all the intangible qualities of the site and establish the design decision upon sustainability and usability. Besides, combine the physical and intangible components and characteristics of a design area. Unused and abandoned areas become oases for various habitats in such unexpected urban areas sometimes in a very naturalistic, basic way and sometimes with high-tech features such as interactive light or water uses by the help of new technologies. So, futuristic landscape design benefits from technology but acting as an ecologist and living system designer.

Futuristic landscape design studies feature the future in order to gain an advantage from actual changes in designing either the rural or built urban environment.

This study is unique because it has a try on the realization of the 21st Century futurist way of looking at landscape architecture. However, these studies are still at concept stage. For example, although 'Gaon' was thought as a futuristic and sustainable application, it was not put into practice. The 'Unwind' concept also can be cited as an example of this. Some implemented practices are still not sufficient. In this context, plants that produce their own energy work with a mechanism similar to fungal biomass, but they are not capable of being used as light energy in open green areas yet. Various experiments and research studies need to be carried out for the development of these systems. Applications that emerge from a futurist perspective and can be seen as innovative and technological have high costs. On the other hand, additional services are needed to ensure the sustainability of these systems. For instance, the 'Biolamb' concept is an application used in cities and can be seen as innovative. But, the unit cost is quite high. Creating a separate service unit for this also increases additional costs. It also means constant renovations. Creating a separate service unit for this also increases additional costs. Moreover, these futuristic applications have disadvantages in case of vandalism and security. If they are damaged or stolen, they can cause serious financial damage to open green areas. It is not known for sure that the lighting element, which is intended to be recommended on the coasts or in streams and works with wave energy, will not harm the fauna or flora despite the precautions taken. Similarly, it is not known for certain whether the proposed wind trees can give harm to birds. Even though, since many of these applications proposed in a futuristic context are in the concept or trial phase, they are expected to be widely used over time such as green roofs, vertical gardens or solar energy-powered equipments and hardscape elements. As Marinetti said 'Why should we look to the past instead of entering the mysterious door of the future?'

In conclusion the future of landscape design is futurism.

Conflict of Interest Statement | Çıkar Çatışması Beyanı

There is no conflict of interest for conducting the research and/or for the preparation of the article.

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Please identify the type of contributions for each author as a statement. The contributions table identifies the type of contributions, which have been identified by the authors previously on the Publication Consent and Copyright Transfer Form.

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D. Danışmanlık / Supervision	E. Malzeme, Kaynak Sağlama / Material, Resource Supply	F. Veri Toplama, İşleme / Data Collection, Processing
G. Analiz, Yorum / Analyses, Interpretation	H. Metin Yazma / Writing Text	I. Eleştirel İnceleme / Critical Review

AUTHOR 1: A/B/D/E/H/I
AUTHOR 2: A/B/C/F/G/H

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