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Araştırma Makalesi

Effects Of Urban Parks On Urban Ecology: A Case Study On The City Of Eskisehir

Aysun TUNA

Department of Architecture, Faculty of Art Design and Architecture, Düzce University, Düzce, TURKEY
aysuntuna17@gmail.com

ABSTRACT

Fast population increase, dense housing and defective urban planning, which are the main environmental problems, cause destruction of urban ecologic balance. Urban open green area systems have substantial functions such as balancing defective relationship between humans and nature and improvement of urban living conditions. Parks are components of open green area system having vital contributions for the habitability of cities, protection of ecological environment, urban aesthetics, education and recreation. Parks have multiple functions within the urban texture and are recreation areas enabling urban relaxation and entertainment. The most extensive recreation units serving the entire city and satisfying the needs of relaxation, entertainment and social activities of individuals are defined as 'Urban Parks'. Urban parks are significant habitats affect not only human living quality but also enable protection and development of wild life.

In this research, urban park, one of the urban ecosystem services in the city local factors of urban ecology urban parks and their environmental impacts (air filtering, noise filtering, microclimate stabilization, as a green infrastructure, social and psychological services) are evaulated in the example of city of Eskisehir in Turkey.

Characteristics of urban parks, which are the living texture of cities and have various functions, are discussed and their place and significance within urban ecology are emphasized. As a result, suggestions are developed for approaching sustainability principal with the ecological foundation in order to improve urban living quality and forming more habitable cities.

***Keywords**: Urban Ecology, Urban Park, Eskisehir*

Kent Parklarının Kent Ekolojisi Üzerine Etkileri: Eskişehir Örneği

ÖZET

Çevre sorunlarının başında yer alan hızlı nüfus artışı, yoğun yapılaşma ve hatalı kent planlamaları, kentsel ekolojik dengenin bozulmasına neden olmaktadır. Kentsel açık yeşil alan sistemleri, insan ve doğa arasındaki

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bozulan ilişkiyi dengelemek ve kentsel yaşam koşullarını iyileştirmek gibi önemli işlevlere sahiptir. Kentlerin yaşanabilirliği, ekolojik çevre koruması, kent estetiği, eğitim ve rekreasyon gibi kent üzerinde önemli katkıları bulunan parklar, açık yeşil alan sisteminin bileşenleridir. Kentsel doku içinde birçok fonksiyona sahip olan parklar, kentsel dinlenme ve eğlenmeye olanak sağlayan rekreasyon alanlarıdır. Kentin tümüne hizmet veren ve bireylerin dinlenme, eğlenme ve sosyal etkinliklere katılma ihtiyacını karşılayan en kapsamlı rekreasyon birimleri 'Kent Parkları' olarak tanımlanmaktadır. Kent parkları sadece insan yaşam kalitesi üzerinde değil, yaban hayatının korunması ve geliştirilmesini sağlayan önemli habitatlardır.

Bu çalışmada kent ekolojisi servislerinden biri olan kent parkları, hava filtreleme, gürültü perdeleme, mikro iklim düzenleme, rekreasyon ve kültürel kalite, sosyal ve psikolojik etkileri Türkiye'nin Eskişehir kentinde yer alan kent parkları örnekleri üzerinden değerlendirilmiştir.

Kentin yaşayan dokusu olan, çeşitli fonksiyonlara sahip kent parklarının özellikleri irdelenerek, kent ekolojisi içinde yeri ve önemi vurgulanmıştır. Sonuç olarak kentsel yaşam kalitesinin arttırılması ve daha yaşanabilir kentler oluşturmak için sürdürülebilirlik ilkesinin ekolojik temel ile ele alınması ile ilgili öneriler geliştirilmiştir.

***Anahtar Kelimeler**: Kent Ekolojisi, Kent Parkı, Eskişehir*

I. INTRODUCTION

THE term 'Urban Ecology' can be defined in different ways. Within the natural sciences, urban ecology addresses biological patterns and associated environmental processes in urban areas, as a subdiscipline of biology and ecology. In this sense, urban ecology endeavours to analyse the relationships between plant and animal populations and their communities as well as their relationships to environmental factors including human influences. In other definition of urban ecology, complementary, definition implies the anthropocentric perspective. Here, urban ecology is understood as a multidisciplinary approach to improving living conditions for the human population in cities, referring to the ecological functions of urban habitats or ecosystems for people – and thus including aspects of social, especially planning, sciences [1].

According to report of IFPRA, urban parks are defined as delineated open space areas, mostly dominated by vegetation and water, and generally reserved for public use. Urban parks are mostly larger, but can also have the shape of smaller 'pocket parks'. Urban parks are usually locally defined as 'parks'. Parks as an urban landscape feature serve many functions as providers of passive and active recreation, environmental benefits,and wildlife habitat [2].

Urban parks and open green spaces are of a strategic importance for the urban ecology and the quality of life of our increasingly urbanized society. Increasing empirical evidence, in fact, indicates that the presence of natural assets (i.e. urban parks and forests, green belts) and components (i.e. trees, water) in urban contexts contributes to the urban ecology in many ways. Besides important environmental services such as air and water purification, wind and noise filtering, or microclimate stabilization, natural areas provide social and psychological services, which are of crucial significance for the livability of modern cities and the well being of urban dwellers [3].

The aim of this paper is to analyse some of the ecosystem generated by urban ecosystems and discuss their importance for the quality of urban life. The findings are discussed in the example of Eskisehir.

II. MATERIAL and METHOD

The main subject of the study is to define urban parks, urban ecology and factors affecting the urban ecology. Literature review and desk research have been gathered. The data obtained from literature review are evaluated in the example of the city of Eskisehir which is the main material of the study and different approaches and uncovered latest comments on the subject.

A. SITE DESCRIPTION

As a case study, the city of Eskisehir of Turkey is selected. Eskisehir is a city in northwestern Turkey and the capital of the Eskisehir Province. The population of the city is 700.281. The city is 233 km. to the west of Ankara, 330 km. to the southeast of Istanbul. The province covers an area of 2,678 km^2. The name Eskisehir literally means *Old City* in Turkish; indeed, the city was founded by the Phrygians in at least 1000 BC, although it has been estimated to be older than 4000 years old [4].

Recently, the rise in urban green space is observed in the city of Eskisehir. In the city of Eskisehir the amount of green space has increased 26% from 2009 until 2012. As of July 2012, the green area with a nominal amount per person is 9.07 square meters [5]. This rate is below the European average and is above Turkey‘s average.

Urban parks of Eskisehir are discussed in the frame of urban green spaces. Urban parks are established on a surface area of 20,000 square meters and above and among these there are Eskisehir Kent Park, Bilim Sanat Kültür Parkı, Şelale Park, Büyük Park, and Şehr-i Aşk Adası are located in the city center (Figure 1).

Figure 1. The parks of the city centers

Eskisehir Kentparkı (Eskisehir Urban park): Urban park is located on approximately 300.000 square meters of space between the intercity bus terminal and Gökmeydan Quarter**.** There are an artificial beach, two outdoor swimming pools, a half olympic-size indoor swimming pool, playgrounds, town houses, restaurants, a pond and kiosks in the park. To urban park, which has a bank to Porsuk River, boat transportation is also provided [6].

Bilim, Sanat ve Kültür Parkı (Science and Art Cultural Park): It is established on an approximately 400,000 m^2 area and it is the largest park of the city. There is a large pond where a variety of water sports and activities can be carried out. There are also restaurants, a 2000-person capacity outdoor concert venue amphitheater, the fairy-tale themed playgrounds, various sport activities related with children, playground for children with disabilities, a large planeterium (observatory) and a fairy-tale castle. Transportation in the park area is provided by German- made narrow-gauge railroad. The narrow gauge railway that transported workers between the sugar factory and Air Supply and Maintenance Center during 1950-1970 has been redesigned today and it carries visitors between 4 stations [6].

Şelale Park (Waterfalls Park): The Park has a surface area of 22.000 square meters and is located in a vantage point of urban landscape. There are an artificial waterfalls and service and activities units in the park [6].

Büyük Park (Big Park): It is a city park that has been formed by the rehabilitation of an abondened graveyard and contains large scale ponds. In Büyük Park, there is a symbolic house of Yunus Emre which is the leading historical assets of Eskisehir [6].

Şehr-i Aşk Adası (Love Island): It was founded on the island formed by the enclosure of Porsuk River. Access to the island is provided with bridge (Love Bridge). The emphasis of Yunus Emre[1]'s love for humans and the Got ist the main theme of the park [6].

III. RESULTS and DISCUSSION

The effects of the city parkst o the city ecosystem were scrutinized generally in terms of environmental factors such as air, noise filtering, balancing of micro-climate and infrastructural opportunities and in terms of social and psychological effects and Eskisehir city parks were evaluated based on the gathered findings.

A. AIR FILTERING

Air pollution caused by transportation and heating of buildings, among other things, is a major environmental and public health problem in cities. The air purification services of an urban park, characterized by lawns, ponds, paths, as well as trees and shrubs can be quantified by analyzing the air filtration capacity of the park's trees, where for example a difference can be seen between evergreen trees that filter the air all year long and trees with bigger crowns, which have an important function to filter specific pollutants. A city park can provide various benefits to urban citizens, such as reduction of harmful air pollutants and less risk of respiratory illnesses, which can be expressed in both monetary (reduced health costs) and non-monetary (increase in life expectancy) terms.

According to Svensson and Eliasson (1997), specially, vegetation reduces air pollution, but to what level seems to depend on the local situation [7]. The reduction is primarily caused by vegetation filtering pollution and particulates from the air. Trees, bushes, grassland generally vegetation have big filtering capacity and are sensitive to air pollution and especially deciduous trees are better at absorbing gases [8]. In general, vegetation is much better than water or open spaces for filtering the air [9]. The location and structure of vegetation is important for the ability to filter the air. Bernatzky (1983) reports, that up to 85% of air pollution in a park can be filtered out, and in a street with trees,

[1] Yunus Emre, who is the pioneer of Turkish poetry, Sufi mystic in Anatolia, was born and died in Eskisehir.

up to 70%. Thick vegetation may simply cause turbulence in the air while a thinner cover may let the air through and filter it [10].

The green areas of Eskisehir Metropolitan Municipality have a surface area of 1.239, 350 square meters. Approximately 56% of the green area in the city of Eskisehir is urban parks. Such an important amount of parks has a significant air filtering capacity which leads to an improvement of air quality. The total filtering service of urban parks of Eskisehir vegetation has not been estimated.

B. NOISE FILTERING

Studies have examined the effect of urban vegetation on filtering noise levels in the urban environment. Distance from source and vegetation features are the main key factors on noise level. According to Bucur (2006), the planting at a high density can cause an efficent reduction of noise levels within the urban tissue. Nevertheless, the existing literature has paid inadequate attention to the seasonal and enviromental impact of urban vegetation on noise levels [12]. Vegetation also contributes to the decrease, but at what level is uncertain. One source states that a dense shrubbery, at least 5 m wide can reduce noise levels by 2 dB(A) and that a 50-m wide plantation can lower noise levels by 3–6 dB(A) [13]. Another source claims that 100 m of dense vegetation is only reported to decrease noise by 1–2 dB(A) [9, 14].

No noise measurement studies were conducted about the areas surrounded by city parks. General noise measurements made by Eskisehir Metropolitan Municipality were considered. According to noise measurements in the City of Eskisehir , the noise levels of 30 db(A) in entertainment venues and noise levels of 11 db(A) in industrial facilities have been determined. Increasing the areas with soft ground and vegetation may decrease these noise levels. Especially planting everygreen trees was preferred for further noise reduction.

C. MICROCLIMATE STABILIZATION

The urban parks in the cities are important factor, to stabilization micro-climate of the cities. The greenhouse effect brought about by rapid urbanization due to the increase of the population is a major threat to urban ecosystems. The urban heat island effect, is caused by the large area of heat absorbing surfaces, in combination with high amounts of energy use in cities.

Urban trees can ameliorate these environmental variables by preventing solar radiation from heating the surrounding buildings and surfaces, cooling the air by evapotranspiration, and reducing wind speed [15]. Plants have a large effect on the microclimate. Trees function in urban parks as natural ‘air conditioners’, at least with regards to the microclimate of the city. The studies have examined, trees found in the urban environment prevent solar radiation from heating buildings, cool the area through their evapotranspiration, reduce wind speed and reduce the need to use air-conditioning systems [16]. However, due to the reduction of vegetation in urban areas, the problem of the thermal island is continuously increasing. Trees and green areas help to cool cities and to save energy. The evapotranspiration that results from vegetation foliage reduces the temperature in urban areas.

In city of Eskisehir the major micro-climate regulators are Sakarya River and Porsuk River, that passes through the province of Eskisehir and flows for 448 km. The city of Eskisehir is sited on the banks of these rivers. The river is dammed by the Porsuk I dam and Porsuk II dam forming large reservoirs. There is Gökçekaya Dam on Sakarya River. Because of the wetlands, the city has rich biodiversity. In terms of micro-climate stabilization, the urban park with large ponds and the urban park which was

created with the rehabilitation of a part of Porsuk River have a important role in urban ecology. However, the improvemet works of river should be continued.

C.1. As A Green Infrastructure

The urbanization causes increasing the types and amounts of pollutants into surface waters. The built-up infrastructure, with concrete and tarmac covering the ground, results in alterations of water flow compared to an equivalent rural catchment. These areas prevents the absorption of rain and snow on the ground water. Particularly in settlements where there is no or inadequate infrastructure, increasing the amount and velocity of runoff water causes flooding.

Just as growing communities need to upgrade and expand their built infrastructure of roads, sewers, and utilities, they also need to upgrade and expand their green infrastructure, the interconnected system of green spaces that conserves natural ecosystem values and functions, sustains clear air and water, and provides a wide array of benefits to people and wildlife. Green infrastructure is a community's natural life support system, the ecological framework needed for environmental and economic sustainability [17].

In their role as green infrastructure, parks and open space are a community necessity. By planning and managing urban parks as parts of an interconnected green space system, cities can reduce flood control and stormwater management costs. Parks can also protect biological diversity and preserve essential ecological functions while serving as a place for recreation and civic engagement. They can even help shape urban form and reduce opposition to development, especially when planned in concert with other open spaces [18].

An urban park as a green infrastructure systems help protect and restore naturally functioning ecosystems and provide a framework for future development. In doing so, they provide a diversity of ecological, social, and economic functions and benefits: enriched habitat and biodiversity; maintenance of natural landscape processes; cleaner air and water; increased recreational opportunities; improved health; and better connection to nature and sense of place. Wellplanned with green infrastructure system an urban park has also been shown to increase property values and decrease the costs.

In the city of Eskisehir, in the scope of water resources management, sewage and rainwater harvesting systems are separated. Sewage type realization rate is 93%, and waste water collected from the town center is purified in wastewater treatment plants. The treated water is discharged to Porsuk River. Waste water-recycling is not possible [19].

An inventory of parks, gardens and organic waste has been prepared. It was determined that an average of 0.85 kg of household waste per person was generated that the amount of organic waste was 567. In the studies conducted on the characterization of the amount of organic waste, it was determined to be considerably high [19].

In the examination of Eskisehir city parks, it was observed that there are no infrastructure problems. On the other hand, it was seen that green infrastructure studies have not been conducted yet however especially the city parks have a substantial potential.

C.2. As Social and Psychological Services

A city is a stressful environment for its citizens. The overall speed and number of impressions cause hectic lifestyles with little room for rest and contemplation [9]. Urban parks that have more recreational possibilities (play, raste, sport activities etc.) of urban ecology and provide aesthetic and cultural values to the city.

The urban green spaces can increase the physical and psychological wellbeing of urban citizens. Certainly, improvements in air quality due to vegetation have a positive impact on physical health with such obvious benefits as decrease in respiratory illnesses. The connection between people and nature is important for everyday enjoyment, work productivity and general mental health [19].

The urban parks with indirect health effects by providing arenas and opportunities for physical activity can be defined as a social and psychological services of the cities.

There are any studies about social or psychological effects of urban parks of the city of Eskisehir. But, according to CNBC-e Business‘s study the category of urban life, the city of Eskisehir is the one of the most livable cities in Turkey [20]. It can be stated that an increase in green areas increase every year leads to this result and the improvement of city quality.

IV. CONCLUSION

Urban parks have many functions and benefits for the city life. These functions and benefits are important for improve life quality in the urban areas. This research presents the findings of a major literature review relating to benefits of urban parks for urban ecology. The environmental benefits of urban parks:

- Urban parks improve air quality and cover also filters out other particles and dust in the air.
- Urban parks provide flora and fauna, diverse habitat for mainly common bird and animal species and support biodiversity conservation.
- Urban parks also improve the climate, reduce the heat island effect, cover raises humidity levels and help to improve micro-climate of urban areas where climate is warmer than their surroundings due to dense built environment.
- Urban parks act as ecological corridors between urban, per urban and rural areas. Daytime temperature in large parks was found to be 2-3°C lower than the surrounding streets.
- Urban parks can reduce noise pollution and absorb the noise generated by human activities, especially trees act like noise barrier.
- Urban parks control water regime and reduce runoff, hence helps to prevent water floods by absorbing excess water. The risk of flooding is lower where there are plenty of urban parks to intercept and absorb storm water, can be summarized.

The social and psychological benefits are as follows:

- Urban parks provide environments for walking, sports and other recreational activities
- Urban parks play a role in providing places for social interaction. Social aspects such as social cohesion are associated with an overall sense of wellbeing for certain sections of society who may feel excluded for one reason or another.

- Physical exercise in urban parks is generally positively associated with promoting wellbeing and upturn from stress. Being able to view urban parks also seems to have positive effects, especially on stress reduction.
- Health benefits and social benefits may be linked when people participate in communal or group activities in urban parks.

Contributions of city parks that are designed according to ecological principles to city ecology were indicated. When the examples that were examined in the study scope were evaluated, it was observed that city parks in Eskisehir city increased every year and that there were positive effects of this increase on urban quality. On the other hand, it was determined that researches on the significance of city parks in terms of habitat and ecology were insufficient. Furthermore, when the contributions of city parks to the biological diversity were evaluated; it was found that green area increasing aplications were evaluated to increase the number of trees and to use ornamental plants for decoration. At this point, ‚biological diversity' concept is realted with cityscape. In this context, it is necessary that measures supporting city ecology are taken in the local administration strategic plans. In this context, it is required that;

- City parks and other public open areas are founded as nature-oriented,
- Improvement of biological diversity as a primary target is aimed,
- Natural reserve areas are protected and developed,
- Biotopes are preserved and green corridors are formed,
- Access and development of city parks are supported,
- Green infrastructure opportunities in city parks are developed,
- Public awareness is improved in the scope of city ecology matter.

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