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RESEARCH NOTE

Examining the Ecological Quality of Küçükçekmece District Parks in Istanbul in Terms of Permeability and Natural Vegetation

Yıldız AKSOY

University of Bahcesehir, Faculty of Architecture, 34353, Besiktas-Istanbul-TÜRKİYE

Corresponding author: yaksoy@bahcesehir.edu.tr

Abstract

Küçükçekmece, is one of the important districts to define the city of Istanbul at the international level with its historical, cultural, and natural values. In this study, the parks in Küçükçekmece District were examined in terms of ecological quality, principles, and standards. Ecological quality is a composite of the structural and functional features determining the habitat values of a landscape. An objective evaluation on the ecological quality of parks is important from the point of rehabilitation from an existing situation, and providing areas which will have high habitat value in the future. Recovery in the existing park area will generate a livable urban atmosphere. In line with this basic comprehension, the ecological quality of the parks in Istanbul's Küçükçekmece District was examined. There are four principles determining ecological quality of an area: vegetative production, water, permeability (soil), and natural vegetation cover (biological diversity). This research was done in two phases regarding the permeability and natural vegetation cover using ecological quality principles.

In the first phase of the study, a vegetation list was provided by the Park and Garden Department of the Küçükçekmece Municipality. The park names and size were acquired from the "Küçükçekmece District green corridor Transformation Project". The space where the soil surface is covered by soil material, or is suppressed because of overuse and can not sustain plant growth is accepted as an impermeable soil surface. Whether there is a relation between park areas and permeable surface areas was examined using the Spearman correlation test. Whether permeability ratio of parks changes according to their location was analyzed using the Chi-Square test.

In the second stage of the study, the existing vegetation cover was analyzed on-site. Existing vegetation cover analysis is made according to trees, shrubs, bushes, flowers, and trailings.

Findings of, this study show that the average permeability ratio is 35.19% and the naturality ratio is 52% in the 63 parks under examination. This study shows that the permeable land surfaces of the parks remain incapable of sustaining vegetative growth and therefore the habitat values of the park areas, which can have an economic, social and ecologic contribution to the urban environment, will reduce.

Result of this study will contribute to the sampling used for the ecological quality principles in other parks in other districts. The study reveals the importance of the ecological quality factors that need to be taken into consideration in the design and planning of parks.

Keywords: Ecological quality, vegetation, permeability, Küçükçekmece, parks.

İstanbul İli Küçükçekmece İlçesi Parklarında Ekolojik Kalitenin Geçirgenlik ve Doğal Vejetasyon Açısından İrdelenmesi

Özet

Küçükçekmece; sahip olduğu tarihi, kültürel ve doğal değerleri ile İstanbul'un Uluslararası düzeyde kimliğini belirleyen önemli ilçelerinden biridir. Bu araştırmada Küçükçekmece ilçesinde mevcut olan parkların ekolojik kalite ilkeleri açısından irdelenmesi yapılmıştır. Ekolojik kalite, bir peyzajın habitat değerlerini belirleyen strüktürel ve fonksiyonel özelliklerinin bileşkesidir. Parkların ekolojik kalitelerinin objektif bir değerlendirilmesinin yapılması mevcut durumun iyileştirilmesi ve gelecekte kent ortamına habitat değeri yüksek olan alanların kazandırılması açısından önemlidir. Mevcut park alanlarında yapılacak iyileştirmeler yaşanabilir bir kent ortamı oluşturacaktır. Bu temel anlayış doğrultusunda Küçükçekmece İlçesi parklarında ekolojik kalitenin irdelenmesi yapılmıştır. Bir alanın ekolojik kalitesini belirleyen dört ilke vardır. Bitkisel Üretim, su, geçirgenlik (toprak) ve doğal vejetasyon örtüsü (biyolojik çeşitlilik). Bu araştırma ekolojik kalite ilkelerinden geçirgenlik ve doğal vejetasyon örtüsü dikkate alınarak iki aşamada yapılmıştır. Araştırmanın birinci aşamasında Küçükçekmece Belediyesi Park ve Bahçeler Müdürlüğünden bitki listesi temin edilmiştir. Park isimleri ve parkların alanları "Küçükçekmece İlçesi Yeşil Koridor Dönüşüm Projesinden" elde edilmiştir. Toprak yüzeyinin zemin malzemesi ile kaplandığı veya aşırı kullanımdan dolayı toprağın sıkıştırıldığı ve bitki yetişmesine olanak veremediği yerler geçirimsiz toprak yüzeyi olarak kabul edilmiştir. Park alanları ile geçirimli yüzey alanları arasında bir ilişkinin olup olmadığı

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Spearman Korelasyon testi ile irdelenmiştir. Parkların geçirimlilik oranının parkların bulundukları mevkiiye göre değişip değişmediğide Pearson Chi-Square testi kullanılarak analiz edilmiştir. Araştırmanın ikinci aşamasında 63 parkta mevcut olan bitki örtüsü yerinde incelenmiştir. Mevcut bitki örtüsü analizi ağaç, ağaççıklar, çalılar, çiçekler ve yerörtücüler olarak yapılmıştır. Araştırmanın sonunda incelenen 63 parkta ortalama geçirimlilik oranının %35,19 ve doğallık oranının ise %52 olduğu ortaya çıkmıştır. Bu araştırma aynı zamanda parkların geçirimli toprak yüzeylerinin yetersiz kaldığını ve bundan dolayı kent ortamına ekonomik, sosyal, ekolojik katkısı olan park alanlarının habitat değerlerinin düşebileceği sonucunu ortaya koymaktadır. Araştırma sonucu diğer ilçelerde parklarla ilgili çalışmalarda ekolojik kalite ilkelerinin kullanımına yönelik somut bir örnek olacaktır. Araştırma parkların tasarımı ve planlamasında ekolojik kalite faktörlerinin dikkate alınması gerektiğinin önemini ortaya koymaktadır.
Anahtar Kelimeler: Ekolojik kalite, bitki örtüsü, geçirgenlik, Küçükçekmece, parklar

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INTRODUCTION

Parks mean many things to many people. Parks are viewed as spaces where a spectrum of recreational and leisure activities can be pursued, from active endeavors such as baseball and soccer to passive activities such as walking, picnicking, and relaxing. Parks are also seen as places or landscapes that by design or happenstance provide people with unique experiences as a result of the natural and cultural features present and the social communities that gravitate to them (Gobster 2001).

Parks offer recreational opportunities which will relieve the pressures of the urban environment by composing a livable environment with their social, economic, and ecological functions (Chiesure 2004).

Parks are of strategic importance for quality of life in a rapid urbanized society. Increasing empirical evidence, in fact, indicates that the presence of natural assets and components in urban contexts contributes to the urban-environmental quality in many regards. Besides important environmental benefits, such as air and water purification, wind and noise filtering, or stabilization of local climate conditions, the sustainability of natural areas provide for social, cultural, and psychological facilities, which are of crucial significance for the livability of modern cities and the well being of urban dwellers.

Parks are spaces where different classes of people, such as different social-cultural, educational, and economic classes, socialize with nature by coming together (Thompson 2002).

Parks can also be seen as a domain of active experience. They provide a sense of challenge, privacy and intimacy, and an aesthetic and historical continuity. Besides the social and psychological benefits mentioned above, the functions of urban nature can provide economic benefits for both municipalities and citizens. Air purification by trees, for example, can lead to reduced, and also presentable costs for air pollution. Furthermore, aesthetic, historical, and recreational values of urban parks increase the attractiveness of the city and promote it as a tourist destination, thus generating employment and revenues. Also, natural elements such as trees or water increase property and home values and prices, and therefore tax revenues as well (Chiesure 2004).

Parks as public spaces for meeting the local community is also where people can socialize. The qualitie of wooded parkland is desired because of their natural, intimate, and malleable qualities and yet are also feared because of this element of freedom and wilderness, which imply lack of control (Thompson 2002).

Climate control, soil, and water resource purification, the distribution of biological diversity is the major ecological functions of the parks. Also, parks become important shelters for wilderness when they are designed and planned correctly (Eşbah 2006).

Although the advantages of social, economical, physical, and ecological functions of parks are known by municipalities, many problems in the parks, about the process of planning, designing, implementation, conservation, and maintenance programs have been seen.

Parks are spaces which are affected directly from the budget constraints of the local government. Lack of budget causes the failure of management, rehabilitation, and maintenance programs of parks, and has lead to visual pollution. Disregarding these negative effects, the design and planning of the parks

has greatly reduced the contribution of the park to the urban living space.

Evaluating the ecological quality of parks objectively is important from the point of recovering the existing situation and bringing open spaces which have a high habitat value (Eşbah 2006).

MATERIAL AND METHOD

Material

Park areas have an urban importance due to the desire to create urban green areas, from the point of providing balanced land use between green areas and a built-up environment as well as their being common use areas which have a great social role (Emür and Onsekiz 2007).

From the viewpoint of urban planning, parks are green area equipment and they can be classed as spatial or functional according to the settlements surrounding them. Park areas change according to their type, their content, their size, the serviced population size, their physical features, and the natural features of the surrounding settlements (Ersoy 1994).

Parks in Küçükçekmece District are categorized as mobile, small, neighborhood, district, and urban parks with respect to their size (Aksoy 2001).

(0-5000) m^2 mobile parks
(5001-20000) m^2 small parks
(20001-50000) m^2 neighborhood parks
(50001-250000) m^2 district parks
>250000 m^2 urban parks

In 2008, the Küçükçekmece District had 82 parks. The material of this study is the park areas in the Küçükçekmece District. Landscape projects prepared by AutoCAD and the lists which specify the amount of green areas were obtained from the Park and Garden Department of the Küçükçekmece District and are used together with the field surveys. Correctness of park surface areas is provided by using the Arc-GIS 9.2 program (Fig. 1).

The areas of parks under examination change between 258 m^2 and 476027 m^2. According to the classification created by Aksoy (2001), the examined parks are classified in classes of 40 mobile (cell) parks, 13 small parks, 2 neighborhood parks, 7 district parks and 1 urban park. In the parks of the Küçükçekmece District, there are 59 children's playgrounds, 4 buffets, 10 cafeterias, 17 basketball courts, 3 football pitches, 2 volleyball courts, and 3 tennis courts. For parks which provide buffet and cafeterias, maintenance responsibility belongs to the owners of said enterprises. Since there is no regular control of parks under the responsibility of enterprises by municipalities, a ranking view is encountered in the generality of all.

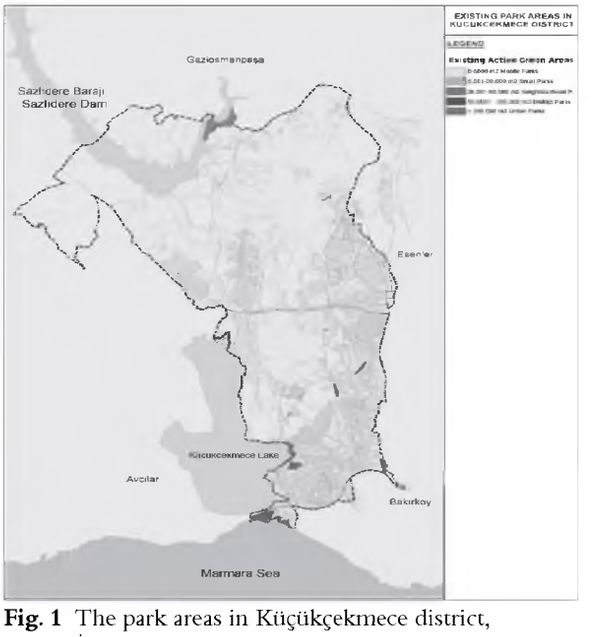

Fig. 1 The park areas in Küçükçekmece district, İstanbul.

Within the context of the "Küçükçekmece District Green Corridor Project", the quality of the parks was qualitatively estimated by examining them according to location, condition, equipment condition, and function of the parks. Equipment component sufficiency, maintenance, and quality of the parks were determined as in good, average, and bad quality, as a consequence of subjective observations.

When the distribution of the existing 63 parks are reached according to quality, it is seen that 17 parks are in good quality, 23 parks are in medium quality and 23 parks are in bad quality. Bad design, planning, and the lack of aesthetics and functionality of materials used results in ineffective social, economic, physical, and ecologic functions that bring livable conditions to cities.

Existing park conditions need to be examined in order to raise the maximum level of advantages that will help the formation of prudential, sustainable, and livable spaces.

Method

This study attempts to examine parks in the Kücükçekmece District according to the ecological quality criteria by using the Spearman correlation

test and the Chi-square test.

The main characteristics of the landscape elements include size and type, vegetative structure and diversity, and naturalness (Cook 2002).

Case study areas content analysis incorporates four basic variables:

Patch size and type

Vegetative structure and diversity

Patch context and

Patch naturalness.

Each variable has several sub-variables or attributes that are used to describe and assess patch characteristics (Cook 2002).

Patch size and type have been shown to affect the interactions of wildlife and affect ecological value (Cook 2002).

The size of patches also affects their viability and ecological value. Large patches are more valuable because they support large persistent populations. Thus, there is a relationship between patch area and wildlife abundance, persistence, and diversity (Cook 2002).

The ecological quality is a composition of the spatial and functional characteristics determining the condition-health of a landscape or ecosystem.

- Vegetal production
- Water (irrigation opportunities, sources) potentials
- Biological diversity
- Location and its environment
- Climate condition (wind)
- Planning- design problems
- Soil profile

Productivity, as an indicator of ecological integrity, should be at near natural levels as an average for a landscape. This means it should be sustained at a level not far from that which would prevail if the landscape had a native ecosystems. Specific elements that could be measured include biomass, animal or secondary production, length of food chains, herbivory, and decomposition. Biodiversity is represented by a number of native species for each major group. The condition should be relatively few extirpated species and measurements could include assessment of community types, keystone species, rare species, and genetic diversity. Soil is best measured by the amount of soil erosion, compaction, or the amount of area sealed by paving. Measures could include soil moisture, runoff of minerals and nutrients, and toxic materials in the soils.

Water can be assessed by quality and quantity. Quality indicators include measures of turbidity, nutrient status, and fish populations. Water quantity is best measured through indicators such as the ability to accommodate floods, low flow events, evapotranspiration, water tables, stream flow, and aquifer recharge (Cook 2002).

More objective comments can be done about ecological quality in an area, by taking into consideration one or a few of the factors determining ecological quality such as vegetative production, water potential, biological diversity, and soil productivity (Cook 2002).

When "water criteria" is taken into consideration, in order to be able to determine ecologic quality, it should be approached with regard to both qualitative and quantitative neutrality values, pollution, and consistency of minerals. "Water criteria" is quite easy to use in such urban areas close to sea or lakes, etc. Biologic variation may be one of the most widespread criteria's used to measure the ecologic quality. Reaching a level of biologic variation that is close to natural level can be done by using natural species as much as possible. While examining biological variation, natural factors play an important role instead of the richness provided by every sort of plant (Shaw et al. 1998).

Another category by which ecological quality can easily be measured is soil. Factors like the amount of erosion, condition of the minerals, and salinity give concrete information about the land quality. In addition to these, it can be said that the permeability or coating level of soil surfaces in urban areas is the most common criteria which landscape architects may refer to. The park which has high habitat value because of its high permeability will have high ecological value as well.

In urban land use, there is a wide gap between "human and land relations" and environment (land) and that can be difficult to summarize numerically. Moreover, not only the type, but also the densities and the land use patterns within the watershed are likely to determine its impact on the biological community of the stream. In previous studies, several different measures have been used to characterize the degree of urbanization and its relation to stream biota and their habitat. Biological diversity and integrity have been shown to be negatively correlated with the percentage of urban

land surface. However, Wang et al. (1997) did not find a strong correlation between a stream habitat for fish and the percentage of urban land cover within either the entire watershed or the riparian corridor.

Determining the ecological quality of parks existing in the Küçükçekmece District can be made in two different phases and also by taking into consideration the two different ecologic quality criteria.

In the first stage of the research, data regarding green areas and the amount of impermeable soil surface was acquired from the local. The cases where the soil surface is covered by certain covering material or suppressed by constant interference, until a condition that it is impossible for growing of plants, are evaluated as impermeable soil surfaces. Of each analyzed park, the ratio of green space amount to the total park area gives the soil permeability ratio of that park. Whether there is a relation between park areas and permeable surface areas was examined with the Spearman correlation test. Whether permeability ratio of parks changes according to their location was analyzed by using the Chi-Square test.

It is assumed that the higher the permeable surface ratio in a park, the higher the ecological quality. Because, as the permeability ratio is higher, it means that the park enables more biological activity, material, and energy. The opposite situations shows a low ecologic quality and these kinds of areas have less ecological benefits both for the wildlife and the city.

In the second stage of the research, existing vegetation cover is examined by an area analysis of the parks. In the research, the analysis of vegetation cover is limited to only trees and bushes. Creepers, tailings, seasonal flowers, and grass categories are not determined. If a park contains natural vegetation cover, it means that the park is in harmony with its environment ecologically, consequently the naturalness value of vegetation determines the ecological quality.

An inventory for every park in the Küçükçekmece District was prepared. The criteria applied by Livingston et al. (2003) such as structural diversity and seasonal diversity of vegetation cover were taken into consideration.

RESULTS

The soil permeability ratio

The permeability surface average of the examined 63 parks is 35.19 % (Table 1).

The parks such as Merkez Park and Güvercintepe Park have the highest permeability ratio with 60%, and the 508 Block Park as the park having the lowest ratio with 16%. The permeable surface ratio is only 50% and over 50% at the other 5 parks. In other words, green areas in these parks are equal to or greater than the amount of impermeable soil.

The permeability is between 40-60 % in 17 parks, 20-40 % in 42 parks and 16-20 % in 4 parks. Because of low permeable surfaces, the ecological and social advantages of the parks will also be low in the 508 Block Park (16%) and the G-7 park (18%).

During the research, a correlation test was applied to determine whether there is a relation between the park areas and the permeable surface areas (Table 2).

The result of the Spearman correlation test shows that there is a meaningful relation between the total park areas and the permeable surfaces that they contain. (s=,960).

Küçükçekmece District Parks are located in the Küçükçekmece Halkalı, İkitelli, and Sefakoy regions. Whether the permeability ratio of parks changes according to their location was analyzed by using the Pearson Chi-square test (Table 3).

According to the Pearson Chi-square test, the permeability in the parks changes according to the location of the parks. The permeability ratio of the parks in the Halkalı center is higher, and the permeability ratio of Küçükçekmece Region parks where people with lower incomes and education levels live, is a little bit lower (p=0,682) (Table 3).

The condition of vegetation cover

In the 63 examined parks 37 species of tree and bush groups were found. The distribution of these species was 16 tree (43%) and 21 (57%) bush species. The distribution of these species is given in tables 4 and 5 in accordance with their evergreen and non-evergreen conditions.

In order to examine the ecological quality of the parks in the Küçükçekmece District, on-site work was accomplished and discovered 153270 plants (Table 6).

Of the 4725 plants (3%) are trees and 148545 (97%) of them are bushes. The areas covered by seasonal flowers and trailing were not considered,

Table 1. The naturality and permeability ratio in the parks.

	N	Minimum	Maximum	Mean	Std. Deviation
Naturality ratio	63	33	77	52,00	9,342
Permeability ratio	63	16	60	35,19	9,421

Table 2. The relationship between park areas and permeable surface areas.

			Total Area meter=(m²)	Permeable surface meter=(m²)
Spearman's rho	Total Area M²	Correlation Coefficient	1,000	,960(**)
		Sig. (2-tailed)	.	,000
		N	63	63
	Permeable surface M²	Correlation Coefficient	,960(**)	1,000
		Sig. (2-tailed)	,000	.
		N	63	63

** Correlation is significant at the 0.01 level (2-tailed).

Table 3. The relation between location of the parks and permeable surface amounts.

Location	Chi-Square (a,b)	df	Asymp.Sig (2-sided).
Sefakoy*	8,615	17	,952
Küçükçekmece**	5,692	8	,682
Halkalı***	,000	11	1,000
Ikitelli****	1,364	7	,987

* a 26 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,0.
b 18 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,4.
** a 9 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,4.
b 13 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,1.
*** a 12 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,0.
**** a 11 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,0.
b 8 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 1,4.

Table 4. The distribution of tree species in the parks.

	Species	
Species name	Evergreen	Non-evergreen
Cercis siliquastrum L.	-	+
Albizzia julibrissin Durazz.	-	+
Betula pendula Roth.	-	+
Tilia tomentosa L.	-	+
Picea pungens Engelm.	+	-
X Cupressocyparis leylandii (Jackson et Dallimore) Dallimore	+	-
Cupressus macrocarpa Hartweg	+	-
Magnolia grandiflora L.	+	-
Magnolia grandiflora "lanccolata" L.	+	
Cedrus atlantica (Endl.) Carr.	+	-
Biota orientalis Endl.	+	-
Quercus ilex L.	+	-
Chamaerops humulis	+	-
Liquidambar orientalis L.	-	+
Sophora davidii Linnaeus	-	+
Lagestroemia indica (L.) Pers	-	+
Total number	9	7

Table 5. The distribution of bush species in the parks.

	Species	
Species name	Evergreen	Non-evergreen
Abelia grandiflora	+	-
Photinia serrulata	+	-
Juniperus sabina	+	-
Pyracantha coccinea	-	+
Berberis thunbergii atropurpurea	-	+
Cotoneaster horizantalis	-	+
Laurus nobilis L.	+	-
Yucca gloriosa	+	-
Callistemon citrinus	-	+
Alcea rosea L.	-	+
Lonicera nitida	+	-
Hibiscus syriacus L.	-	+
Ilex aquifolium	+	-
Spiraea japonica	-	+
Cydonia oblonga Mill.	-	+
Viburnum tinus	+	-
Cornus mas L.	-	+
Lavandula dentate L.	+	-
Syringa vulgaris Mill.	-	+
Ligustrum ovalifolium	-	+
Nandina domestica	+	-
Total number	10	11

Table 6. The distribution of plants as number in the parks.

Species	Plant (number)	Evergreen Species (number)	Non-evergreen species (number)
Tree	4725	2800	1925
Bush	148545	97030	51515
Total number	153270	99830	53440

since it is not possible to count flowers and trailings in numbers. The area covered by these kinds of plants is about 12% .

The evergreen plant number is 1.5 times more than non-evergreen plants in the Küçükçekmece District Parks.

Structural diversity reflects the existence of 4 different plant forms like tree, shrub, bush, and trailing in a certain areas. Structural diversity increases habitat value of an area, since vegetation of different heights will serve different animal groups. According to the findings acquired from the study, the structural diversity value is 4.12 on the average in the Küçükçekmece Parks. When it is considered that the structural diversity value should be 4, it is seen that structural diversity on the planting pattern is at the very highest level.

A Spearman correlation analysis shows that the total vegetation of the parks increases in a quite meaningful way when total area of the parks increases (Tables 7, 8, 9).

DISCUSSION

Objective comments can be made about the ecological quality in the parks of the Küçükçekmece District by taking into consideration that permeability (soil) and natural vegetation (biological

Table 7. The relation between park area and total plant number.

			Total Area metre=(m²)	Total Plant number
Spearman's rho	Total area M²	Correlation Coefficient	1,000	,852(**)
		Sig. (2-tailed)	.	,000
		N	63	63
	Total Plant number	Correlation Coefficient	,852(**)	1,000
		Sig. (2-tailed)	,000	.
		N	63	63

** Correlation is significant at the 0.01 level (2-tailed).

Table 8. The relation between park area and total tree number.

			Total Area metre=(m²)	Total Tree Number
Spearman's rho	Total area M²	Correlation Coefficient	1,000	,589(**)
		Sig. (2-tailed)	.	,000
		N	63	63
	Total Tree Number	Correlation Coefficient	,589(**)	1,000
		Sig. (2-tailed)	,000	.
		N	63	63

** Correlation is significant at the 0.01 level (2-tailed).

Table 9. The relation between park area and total bush number.

			Total Area metre=(m²)	Total Bush Number
Spearman's rho	Total area M²	Correlation Coefficient	1,000	,848(**)
		Sig. (2-tailed)	.	,000
		N	63	63
	Total Bush Number	Correlation Coefficient	,848(**)	1,000
		Sig. (2-tailed)	,000	.
		N	63	63

** Correlation is significant at the 0.01 level (2-tailed).

diversity) form ecological quality. The average permeability ratio of the examined parks is 35.19 % (in other words, the ratio of impermeable concreted area is more than half the park) city dwellers who come to these parks to be with nature and blow off daily steam, will have less benefit from the social and ecological advantages of the parks and less psychological satisfaction, as mentioned by Thompson (2002).

The easiest measurable principle of ecological quality is the permeability principle. The factors like erosion level, condition of the minerals, and salinity give concrete information about land quality. The permeability level of the soil surface in the urban atmosphere is the most important principle which needs to be considered for park designs. When Kucukcekme District Parks are researched according to the permeability principle, the result is considerably thought provoking from the point of impermeable surfaces.

The negative effects of the surrounding landscape by increasing the amount of impermeable surfaces are clearly expressed in literature (Paul and Meyer 2001, Wang et al. 2001). Therefore, a condition occurs where, the parks' ecological contribution to the urban ecosystems is decreased. In this situation, during the process of park designing, design should go further than just being some elegant shapes on paper and should accommodate design accuracy where surfaces are decreased to a minimum. Another point that should be taken into consideration is community education about the usage of the park and the green areas (Gobster 1998).

The areas of the 63 parks in the Küçükçekmece District are between 258 m^2 and 476027 m^2. Throughout Küçükçekmece, parks having greater surface areas are needed in terms of their social and ecological aspects. Many park areas are way under the amount indicated by Westmacott (1991) and they are not large-scale enough to be wilderness habitats. Despite the fact that the results show a meaningful relation between the total area of the parks and permeable surface amount, for these kinds of open spaces, having larger possible areas means that they can accommodate more animal and plant species. Thus, the results show that there is a linear relation between park areas and plant numbers when it is combined with vegetation data. This verifies that big areas accommodate more species considering the island bio-geography of Meffe and Carroll (1997).

Data about the vegetation condition shows that the plants used in the parks, the ratio of evergreen and non-evergreen is half-and-half species based. As for the number based total, evergreens are twice as numerous. This result is natural, because in the parks, creating a greener pattern is generally a desired situation. The data shows that trailings are not given enough place in the Küçükçekmece Parks. The biggest reason of this is the use of grass as trailing material. In addition to the increased workmanship, water and time increase expenditure of maintenance that this application requires, it is also inconvenient ecologically. Pavement materials, which are well-matched for the ecological conditions of Küçükçekmece District, need to be researched and evaluated.

Getting high results for structural diversity in the parks is pleasing. In this research, there is a focus on whether different forms exist however, it was not examined, about whether they are sufficient in number or is there a balance between them. By correcting this deficiency in future studies, more realistic comments can be made on this subject. Planting inappropriate grounds, which is established in Kelkit's (2002) and Esbah's (2006) studies, is a widespread problem in our country, and is one which is also seen in Küçükçekmece District Parks.

Municipalities in European countries and the U.S.A. use regulations corresponding to their location for the usage of natural vegetation cover species in city-wide areas. To implement the same approach in the Küçükçekmece District, research should primarily be started on the selection of appropriate species and strategies should be improved for usage of plants on the list which are recommended. (Livingston and et al. 2003).

This examination of Küçükçekmece District Parks with the ecological quality criteria, gives the result that parks are not sufficient in this area. Not using enough green areas and natural plant species especially causes a decrease in the habitat value of these kinds of areas. Due to the fact that, the area size of mobile and small parks are insufficient, an ecosystem which would be able to diversify can not be created.

It is seen throughout the examined parks that the natural species of Istanbul or species which are convenient to range in the Istanbul region is preferred.

The esthetic effect has become superior with usage of tree, shrub, and bush species. Thus, it allows living components to receive a benefit from every stage of the usage area.

Paying attention to design principles for landscape design and planting design of the parks will provide good works and the great efforts of the municipality will generate the appreciation that they deserve. Although this research creates some questions, it is obvious that this subject will lead the way to green spaces works in the other districts of Istanbul.

The general result of this study is that there is a need to improve the criteria which allows the usage of plants by municipalities and brings some standards of park design principles from the viewpoint of covered surface amounts.

In Turkey, a 7 m^2 green area is standard per person which is legislated based on the 1985 Construction Law 3194 and standards given by regulations with respect to its changes were effective from 1957 to 1997. Dated 9 May 1985 and 18749 numbered official gazette. The 10 m^2 active green area standard per person was approved with changes of the Regulations dated 1985, dated 2 September 1999 and 23804 numbered official gazette. The parks in Küçükçekmece District need to be revised according to the green area standards. After this revision, the rehabilitation of green areas should become an obligation that reflects the decisions taken over green areas.

The existence of green areas in the Küçükçekmece District has not been designed and planned according to the population or the norms related to the green area needs. This shows that rather than being part of a system, existing green areas are distributed unbalanced. In cities of the European Union that have been planned depending upon spatial functional strategies focused on sustainable urban development, a figure of 30-50 m^2/per capita of green areas has been proposed for urban settlements with a population between 30.000-50.000 (Ersoy 1994).

As for Turkey, the 10 m^2 of active green areas per capita proposed by the Ministry Under Construction Law number 3194 and the 5.4 m^2 of actual active green areas per capita in Küçükçekmece District are far from being sufficient.

In conclusion, an effective planning model must be developed to arrange for the use of the open air green areas. This model should be created in accordance with urban planning, urban design and landscape architectural principles.

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