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An Evaluation of Distribution and Quantity of Parks in Istanbul

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1. Introduction

Some researchers have pointed out that the availability of accessible and attractive green areas is an integral part of the urban quality of life (Herzele and Wiedmann, 2003). Others maintain that the provision of green areas improves the urban environment, contributes to public health, increases the quality of life and provides amenities to residents in the form of recreational benefits (Wu and Plantinga, 2003). For instance, green areas can sequester carbon dioxide emissions and produce oxygen (Jo, 2002); purify air and water, regulate micro climate, reduce noise (Bolund and Hunhammer, 1999); (Hanamaen et al., 2003); protect soil and water (Pauleit and Duhmer, 2000); absorb rainwater and pollutants (Connine et al., 2004) and mitigate urban heat island effect (Rudie and Dewers, 1984; Stanners and Bourdeau 1995; Simpson and McPherson 1996; Bonan, 2000).

Some have pointed out that the benefits of parks are not just environmental but also recreational, aesthetic and emotional (Kaplan and Kaplan, 1989; Savard et al., 2000); (Ong, 2003); (Gobster and Westphal, 2004; Jim, 2006a). Furthermore, public parks can have a statistically significant effect on the sale price of nearby houses (Benson et al., 1998; Tyrvainen, 1997). Most Istanbul residents generally view parks as recreational areas and the paucity of these areas have led to the severe overcrowding of available green areas on weekends and holidays (Aksoy, 2011).

Linking the quantified and spatially explicit urban green area pattern with an economic model, such as the hedonic price model combined with property characters can help clarify the relationship between green areas and economic values (Geoghegan, 2002; Morancho, 2003). In the future, it is expected that the social and spatial implications of new lifestyles, values, attitudes to nature and sustainability will even lead to higher demands for urban green area (Thompson, 2002). This situation has also been observed in Istanbul as residents have begun to demand more green areas and parks set aside for their use.

Although intrusion into forests is officially forbidden, developers enticed by high profit have often succeeded in obtaining needed permits and most of those who have moved to the periphery are in search of green and tranquil places of residence despite the high cost of living (Dokmeci and Berkoz, 2000).

Residential invasion of green areas in the periphery of the cities is not only a phenomenon in Istanbul as it has also occurred in other countries. In the US, suburban expansion is converting forests, agricultural land, and wetlands into built environments beyond the edges of urbanized areas at an alarming and increasing pace (Gillham, 2002; Robinson et al., 2005). In addition, Canada (Rothblatt, 1994) and the United Kingdom also suffer from the loss of forests, agricultural lands, and green areas to urban expansion.

Rapid urbanization, together with an increase in leisure time, has resulted in the public's greater awareness regarding the amount and quality of nearby green areas (Shultz and King, 2001; Geoghegan et al., 1997). In order to deal with the problems of urban expansion and to answer the recreational, hygienic and aesthetic needs of people, the preservation and development of green areas are central issues (Turner, 2005). Several studies have investigated access to park and recreational facilities in the fields of planning, geography and leisure studies (Gobster, 1995; Talen and Anselin, 1998). (Cho and Choi's paper 2005) was based on the investigation of equity of public parks distribution by using GIS method. (Li et al., 2005) propose a comprehensive concept for planning urban green areas based on ecological principles and its implication is illustrated in Beijing, China and (Jim and Chen 2003) in Nanjing city, China. The increasing number of studies on green areas in China illustrate that fast economic and social changes in recent years have brought massive expansion, redevelopment and restructuring of cities and these changes offer cities the opportunity to improve environmental quality through urban green areas.

Comprehensive planning of park areas in cities is required to improve our ability to relate land use patterns to environmental characteristics. This is essential for understanding urban green area systems and cannot be done effectively without first quantifying spatial patterns in local areas.

The review of the literature illustrates that most of the studies at hand have been carried out on developed countries. Despite this, more recently a number of studies on the evaluation of green areas in developing countries have gained momentum, such as the studies by (Oduwaye, 1998) for Nigeria, (Oguz 2000) for Ankara (Turkey), (Li et al., 2005) for Beijing (China), (Jim and Chen 2003) for Nanjing city (China), (Jim and Chen 2006) for Guangzhou (China) and Kong and Nakagoshi (2006) for Jinan (China).

In the Istanbul case, the balanced spatial distribution of parks with respect to population has become a public concern that involves many factors. For example, in Istanbul there has been an overall decrease in green areas and this has had a negative effect as environmental pollution is on the increase and settlements built in rain catchment areas have led to disastrous floods in some areas of the city, such as Alibeyköy.

The present paper evaluates the distribution of parks in Istanbul by considering the different characteristics of the city's districts. A regression analysis has been used in order to analyze the spatial distribution of parks with respect to the characteristics of districts such as population, income, planned development ratio of districts and distance to the Central Business District (CBD)

2. Materials and methods

Istanbul, the largest city of Turkey with a population of 10 million (2000) ranks as the country's most important socio-economic and cultural center. Istanbul is also an important

tourism center due to its historical background as the capital of three empires and thanks to its natural amenities. The long historical background of Istanbul not only enriches its urban structure but also its renowned green areas by starting from Roman times and continuing through Byzantium and Ottoman times (Maguire, 2000; Melling, 1819).

Despite all of its positive attributes, Istanbul's tremendous population growth after 1950s, due to rural migration, has negatively affected its socio-economic and cultural life as well as its physical structure and green areas. In 1975, the unit park area per person was 0.3 m^2/person, slowly increasing to 1.1 m^2/person in 2004 due to modern housing development to some extent in recent years. This figure is much lower than legislative requirements for unit park area ratio of 2 m^2/person within the legislative requirements for the general green areas which is 10 m^2/ person and should therefore be increased (Aksoy et al., 2007).

While in some districts green areas have been used to locate new public facilities such as schools or mosques under the pressure of population increase, some other districts have been demanding the preservation of the existing green area, in addition to demanding new park areas. Further investigation of the relationships between the unit park area ratio and the characteristics of districts are explained.

Despite these important roles of green areas for the quality of urban life in Istanbul, aggressive entrepreneurs have built modern housing complexes in forest areas in the periphery of city and other green areas have been invaded by squatters, all resulting in a park/ person ratio that is even lower in the second ring than it is in the core and the first ring (Table 1).

Years	Core	I Ring	II Ring
1975	0.8	0.2	0.14
1980	0.95	0.22	0.22
1985	1.76	0.25	0.09
1990	2.84	0.87	0.30
1995	3.19	1.42	0.61
2004	3.39	1.76	0.88

Table 1. Unit Park Area Ratio (m^2/person) values according to Concentric Rings

First the study area is analyzed according to the concentric rings with respect to population and green area distribution and then regression analyses with respect to the characteristics of the districts are provided.

For the regression analysis green areas per person is taken a dependent variable and income, population, planning ratio, distance to the CBD, education are taken as independent variables. The number of, and information about, the green areas have been obtained from reports and in situ measurements prepared and taken by the Greater Municipality of Istanbul and the Office of Parks and Gardens. Arcview 3.2 Software (Herzele and Wiedemann, 2003) has provided successful results in Mapping and Geographical Information Systems works.

Data for the analyses were obtained by satellite image analysis checked with extensive field research and implemented on the GIS Maps by comparisons with the master plan.

A spatial analysis can serve as a starting point for an evaluation of the distribution of green areas with respect to population needs. As (Jim, 2004) has suggested, variations in land use and urban development patterns have generated green areas of different geometry, distribution and composition. To this regard, the quantification of green area patterns is a prerequisite to understanding green area spatial distribution and green area changes overtime. The hypothesis in this study is that education and income have a positive impact on green areas of the districts. Most of the squatter areas have very low unit park ratios due to the fact that their development was random and without planning.

In order to understand the reasons for different patterns of park distribution in different districts, we must first investigate the interaction between socio-economic and planning forces in different districts as they are already taken into consideration by other studies (Alberti, 1999; Kline, 2006). The spatial distribution of green areas has been investigated in two stages. First, the spatial distribution of unit park area has been investigated over time according to the districts and concentric zones of the city.

3. Results and discussion

The results illustrate that there is a wide width between the lowest and the highest unit park area ratio of districts.

The spatial distribution of parks has been analyzed according to Istanbul's concentric rings. The core area is taken to be the area stretching 3000 m. from the centre, which corresponds to the old Central Business District (CBD); the first ring is from 3000 m. to 12000 m, which covers the area occupied by the city in the 1950s before heavy rural migration started; the second ring is taken as the peripheral area beyond the first ring (Dökmeci et al., 2007)

While the core area was home to 6% of the total population in 1985, this percentage decreased to 3% in 2000 due to suburbanization and the functional transformation of some of the buildings from residential to business utilization.

A similar trend was observed in the first ring where in 1985 the population ratio of this zone was 51%, decreasing to 30% in 2000. On the other hand, the population ratio of the second ring witnessed a sharp increase from 43% to 67% in 2000. This population increase in the periphery caused the expansion of the city at the expense of the green areas.

The investigation of the spatial distribution of unit park areas per person according to the rings and their growth rates illustrates different patterns (Table 1). While in 1975 the unit park area ratio was 0.8 m²/person in the core area (Eminönü and Beyoğlu), it increased to 3.39 m² in 2004 due to population decrease as a result of suburbanization, the functional transformation from housing to business, and the Municipality's creation of green areas in these districts.

The same ratio was 0.19 m²/person in the first ring in 1975 increasing to1.76 m²/person in 2004. In the second ring, the same ratio was 0.14 m²/person in 1975 and it increased to 0.95 m²/person in 2004 due to provision of green areas in the recent modern housing projects according to the legal requirements in both zones. Thus, during the rapid urbanization process after 1975, park areas increased at a slower pace at the metropolitan level.

At the same time, there was a determined effort to preserve public or private green areas along the shore lines of Bosphorus and the historically world wide famous image of Bosphorus was conserved (Lamartine, 1897). Moreover, during the restructuring process of the 1980s, in order to increase green areas in the existing urban structure, warehouses and manufacturing plants along the Golden Horn shores were relocated and new park areas were created. Also, land was reclaimed from the sea along the Marmara Sea coast and new park areas were created, thus increasing amenities on the shore lines.

The spatial distribution of unit park areas according to the districts between 1995-2004 has been investigated and the results are illustrated in Figure 1. Among the districts, Eminonu has the highest ratio, 10.6 m²/person. This can be explained by the opening of some of the large gardens of the Topkapı Palace to public use and the utilization of the Byzantine Hippodrome as a park area, a utilization that actually began in the 1880s as a result of the Westernization movement (Celik, 1993).

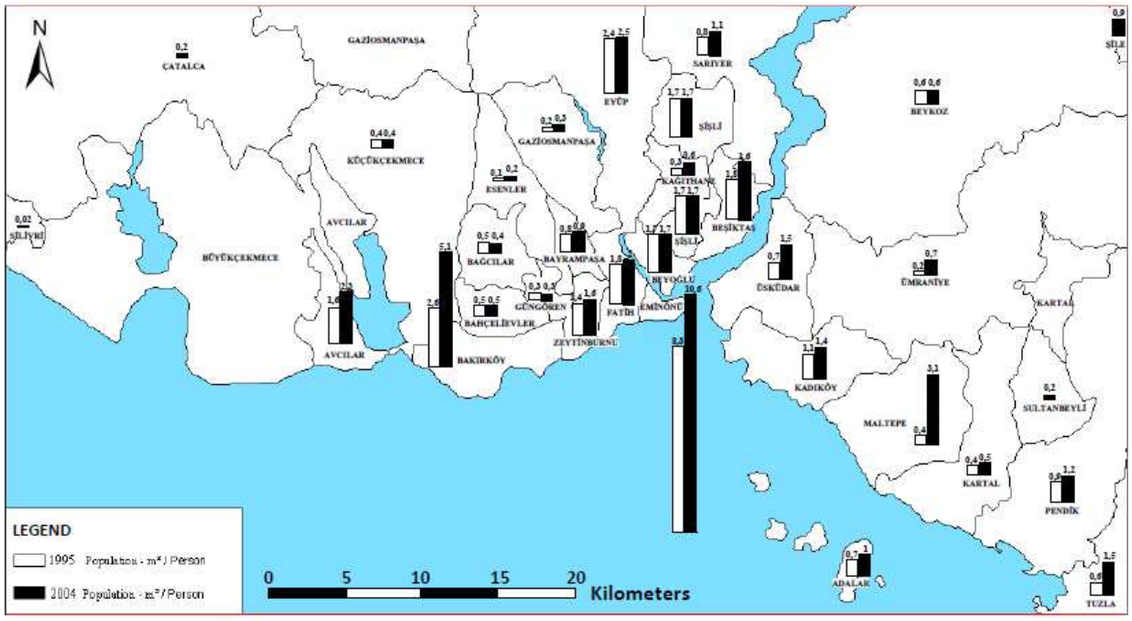

Fig. 1. Spatial Distribution of Unit Park Areas Between (1995-2004) in Istanbul

The second highest ratio (5,1 m²/person) belongs to Bakırköy, a district located in the periphery. The fact that it enjoys larger park areas than most of the other districts can be explained by its historical background as a recreation/excursion area of Istanbul during the Ottoman Empire period.

While the majority of squatter districts such as Esenler and Sultanbeyli (0,2 m²/person) and Güngören and Gaziosmanpaşa (0,3 m²/person), have lower park person ratios due to their limited budget to develop park areas there are also exceptions to this, such as Avcılar (2, 3 m²/person) and Maltepe (3,1 m²/person). On the other hand, some of the high income districts have lower park person ratios such as Kadıköy (1,4 m²/person) and Sarıyer (1,1 m²/person). At the same time some other districts, such as Silivri and Çatalca, are included in the lowest park per person ratio group due to the fact that they have only recently been included within the boundaries of the expanding Metropolitan area (Table 2).

DISTRICT	1975 (State Institute of Statistics)			2004 (T.R. Office of Turkish Statistics of the Office of the Prime Minister)		
	POPULATION	SURFACE AREA		POPULATION	SURFACE AREA	
		Surface (m^2)	m^2/ person		Surface (m^2)	m^2/ person
ADALAR	-	-	-	17806	17710	1
AVCILAR	-	-	-	236885	553.000	2,3
BAĞCILAR	-	-	-	558653	250210	0,4
BAHÇELİEVLER	-	-	-	464903	227.915	0,5
BAKIRKÖY	200942	26200	0,1	192000	972255	5,1
BAYRAMPAŞA	-	-	-	246646	211740	0,9
BEŞİKTAŞ	174931	19360	0,1	190139	501545	2,6
BEYKOZ	76804	13850	0,2	213203	117440	0,6
BEYOĞLU	230532	62000	0,3	235733	401715	1,7
EMİNÖNÜ	122885	237440	1,9	55180	583330	10,6
ESENLER	-	-	-	394423	97290	0,2
EYÜP	95486	6400	0,06	253252	627245	2,5
FATİH	504127	51150	0,1	407991	805525	2
G.O.PAŞA	97118	-	-	754790	240670	0,3
GÜNGÖREN	-	-	-	269939	93785	0,3
KADIKÖY	354957	51600	0,1	653000	895160	1,4
KAĞITHANE	-	-	-	344547	213020	0,6
KARTAL	-	-	-	417034	217020	0,5
K. ÇEKMECE	-	-	-	589139	244895	0,4
MALTEPE	-	-	-	356568	1.109.945	3,1
PENDİK	-	-	-	388940	484630	1,2
SARIYER	79329	24000	0,3	241234	259605	1,1
ŞİŞLİ	270577	135800	0,5	270582	473220	1,7
TUZLA	-	-	-	124037	190655	1,5
ÜMRANİYE	-	-	-	626312	463165	0,7
ÜSKÜDAR	202957	60800	0,3	501804	746700	1,5
ZEYTİNBURNU	123548	9150	0,07	241825	383690	1,6
BÜYÜKÇEKMECE	-	-	-	396937	-	-
ÇATALCA	-			82149	13220	0,2
SULTANBEYLİ				175771	42500	0,2
ŞİLE				32923	30000	0,9
SİLİVRİ				107486	2590	0,02
İSTANBUL	**2534193**	**697750**	**0,3**	**10041831**	**1147139**	**1,1**

Table 2. Unit Park Area Ratio (m^2/person) values according to District

Secondly, a regression analysis has been used to determine the relationships between the unit park area ratio and the demographic, socio-economic and physical characteristics of the districts (Table 3).

$R^2 = 0.693$			
Adjusted $R^2 = 0.645$	F=14.655	Sig.=.000	
Variables	Beta	t	Sig.
(Constant)		2.385	.025
Population	-.445	-3.433	.002
Income	-.113	-.594	.557
Planning ratio	.450	2.761	.010
Distance to the CBD	-.473	-3.157	.004
N= 31 districts			
Dependent variable: unit park ratio (m^2/ person)			

Table 3. Regression Results

In the analysis, the park area/per person ratio has been taken as a dependent variable and population, distance to the Central Business District (CBD), income and planned development ratio of the districts have been taken as independent variables.

According to the results of the regression analysis the significant values include population figures, the distance to the Central Business District (CBD and whether the district had planned development. However, income per capita has not been found to be significant, despite the expectations that higher income people have more power to influence the municipal governments to provide necessary green areas in their districts according to the legislative requirements. There is actually a negative relationship between the population and the unit park area ratio of the districts which means that as the population increases the unit park area ratio decreases as it is expected due to higher construction pressure in the more populated districts. Also, there is a negative relationship between the unit park ratio and distance to the Central Business District (CBD) for as the distance increases, the unit park area ratio decreases. This can be explained by the existence of large unplanned squatter areas in the periphery of Istanbul.

There is a positive relationship between the planned area ratio and the unit park area ratio as it is expected that as the planned area ratio increases, unit park area ratio increases also. Thus, restructuring of the squatter areas in the periphery of Istanbul which is currently underway and the creation of new park areas such as in Başakşehir, will not only provide economic benefits to the owners and municipalities but will also help to improve the hygienic and aesthetic conditions by creating new park areas. This expectation has already been supported by previous studies (Bourassa, 1992; Bourassa et al., 2005; Jim and Chen, 2006c). At the same time, improving the participation of all stakeholders and better coordination of planning institutions is crucial for the successful development of green areas according to the needs of people.

4. Conclusions

Rapid urbanization and the expansion of Istanbul have caused continual restructuring and changes in land-use at the expense of green areas. Although recent housing projects fulfill

necessary green area requirements, this only helps to increase a small amount of the unit park area ratio at the metropolitan level. The spatial distribution of green areas varies according to the different characteristics of districts. Yet gaining an understanding of the changes in green areas has been hindered by a lack of systematic analysis. The purpose of this paper is to provide some insights into the spatial distribution of green areas in Istanbul and changes that have occurred overtime. The relationships between the characteristics of districts and provision of parks have been investigated to understand how the interaction between socio-economic and planning forces vary overtime and space in different districts. This study can provide a comprehensive background for the planning of a green area framework and it pinpoints the need for the development of new park areas. The major originality of the research lies in the attempt to span a bridge between legislative requirements of green area and planning practice under the pressure of real estate pressures.

While the historical Central Business District (CBD) has the highest unit park area ratio due to the palace gardens and the use of the Hippodrome square as a public park, squatter areas in the periphery have very low unit park area ratios since they are not planned developments according to legislative requirements.

According to the results of the study, population, distance to the Central Business District (CBD) and planning ratio of the districts have an effect on the unit park ratio per person of the districts. However, despite prior expectations, no relationships between income per capita and the unit park area ratio of the districts were determined. This can be explained by the fact that high density construction is being used to respond to the higher demand for higher income neighborhoods.

Population rates and distance to the Central Business District (CBD) have a negative effect which means that as the population and distance to the Central Business District (CBD), increase, unit park area decreases. This phenomenon is due to the large numbers of squatter settlements in these areas. On the other hand, there is a positive relationship between the unit park area of the districts and the planning ratio, as it is expected. This means that as the ratio of planned areas in the districts increases, so will unit park area per person. Thus, it is necessary to improve the existing unit park area ratio, especially in the peripheral districts and to support the restructuring of squatter areas in the periphery by improving urban planning standards. The analysis as it is developed here enables the calculation of necessary green areas by linking it to demographic data.

Thus, the analysis illustrates that wide discrepancies exist among the districts with respect to unit park area ratios. This situation should be corrected during the ongoing restructuring process of squatter areas.

The model and results presented here have important implications for the development of planning policies. They can be useful for landscape and urban planners. Developing and understanding the dynamic spatial patterns of green areas can improve our ability to assess and create future planning scenarios by combining appropriate spatial models.

There is a widespread public support for green area provision at the metropolitan level with the condition that the land and budget are available in the districts of local level. At the same time, efforts to limit urban expansion should also be considered in the case of Istanbul.

Further research is suggested by increasing the number of variables as in (Herzele and Wiedemann, 2003), by using time-series analysis, by making lost-benefit an analysis suitable to the socio-economic conditions of Istanbul and by taking into consideration different types of green areas for the development of a more comprehensive ecological system for the Istanbul Metropolitan Area as in (Jim and Chen, 2003).

Finally, developing an understanding of the dynamic spatial patterns of green areas and their interactions with urban environment can improve our ability to assess and create future planning scenarios by combining appropriate spatial models, such as the Cellular Automata model, which gives the opportunity to investigate internal impact of different land uses.

The results of the study can be especially useful for the recent metropolitan planning process of Istanbul and for the restructuring of squatter areas by increasing green areas per person as in (Jim & Chen, 2006). Moreover, previous studies illustrate that creating parks in undeveloped areas before they are subject to development pressures will reduce leapfrogging development (Turner, 2005).

5. References

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Cities are growing as never before and nowadays, it is estimated that at least 50% of the world's population lives in urban areas. This trend is expected to continue and simultaneously the problems in urban areas are anticipated to have an increase. Urbanization constitutes a complex process involving problems with social, economic, environmental and spatial dimensions that need appropriate solutions. This book highlights some of these problems and discusses possible solutions in terms of organisation, planning and management. The purpose of the book is to present selected chapters, of great importance for understanding the urban development issues, written by renowned authors in this scientific field. All the chapters have been thoroughly reviewed and they cover some basic aspects concerning urban sustainability, urban sprawl, urban planning, urban environment, housing and land uses. The editor gratefully acknowledges the assistance of Dr Marius Minea in reviewing two chapters.

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