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POPULATION AGGLOMERATIONS AND ITS IMPLICATION IN DEVELOPING COUNTRIES: A SURVEY OF GREEN AREAS IN THE TURKISH MEGACITY ISTANBUL*

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Abstract

Developing countries experience high population growth and pronounced agglomerations with extreme population increases in metropolitan centers which lack relevant infrastructure. Frequently, urban development in developing countries can not proceed in an environmentally friendly fashion, urban plans are not implemented correctly, and green areas are lost due to constructions. Occupying 1% of the Turkish land area and accommodating over one sixth of the Turkish population, Istanbul is one of such cities and its population has increased from one million to 13 million in the last 60 years. Urban area including settlements has been increasing continuously throughout those years at the expense of losing the green areas. The amount of green areas had diminished from 27325 to 8908 hectares in the last 60 years with a reduction of 67% as opposed to settlement areas increasing by more than five fold from 3417 to 22178 hectares in the study area. The most significant reason behind that is that Istanbul has to live through a vast population increase. Although green areas kept increasing constantly in the 30 years between 1975 and 2004 from 1695 hectares to 5435, the amount of urban green per capita had dropped from 6.7 m^2/person in 1975 to 5.5 m^2/person in 2004 even though the total amount of green areas had increased, to show that the enhancement of the green areas could not keep up with the pace of incoming population.

Keywords: *Green areas; Settlement areas; Istanbul; Megacity; Developing countries*

1. INTRODUCTION

Population growth in developed countries is low and the distribution of population among various cities is balanced in the sense that extreme agglomerations in cities are not common. The high population growth rate in developing countries is the major reason of the population growth in the world. Paralleling the population growth, urbanization is also growing throughout the world. Metropolitan areas have become centers of attraction as they are the most developed areas especially in developing countries, providing the majority of opportunities for employment, health care and education. In the 50 years between 1950 and 2000, as the number of mega cities with a population of 8 million or more had increased from 2 to 6 in the developed countries, the number had gone from none to 22 in the developing world.

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The latter had to face, and most of them are still facing, severe problems in terms of environmental well being, standards of life, green areas etc. due to the rapid and in most cases unplanned urbanization. As may be observed from Table A1 appended listing mega cities, Istanbul is one of the examples [1].

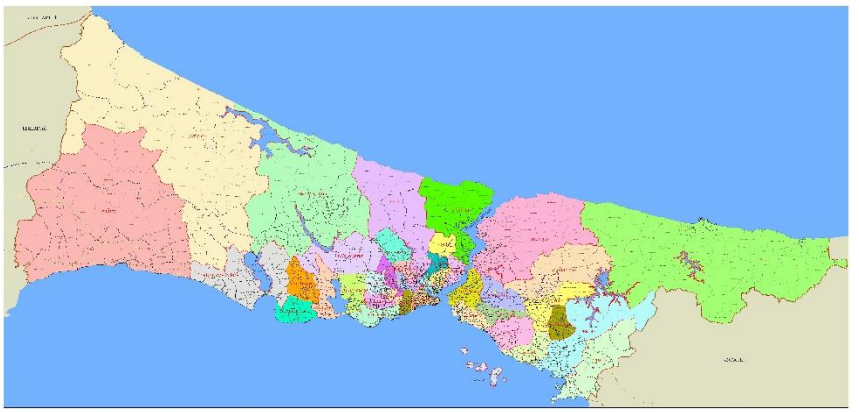
The population growth rate has been between 1.1 and 4.1% in 19 of the mega cities in developing countries, and 5.0 to 6.0% in remaining three. This is to be compared to 0.1 to 0.5% in five of the six mega cities in the developed countries, and 1.6% in one as shown in Table A1.

High population growth rates in urban areas of mega cities usually end up deteriorating the environment and impact the ecological balance negatively. One major driving force for the negative impact is the vast increase in the demand for settlements which are generally erected at the expense of losing the urban green. Still another problem is the lag in the completion of urban infrastructure which frequently fails to grow proportional to the growing population. This paper aims to present the case of Istanbul as an example of mega cities concentrating upon the settlement areas and urban green.

The first aerial photograph of the city recorded in 1946 was used as the basis for the study area. Changes in the settlement areas and green areas in the area photographed were determined using aerial photographs / satellite images for years 1946, 1982 and 2008 and comparisons with the municipal plans were made.

1.1. The Turkish Mega City Istanbul

Established over 2000 years ago the Turkish mega city Istanbul is unique as it lays on two continents, bridging Europe and Asia also the east and the west. Map 1 is the location map of the city which occupies a land area of 5712 km2.



Map 1. Location Map Of Istanbul

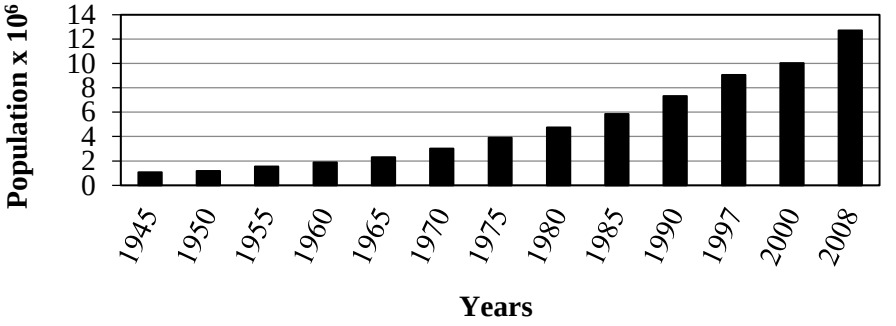


Figure 1. Population of Istanbul [2]

Although the sixth five year national development plan of Turkey recommends the promotion of cities of 50.000 - 500.000 inhabitants, the advice of the plan has not been actualized and masses have clustered around greater metropolitan areas. As of 2008, of the 81 provinces in the country, 18 have reached populations exceeding one million. Istanbul almost with a population of 13 million in 2008 is the most striking example of this discrepancy.

Occupying 1% of the Turkish land area and accommodating over one sixth of the Turkish population, Istanbul has experienced a vast population increase from one million to 13 million in the last 60 years. Figure 1 shows the population increase in the mega city between 1945 and 2008. The overall population density in the province was 22 persons/ha in 2008.

Urban area including settlements has been increasing continuously in Istanbul throughout that period at the expense of losing the green areas and infrastructure could not keep up with the pace of the rapidly growing metropolis.

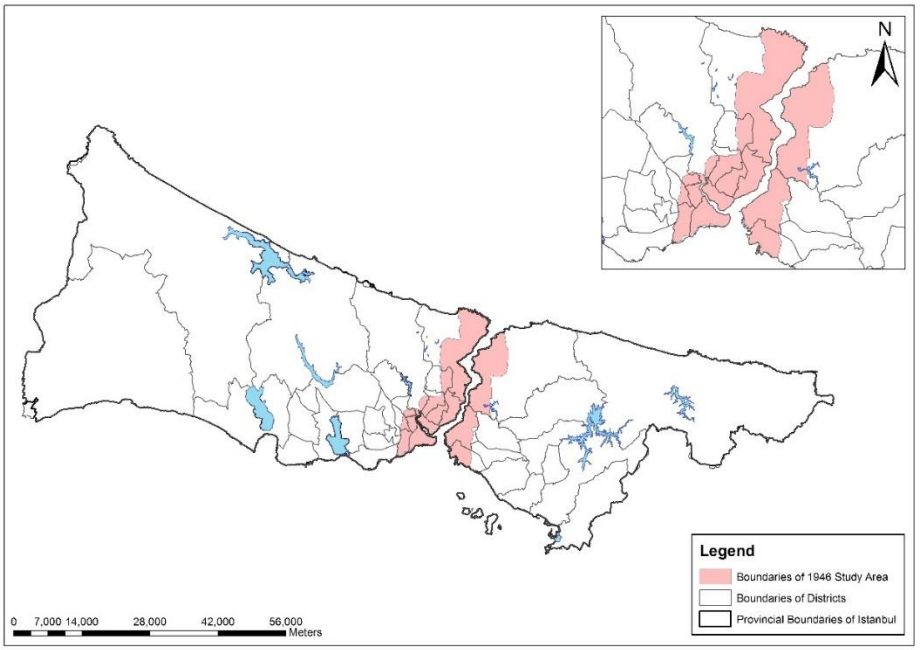
1.2. Methodology

The oldest aerial photograph of Istanbul available belongs to 1946. The boundaries of the image on the two banks of the Bosphorus, which constitute the study area, are shaded red in Map 2. The provincial boundaries of Istanbul, which also coincide with Istanbul Metropolitan Municipality boundaries as indicated by the Turkish Federal Register dated July 22, 2004, are also plotted on the map. The area scanned by the first aerial photograph totaling 30769 hectares is taken as the basis of analysis.

Aerial photographs of 1946 and 1982 together with the satellite image in 2008, showing the actual land use in those years, were used in the analysis of the study area within 60 years. The images were first compared in terms of settlement areas and urban green. Additionally, actual conditions were compared with the master plans issued in 1980 (also covering 1982) 1995 and 1/100.0000 scale development plan of 2008.

The two band black and white aerial photograph of 1946 and 1982 and the colored satellite image of 2008 were used in the analyses of this work. Additionally, graphical data from the master plans of 1980 and 1995 together with 1/100.000 scale development plan of 2008 were utilized. Demographical data were used as non graphical data in the determination of the green areas per capita.

Geographical Information Systems (GIS) was used as the tool for the determination and analysis of green areas and settlement



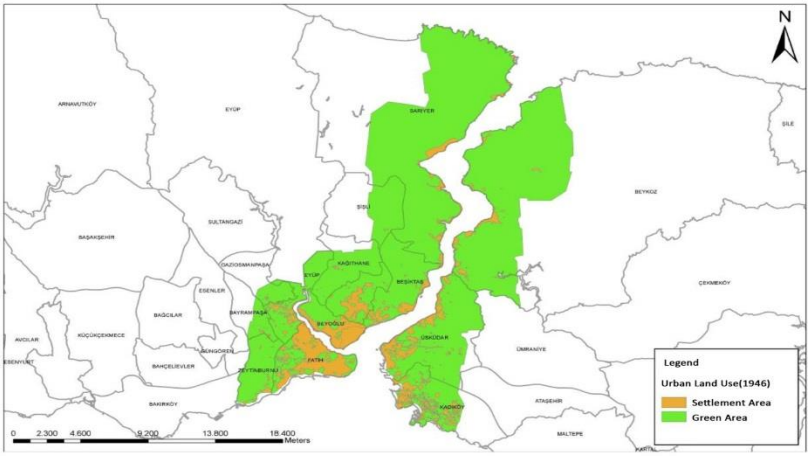
Map 2. The Study Area And The Provincial Boundaries Of Istanbul

areas in 1946, 1982 and 2008. Both graphical and non graphical data were entered into the GIS along with aerial photographs and satellite images. All data were integrated both as geographical and as file format to generate the planning information system. All settlement areas and green areas were colored for the ease of differentiation and land areas were determined and analyses were made using Arc GIS – Arc View software.

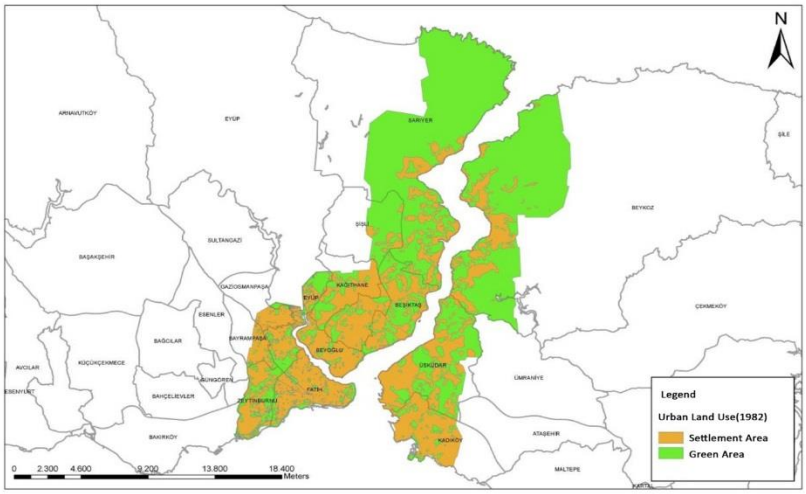
Using the results obtained from the GIS analyses, the change in the settlement areas and green areas were tabulated and the outcome was evaluated.

2. SETTLEMENT AREAS AND GREEN AREAS IN THE STUDY AREA BETWEEN 1946 AND 2008

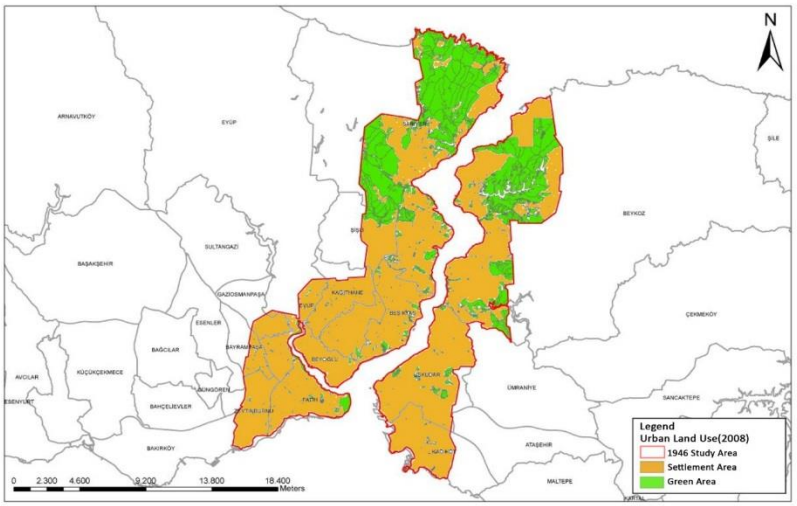
The actual settlement areas and green areas in Istanbul in the three years considered, i.e. 1946, 1982 and 2008, are shown in Map 3, while those that are suggested by the plans are presented in Map 4. Numerical values of land areas of settlements and urban green obtained from those maps are summarized in Table 1. The results are illustrated further in Figures 2, 3 and 4.



a) 1946

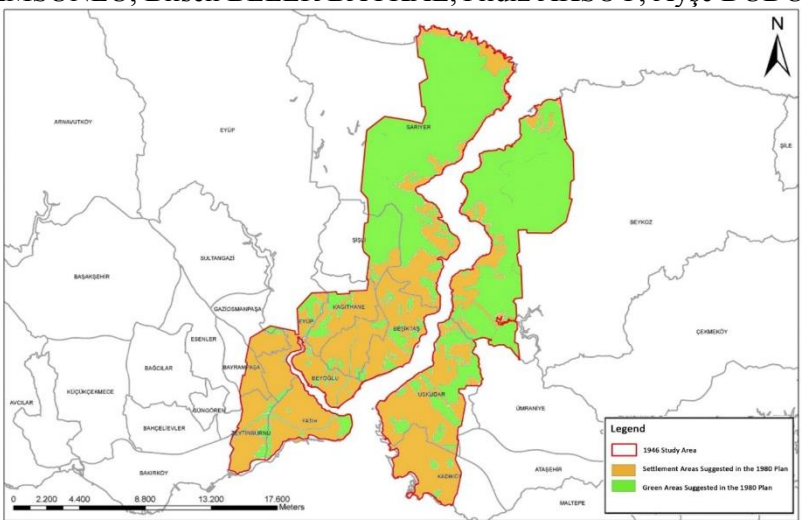


b) 1982

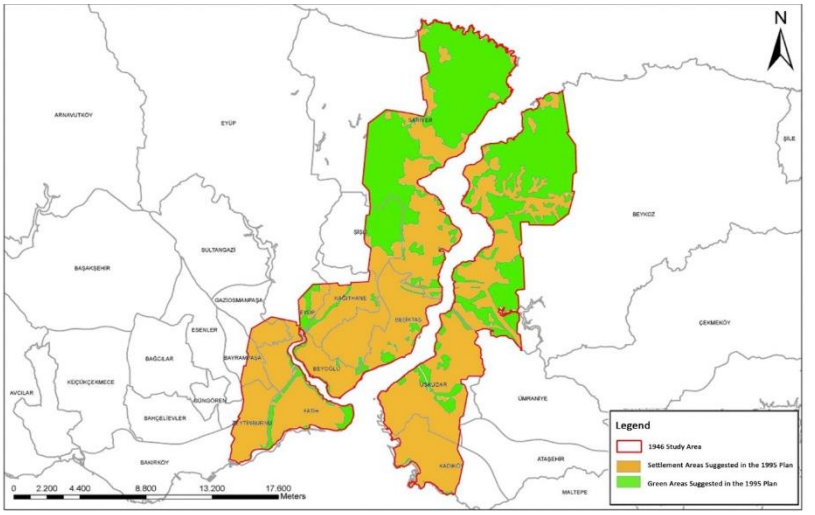


c) 2008

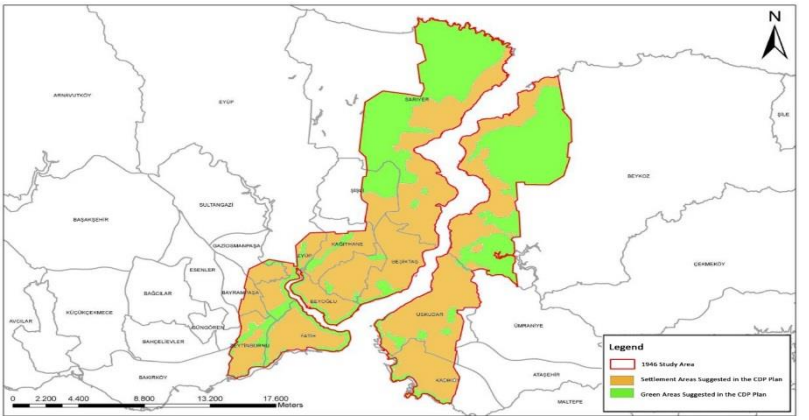
Map 3. Actual Land Use In Istanbul



a) 1980 (also in 1982)



b) 1995



c) 2008

Map 4. Plan Suggestions For Settlements And Green Areas In Istanbul

As may be observed from Table 1, 27352 hectares of the 30769 hectares of the study area was actually used as urban green in 1946. Figure 2 indicates that urban green corresponds to 89% of the total study area and settlement areas to 11%. In 1982, corresponding percentages were 62% and 38%, showing a considerable decrease in the green areas at a reduction rate of 30 % within those years. In 2008 on the other hand, only 8908 out of 30769 hectares remain as the urban green corresponding to 29% of the total study area. This indicates a decrease of 67% as compared to 1946. As such the amount of settlement areas has gone from 3417 hectares up to 22178 hectares in about 60 years between 1946 and 2008, indicating an increase of over 5 fold.

A survey of Map 3 and Table 1 shows that the plans had also foreseen a decrease in those 60 years in terms of the green areas however at a much smaller rate than the actually occurring one. The intended green area was 12530 as opposed to the actually occurring 8908 hectares, and the land allocated to settlements in the 2008 plan as 18240 was actualized as 22178 hectares.

Figure 3 shows that the green areas in the study area kept decreasing steadily from 1946 onwards from 27352 ha to 19227 ha and 8908 ha in years 1946, 1982 and 2008 respectively. Respective areas for settlements in those years were 3417, 11744 and 22178. This corresponds to a six fold increase in the settlements and a 70% decrease in urban green in a period of 62 years. The figure also presents the planned areas for the two functions. As can be observed, the plans also show a decreasing trend for green areas while increasing settlement areas.

Figure 4 is the comparison of the planned and actually occurring areas for settlements and urban green. Clearly the percentage of actual green areas were higher than that presumed by the development plan by 17% in 1982 in contrast to 2008 where the actual green areas lagged the plan by 29% as shown in Figure 4.

The foregoing results and discussion clearly indicates that the settlement areas in Istanbul keep increasing at the cost of losing green areas in the city. The most significant reason behind that is that Istanbul receives a vast amount of migrating population in addition to its natural birth rate. As a result of those two phenomena, the population of Istanbul keeps increasing constantly and the new comers are in need of settlements.

Year	Actual (ha)		Year	Planned (ha)	
	Green areas	Settlement areas		Green areas	Settlement areas
1946	27352	3417			
1982	19227	11744	1982	16456	14314
			1995	12494	18275
2008	8908	22178	2008	12530	18240
Rate of change					
1946-1982	30% decrease	244% increase	1980-1995	24% decrease	28% increase
1982-2008	54% decrease	89% increase	1995-2008	0.3% increase	0.2% decrease
1946-2008	67% decrease	549% increase	1980-2008	24% decrease	27% increase

Table 1. Summary Of Land Areas For Settlements And Urban Green

Survey undertaken by Aksoy (2001, 2005) [3, 4] had investigated the active, passive and total green areas in Istanbul between 1975 and 2004. Active green areas include children's play gardens, park areas, sports areas, and forests, meadows and green areas open to public access while the passive ones include other green areas like town squares, road side plantations, cemeteries, etc… The results are presented in Table 2 and Figure 5. It may be observed that the land area devoted to urban green kept increasing constantly in the 30 years between 1975 and 2004 in contrast to the sharp decrease of about 40 % in the amount of green area per capita by 1985 after which a gradual increase became apparent. However, the level of this parameter still lagged the value in 1975 by about 20 % in the year 2004. The amount of urban green areas per person had dropped from 6.7 m2/person in 1975 to 5.5 m2/person in 2004 even though the total amount of green areas had increased from 1695 hectares to 5435 within those 30 years.

An important issue to note here is that even though there is a positive move in terms of enhancing urban green within the mega city, the enhancement in terms of green areas, which will act to maintain the ecological well being of the city, can not keep up with the vast population increase

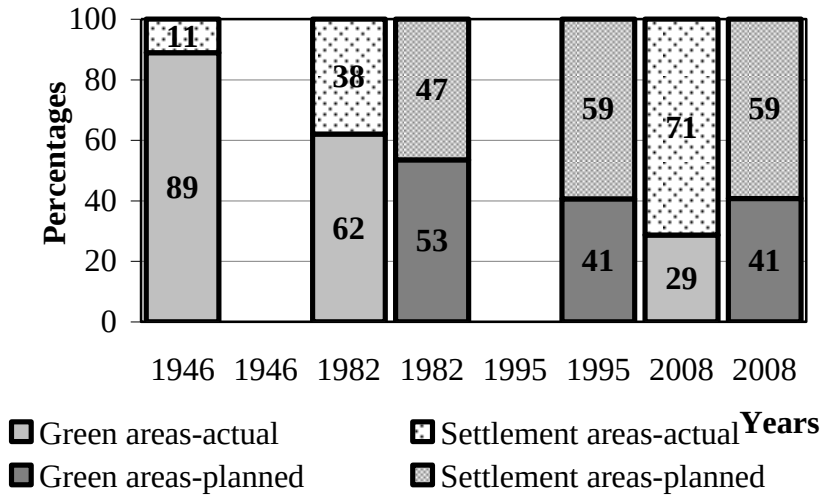


Figure 2. Green And Settlement Areas As Percentages Of The Total Provincial

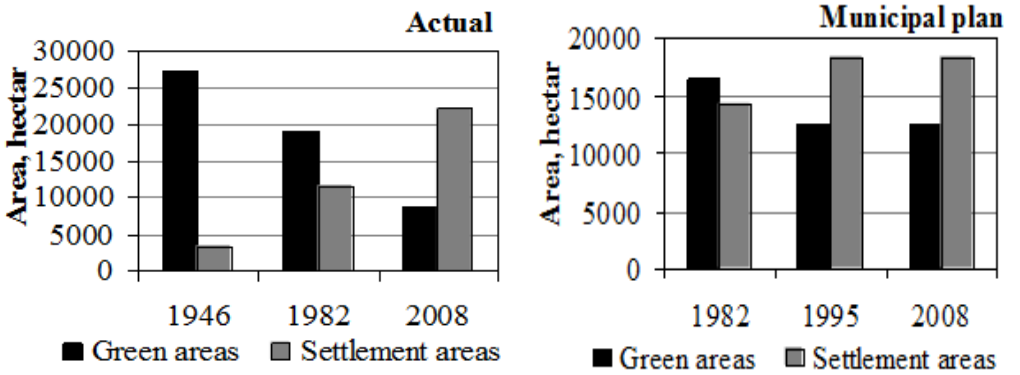


Figure 3. Change In The Settlement Areas And Green Area In The Study Area

3. CONCLUDING REMARKS

Population in developing countries frequently clusters around larger metropolitan cities and mega cities. This is a potential threat leading to an imbalance with regards to environmental and ecological friendliness.

The foregoing results and discussion clearly indicates that the settlement areas in Istanbul keep increasing at the cost of losing green areas in the city. The amount of green areas had diminished from 27325 to 8908 hectares in the last 60 years with a reduction of 67% as opposed to settlement areas increasing by more than five fold from 3417 to 22178 hectares in the study area. The most significant reason behind that is that Istanbul has to live through a vast population increase.

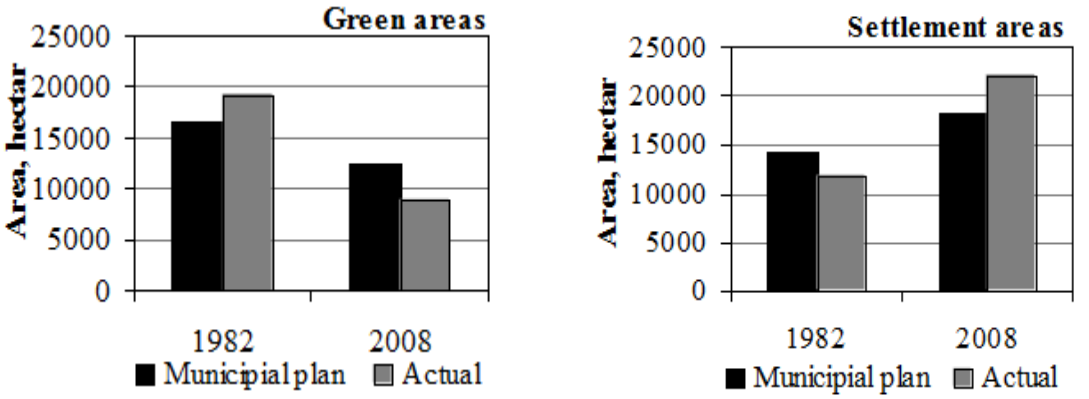


Figure 4. Comparison Of Actual And Proposed Areas For Settlements And Urban Green

YEARS	POPULATION (Municipality)	ACTIVE GREEN AREAS		PASSIVE GREEN AREAS		TOTAL GREEN AREAS	
		Total area (ha)	Area per capita (m^2/person)	Total area (ha)	Area per capita (m^2/person)	Total area (ha)	Area per capita (m^2/person)
1975*	2534193[a]	553	2.3	1142	4.5	1695	6.7
1980*	2754476[a]	600	2.2	1177	4.3	1777	6.5
1985*	6240989[a]	697	1.1	1870	3.0	2567	4.1
1990*	6629431[b]	834	1.3	2090	3.2	2924	4.5
1995*	7716716[b]	1492	1.9	2449	3.2	3941	5.1
2004**	10047675[a]	1951	2.0	3484	3.5	5435	5.5

[a] Official results , [b] Predicted * Aksoy, 2001, ** Aksoy et al., 2005

Table 2. Population And Corresponding Green Area Per Capita In Istanbul Between 1975 And 2004.

It may be observed that the land area devoted to urban green kept increasing constantly in the 30 years between 1975 and 2004 from 1695 hectares to 5435 within those 30 years. However, the amount of urban green areas per person had dropped from 6.7 m2/person in 1975 to 5.5 m2/person in 2004 even though the total amount of green areas had increased, showing that the enhancement of the green areas could not parallel the pace of incoming population.

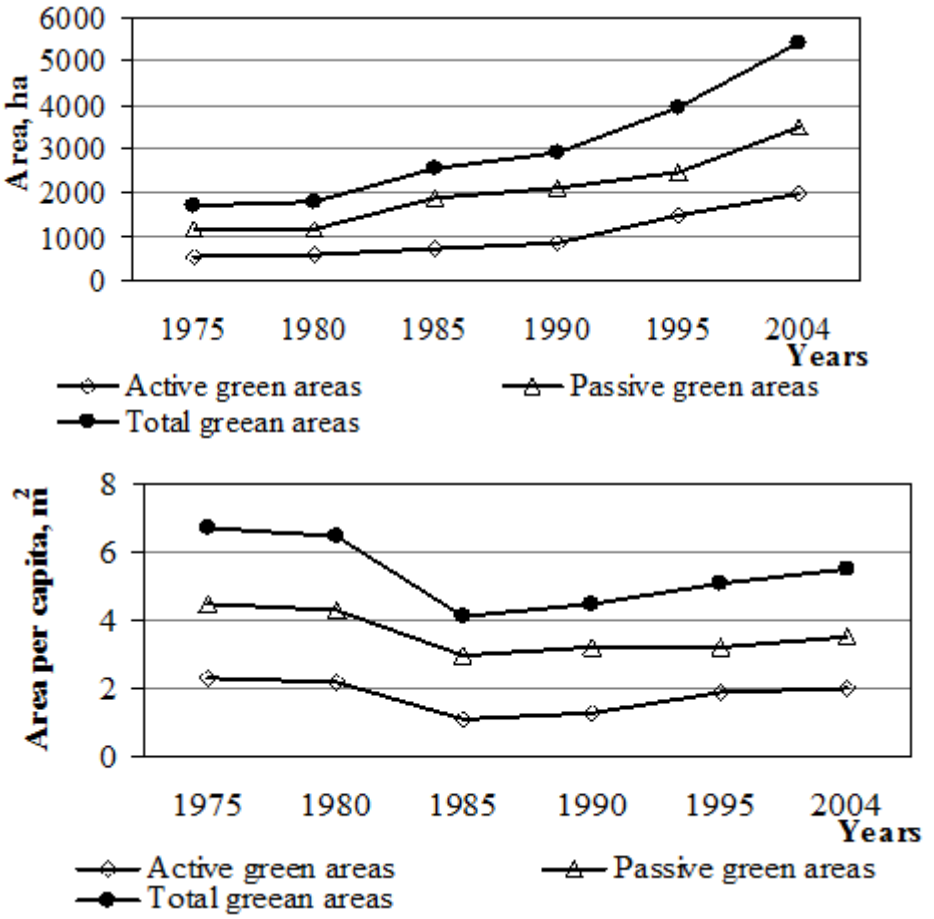


Figure 5. Active, Passive And Total Green Areas In Istanbul Between 1975 And 2004

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APPENDIX

City	Country	Population in 1950 (millions)	Average annual rate change between 1950-1960	Population in 2000 (millions)	Average annual rate change between 1990-2000
Less developed					
Dacca	Bangladesh	0.4	4.3	12.2	6.0
Lagos	Nigeria	0.3	9.7	12.9	5.1
Banglore	India	0.8	4.3	8.2	5.0
Karachi	Pakistan	1.0	5.9	11.7	4.1
Delhi	India	1.4	5.0	13.2	4.1
Jakarta	Indenosia	2.0	3.4	13.7	4.0
Bangkok	Thailand	1.4	4.6	10.3	3.6
Istanbul	Turkey	1.1	4.8	9.5	3.6
Manila	Phillippines	1.5	3.9	11.8	3.3
Bombay	India	2.9	3.4	15.4	3.2
Tianjin	China	2.4	4.2	12.7	3.1
Calcutta	India	4.4	2.1	15.7	2.8
Cairo	Egypt	2.4	4.3	11.8	2.7
Lima	Peru	1.0	5.5	8.2	2.7
Beijing	China	3.9	4.7	14.0	2.6
Shanghai	China	5.3	5.1	17.0	2.4
Sao Paulo	Brazil	2.4	6.6	22.1	2.4
Mexico City	Mexico	3.1	5.4	25.6	2.4
Teheran	Iran	1.0	5.9	8.5	2.3
Rio de Janeiro	Brazil	2.9	5.4	12.5	1.5
Seoul	Korea	1.0	8.4	12.7	1.5
Buenos Aires	Argentina	5.0	3.0	12.9	1.1
More developed					
Los Angeles	USA	4.0	4.8	13.9	1.6
Tokyo	Japan	6.7	4.6	19.0	0.5
Newyork	USA	12.3	1.4	16.8	0.3
Moscow	Russia	4.8	2.6	9.0	0.2
Paris	France	5.4	2.8	8.6	0.1
Osaka	Japan	3.8	4.1	8.6	0.1

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