

LANDSCAPE MODELLING AND VISUALIZATION IN SUBURBAN AREAS: A CASE STUDY

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ABSTRACT

Recent developments in computer technology and the availability of digital databases have made it much easier to generate landscape visualizations that can be used to support decision making on urban planning. GIS is also an important tool for urban planning. GIS includes software and hardware tools, and a group of procedures elaborated to facilitate the capture, edition, administration, manipulation, analysis, modeling, representation and the exit of spatial referenced and semantic data, to solve any type of planning, administration, storage, and further information concerning the problem.

In this study, Municipality of Metropol Istanbul provided data, which has been used in this study, in the scale of 1:1000 digital maps in micro station format produced by means of photogrammetric techniques from aerial photographs. Digital terrain model (DTM) of study area was being produced and captured with orthophoto in ArcView software. Afterwards 3D model of the suburb was obtained. The all attributes which is belong to suburb were also used in 3D model. Therefore, at the end of the research, we created a 3D GIS. The model is capable of responding a lot of queries for Armutlu suburb area. The research also shows up land use of Armutlu suburb area. The constructions in the research were almost built without taking official permissions. Consequently, the research is also seeking ways to save the suburb life for its future.

1. INTRODUCTION

Turkey, as a developing country, has been undergoing a migration process since the 1950s. Migration from rural to urban areas or from small towns to big cities has created many problems that the governments or local authorities had not faced before. The most severe problems have arisen in Istanbul since it is the most attractive city for all the citizens. Istanbul had been one of the most important capitals of the Mediterranean basin for almost sixteen centuries, starting from the foundation of Constantinople in the 4th century A.D. and ensuring up to the end of the Ottoman Empire in the 1920s. Istanbul has had to face three major transformations in its history because of its unique location. (Turgut, 2001).

Starting from the Ottoman period in the 19th century, Istanbul has experienced migration from different parts of Anatolia and Thrace at gradually increasing speed. The background of these newcomers has been the most powerful factor in the reshaping of the city during the last three decades. Istanbul has been struggling with the population growth since the 1900's to save its values against these uncontrollable developments. The changes which have occurred in Istanbul in the second half of this century reflect the social and cultural differences of its population within the transition process.

Migration from rural areas to towns and metropolises both means a change from rural to urban life as well as a change from rural production to industrial production. The characteristics of this transition period from tradition to the futuristic are reflected in the physical environment. Squatter settlements are a continuation of rural life styles which develop in urban areas and change through time. Such an urbanization starting with migration to towns from rural agricultural traditional areas and ending in an urban, industrial-modern society can be analyzed for its values of culture-space interactions according to different scales, leading to a better understanding of squatterization as a fact, not only as a problem area (Turgut, H., et al, 1995).

1.1 The Importance Of Istanbul Metropolitan Area In Turkey:

The urbanization process in Turkey gained its impetus from

modernization in agriculture. In the late 40's with mechanization of agriculture the people in rural areas were rendered jobless and migrated into the cities to find jobs. They were employed mostly in the marginal jobs of the service sector. However, the internal migration process in last 50 years in Turkey has captured different migratory trends in it. There are multiple forms of internal migration like interregional seasonal migration from rural to urban places; seasonal rural to rural or migration from rural to urban, from urban to urban and particularly after late 80's the forced migration from Eastern part of the country. The most important consequence of this rapid internal migration is the beginning of the informal housing process named Gecekondu settlements in big cities of the country.

Turkey's population has risen from 13.6 million people in 1927, when 76% were rural, to 60.5 million in 1994, when the same proportion now lived within municipal boundaries. In 1955 4.7% urban population lived in gecekondu, this figure reached 23.7% in 1970's and %50 in 1984. In 1995, of the estimated total urban population of 37.8 million (that is, 60.9% of the total population) lived in gecekondu-type settlements. Between 1960 and 1990, the urban population living in towns increased from 6 million people to 29 million people in other words from 22% to 51%. (Çolakoğlu, 2004).

With 5512 km² area, Istanbul covers nearly 0.71 % of total area of Turkey and it's the greatest province of country for population size (Figure 1). As a result of the industrialisation and engineering in agriculture in 1950's and the migration from rural to urban areas increase the proportion of Istanbul Metropolitan Area in Turkey's population from 5.6 % in 1950 to 14.8 % in 2000 (Table 1)

Years	Population		Istanbul/Turkey Proportion (%)
	Turkey	Istanbul	
1950	20.947.188	1.166.477	5.57
1960	27.754.820	1.882.092	6.78
1970	35.605.176	3.019.032	8.48
1980	44.736.957	4.741.890	10.60
1990	56.473.035	7.309.190	12.94
2000	67.844.903	10.033.478	14.78

Table 1. Population values of Turkey and Istanbul

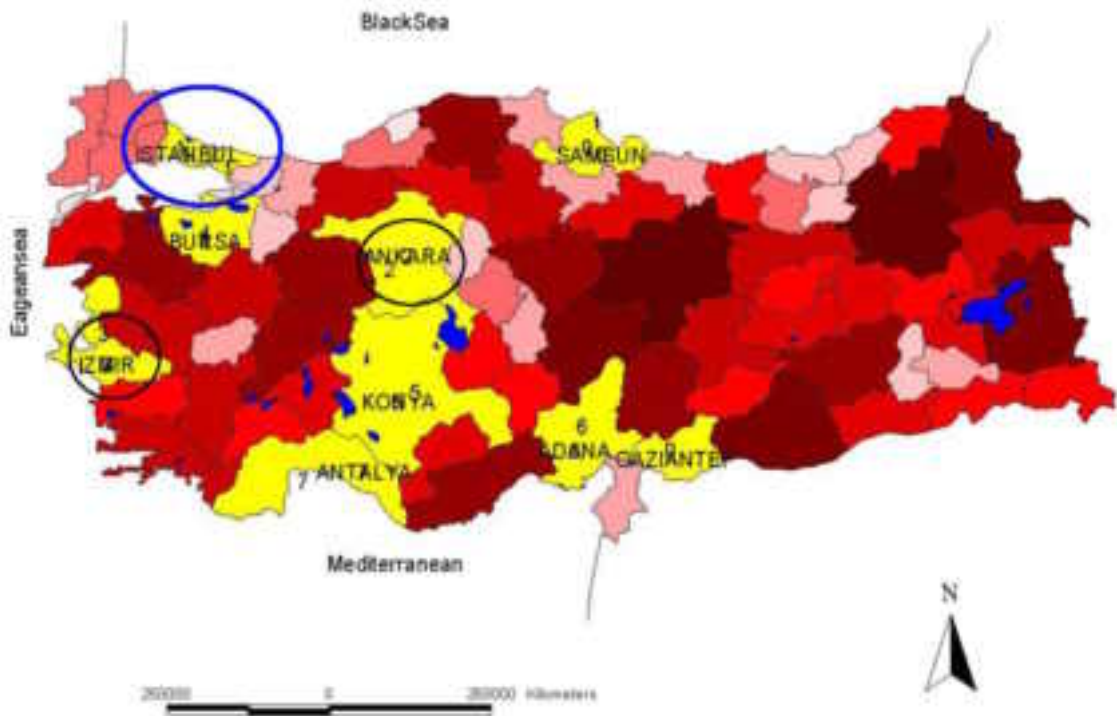


Figure 1. The Hierarchy of Metropolitan Cities in Turkey According to Population Growth (DIE, 1998, 2001) Table 1. Population Values Of Turkey and Istanbul



Figure 2. The local name associated with informal housing in Turkey is “Gecekondu.”

2. STUDY AREA

Istanbul with 10 million of population and 5512-km² land area sits on a two continents. Land area dedicated to residential use is even on both sides. It is the largest metropolitan center of Turkey and accounts for %20 percent of urban population. The municipal authorities have been unable to cope with this demand of the mostly poor migrant population, for land, housing and services. The migrants responded to this by invading the empty state land around the periphery of the city illegally erecting homes.

More than %60 of residential land use has been unplanned. The hazard population growth is generating new informal housing

settlements very fast such that municipalities cannot provide adequate infrastructure, service and control land management (Farida, 2003).

Istanbul receives 5 hundred thousand immigrants from all over Turkey each year. The grow rate of the city (%5) is bigger than Turkey's grow rate (%2). What makes this more complicated is that in some districts the population increase is %5, in another district by %13. Forty-five percent of the buildings in Istanbul have no planning permission, while 73 percent of the squatter houses are built on state-owned lands.

İstanbul has desintegrated management structure. The most important areas of urban development are controlled independently by districts, sub-districts or province administrations, which remain outside the control of Greater Municipality of İstanbul. However, vital functions for the city such as water base in areas, forest areas, and industrial areas, mass housing areas are all included in the mentioned areas (Eyüboğlu, 2004).

The public land-use control policy in İstanbul has failed. The local municipalities are in charge to apply (as far as possible) the metropolitan plan, in drawing their own, in opening new areas to building process, in delivering building permits, and in controlling technically speaking the building process. However, many contradictions between local and metropolitan authorities -especially when local authorities do not belong to the same party than the metropolitan ones- have occurred.

The uncontrolled urbanization of İstanbul in the direction of the north -in other words, toward the Black Sea sides and the last near forest areas spread in last two decade. One such area is the Armutlu region located in the near the Fatih Sultan Mehmet Bridge (Figure. 3).

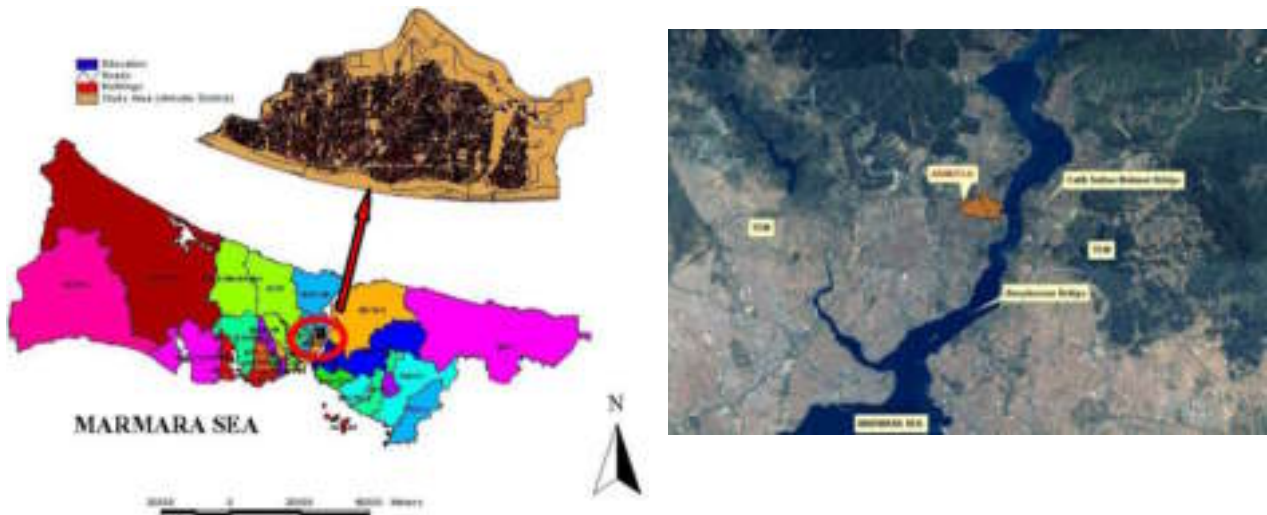


Figure. 3 Study area

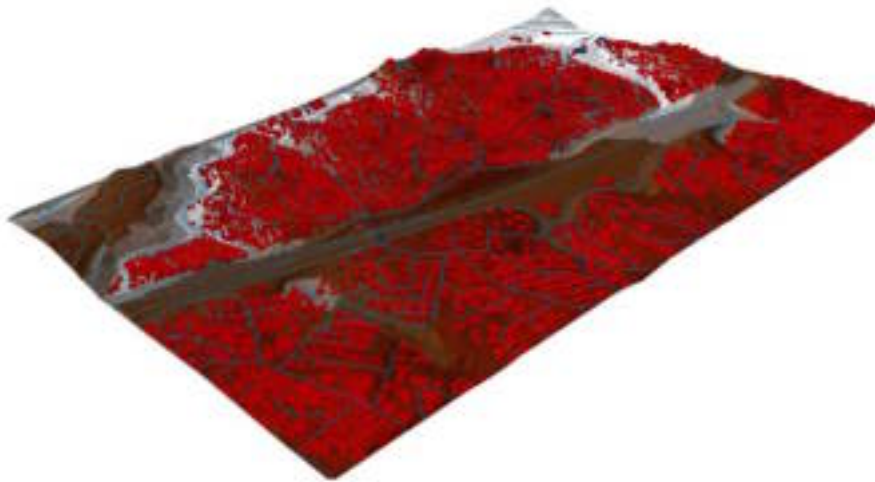


Figure 4. 3D model of the study area

This area is known with the extent of illegal settlements growth between 1992 and 2000. The population living in this area increased rapidly.

The aim of this study is to collect data from study area so as to determine development of informal settlement by GIS. GIS spatial database to analyze the dynamics of sub-urbanization in Armutlu district. Arc View 3.3 and ArcGIS are used in order to implement the work. To compare development properly of informal housing the work need data before 1999. There are big changes in the area from 1960 to 2000. We are still collecting data to determine land-use changes and informal housing.

Data were provided from Municipality of Metropolis Istanbul in the scale of 1:1000 digital maps in Micro Station file format (dgn) produced by means of photogrammetric techniques from aerial photographs.

We are still collecting data such as quarter name, street name, door number, building functionality, basement, medium floor, roof, total floor, building condition, registration, building name, etc. Afterwards digital terrain model (DTM) of study area was being produced in Arc GIS. This model is shown Figure 4.

3. CONCLUSIONS

Authorization for control and plan making of districts, subdistricts and Greater Municipality of Istanbul must be cleared appropriate to comprehensive planning hierarchy. There is not a general plan, which covers all districts and sub districts of Istanbul. It has to be prepared immediately. Development plans of district and subdistrict municipalities are absence of technical context and not integrated each other. These plans must be renovated appropriate to be prepared general plan of Istanbul.

Especially 3D city models and GIS support decision systems for management of municipality. These models are very important in order to control development of cities.

This study will be enhanced to examine the region properly.

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