

LAND USE PATTERNS IN EASTERN ISTANBUL, TURKEY

Coskun, M. Z.^{a,*}, Musaoglu.^a Saroglu ^a, E., Bektas ^a

^a ITU, Civil Engineering Faculty, 80626 Maslak, Istanbul, Turkey – (coskun, nmusaoglu, saroglu, bektasfi @itu.edu.tr)

This study is part of the project funded by TUBITAK (The Scientific And Technical Council of Turkey) in order to analyze the land use patterns in state owned land in Asian Side of Istanbul. A part of asian side of istanbul has been selected for this study. The study area is located eastem side of Bosphorus. In this paper Corona Lansad TM and SPOT 5 images belong to 1960-2001 period were used for multitemporal analysis of forest areas. Satellite images were clasified by using image clasification method. After clasification forest areas were converted vector polygons and the all information were transfered to GIS media. It is compared that the existing situation of state owned land and that obtained from satellite data. Changes both forest and state owned land were analyzed through the queries. The query is realized in two parts which are among 1960,2002,2004 and 1984,1992,1997 respectively.

Keywords : Land, Istanbul, GIS, Remote Sensing, State Owned, Corona Lansat, Spot

1. 1. INTRODUCTION

Since 1960, when development plans started to applied, Turkey's industrial era begun; however, industrialism has taken only in urban areas, and, at the mean time people began exodus from rural to urban. That situation has created new districts that suffer from lack of infrastructure. In 1960s rural areas represented % 70 of Turkey's population; however, now that ratio declined to %40; on the other hand, urban population has increased almost %30. That picture has created big problems in terms of urban development because of ignorant corrupt people who were replaced in every election and were charge of urban development. Those government representatives have allowed some groups to construct mass houses and other buildings on State Owned vs. State Owned Lands have given in charge of some entities.

Turkey covers 77.945.200 hectare whose 20.763.248 is forest; in other words, %26.6 of Turkey is forest and 9 million hectare of all forests is in very good conditions and remaining 11 hectare is in poor condition. The big portion of forests is natural forest and %48 of forests is efficiency forest; %99 of forests owned and taken care of by the state. The state's institution, which is called milli parklar isletmesi, is under the charge of Environmental and Forestry Ministry.

2B is an abbreviation that represents forestry law 2 article B. This abbreviation is used for the land that can not be used to create a forest; in other words, 2B is used for the lands that created under the cover of cadastral works by classifying them poor lands which is not appropriate for forests.

These problems, abolishing forests, had been researched in Istanbul's Anatolian part. Istanbul has 5220-km² land and 3495km² of it, %67, is owned by the Turkish republic; and, %49 of the state owned land represents by the forests. Istanbul has 18233-m² land of 2B.

The purpose of research was to find out the modifications that took place on stated owned lands and to create a database about those modifications. In order to do that research, information need to collect by space image and these images needed to integrate with geodetically information and finally the results need to be analysed in CBS.

It is really important to obtain changing of land use in order to promote better decision making about urban planning (Lu at al., 2003). Remote sensing has traditionally concentrated on rural or natural areas about land use changes (Yeh and Li, 2001). There have been many studies regarding land-use and classification using remotely sensing data

(Jensen at all, 1986; Allm and Dreisinger 1986; Jensen at all 1995; Hewitt and Cetin 1999).

This project was examined to assess the land cover and land use change in Asian Side between 1960 and 2002 years by using classification and level slicing techniques.

2. STUDY AREA AND METARIALS

Istanbul is Turkey's major and dominant center of all kind of business and culture. The city contains 32 sub districts and has two big parts as known Asian and European side. As Istanbul is a Turkey's major city, has more than twelve million population and the land is limited for commercial use, 2B areas and forests are being destroyed to open new lands for commerce. Asian side, whose location is shown in Figure 1, is located on east side of Istanbul. $40^{\circ} 48'$ and $41^{\circ} 16'$ in latitude and $29^{\circ} 04'$ and $29^{\circ} 58'$ in longitude bound it.



Figure 1. The Location of Study Area

In this study many kind of data were used from various data sources. Landsat 5 TM, acquired on June 1984, Landsat 7 ETM acquired on May 2001, Spot 5 acquired on May 2002 satellite images, 1960 dated Corona satellite photograph, 1/25000 and 1/5000 scale topographic maps, orthophotos, digital boundaries maps and several thematic maps were used as project data.

3. METHODOLOGY AND IMAGE PROCESSING

1.1 3.1 Processing

Raw digital images usually contain geometric distortions so significant that they can not be used as maps. The intend of geometric correction is to compensate for the distortions introduced by these factors so that the corrected image will have the geometric integrity of a map (Lillesand and Keifer 1987). Rectification is the process of projection the data onto a plane, and making it conform to a map projection system. Satellite images are rectified to the Universal Transversal Marcator (UTM) projection system with 0.5 pixels RMS accuracy.

1.2 3.2. Classification

The purpose of digital land cover classification is to link to special characteristic of the image to a meaningful information class value, which can be displayed as a map so that resource managers or scientist can evaluate landscape in an accurate cost effective manner (Tau and Gonzoles 1974).

In this study, accuracy assessment of classification was calculated using an error matrix that showed the accuracy of both the producer and the user. Accuracy assessment is an important future of land-cover and land-use mapping, not only as a guide to map quality and reliability, but also in understanding thematic uncertainty and its likely implication to the end user (Lillesand and Kiefer 2000).

1.3 3.3. Level Slicing

Level scaling is an enhancement technique whereby the DN's distributed along the x-axis of an image histogram are divided into a series of analyst-specified intervals or slices. It involves the grouping image regions with similar DN. All of the DN's falling within given interval in the input image are then displayed at the single DN in the output image (Lillesand and Kiefer 2000).

4. RESULTS AND CONCLUSIONS

In the first phase of the research, all images have described in the same coordinate system by

renewing them geometrically. To do that, national coordinate system UTM is taken as base of our coordinate system. By using geometric renovation of images, Istanbul's boundary has been determined.

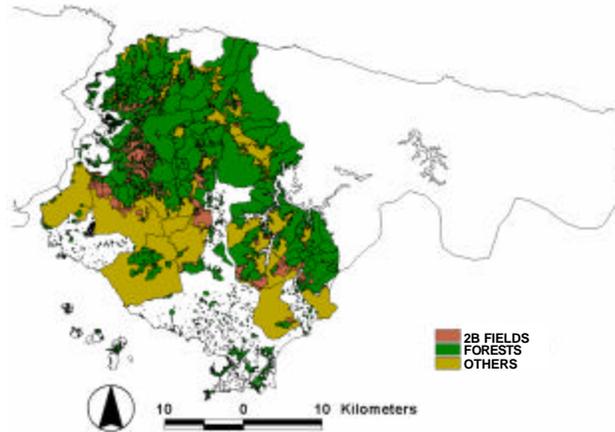


Figure 3. Boundaries of Istanbul's State Owned Land

Other important information, boundary of state owned land, had been collected from forest director's office and Istanbul cadastral director's office to complete the project. Figure 3. above shows the boundary of Istanbul Anatolian part's state owned land in the digital media.

Table 1. Classification Results

CLASS	1984		1992		1997	
	ha	%	ha	%	ha	%
FOREST	3400	77	2645	60	2535	57
OTHER	933	21	1698	38	1793	40

By using 1984,1992, and 2002 space data in uncontrolled classification method, some results were found which is shown in Table 1, for Cavusbasi Village as an example.

Remote sensing is the most convenient and mostly used technique to collect a large amount of data large areas quickly and another dimension of remote sensing is the time because the data can be collected depending on time. It is possible to detect and analyse the magnitude and spatial change of

natural environment by using satellite images. This project will make easier monitoring and controlling the lands, which are State Owned and 2B Lands, by remotely sensing data and GIS after the system builds up.

ACKNOWLEDGEMENTS

This research is a part of Project ICTAG-1433 funded by the Scientific and Technical Research Council of Turkey (TUBITAK).

REFERENCES

- Allum, J. A. E., B. R. Dresigner 1986. Remote Sensing of Vegetation Change Near Inco's Sudbury Mining Complexes. *International Journal of Remote Sensing*, (3): 399-416
- Hewitt, M. J. and H. Cetin. 1999. Environmental Change Detection Using Thematic Mapper Simulator (TMS) and Modis Airborne Simulator (MAS) Data: Mapping of Hurricane Marilyn's Damage on St. Croix Island. *ISPRS Annual Conference Oregon, USA, May 17-21 1999*.
- Jansen, J. R., K. Rutchey, M. S. Kotch, and S. Narumalani, 1995. Inland Wetland Change Detection in the Everglades Water Conservation Area 2A Using a Time Series of Normalized Remotely Sensed Data, *Photogrammetric Engineering & Remote Sensing* 6(12): 199-209.
- Jensen, J. R., M. Hodgson, E. Christensen. 1986. Remote Sensing Inland Wetlands: A Multispectral Approach. *Photogrammetric Engineering & Remote Sensing* 52(1): 87-100.
- Lillesand, T. M. & Keifer. R. W. 2000. *Remote Sensing and Image Interpretation*. New York: John Wiley and Sons.
- Lu, D., Mausel, P., Brondizios, E. & Moran, E., 2003. Change Detection Techniques, *International Journal of Remote Sensing* 25(12): 2365-2407.

Tou, J. T. and R. C. Gonzales. 1974. Pattern Recognition Principles. Reading, Massachusetts Addison-Wesley Publishing Company.

Yeh, A. G., and X. Li. 2001. Measurement and Monitoring of Urban Sprawl in Rapidly Growing Region Using Entroph. *Photogrammetric Engineering & Remote Sensing* vol. 67.