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FOREST DAMAGE ASSESSMENT BY USING REMOTE SENSING DATA

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ABSTRACT

In this study, 12 June 1984 and 18 July 1997 dated, 180/31 orbit/frame numbered LANDSAT 5 TM satellite data of this region were used. To supply the demand for current and accurate data for forest area change analyses; multitemporal remotely sensed images are increasingly used as the data source. Image enhancement, manipulation, registration and classification were conducted for digital change analyses. In these phases, LANDSAT 5 TM 1,2,3,4 and 5 bands were used and in the final phase, accuracy assessment was made by 100 random pixels and area expansion of the forest area was shown with percentages.

1 INTRODUCTION

In Istanbul which is the biggest city of Turkey, rapid population growth caused many problems related to mainly settlement and environment such as forest damage. The conventional methods of environmental data collection and analysis can not deliver necessary information in a timely and cost effective fashion (Michalak 1993). Changes made on the surface of the earth today are more extensive and occur more rapidly than ever before. The ramifications of these changes have become more significant the world's population grows the available and base declines and the resiliency of our environment becomes increasingly taxed. Planners and resource managers need a reliable mechanism to assess these consequences by detecting, monitoring and analysing land use changes quickly and efficiently (Green at al. 1994). To meet the demand for current and accurate data multitemporal remotely sensed images are increasingly used as one of the data sources of land use change analysis (Sunar at al. 1996).

Multitemporal analysis of satellite imagery is effective for change detection only because there is high correlation between spectral variation in the imagery and land cover change (Green at al. 1994). In this study, land cover changes and forest damage assessment were analysed by using the multitemporal Landsat TM images.

2 STUDY AREA AND DATA CHARACTERISTIC

In order to evaluate multitemporal data sets 609 rows and 697 columns study area located on the eastern part of Istanbul, which is the biggest city of Turkey, has been chosen (Fig. 1). There is Omerli water basin, which is one of the main water supplement sources for the Istanbul on the south of the study area. A large amount of this region covered by forest. Open mining areas located in this region is getting larger day by day, on the other hand forest area becoming smaller.
The keys characteristic of the satellite data used is given in Table 1.

Table 1: Characteristic of the data used

Satellite	Data	Number of bands	Spatial Resolution	Wavelength Region	Swath Width
Landsat 5 TM	12 June 1984 18 July 1997	7	30 m Thermal 120 m	0.45-12.5 μm	185 km

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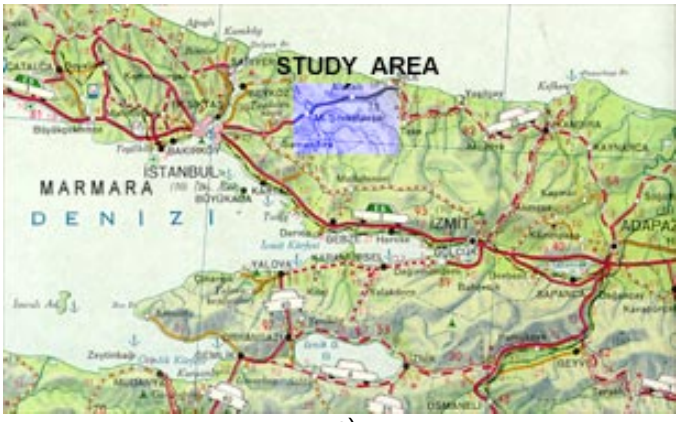

a)

b) c)

Figure 1: Study area a) Map b) Landsat TM 12 June 1984 c) Landsat TM 18 July 1997

3 METHOD

Image enhancement, manipulation, registration and classification were conducted for digital change analysis. An ERDAS image processing system was used for all image data processing.

In the registration phase, both of the two images were registered geometrically to each other by using 1/25000 scale topographic map. Transformation was made 0.3-pixel registration accuracy.

In the classification phase, the Maximum Likelihood classification algorithm was applied to both different dated Landsat images. For the selection of the training areas in the classification and also evaluation of the results, SPOT P data, merged SPOT P+LANDSAT TM and 1/25000 scale topographic maps, ground photographs were used as well as the field check (Fig.2).

Figure 2: Ground photographs

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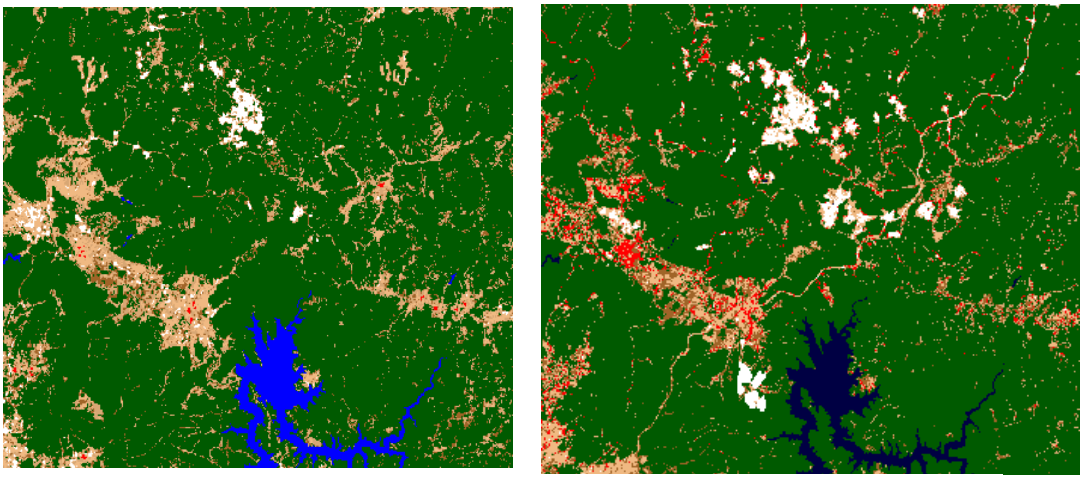
Firstly, twenty-five spectral classes for both images were selected and these classes representing five majors (lake, forest, bare area and open mining area) were derived from training samples (Fig 3). After the examined of the Firstly, twenty-five spectral classes for both images were selected and these classes representing five majors (lake, forest, bare area and open mining area) were derived from training samples (Fig 3). After the examined of the classified images received in 1984 and 1997, while the urban areas and mining areas are become larger, forest area become smaller.

a) b)



c)

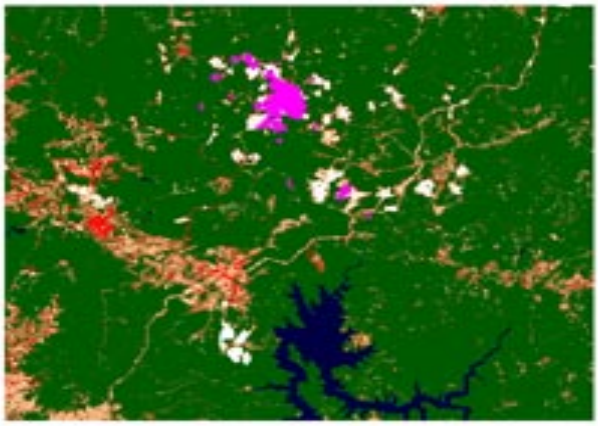


Figure 3: Classified images a) 12 June 1984 b) 18 July 1997 c) Overlay of open mining areas on the classification images 12 June 1984 to 18 July 1997.

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Table 2: Land Use / Cover Change

Land Use /Cover	1984 (Km²)	1997 (Km²)
Lake	12.15	12.40
Forest Area	329.32	297.49
Bare Area	34.29	55.31
Urban Area	1.11	8.78
Open Mining Area	5.16	8.04

The classification accuracy was calculated by comparing the results obtained from a digital classification to the known identity of land cover in 100 randomly test pixels and accuracy assessment was made. ' Classification accuracy ' refers to the agreement between the training area pixels and the ground truth information (Treitz 1992). Accuracy assessment is a general term for comparing a Classification to geographical data that is assumed to be true. Usually, the assumed true data is derived from ground truthing (ERDAS Field Guide, 1991). An overall classification accuracy of % 86 and % 84 percent were achieved for the two different dated images respectively. In table 2, the land cover changes as per the years are shown.

4 RESULTS

Forests are inevitable for the human health, ecological balance and economy. Mining is also important for the economy. In this study, forest changes are examined using multitemporal remotely sensed data received in 12 June 1984 and 18 July 1997. As shown in these classification results, open mining areas located in to this region is getting larger day by day, on the other hand forest area getting smaller (Fig. 3 and Table 2). This changes becoming danger for the environment if it is not controlled soon, it will be more and more danger. Using periodic remote sensing data will help to evaluate the land use change and prevent it.

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