

Integrations of Remote Sensing and GIS to Land Use and Land Cover Change Detection of Coimbatore District

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Abstract-

Changes in Land use and land Cover is a dynamic process taking place on the surface, and the spatial distribution of the changes that have taken place over a period of time and space is of immense importance in many a natural resources studies. Land use/land cover mapping serve as a basic inventory of land resources through out the world. Whether regional or local in scope, remote sensing offers a means of acquiring and presenting land cover data in timely manner. In recent years remote sensing and geographical information system have gained importance as vital tools in the analysis of change detection at district and city level. This paper describes the changes in Land use/land cover pattern of Coimbatore District in Tamil Nadu State in between 2004 to 2007 so as to detect the changes that has taken place in this status between these periods. This study links with socio-economic change of Coimbatore in that period. This research compares the change detection in every year form 2004 . i.e. 2004 to 2005, 2005 to2006, 2006 to 2007. The result of this work will show a rapid growth in land use of Coimbatore in the period of 2004 to 2007.

Key words: Land use and Land Cover, Remote Sensing, GIS

I. INTRODUCTION

Land use is clearly constrained by environmental factors such as soil characteristics, climate, topography, and vegetation. But it also reflects the importance of land as a key and finite resource for most human activities including agriculture, industry, forestry, energy production, settlement, recreation, and water catchments and storage. Land is an essential factor of production, and through much of the course of human history, it has been tightly coupled with economic growth. Often improper land use is causing various forms of environmental humiliation. For sustainable utilization of the land ecosystems, it is essential to know the natural characteristics, extent and location, its quality, productivity, suitability and limitations of various land uses. Land use is a product of interactions between a society's cultural background, state, and its physical needs on the one hand, and the natural potential of land on the other .In order to improve the economic condition of the area without further deteriorating the bio environment, every bit of the available land has to be used in the most rational way. This requires the present and the past land use/ land cover data of the Coimbatore area

The land use/land cover pattern of a region is an outcome of natural and socio – economic factors and their utilization by man in time and space. Land is becoming a scarce resource due to immense agricultural and demographic pressure. Hence, information on land use / land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare. This information also assists in monitoring the dynamics of land use resulting out of changing demands of increasing population.

Land use and land cover change has become an important component in current strategies for managing natural resources and monitoring environmental changes. The advancement in the concept of vegetation mapping has greatly increased research on land use land cover change thus providing an accurate evaluation of the spread and health of the world's forest, grassland, and agricultural resources has become an important priority.

Viewing the Earth from space is now crucial to the understanding of the influence of man's activities on his natural resource base over time. In situations of rapid and often unrecorded land use change, observations of the earth from space provide objective information of human utilization of the landscape. Over the past years, data from Earth sensing satellites has become vital in mapping the Earth's features and infrastructures, managing natural resources and studying environmental change.

TABLE 1.LULC OF COIMBATORE DISTRICT FROM 2004 TO 2007

LULC Class	Area in Lha(2004-05)	Area in Lha(2005-06)	Area in Lha(2006-07)	percentage(2004-05)	percentage(2005-06)	percentage(2006-07)
Kharif	2.31	0.59	0.31	68.5	17.3	11.5
Rabi	0.17	1.34	0.76	5.0	39.3	28.1
Double	0.43	1.02	1.17	12.8	29.9	43.3
Plantation	0.46	0.46	0.46	13.6	13.5	17.0
Fallow Land	0.39	1.2	2.11	11.6	35.2	78.1
Forest Cover	1.36	1.31	1.31	40.4	38.4	48.5
Others	2.34	1.54	1.33	69.4	45.2	49.3
Net Sown Area	3.37	3.41	2.7			

III. DATA USED

Survey of India Topographical map on the 1: 50,000 scale for the year 2004 and LANDSAT (TM), LULC Data from National Remote Sensing Center refer Table 1.

IV. METHODOLOGY

Satellite imagery in the Print form (2004) and digital data (2004 and 2006) was visually interpreted. The variation in the image characteristics like tone, texture, pattern etc. It is used to identify various land use classes. The information obtained from the imagery was transferred to base map prepared from topographical map. The digital data procured for land use land cover mapping was geo-referenced with Survey of India (SOI) topographical sheets.

- In designing the database, the study area boundaries were determined from the topographic as well as land use land cover maps.
- Spatial data were digitized using Calcomp 9100 digitizer table.
- Creation of topology is necessary to make the spatial data usable. Errors were edited which included arc, label, move and intersect. The topology was constructed by using CLEAN and BUILDS commands. The topology was reconstructed when errors were found.
- This stage requires getting attribute data into ARC/INFO. Data file names were assigned to all the files created. While the JOINTITEM command was used to link attributes from data file with the related coverage.
- In managing the database all coverage from digitizer units were converted to real world coordinates using UTM system.
- At this stage graphic analysis was carried out:
 - Landuse and land cover 2004
 - Landuse and land cover 2005
 - Landuse and land cover 2006

Area of each category was calculated. The flow diagram indicating the methodology for landuse/cover mapping is given in Fig 1. The procedure adopted in this research work forms the basis for deriving statistics of land use dynamics and subsequently in the overall, the findings.

V. RESULT AND DISCUSSION

The results of land use/cover assessment based on visual interpretation for four different years of satellite data between 2004 to 2007. It has a total area of about 254 square km and a total population of about 4,27,1856 people. In 2004-05 landuse coverage as follows cropland covering is 86.4 % ,plantation occupies 13.6%, fallow land covering is 11.6% from the net sown area, forest coverage in this period is 40.4% while other (settlement, water body, sand etc) landuse features occupied 69.4 %. The trend of the landuse and land cover continued in the same manner in 2005-06 with the same order of importance. However the

The information being in digital form can be brought into a Geographical Information System (GIS) to provide a suitable platform for data analysis, update and retrieval. Improvements in satellite remote sensing, global positioning systems and geographic information systems techniques in the past decade have greatly assisted the collection of land cover data and the integration of different data types.

The present study was carried out to evaluate the effectiveness of data in and around Coimbatore on 1:25,000 scales by using satellite data of LANDSAT (TM), and Base information from Topo sheet

II. STUDY AREA

Coimbatore, district is situated on the banks of river Noyyal between 11° 00' of north latitude and 77° 00' of East longitude. The total area of Coimbatore district is 254 square km. Coimbatore is located at an elevation of about 398 meters. The mean maximum and minimum temperatures during summer and winter varies between 35°C to 18°C. Highest temperature ever recorded is 41 °C and lowest is 12 °C. Coimbatore is situated in the extreme west of Tamil Nadu, near the state of Kerala. It is surrounded by mountains on the west, with reserve forests and the (Nilgiri Biosphere Reserve) on the northern side. The eastern side of the district, including the city is predominantly dry. The entire western and northern part of the district borders the Western Ghats with the Nilgiri biosphere as well as the Anaimalai and Munnar ranges. It is the third largest district of Tamil Nadu. This district is known as the Manchester of South India and is known for its textile factories, engineering firms, automobile parts manufacturers, health care facilities, educational institutions, and hospitality industries. The hill stations of Ooty, Coonnor and Valparai are close to the city making it a good tourist attraction throughout the year. The district is situated on the banks of the Noyyal River and is close to the Siruvani Waterfalls.

fallow land is increased in its percentage and the other landuse categories decreased in its percentage.

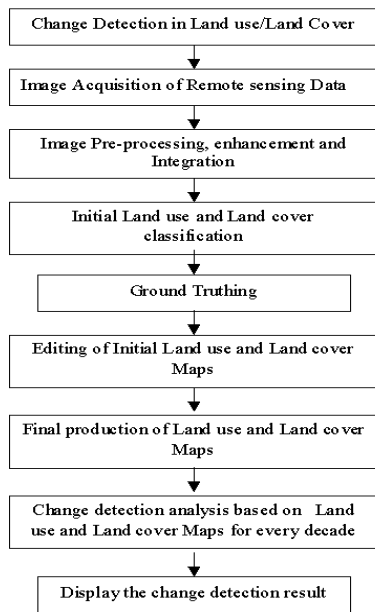


Figure 1. Methodology for land use/cover change Detection

In the period of 2006-07 the percentage of crop land is marinating the same level, the plantation is slightly increased, there is more deviation in fallow land, the forest coverage is increased in its percentage, other categories maintain the same percentage. In short the most common variable explaining the changes in landuse and land cover in Coimbatore is population growth. The variations in area covered under agriculture and fallow land attributed to changes in crop rotation, harvesting time and conversion of these lands into plantation. We can see the difference in land use and land cover in the comparison chart Figure 2.

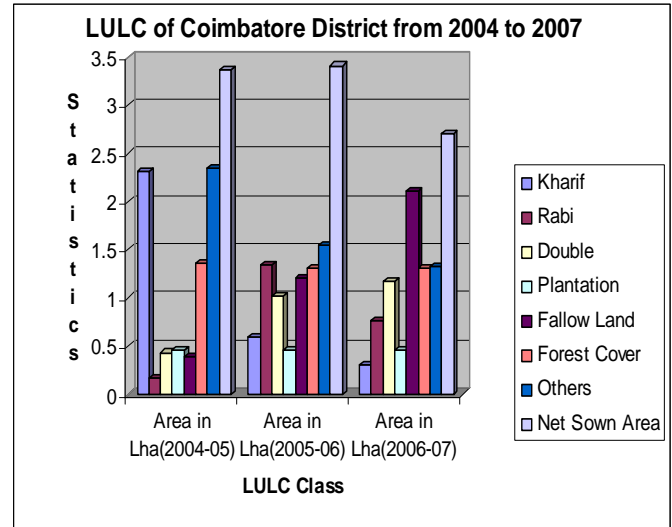


Figure 2. LULC Comparison Chart

VI . CONCLUSION

The study has revealed that satellite data has the unique capability to detect the changes in landuse quickly and accurately. From the analysis it has been found that the satellite data is very useful and effective for getting the results of temporal changes, with this effective data it has been found that the cropland is decreasing at the cost of haphazard growth of plantation and settlements. This will help in maintaining the ecological balance and improving microenvironment of the region.

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Bibliography:



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