

Land Use And Land Cover Change Detection In Thirumanimuttar Sub Basin, Cauvery River, Tamilnadu

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Abstract—Identification of Land Use and Land Cover (LULC) changes is an important for many planning and management activities. Remote sensing and GIS technology can be used to assess the Land use Land cover changes. By using NRSC and supervised classification methods in ERDAS IMAGINE software the Land use/Land cover map of the study was prepared. Considerable LULC pattern can be seen in the study area because of the rapid Urbanization and development. The socioeconomic development affects the water resources, mineral wealth and ecosystems which are available in the study area. The results show that significant land use changes occurred in the Thirumanimuttar area from 1992 to 2010, which may be related to economic development and urban expansion between 1992 and 2010. The result reveals that the maximum changes were noticed in increase in Built-up-Land and in semi evergreen forest in the study area. Other changes also can be seen in the spatial distribution.

Keywords: Land use / Land cover, Urbanization, Remote sensing, Landsat data, Thirumanimuttar

1. INTRODUCTION

Land-use and land-cover change, as one of the main driving forces of global environmental change, is central to the sustainable development debate. Land use and land-cover changes have impacts on a wide range of environmental and landscape attributes including the quality of water, land and air resources, ecosystem processes and function. Information on land use/land cover change is essential for the selection, planning and implementation of land management schemes to meet the increasing demands for basic human needs and welfare (Reddy and Gebreselassie, 2011). Remotely sensed change detection based on multitemporal, multispectral and multisensor imagery provides this information (Singh, 1989; Othman *et al.*, 2013). LULC studies include, image enhancement, LULC classification and change detection. Qualitative and quantitative terrestrial land-cover changes have been identified using Satellite imagery. Landsat satellite data are most widely used for studying the Land use and Land cover changes. J. Li and H.M. Zhao have studied the Urban Land Use and Land Cover Changes in

Mississauga using Landsat TM images. H.S. Sudhira *et al.*, studied about Urban sprawl metrics, Land cover dynamics and modelling using GIS for Udipi Mangalore. M. Turker and O. Asik has studied Land Use Change Detection At The Rural- Urban Fringe Using Multi-Sensor Data In Ankara, Turkey. K. C. Seto *et al.*, have monitored the land-use change in the Pearl River Delta using Landsat TM. Tamilenth, J. *et al.* have studied the dynamics of urban sprawl, changing direction and mapping using a case study of Salem city, Tamilnadu, India. Bassam Saleh and Samih A Rawashdeh studied about Study of urban expansion in Jordanian cities using GIS and RS. Information on urban growth, land use and land cover change study is very useful to local government and urban planners for the betterment of future plans of sustainable development of any area. Heavy urbanisation is witnessing the decrease in, vegetation land, agriculture land, forests land, mineral wealth and water bodies. The recent developments of Remote Sensing and Geographical Information System Technology helps us to measure the land use land cover changes accurately. The present study has been conducted in the Thirumanimuttar river Sub Basin of Cauvery River, which is spread over in Salem and Namakkal District of Tamil Nadu, South India. The objectives are to create land use / land cover map based on NRSC classification and interpretation of those changes. To achieve the objective we used 1992 and 2010 satellite data and assessed the changes using remote sensing and GIS Technology.

2. MATERIALS AND METHODS

2.1. Data Used

1. Survey of India Toposheet, 1: 50,000 scale, (1972-74) to verify the LULC changes.
 2. Landsat imagery – (1992 and 2010).
 3. Image processing software-ERDAS
 4. GIS software-ARC GIS
- The methodology to assess the Land use / Land cover changes is given below (Figure 1):

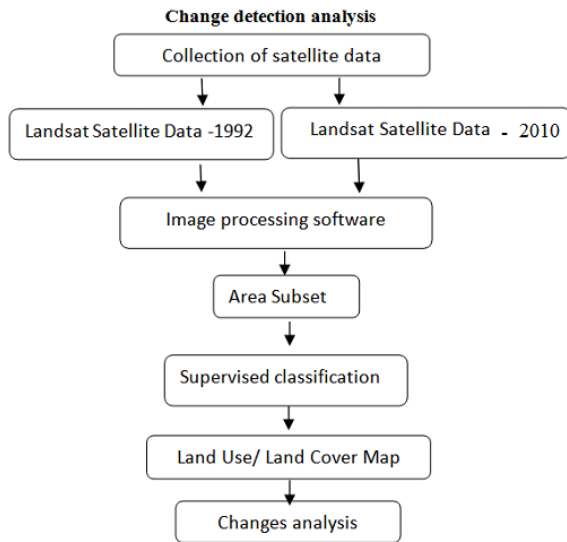


Figure-1. Methodology

2.2. Study Area

The study area is located in between North Latitude $10^{\circ} 58'$ and $11^{\circ} 50'$ and East Longitude $77^{\circ} 53'$ and $78^{\circ} 23'$ total area covered by 2432km^2 (Figure.2). The average elevation is 278m (912ft). The study area is bounded by many wavy hills and undulated terrain characterised with archean rocks.

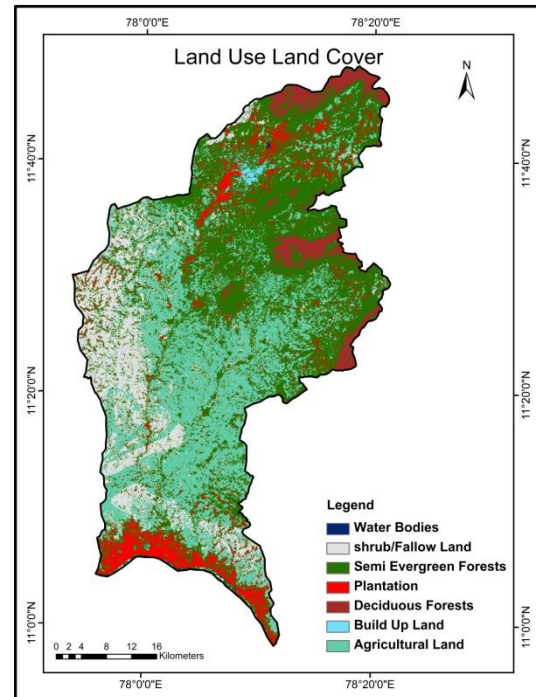


Figure 3. LU/LC Map for the year 1992

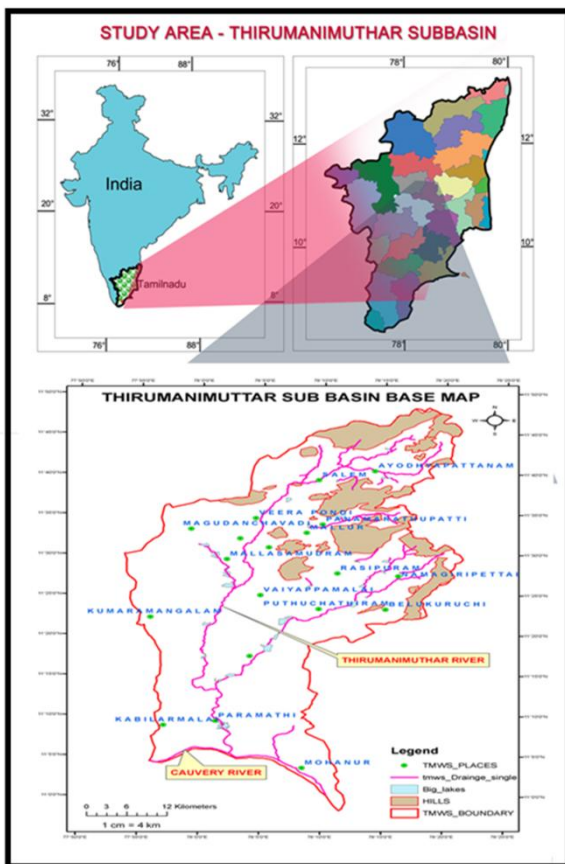


Figure 2. The Study Area

The Thirumanimuttar is the main river and it is a tributary of Cauvery river. The sub basin is shared by Salem and Namakkal Districts .

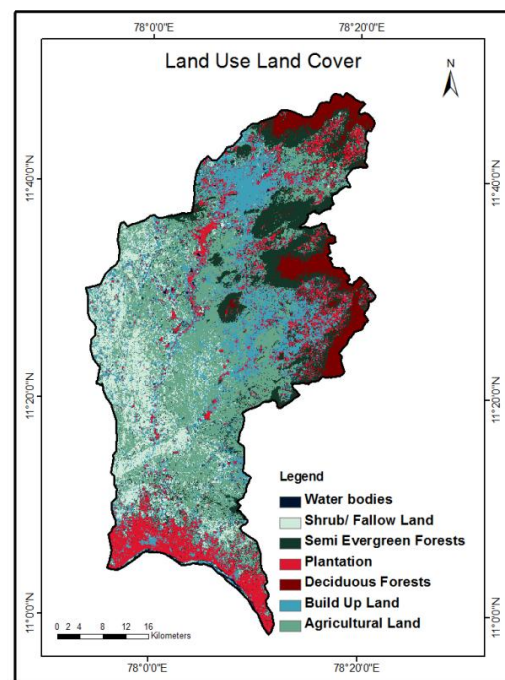


Figure 4. LU/LC Map for the year 2010

Landsat TM 1992 and 2010 satellite data have been downloaded using the www.landcover.org website. The Land Use/ Land Cover map was prepared by processing the imageries in ERDAS image processing software (Figure 3, Figure 4). These maps were classified by using NRSC and supervised classification methods. There are seven classes of the classification and these seven classes are Build-up land,

Shrub land, Deciduous Forest, Semi evergreen Forest, Agri./Fallow land, Water bodies and Plantation. The classified fields clearly show the current scenario of the region. The above maps are clearly showing the land use/land cover changes for the year 1992 and 2010. The comparative changes are given below (Table 1). In this study, the Tasseled Cap Transformation was carried out for TOA corrected Landsat satellite imagery by applying Huang *et al.* (2002)

Agri./Fallow land, and Plantation changes are distributed around the study area.

4. CONCLUSION

The LU/LC change detection study of this area shows that Shrub land (2%), Deciduous Forest (3%), Agri./Fallow land (2%), Water bodies (1%) and Plantation (4%) are relatively decreased. This is due to less amount of rainfall where as Built-up-Land (11%) and Semi Evergreen forest (3%) are relatively increased. The abnormal growth of Salem City and other important towns are the main causes of increasing built-up-land.

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Classification	Year 1992		Year 2010		Change s %
	Km ²	%	Km ²	%	
Built-up land	226	9	482	20	(+)11
Shrub Land	380	16	341	14	(-)-2
Deciduous Forests	300	12	208	9	(-)-3
Semi Evergreen forests	227	9	285	12	(+)-3
Agri./Fallow Land	740	30	680	28	(-)-2
Water bodies	39	2	26	1	(-)-1
Plantation	520	21	410	17	(-)-4
Total Area	2432 Km ²		2432 Km ²		

Table .1 The comparative changes between the year 1992 and 2010

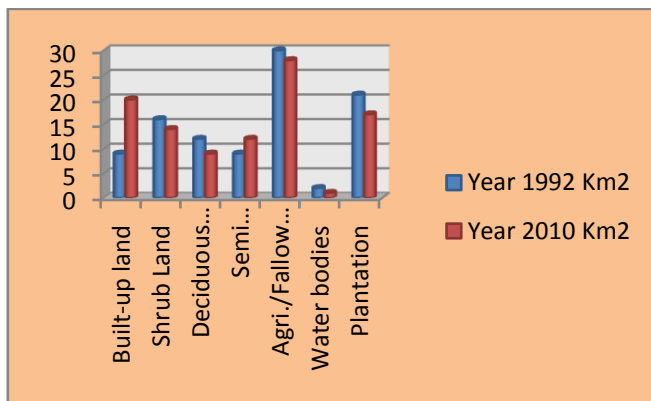


Figure 5. Chart shows the relative changes of LU/LC on 1992 and 2010

3.RESULT AND DISCUSSION

During the 18 year interval both the districts in the study area have faced many tremendous changes. The Built-up-land has increased in almost all major towns and places located in the study area. The Salem City has seen the development along the western side. Water bodies are changed with their reduction in area and dried out because of extinct of streams due to urbanisation and dried up watersheds. Other classes of Shrub land, Deciduous Forest, Semi evergreen Forest,

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