

Dynamics of landuse and landcover changes in Papanasam Taluk, Thanjavur District, Tamilnadu, India

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ABSTRACT

Remote sensing has been in common use to provide the primary data from which land use and land cover types and their boundaries are for interpretation purpose. During the past four decades several surveys, studies, and other projects have successfully demonstrated that remote sensing data are useful for land use and land cover inventory and mapping. These surveys have contributed to our confidence that land use and land cover surveys of larger areas are possible by the use of remote sensing data bases. It has been argued in this paper that a systematic analysis of local-scale land-use change studies, conducted over a range of timescale. Over the last few decades, numerous researchers have improved measurements of land-cover change, the understanding of the causes of land-use change.

Key words: Landuse, Landcover, Remote sensing

INTRODUCTION

Present use of land is one of the characteristics that are widely recognized as significant for planning and management purposes. One concept that has much merit is that land use refers to, "man's activities on land which are directly related to the land" [1]. Land cover, on the other hand, describes, "the vegetation and artificial constructions covering the land surface" [2]. Predicting how land-use changes affect land degradation, the feedback on livelihood strategies from land degradation, and the vulnerability of places and people in the face of land-use/cover changes requires a good understanding of the dynamic human-environment interactions associated with land-use change [3, 4]. Over the last few decades, numerous researchers have improved measurements of land-cover change, the understanding of the causes of land-use change, and predictive models of land-use/cover change, in part under the auspices of the Land-Use and Land-Cover Change (LUCC) project of the International Geosphere-Biosphere Programme (IGBP) and International Human Dimensions Programme on Global Environmental Change (IHDP) [5, 6]. Land Use (LU) and Land Cover (LC) recognition and classification of an urban environment or landscape depends largely on three major factors; one of which is a good knowledge of the area of study; which is usually acquired through thorough fieldworks and ground truth exercises. The development of good training sites and spectral signatures for land use and land cover classification is a product of such knowledge when combined with the applications of the image characteristics such as size, shape, pattern, shadows, tone texture, location and sometimes colors. The second and the third factors are the qualities of the image data and hardware/software available to the user or image analyst.

STUDY AREA

The uneven distribution of various natural and cultural elements on the surface of the earth forms the basis for any geographical analysis. The present study area namely Papanasam taluk forms a part of Thanjavur district in Tamil

Nadu. Thanjavur District is one of the 32 districts of the state of Tamil Nadu, in southeastern India. Its headquarters is Thanjavur. As of 2011, Thanjavur being the foremost district of the cauvery delta occupies an important position in the agricultural map of Tamil Nadu state. Since its formation, the district is called as the rice bowl of Tamil Nadu. Thanjavur District lies in the East Coast of Tamil Nadu. It is located between 9°50' and 11°25' of the northern latitude and 78°45' and 79°25' of the Eastern longitude. Thanjavur district stands unique from time immemorial for its agricultural activities and is rightly acclaimed as the Granary of the South India lying in the deltaic region of the famous river Cauvery and criss-crossed by lengthy network of irrigation canals it is a plain region.

OBJECTIVES

- a. To understand changes in land use and land cover occurring in Papanasam taluk based on analysis of remotely sensed data,
- b. To identify and compare drivers of land use and land cover change in the study areas

MATERIALS AND METHODS

Satellite Imageries in LANDS TM 1981 and LANDSAT ETM+ 2011 (30m resolution), Survey of India topographical sheets at the scale of 1:50000 and secondary data were used to carry out the study of landuse changes in the study area. Arc GIS 9.3, and ENVI 4.7 version image processing software were used to have a spatial analysis of landuse pattern and its changes. Different systems of land use classification are in vogue. In India, a nine fold land use classification was initially used. United States Geological Survey (USGS) and National Remote sensing Agencies (NRSA) have their own classification methods where different hierarchical levels are considered (4, 7). In the present study, land use is classified based on local conditions of Papanasam taluk. The land use classification adopted here is a supervised and Spectral Angle Mapper (SAM) procedure.

RESULTS AND DISCUSSION

The land use types present in this taluk are farm land (mixed plantations), fallow land, scrub land, barren land, water bodies and settlements. The spatial distribution of various types of land uses in Papanasam taluk for the year 1981 and 2011 is discussed below. Table 1 shows overall pattern of the land use types in the study area.

Table-1 Landuse and Landcover Changes in Papanasam Taluk 1981 – 2011

S. No	Landuse Classification	1981 (Sq. m)	2011 (Sq. m)	1981 (in %)	2011 (in %)	Difference
1	Water bodies	10597500	8789500	2.77	2.29	-0.48
2	River Sand	5164200	5093700	1.35	1.33	-0.02
3	Settlements	9953100	45673200	2.60	11.92	9.32
4	Commercial activity	0368100	2711400	0.10	0.71	0.61
5	Agriculture Land use	98225100	8132700	25.63	21.22	-4.41
6	Mixed Plantations	27187200	28788300	7.09	7.51	0.42
7	Barren Land	2430000	4355400	0.63	1.14	0.51
8	Crop Land	14383400	12565800	37.53	32.79	-4.74
9	Vegetation Cover	63829800	56260700	16.65	14.68	-1.97
10	Scrub Land	14529600	12383800	3.79	3.23	-0.56
11	Fallow Land	7137900	12215500	1.86	3.19	1.33
				100.00	100.00	

Source: Data generated from Landsat satellite Imagery

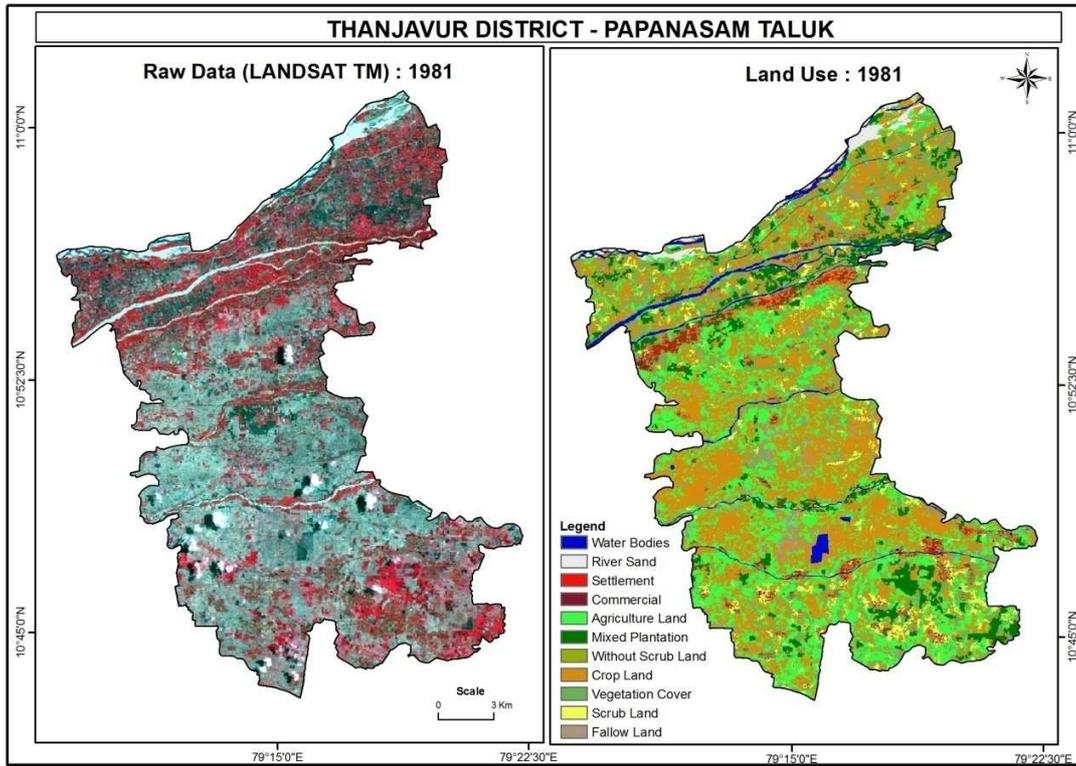


Figure - 1

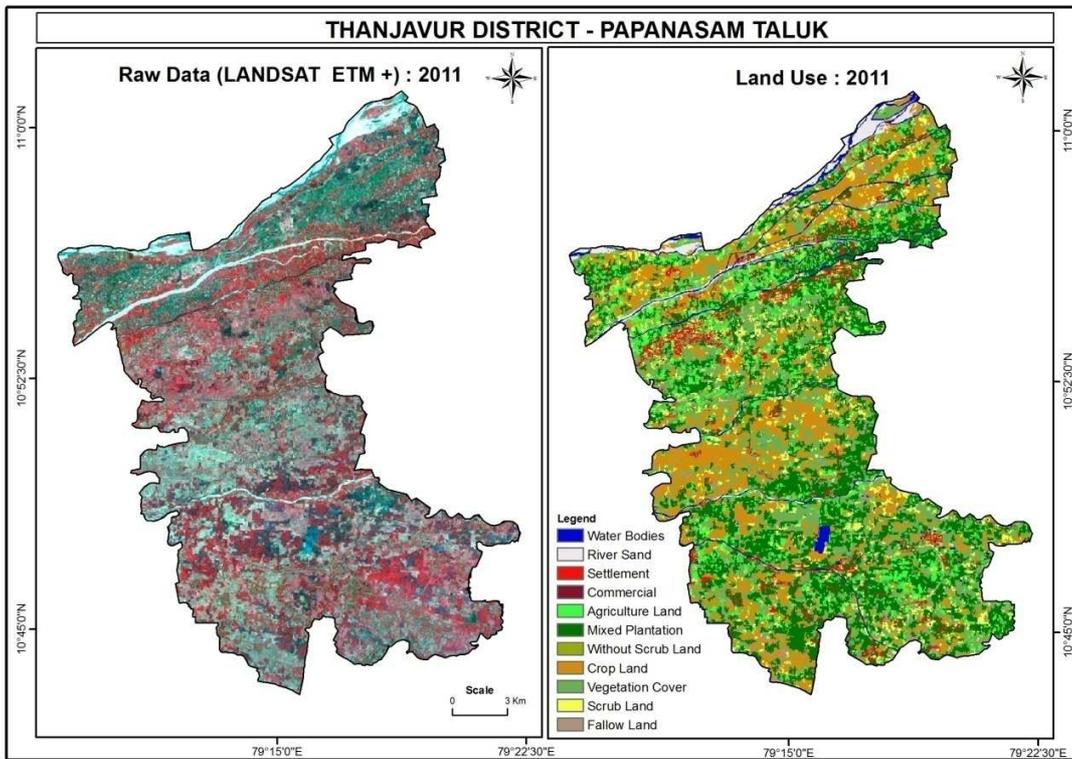


Figure - 2

Table-1 shows the Region of Interest (ROI) statistics of Landuse and Land cover changes from 1981 to 2011 for Papanasam Taluk of Thanjavur District. The raw data for the year 1981 and 2011 were processed (Figure 1 and 2) using image analysis techniques (ENVI) and derived the following land use classification: water bodies, river sand, settlements, commercial activities, Land used for agriculture, mixed plantations, barren land, crop land, vegetative cover, scrub and fallow land. The data generated from the image analysis shows that the water bodies have decreased from 2.77 to 2.29 which are 0.48 negative changes. River sand category have also reduced but the percentile is negligible (-0.02). The settlements have remarkable increase for the past three decades, which is from 2.60 to 11.92 percent with an increase of 9.32 percentages. This is an indication that like many urban expansion, this taluk is becoming an urban centre with increase in settlements and related urban activities along the road nodes along with an increase in commercial activities (0.61). Agricultural land use have decreased from 25.63 to 21.22 percent with a negative impact of -4.41 and this indicates that the transformation of agriculture land for construction activities. Mixed plantations and barren land categories have little impact in the land use and change categories from 1981 to 2011 where as the crop land (-4.74), vegetation (-1.97) and scrub land (-0.56). The fallow land category has increased from 1.86 to 3.19 with an increase of 1.33 percentages.

CONCLUSION

The study points out the following observations with regard to landuse patterns and changes: Agriculture is the dominant type of land use in both time periods. There is a marginal decline in area under water bodies. Fallow land and Barren Lands have shown almost two fold increases while agricultural land has declined sharply and scrub land also decreased. The southeastern parts have undergone maximum change compared to other region in the study area. Increase in non-agricultural activities may indicate a changing landuse of urban-related activities. Land use change thus observed may be because of decline in water availability for farming and discouraging environment for crop and livestock production.

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