ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 07, pp.55292-55299, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

DECADAL VARIATIONS OF LAND USE AND LAND COVER CLASSIFICATION IN THANJAVUR TALUK (INDIA)

[1]Lakshmi, G., [*,1]Senthil, J., [2] Indhira, K., and [1]Anand, P.H.

[1]Department of Geography, Government Arts College (Autonomous), Kumbakonam-612001, India
[2]Department of Geography Nirmala College for Women (Autonomous), Coimbatore - 641 018, India

ARTICLE INFO

Article History:
Received 22nd April, 2017
Received in revised form
10th May, 2017
Accepted 15th June, 2017
Published online 31st July, 2017

Key words:

ERDAS, ArcGIS,
Land Cover, Satellite.

ABSTRACT

Land is becoming a scarce resource due to population growth and industrialization Techniques and methods of using satellite imageries as data sources have been developed and successfully applied for land use classification and change detection in various environments. This study attempted to expose the impact of changes in land use/land cover of Thanjavur Taluk, Tamil Nadu. The relationship between Land Use Changes and its trend is analysed. The land cover and land use study was conducted by mapping LANDSAT data of three different four years (1981, 1991, 2001, 2011) with the help of ERDAS and ArcGIS. The result of the work shows a rapid growth in settlement at the cost of decrease in agriculture area.

Citation: Lakshmi, G., Senthil, J., Indhira, K., and Anand, P.H. 2017. "Decadal variations of land use and land cover classification in Thanjavur Taluk (India)", *International Journal of Current Research*, 9, (07), 55292-55299.

INTRODUCTION

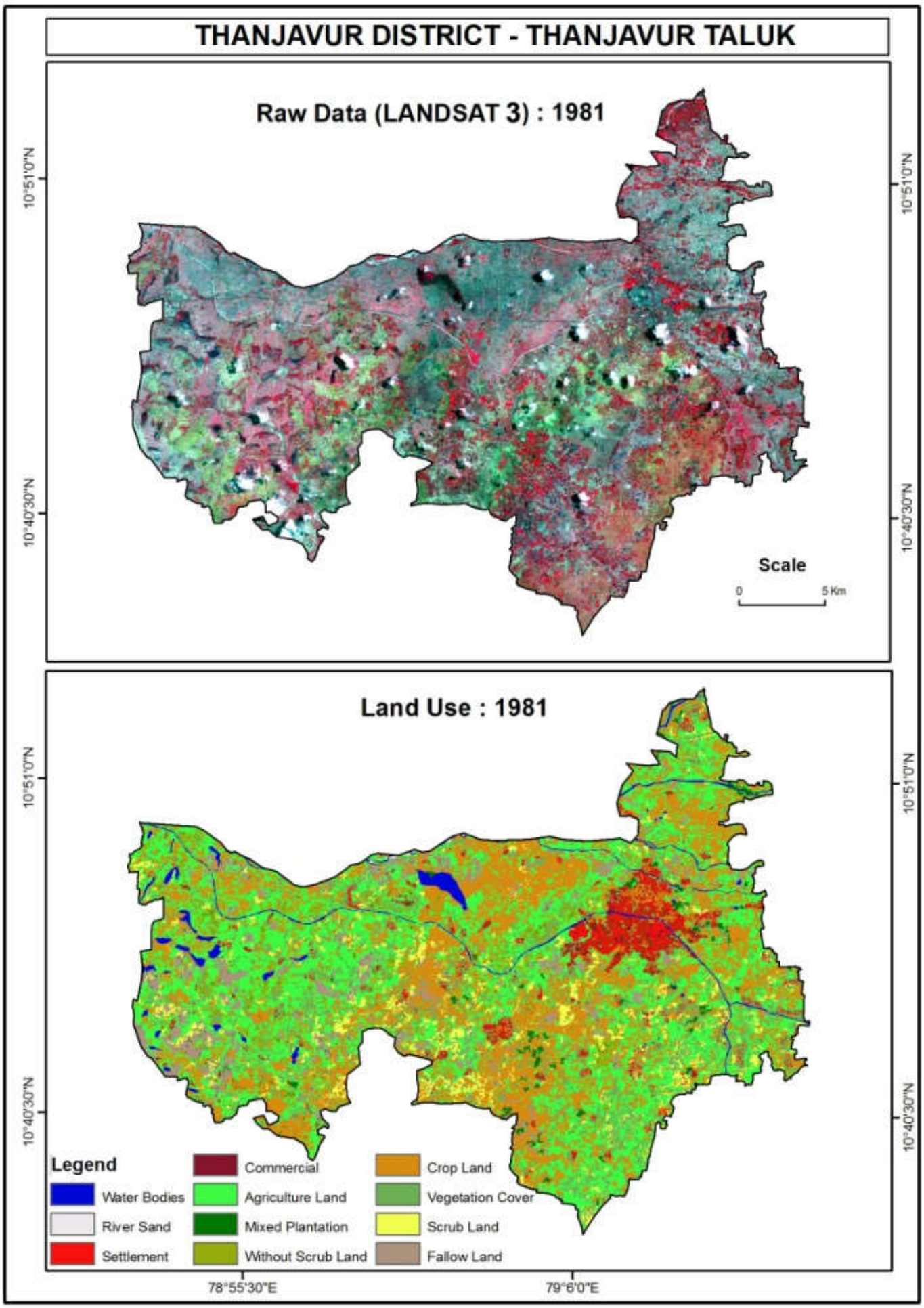
Land cover is the observed as (bio) physical cover on the earth's surface. When considering land cover in a very pure and strict sense it should be confined to describe vegetation and man-made features. Consequently, areas where the surface consists of bare rock or bare soil are describing land itself rather than land cover. Also, it is disputable whether water surfaces are real land cover. However, in practice, the scientific community usually describes those aspects under the term land cover. Land use is characterized by the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it. Definition of land use in this way establishes a direct link between land cover and the actions of people in their environment. Thanjavur was once the headquarters of "the great Chola kingdom" and a land mark of the Brahadeeswarar temple constructed a century before at the centre of Thanjavur, the entire east of Thanjavur with fertile agriculture land, for several years and till present. In the present study land use and land cover classification for the Thanjavur taluk, Tamilnadu, India. Thanjavur is located at 10.8°N 79.15°E.

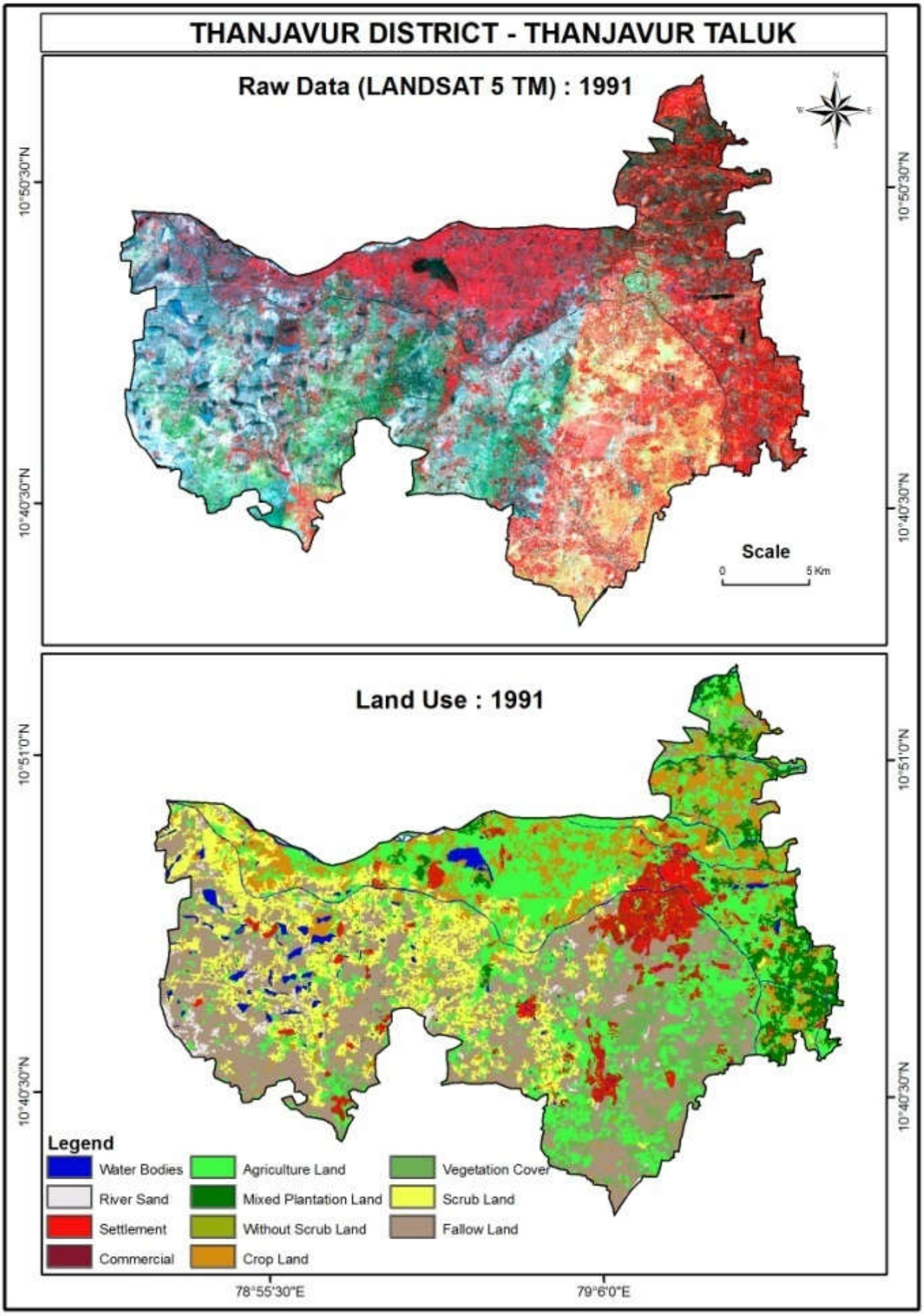
The tributaries of river Cauvery, namely, the Grand Anaicut canal (Pudhaaru), Vadavaaru and Vennaaru rivers flow through the city. Thanjavur is situated in the Cauvery delta, at a distance of 314 km south-west of Chennai and 56 km east of Tiruchirappalli.

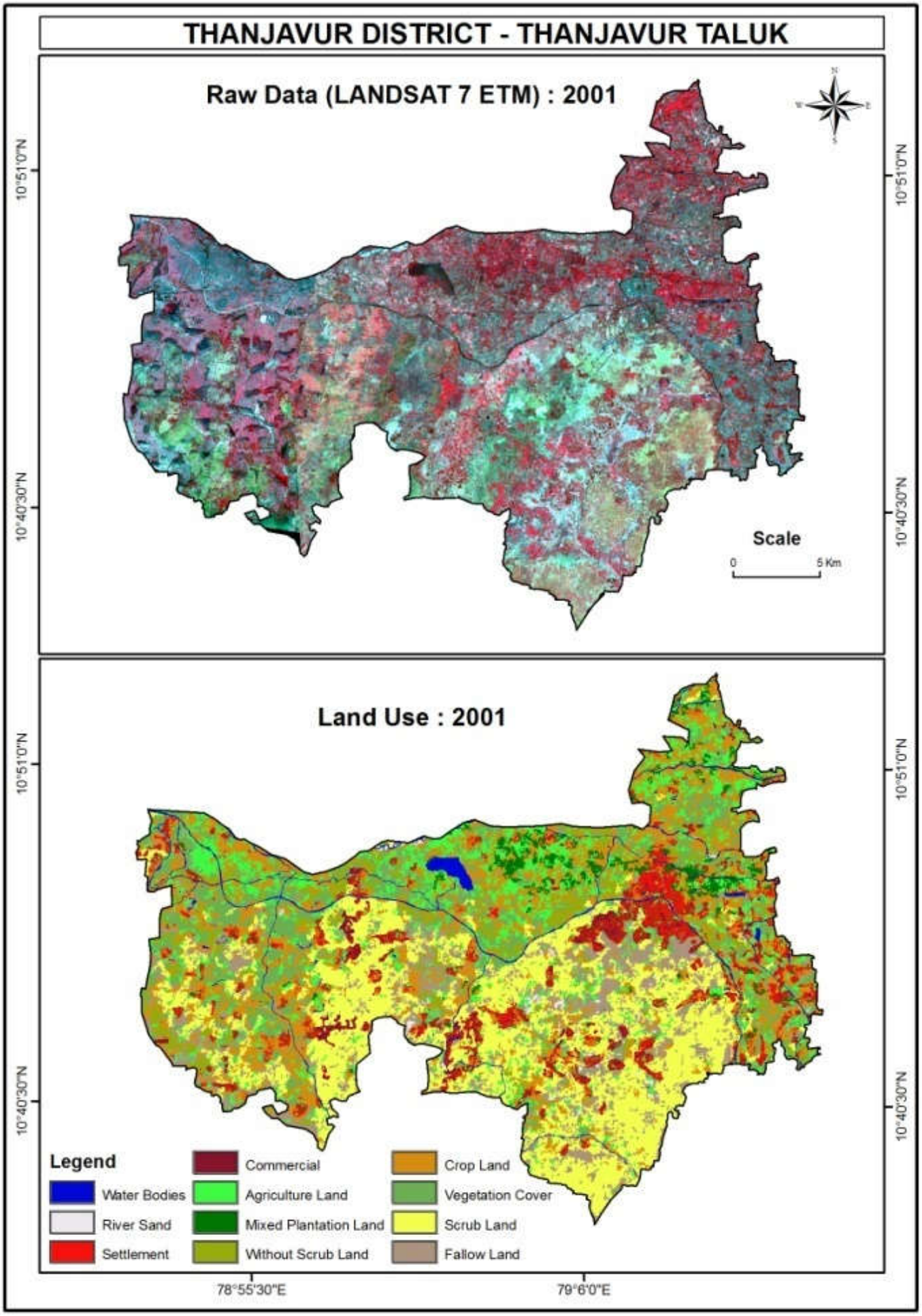
MATERIALS AND METHODS

Optical remote sensing data have been used to derive various maps for different time periods from 1981 to 2011. The data used in this for analytical purpose was the Landsat digital data and subjected to image processing analysis and at the end product gives the results of pixel-by-pixel classification. The results were then tabulated to show the decadal variations among the land use and land cover such as water bodies, river sand, settlement, Land used for commercial and agricultural activities, plantation use, grass land, crop land, vegetation cover, scrub and fallow land. the analytical results were derived for the four different time periods of 1981, 1991, 2001 and 2011. Initially the data derived from the image analysis were in the form of hectares and then converted into square meters and then computed to percentages for interpretation and comparative analysis purpose.

***Corresponding author:* Senthil, J.,**
Department of Geography, Government Arts College (Autonomous), Kumbakonam-612001, India.


THANJAVUR DISTRICT - THANJAVUR TALUK
Raw Data (LANDSAT 3) : 1981
Scale
0
5 Km
Land Use : 1981
Legend
Water Bodies
River Sand
Settlement
Commercial
Agriculture Land
Mixed Plantation
Without Scrub Land
Crop Land
Vegetation Cover
Scrub Land
Fallow Land
10°51'0"N
10°40'30"N
78°55'30"E
79°6'0"E


THANJAVUR DISTRICT - THANJAVUR TALUK
Raw Data (LANDSAT 5 TM) : 1991
Scale
0
5 Km
Land Use : 1991
Legend
Water Bodies
River Sand
Settlement
Commercial
Agriculture Land
Mixed Plantation Land
Without Scrub Land
Crop Land
Vegetation Cover
Scrub Land
Fallow Land
10°50'30"N
10°40'30"N
10°51'0"N
78°55'30"E
79°6'0"E


THANJAVUR DISTRICT - THANJAVUR TALUK
Raw Data (LANDSAT 7 ETM) : 2001
Scale
0
5 Km
Land Use : 2001
Legend
Water Bodies
River Sand
Settlement
Commercial
Agriculture Land
Mixed Plantation Land
Without Scrub Land
Crop Land
Vegetation Cover
Scrub Land
Fallow Land
10°51'0"N
10°40'30"N
78°55'30"E
79°6'0"E

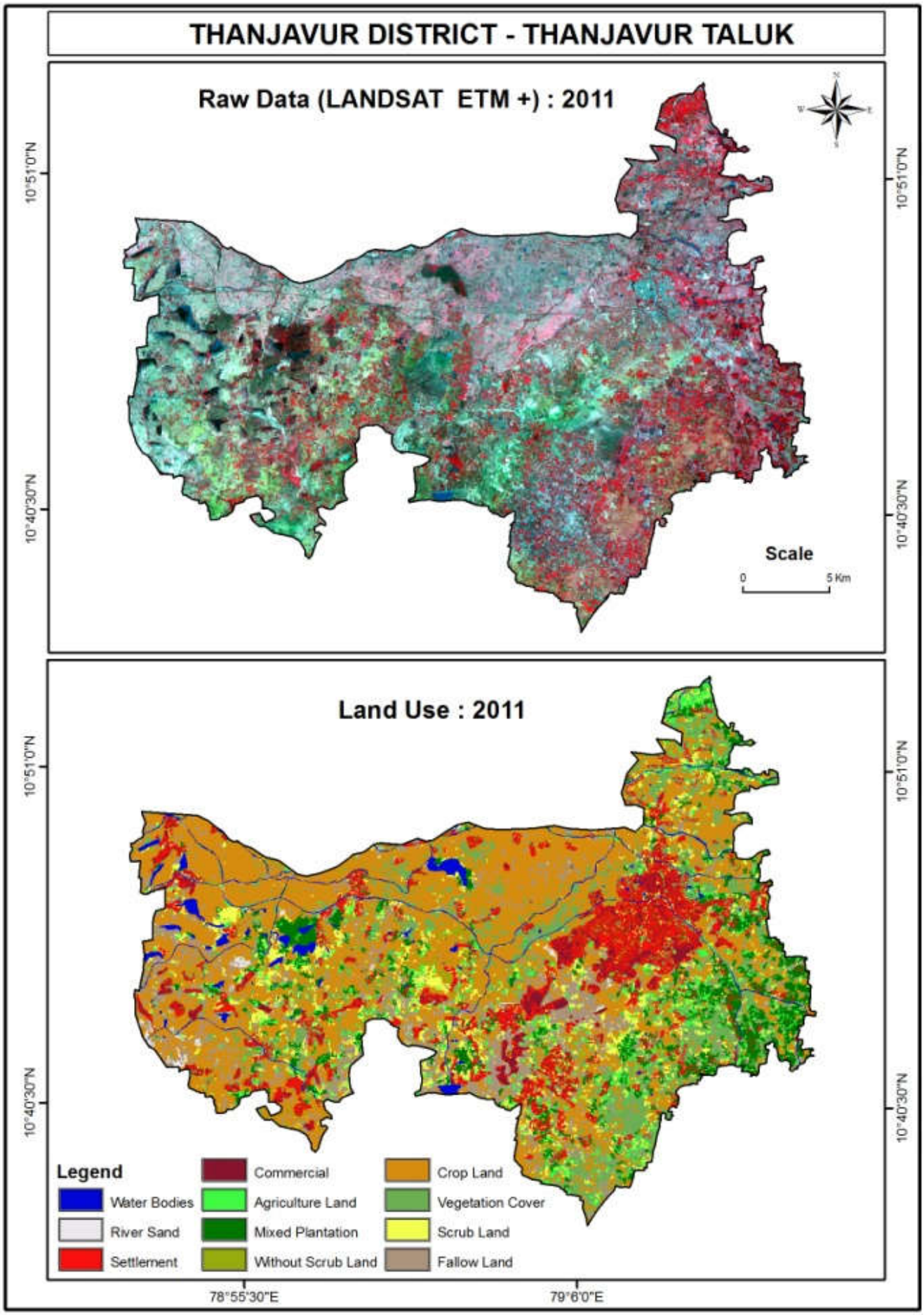


Figure 1. Landsat Images for four Different Period

RESULTS AND DISCUSSION

Analytical data derived from the digital image processing technique for the Lands at data set has been tabulated for eleven land use and land cover from 1981 to 2011 decade wise in figure-1. The highest percentage of land use and land cover data for the year 1981 shows that agriculture land cover and crop land occupies 31.5 and 25.8 per cent respectively. This was followed by vegetation cover (14.7 per cent) and scrub (11.7 per cent); Land cover by Plantation has 5 per cent followed by settlements (4.07 per cent) water bodies (2.04 per cent) and fallow land (1.07 per cent).

The rest of the land categories occupy meager proportion of commercial (0.58 per cent) and grass land category (3.33) which are negligible. When compared to the proceeding three decades, the land used for settlements have been increased from 4.07 per cent (1981) to 5.36 (1991), 6.34 (2001) and 10.58 per cent in 2011. This is a clear indication of this talk is approaching towards urbanization process, in a much faster way. Similarly the commercial category of land has also been increasing gradually, the table shows. The table also shows that the water bodies have been shrinking gradually, which indicates that land reclamation from the water bodies is evident. The major occupying categories of grass land and vegetation has been gradually increased in 2011, from 3.33 and 14.76 to 4.33 and 12.00 per cent, respectively. The transformation of agricultural and plantation crops have been converted into construction and other activities are evident from the table and it shows that from agriculture and plantation from 31.5 and 5.04 in 1981 to 28.0 and 3.81 percent in 2011, respectively. The table shows on agricultural activity, no land is reduced for the four decades. These are indicative of urbanization processes had been replacing for the past four decades, on the northern side of the land categories not used for agriculture.

Changing Pattern of Land use and land cover classifications

Shift and Share Index Method: 1981-2011

In Geographical analysis gains or losses can be defined in a number of ways of much value added that are the most commonly used measures. Both terms are self-explanatory valued added refers to the amount by which a product has increased in value by the process of manufacture, and the employment refers to the number of persons working in manufacturing Industries. In this section changing pattern of urban land use and land cover classification wise (or) decline between 1981 and 2011 has been measured by using value-added data. Fuchs (1962) uses the value added data to calculate the gain or loss of manufacturing (GS) and the similar method has been applied to the present problem in the following manner.

Gs=Ys – Hs and Hs=Xs * Ys/ X

where

Xs Yield in the initial year (1981) indicates in the each class
Ys Yield in the initial year (2011) indicates in the total
X Yield in the initial year (1981 indicates in the each class
Y Value in the initial year (2011) indicates in the total

This Hs is an abstract number representing the value in the state of telephone subscribers in the town. The difference between the actual value Ys and Hs can then be converted into a percentage gain or loss or shift and share index by the following:

100 (Ys-Hs) / Ys (or) Hs

The larger of the two terms in the numerator is always used in the denominator, and as a consequence, the large is limited from +100 to-100 percent. Thus Fuchs further refines it for the influence of the pre-existing indicates and structure in the state. Indicates established during the past two years have been high-growth indicates. When as indicates established prior to this time have grown comparatively, slowly and some have declined. Therefore in order to take into account the pre-existing indicates structure of the state the percentage in manufacturing is adjusted by weighting.

Table -1 presents, results of the shift and share index analysis calculated for different land use classes of Thanjavur taluk to find the change from 1981 to 2011. The table shows the shift values in both positive and negative values. Table 1 to 6 shows the results of shift and share index analysis calculated for different time periods for the land use classes in Thanjavur taluk. Table -1 for example shows the 11 classes in the study area there has been 6 positive changes and the rest of them are towards negative change from 1981 to 1991. The highest positive changes are observed 91 per cent in commercial category and 58 per cent in settlements category followed by fallow and scrub land categories. The highest negative shift is remarked in vegetation cover -90.0 per cent followed by negligible changes in water, agriculture, mixed plantation and crop land, might be used for construction and other purposes.

Table 1. Thanjavur Taluk Shift and share index analysis for land use classes: 1981-1991

Sl.No	Land use classes	XS(1981) (in sq.me)	YS(1991) (in sq.me)	Shift
1.	Water	12,49,62,700	12,43,70,400	-0.47
2.	River Sand	3,84,70,400	3,94,23,600	2.48
3.	Settlement	11,13,52,400	17,67,37,800	58.72
4.	Commercial	1,06,39,900	2,03,39,600	91.16
5.	Agriculture Land	89,64,20,200	84,53,37,500	-5.70
6.	Mixed Plantation	41,78,70,300	38,91,81,200	-6.87
7.	Without Scrub	4,33,56,100	5,53,90,400	27.76
8.	Crop Land	94,40,26,800	89,77,53,500	-4.90
9.	Vegetation Cover	66,67,22,400	6,26,86,800	-90.60
10.	Scrub Land	19,89,71,700	28,23,63,500	41.91
11.	Fallow Land	44,93,600	3,99,63,400	78.93

Source: Results of Shift and Share index analysis

Table-2 shows the shift and share index analysis results of landuse classes from the year 1981 to 2001. The positive shift have been recorded in scrub land (78.6), fallow land (64.8), without scrub (50.2) category and followed by commercial (25.9) and settlement (10.9) categories with positive indicators. The negative changes detected among the vegetation cover (-13.2), mixed plantation (-11.5), land used for agriculture purpose (-10.6), with negligible negative change in water bodies (-2.1). Table-3 shows the results of shift and share index analysis from the year 1981 to 2011 and to find the changes from the above years, either in + or – changes among the land use categories. The highest positive changes are observed among the land categories of without scrub (90.74) followed by fallow land (52.7), commercial (47.7), and settlements (20.1)

and river sand (8.75). The negative changes in the land use categories are detected among the land categories of mixed plantation (-21.2), vegetation cover (-17.7), agricultural land (-16.0) crop land (-14.4) and water logging areas (-7.9) changes.

Table 2. Thanjavur Taluk Shift and share index analysis for land use classes: 1981-2001

Sl.No	Land use classes	XS(1981) (in sq.me)	YS(2001) (in sq.me)	Shift
1.	Water	12,49,62,700	12,22,61,400	-2.16
2.	River Sand	3,84,70,400	4,10,95,800	6.82
3.	Settlement	11,13,52,400	23,34,80,700	10.96
4.	Commercial	1,06,39,900	3,82,64,900	25.96
5.	Agriculture Land	89,64,20,200	80,13,43,200	-10.61
6.	Mixed Plantation	41,78,70,300	36,96,76,700	-11.53
7.	Without Scrub	4,33,56,100	6,51,61,100	50.29
8.	Crop Land	94,40,26,800	85,88,75,900	-9.02
9.	Vegetation Cover	66,67,22,400	57,84,76,700	-13.24
10.	Scrub Land	19,89,71,700	35,54,46,300	78.64
11.	Fallow Land	44,93,600	3,36,46,200	64.87

Source: Results of Shift and Share index analysis

Table 3. Thanjavur Taluk Shift and share index analysis for land use classes: 1981-2011

Sl.No	Land use classes	XS(1981) (in sq.me)	YS(2011) (in sq.me)	Shift
1.	Water	12,49,62,700	11,50,74,400	-7.91
2.	River Sand	3,84,70,400	4,18,37,600	8.75
3.	Settlement	11,13,52,400	33,53,77,500	20.19
4.	Commercial	1,06,39,900	51,90,84,300	47.78
5.	Agriculture Land	89,64,20,200	75,25,61,400	-16.05
6.	Mixed Plantation	41,78,70,300	32,90,87,900	-21.25
7.	Without Scrub	4,33,56,100	8,31,30,400	91.74
8.	Crop Land	94,40,26,800	80,80,22,300	-14.41
9.	Vegetation Cover	66,67,22,400	54,84,13,200	-17.74
10.	Scrub Land	19,89,71,700	40,41,06,500	10.31
11.	Fallow Land	44,93,600	2,82,09,500	52.77

Source: Results of Shift and Share index analysis

The shift and share index calculated from 1991 to 2001 for different classes of land use indicates that highest positive change is observed commercial (88.1), vegetation cover (82.2), settlements (32.1), scrub land (25.8) and without scrub land (17.6). The negative changes are remarked among the land use categories of fallow land (-15.8) agriculture land (-5.2), mixed plantation (-5.0), crop land (-4.3) with negligible changes in water logging (-1.7). The table-4 deficits the positive and negative changes for the different land use classes calculated for Thanjavur taluk from the year 1991 to 2011 shows that positive changes are remarked among the land use classes of settlements (89.7), vegetation cover (77.4) without scrub (50.0), scrub land (43.1) commercial land (24.5) and river sand areas (6.1) per cent. The negative shift or changes are noticed in the land class categories of fallow land (-29.4), mixed plantation (-15.4), agriculture land (-10.9) and water logging (-7.4), from the year 1991 to 2011.

Table 4. Thanjavur Taluk Shift and share index analysis for land use classes: 1991-2001

Sl.No	Land use classes	XS(1991) (in sq.me)	YS(2001) (in sq.me)	Shift
1.	Water	12,43,70,400	12,22,61,400	-1.70
2.	River Sand	3,94,23,600	4,10,95,800	4.24
3.	Settlement	17,67,37,800	23,34,80,700	32.11
4.	Commercial	2,03,39,600	3,82,64,900	88.13
5.	Agriculture Land	84,53,37,500	80,13,43,200	-5.20
6.	Mixed Plantation	38,91,81,200	36,96,76,700	-5.01
7.	Without Scrub	5,53,90,400	6,51,61,100	17.64
8.	Crop Land	89,77,53,500	85,88,75,900	-4.33
9.	Vegetation Cover	6,26,86,800	57,84,76,700	82.28
10.	Scrub Land	28,23,63,500	35,54,46,300	25.88
11.	Fallow Land	3,99,63,400	3,36,46,200	-15.81

Source: Results of Shift and Share index analysis

Table 5. Thanjavur Taluk Shift and share index analysis for land use classes: 1991-2011

Sl.No	Land use classes	XS(1991) (in sq.me)	YS(2011) (in sq.me)	Shift
1.	Water	12,43,70,400	11,50,74,400	-7.47
2.	River Sand	3,94,23,600	4,18,37,600	6.12
3.	Settlement	17,67,37,800	33,53,77,500	89.76
4.	Commercial	2,03,39,600	51,90,84,300	24.52
5.	Agriculture Land	84,53,37,500	75,25,61,400	-10.98
6.	Mixed Plantation	38,91,81,200	32,90,87,900	-15.44
7.	Without Scrub	5,53,90,400	8,31,30,400	50.08
8.	Crop Land	89,77,53,500	80,80,22,300	-10.00
9.	Vegetation Cover	6,26,86,800	54,84,13,200	77.48
10.	Scrub Land	28,23,63,500	40,41,06,500	43.12
11.	Fallow Land	3,99,63,400	2,82,09,500	-29.41

Source: Results of Shift and Share index analysis

Table-6 displays the results of shift and share index analysis for different land use classes from 2001-2011 Thanjavur taluk. The positive changes from 2001 to 2011 are observed among the categories of settlement (43.6), without scrub (27.5), scrub land (13.6), commercial (12.5) and negligible change in river sand categories (1.81) observed. The negative changes for the same two time periods, are fallow land (-16.1), mixed plantation (-10.2), agricultural land (-6.0), crop land (-5.9) vegetation cover (-5.2) and water logging area (-5.88) per cent.

Table 6. Thanjavur Taluk Shift and share index analysis for land use classes: 2001-2011

Sl.No	Land use classes	XS(2001) (in sq.me)	YS(2011) (in sq.me)	Shift
1.	Water	12,22,61,400	11,50,74,400	-5.88
2.	River Sand	4,10,95,800	4,18,37,600	1.81
3.	Settlement	23,34,80,700	33,53,77,500	43.64
4.	Commercial	3,82,64,900	51,90,84,300	12.56
5.	Agriculture Land	80,13,43,200	75,25,61,400	-6.09
6.	Mixed Plantation	36,96,76,700	32,90,87,900	-10.98
7.	Without Scrub	6,51,61,100	8,31,30,400	27.58
8.	Crop Land	85,88,75,900	80,80,22,300	-5.92
9.	Vegetation Cover	57,84,76,700	54,84,13,200	-5.20
10.	Scrub Land	35,54,46,300	40,41,06,500	13.69
11.	Fallow Land	3,36,46,200	2,82,09,500	-16.16

Source: Results of Shift and Share index analysis

Conclusion

A modern nation, as a modern business, must have adequate information on many complex interrelated aspects of its activities in order to make decisions. Land use is only one such aspect, but knowledge about land use and land cover has become increasingly important as the Nation plans to overcome the problems of haphazard, uncontrolled development, deteriorating environmental quality, loss of prime agricultural lands, These land-use changes have important implications for future changes in the Earth's climate and, consequently, great implications for subsequent land-use change.The result of the work showed that there was a rapid change of Settlement and commercial activities during the period from 1981 to 2011. Therefore, it can be concluded that increase in rapid growth of settlement damaging to vegetation cover and agriculture land. The present study can useful to identify the vegetation areas which are under risk due to mining activity. And at the same time water bodies are decreased significantly.

Acknowledgements

The authors would like to sincerely thank Post Graduate and Research Department of Geography, Government Arts College

(Autonomous), for providing the facilities for the preparation of this paper.

REFERENCES

Biswajit Majumder, 2011. Land Use and Land Cover Change Detection Study At Sukinda Valley Using Remote Sensing And Gis. Department of Mining Engineering, National Institute Of Technology Rourkela.

Don Kiser, 1992. A Location Quotient and Shift Share Analysis of Regional Economies in Texas, The Department of Political Science, Southwest Texas State University.

James R. Anderson, Ernest E. Hardy, John T. Roach, and Richard E. Witmer, 1976. A Land Use and Land Cover Classification System For Use With Remote Sensor Data United States Government Printing Office, Washington.

Knudsen, D.C. Barff, R. 1991. Shift-Share Analysis as a Linear Model Environment and planning Sage Publications. Volume: 23 Issue: 3, page(s): 421-431

Nagarajan, N. and Poongothai, S. 2012. Effect of Land Use/ Land Cover Change Detection of Ungauged Watershed *World Applied Sciences Journal,* 17 (6): 718-723, 2012.

****