www.cafetinnova.org

ISSN 0974-5904, Volume 10, No. 03

DOI:10.21276/ijee.2017.10.0303

International Journal of Earth Sciences and Engineering

June 2017, P.P. 478-483

Landuse Change Detection Analysis Using Temporal Satellite Data in Perambalur Taluk, Tamilnadu, India

P KARTHICK, C LAKSHUMANAN AND S SIVAKUMAR

Centre for Remote Sensing, Bharathidasan University, Tiruchirappalli -620 024, INDIA

Email: *geokarthi00@gmail.com, drlaks@gmail.com and geosivakumar@gmail.com*

Abstract: *An increased impervious area due to landuse changes is the major reason for the reduced rainwater recharge. The ground water level depletion is due to the fact that over extraction of groundwater to fulfill the demand of urbanization and industrialization. Landuse and land cover is an important component in understanding the interactions of the human activities with the environment and thus it is necessary to study changes. In this paper an attempt is made to study on the changes of landuse and land cover in Perambalur taluk over the period of 22 years from 1992 to 2013. The landuse land cover maps were prepared using temporal satellite data of LANDSAT ETM of 1992, LANDSAT ETM+ of 2001 and LANDSAT-8 OLI/TIRS of 2013 using digital and visual interpretation method based on the NRSC classification method. Ground truth observations were also performed to check the doubtful areas and also check the classification accuracy. Various landuse classes were interpreted and area calculation was attributed. Crop land area that occupied about 37.85 percent of the area in 1992 and it gradually changed in to 30.12 percent in 2001 and 30.35 per cent in 2013 and also water bodies has changed into 2.55 to 2.08 percent in (2001-2013).Fallow land, Built up land, Scrub land and Waste land also have experienced changes. Built-up lands have been increased from 1.91 percent to 4.24 percent of the total area. Proper landuse planning and management is essential for a sustainable development of area.*

Keywords: *Landuse changes, Perambalur, groundwater recharge and water balance*

1. Introduction

Understanding the role of landuse in global environmental changes require in historical reconstruction of past land-cover conversions and projection of likely future changes. Landuse and land cover (LULC) change is a major issue of global environment change. Urbanization is one the most widespread anthropogenic causes of the loss of arable land [1-3] habitat destruction and the decline in natural vegetation cover.

The growing of population and human activities are increasing the pressure on the limited land and soil resources for food, energy and several other needs. Comprehensive information on the spatial distribution of the landuse /land cover categories and the pattern of their change is a prerequisite for planning, utilization and management of the land resources of the country. Such studies are particularly important because the spatial characteristics of LULC are very useful for understanding the various impacts of human activity on the overall ecological condition of the urban environment [4]. Accurate LULC mapping over large areas has become necessary in order to monitor these changes and has received a considerable boost from the advent of multispectral satellite data. Such data have become operationally available since the early 1970s and have paved the way for LULC and vegetation cover studies due to their suitable spectral, spatial and temporal resolution, thus providing scientists with a useful tool to study LULC changes and their relationship with land degradation processes.

Landuse refers to man's activities on land which are directly related to the land. Remote sensing technology and Geographic Information System (GIS) provide efficient methods for analysis of landuse issues and tools for landuse planning and modeling [5]. By understanding the driving forces of landuse development in the past, managing the current situation with modern GIS tools and modeling the future, one is able to develop plans for multiple uses of natural resources and nature conservation. Over the years, remote sensing has been used for the landuse /land cover mapping in different parts of India [6-9] that change in any form of landuse is largely related either with the external forces and the pressure built up within the system [10-14]. The growing of population and increasing socio-economic necessities creates a pressure on land-use/land cover. This pressure results in unplanned and uncontrolled changes in LULC [15-17]. Therefore attempt has been made in this study to map out the status of landuse/land cover of Perambalur taluk, Perambalur District of Tamil Nadu with a view to assessing changes that have taken place in their status particularly in the Built up land, Crop land, Fallow land and water bodies.

2. Study Area

The Perambalur taluk is the headquarters of Perambalur district. Most of the people are engaged in

Received: January 23, 2017; Accepted: May 03, 2017; Published: June 30, 2017
International Journal of Earth Sciences and Engineering, 10(03), 478-483, 2017, DOI:10.21276/ijee.2017.10.0303

agriculture work. In this area having backward and over exploited area and has no assured water source for irrigation. In this taluk bounded by Veppanthattai taluk in the North, Kunnam taluk in the South, Alatur taluk in the East and Turaiyur taluk of Thiruchirapalli district on the west. The total geographical area of the taluk is around 336.84 Sq.km, The study area extended between $11^0$07'18" N to $11^0$18'36" N and $78^0$40'19" E to $78^0$55'49" E. According to the 2011 the total population of the area has 1, 62,356 with 81,586 males and 80,770 females. The population density of the taluk is 482 inhabitants per square kilometer. The maximum rainfall is during Northeast Monsoon, followed by southwest monsoon and the minimum rainfall was noted in winter. April, May and June with the maximum temperature ranging from 38° to 39°C and the cool months being January and February with the minimum temperature ranging from 20°C to 2°C.

Arulmigu Mathurakaliyamman Temple at Siruvachur in this taluk attracts devotees throughout the year. This temple is also an important pilgrim center.

3. Objectives

The main objective of the study is to analyses the nature and extent landuse/land cover changes in perambalur taluk in the past 22 years and to identify the main driven forces for the changes.

4. Materials and Methods

Three set of data materials were used here, Landsat Enhanced Thematic Mapper (ETM 1992), Landsat Enhanced Thematic Mapper (ETM+2001) and Landsat 8 Observational land imageries / Thermal infrared sensors (OLI/TIRS 2013) images. The data were interpreted visually and analyzed using GIS. The satellite images were interpreted (14).The landuse/land cover classes include Agriculture land, Fallow land, Wasteland, forest, Scrub forest Built up land, Water bodies, guild/Ravenous land in This classification is performed based on the classification scheme of National Remote Sensing Center (NRSC). Calculating the Area in sq/kms of the resulting landuse /land cover types has been done for each study year and subsequently comparing the results of Rainfall, Water level and Population and finding the conclusion.

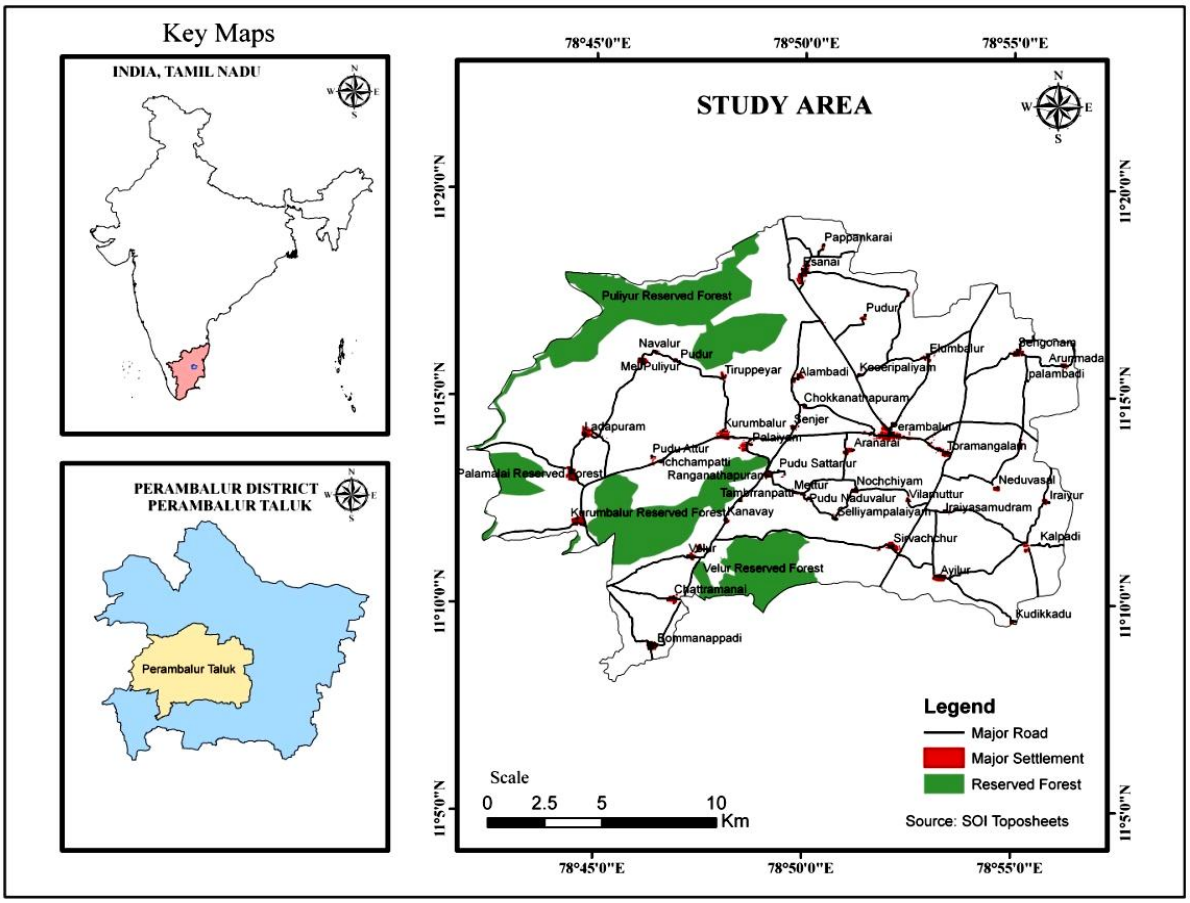

Figure 1: *Study area location map*

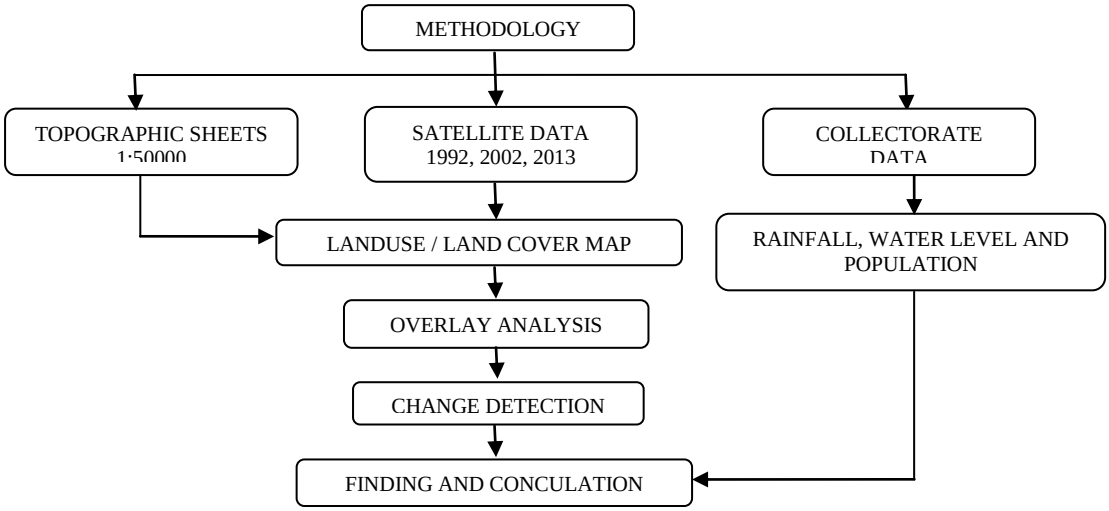

Figure 2: *Methodology of the Present Study*

5. Result and Discussion

Land use land Cover changes over of the study area has been analyzed for the time periods of 1992, 2001 & 2013. The major proportion of the land use is the agricultural, Forest land and Fallow land. Other land use /land covers are built up (urban & rural), Fallow, Gullied/ Ravenous, Barren rocky/Stony waste and Water bodies are descried. The results are presented in the maps, charts and table's shows landuse/land cover analysis of study area (Table.1 & Fig.2). On account of increasing population and decreasing the Rain fall and water level fluctuation in this connection perambalur taluk is facing land use changes in different years. The population (Fig: 9), Rainfall and ground water table fluctuation (Fig: 8) these are the main reason for landuse changes in the Perambalur taluk. The area depends on the well and tank irrigation, otherwise it is mainly rain fed irrigation. Agricultural land occupies a sizeable area prime agricultural crops cultivated in this taluk are maize, Cotton, Rice, Groundnut and Sunflower and major horticulture crops are Onion. Maize and cotton are as rain fed crops, while rice is largely cultivated under irrigated conditions. Oil seeds such as groundnut, Sunflower and sesame are grown both under irrigated and rain fed condition. Pulses like black gram, green gram and red gram are grown in rice fallows. In this Agricultural land 37.85 Percent of the study area in (1992), decreased to 30.12 percent in (2001) and 30.35 percent in (2013). The changes of 7.50 percent transformed have been possibly into fallow land. Plantation land has reduced considerably that have been 9.57 percent in (1992), 9.08 percent in (2001) and 07.67 percent in (2013) it has reduced in 1.90 percentage of the total area (1992-2013).The fallow land recently occupies sizeable area about 14.13 percent (1992), 21.70 percent (2001), 24.28 percent (2013) in these changes was 10.15 percent increased (1992-2013) because in the recent year's rainfall and groundwater levels have been decreased. In the year 2013 the level of Rainfall was 651.17 millimeter and the groundwater Level was 10.05 Meters below the surface (Fig: 8).

Forest land did not have changed in the year of (1992-2013). Land with Scrub and land without scrub has been reduced considerably 0.83 and 1.67 in (1992-2013) it's have been converted into Build up land. In the year of 1992 Built up land covered 1.91 percent of the total area it has increased to 2.92 percent in 2001 and to 4.24 percent in 2013.The Perambalur taluk is densely populated and educational, recreational, business activities are situated in this region. Here the decrease of agricultural area is due to conversion for settlements or discontinuation of agricultural lands. Waste lands are not suitable for agriculture purpose, the barren rocky or stony waste land has been reduced considerably and it is converted into fallow and Land with Scrub. Gullied ravenous land 2.18 percent in1992, increased to 2.98 percent in 2001 and to 2.28 percent land in 2013 (Fig: 3, 4, 5 & Table: 1). Water Bodies included lakes, reservoirs, ponds, rivers and streams tanks, it is presented only 2.55 percent of the lands in 1992 & 2001 and has reduced into 2.08 percent in 2013. The decreased of water bodies has been 0.47 percent in (2001-2013).

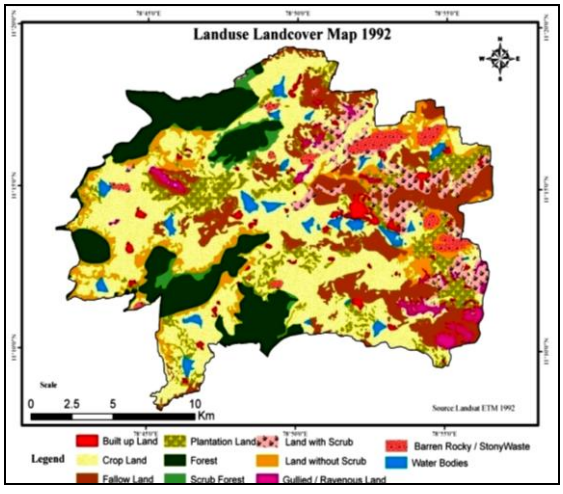

Figure 3: *Landuse /Land Cover map in 1992*

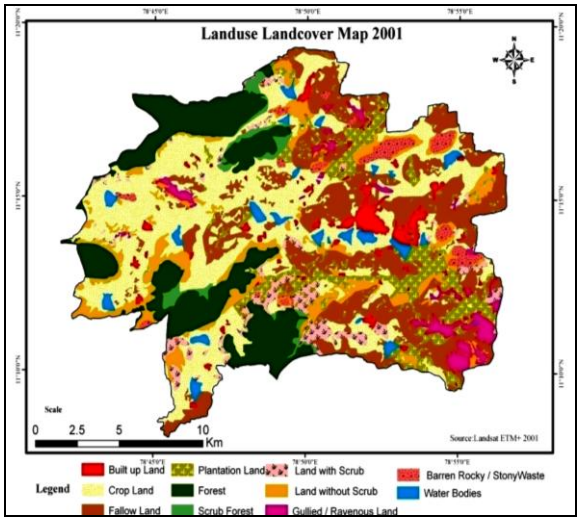

Figure 4: *Landuse /Land Cover map in 2001*

In this taluk surface water sources like tank 487 and 180 tube well and 4911 dug wells were present. A land degradation process is the degradation of natural vegetation due to overgrazing and the remarkable inter-annual variation in the amount of rainfall. Water logging which results from mismanagement of irrigation is another cause of land degradation.

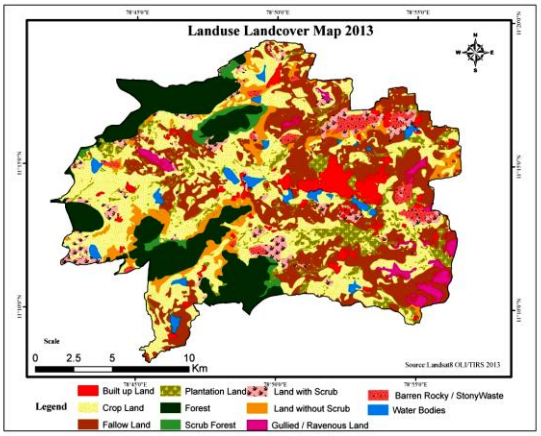

Figure 5: *Landuse /Land Cover map in 2013*

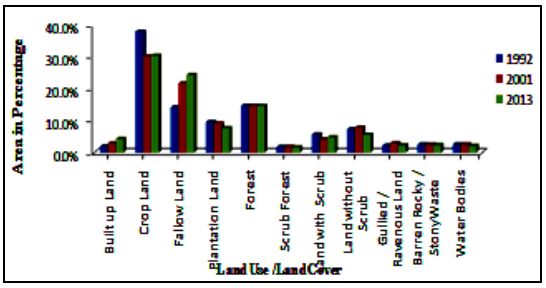

Figure 6: *Landuse /Land cover changes in the study area (1992 - 2013)*

Table 1: *Landuse /Land Cover Changes during (1992-2013)*

S.No	Landuse Classes	Area Sq.Km			Area in Percentage (%)			Changes in Percentage (%)		
		1992	2001	2013	1992	2001	2013	1992 -2001	2001- 2013	1992 - 2013
1	Built up Land	6.42	9.82	14.27	1.91	2.92	4.24	1.01	1.32	2.33
2	Crop Land	127.49	101.46	102.22	37.85	30.12	30.35	-7.73	0.23	-7.50
3	Fallow Land	47.60	73.10	81.78	14.13	21.70	24.28	7.57	2.58	10.15
4	Plantation Land	32.22	30.58	25.83	9.57	9.08	7.67	-0.49	-1.41	-1.90
5	Forest	49.26	49.26	49.26	14.62	14.62	14.62	0.00	0.00	0.00
6	Scrub Forest	5.81	5.72	5.70	1.72	1.70	1.69	-0.03	0.00	-0.03
7	Land with Scrub	19.02	13.64	16.24	5.65	4.05	4.82	-1.60	0.77	-0.83
8	Land without Scrub	24.46	26.31	18.83	7.26	7.81	5.59	0.55	-2.22	-1.67
9	Gullied / Ravenous Land	7.33	10.04	7.69	2.18	2.98	2.28	0.80	-0.70	0.11
10	Barren Rocky / Stony Waste	8.65	8.31	7.99	2.57	2.47	2.37	-0.10	-0.09	-0.19
11	Water Bodies	8.59	8.60	7.02	2.55	2.55	2.08	0.00	-0.47	-0.47
-	-	**336.84**	**336.84**	**336.84**	**100.00**	**100.00**	**100.00**	-	-	-

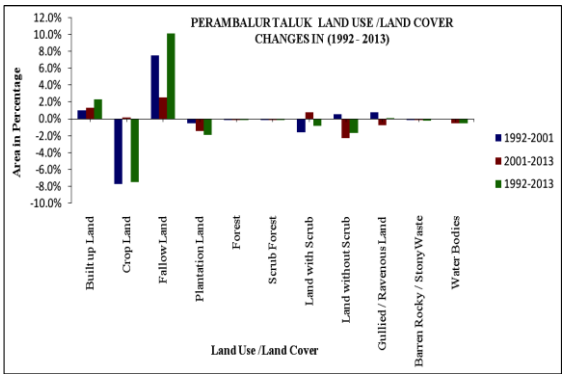

Figure 7: *Landuse /Land cover changes in the study area (1992 - 2013)*

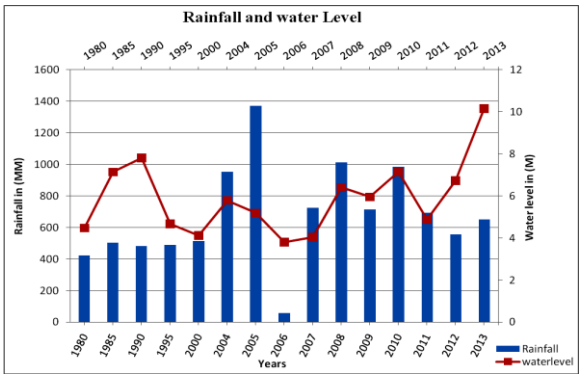

Figure 8: *Year wise Rainfall and Water Level changes (1980-2013)*

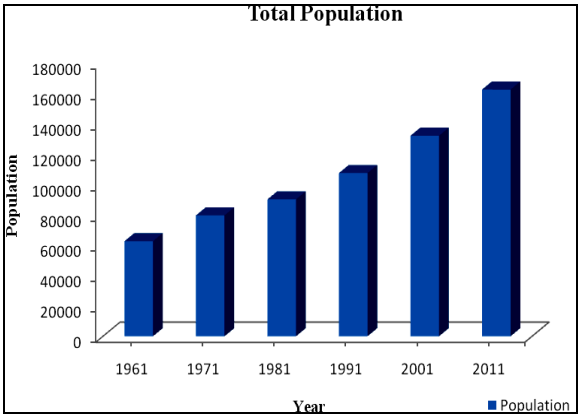

Figure 9: *Population growth in (1961-2011)*

6. Conclusions

The landuse study is the fundamental significance as the land resources play a strategic role in the determination of man's, economic, social and cultural progress. This study provide a recent perspective for land cover types and land cover changes that have taken place in the last twenty three years to examine the capabilities of integrating remote sensing and GIS the spatial distribution of different land cover changes. A considerable increase in settlements and fallow land has taken place as well as huge decrease in agricultural land.

The main causes of landuse changes in the study area are manmade activities, lack of Rainfall and ground water level depletion due to over extraction. In this hard rock terrain area having and high runoff potential and low infiltration rates, so the ground water level is also poor (Fig:8). This problem needs to be seriously studied, through multi-dimensional fields including socioeconomic, in order to preserve.

References

[1] Lopez, E., Bocco, G., Mendoza, M., & Duhau, E., "Predicting land cover and landuse change in the urban fringe a case in Morelia City, Mexico". Landscape and Urban Planning, 55(4), pp 271-285, 2001, http://dx.doi.org/10.1016/S0169-2046(01)00160-8.

[2] Alphan, H. "Landuse change and urbanization in Adana, Turkey". Land Degradation and Development, 14(6), pp 575–586, 2003.

[3] Beven, K.J., Kirkby, M.J., "A physically based variable contributing area model of basin hydrology". Hydrol. Sci. Bull. 24 (1), pp 43–69, 1979, http://dx.doi.org/10.1080/02626667909491834.

[4] Ashraf M. Dewan Yasushi Yamaguchi. "Landuse and land cover change in greater Dhaka, Bangladesh: Using Remote Sensing to Promote sustainable urbanization". Applied geography 29, Pp 390-401, 2009, DOI:10.1016/j.apgeog.2008.12.005 .

[5] Campbell, James B "Mapping the Land Aerial Imagery for LANDUSE Information" Resource Publications in Geography, Association of American Geographers, Washington D.C 1983, DOI: 10.2136/sssaj2013.03.0108

[6] Gautam, N. C., Narayanan, L. R. A., "Landsat MSS data for landuse/land cover inventory and mapping". A case study of Andhra Pradesh", J. Indian Soc. Remote Sensing, 11(3), pp 15-28, 1983, DOI: 10.1007/BF02990710.

[7] Sharma, K.P, Jain, S. C., Garg, R. k, "Monitoring Landuse and land cover changes using landsat images", J. Indian Soc. Remote Sensing 12(2), pp 115-121, 1984, DOI: 10.1007/BF02991439.

[8] Jain, S. K. "Landuse mapping of Tawi catchment using satellite data". Report No. CS72, National Institute of Hydrology, Roorkee, 52, 1992, DOI 10.1007/s11676-008-0044-1.

[9] Brahabhatt, V.S., Dalwadi, G. B., Chhabra, S. B., Ray, S. S., Dadhwal, V. K., "Landuse/land cover change mapping in Mahi canal command area, Gujarat, using multitemporal satellite data", J. Indian Soc. Remote Sensing. 28(4), pp 221-232, 2000, DOI: 10.1007/BF02990813.

[10] Bisht, B.S. and Kothyari, B.P. "Land Cover Change Analysis of Garur Ganga Watershed Using GIS/Remote Sensing Technique". Journal of Indian Society of Remote Sensing, 29(3), pp 165-174, 2001.

[11] Milne, A. K. "Change detection analysis using Landsat imagery a review of methodology". In Proceedings of IGARSS, 88 symposium (pp. 541–544), Edinburgh, Scotland, 13–16 September 1988, DOI:10.1016/j.apgeog.2006.09.004.

[12] Prakasam.C "Landuse and land cover change detection through remote sensing approach: A case study of Kodaikanal taluk, Tamilnadu", Department of Geography, The University of Burdwan, International Journal of Geomatics and Geosciences 1(2), pp 150-158, 2010.

[13] Prabhbir Singh, "Landuse and Land cover change detection through Remote Sensing & GIS Technology: case study of Pathankot and Dhar kalan Tehsils, Punjab". International Journal of Geomatics and Geosciences Volume 1, (4), pp 839-846, 2011.

[14] Rubio, J. L. and Bochet, E., "Desertification Indicators as Diagnosis Criteria for Desertification Risk Assessment in Europe". Journal of Arid Environments, 39, pp.113-120, 1998, http://dx.doi.org/10.1006/jare.1998.0402

[15] Seto K.C., C.E. Woodcock, C. Song, X. Huang, J. Lu., R. K. Kaufmann, "Monitoring LANDUSE Change in the Pearl River Delta Using Landsat TM". International Journal of Remote Sensing, 23 (10), 1985-2004, 2002, http://dx.doi.org/10.1080/01431160110075532.

[16] Sharma, K. D., "The Hydrological Indicators of Desertification", Journal of Arid Environments, 39, pp 121-132, 1998, https://doi.org/10.1006/jare.1998.0403.

[17] Symeonakis, E. and N. Drake "Monitoring desertification and land degradation over sub-Saharan Africa". International Journal of Remote Sensing, 25 (3), pp 573-592, 2004, DOI:10.1080/0143116031000095998.