

LAND USE AND LAND COVER CHANGE DETECTION – MADURAI DISTRICT, TAMILNADU, INDIA

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Abstract

Land use and land cover is a critical part in understanding the interactions of the human activities with the earth and in this manner it is important to screen and distinguish the progressions to keep up a maintainable domain. Digital change detection is the process that aides in deciding the progressions connected with land use and land cover (LULC) properties with reference to geo registered multi temporal remote sensing data. In the recent times, remote sensing and geographical information system (GIS) is extremely profitable and beneficial in giving current land use data. The changes of Land use/Land cover have been studied carefully by comparing these two Landsat images and Land use/Land cover strategies have been suggested for the sustainable Land use development of the study area.

KEYWORDS: Land use, Land cover, GIS, Landsat images, Sustainable and Digital change detection

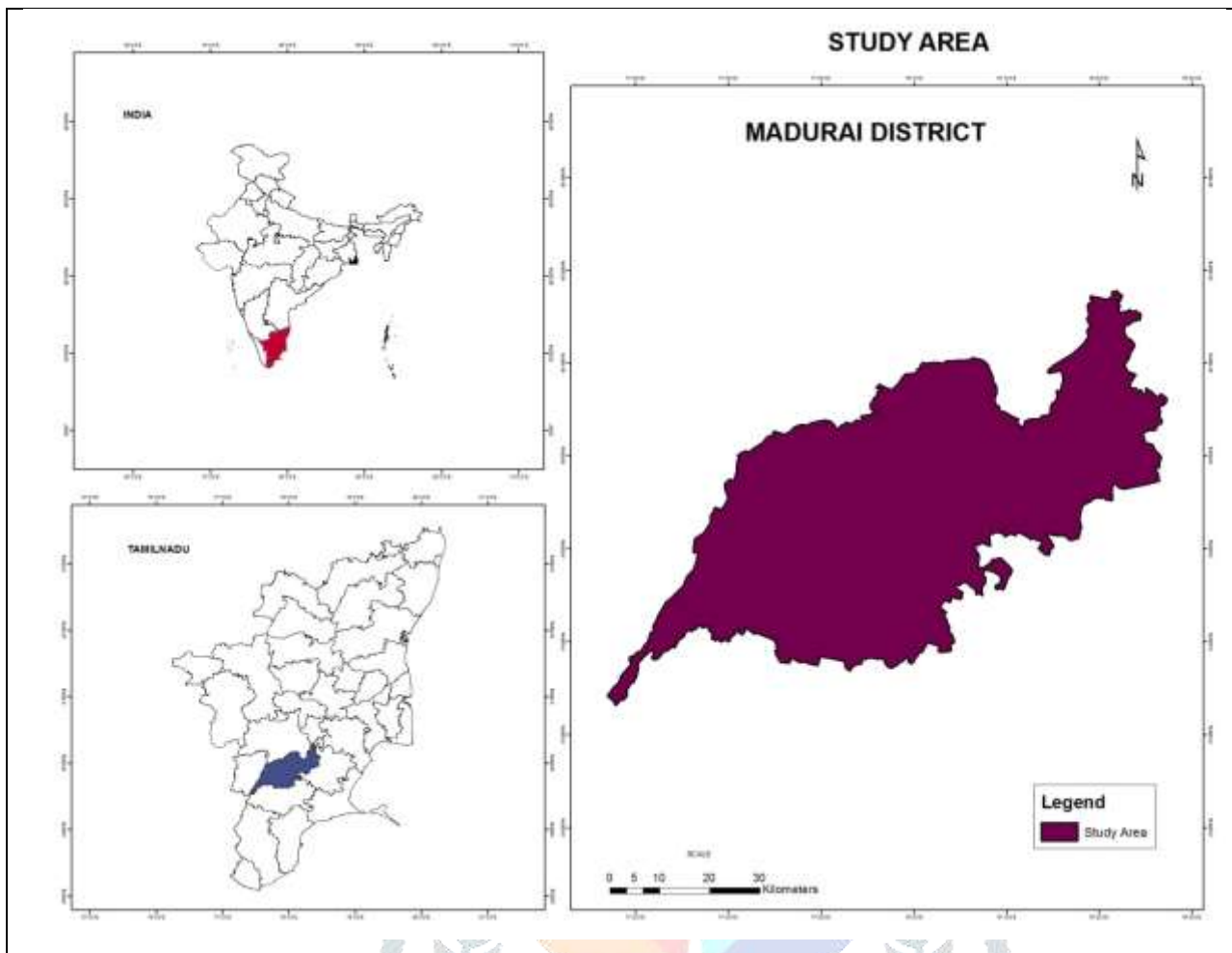
1. Introduction

Land is the stage on which all human activities are being conducted and source of the materials need for this conduct. Land is the most significant of all the natural resources and the human-use of land resources gives rise to "Land use". Land use varies with the man's activity on land or purpose for which the land is being used, whether it is food production, provision for shelter, recreation and processing of materials and so on, as well as the biophysical characteristics of the land itself. The land use is being shaped under the influence of two broad set of forces viz. human needs and environmental processes. In the developing countries like India, due to population pressure and in a bid to extract the maximum output from the available resources, the impact of degradation can be worse than in other countries and adversely affect the land cover of the region. Hence, land uses have been shaped for centuries by human management, and the structure of the land use has emerged and changed over time and space. In the current century, these changes have accelerated in response to a variety of forces such as agriculture, urbanization etc. Land use and land cover information are important for several planning and management activities concerned with the surface of the earth because it constitutes key environmental information for many scientific, resource

management and policy purposes, as well as for a range of human activities. An accurate knowledge of land use and land cover is a key element for any kind development planning of a particular region. Therefore a wide range of scientists and practitioners, including earth system scientists, land and water managers as well as urban planners seek information on the location, distribution, type and magnitude of land use and land cover changes, trend of land use conversion etc. The spatial dimensions of land use and land cover help the policy makers and scientists to take the appropriate decisions, because the changing pattern of land use and land cover reflect changing economic and social conditions. Monitoring such changes is important for coordinated actions at different administrative levels. Modern technologies such as Remote Sensing and Geographical Information Systems (GIS) provide the most accurate means of measuring the extent and pattern of changes in landscape conditions over time. The specific objectives of the study are to assess whether there have been changes in land use and land cover in Madurai District, quantify the changes in land use and land cover.

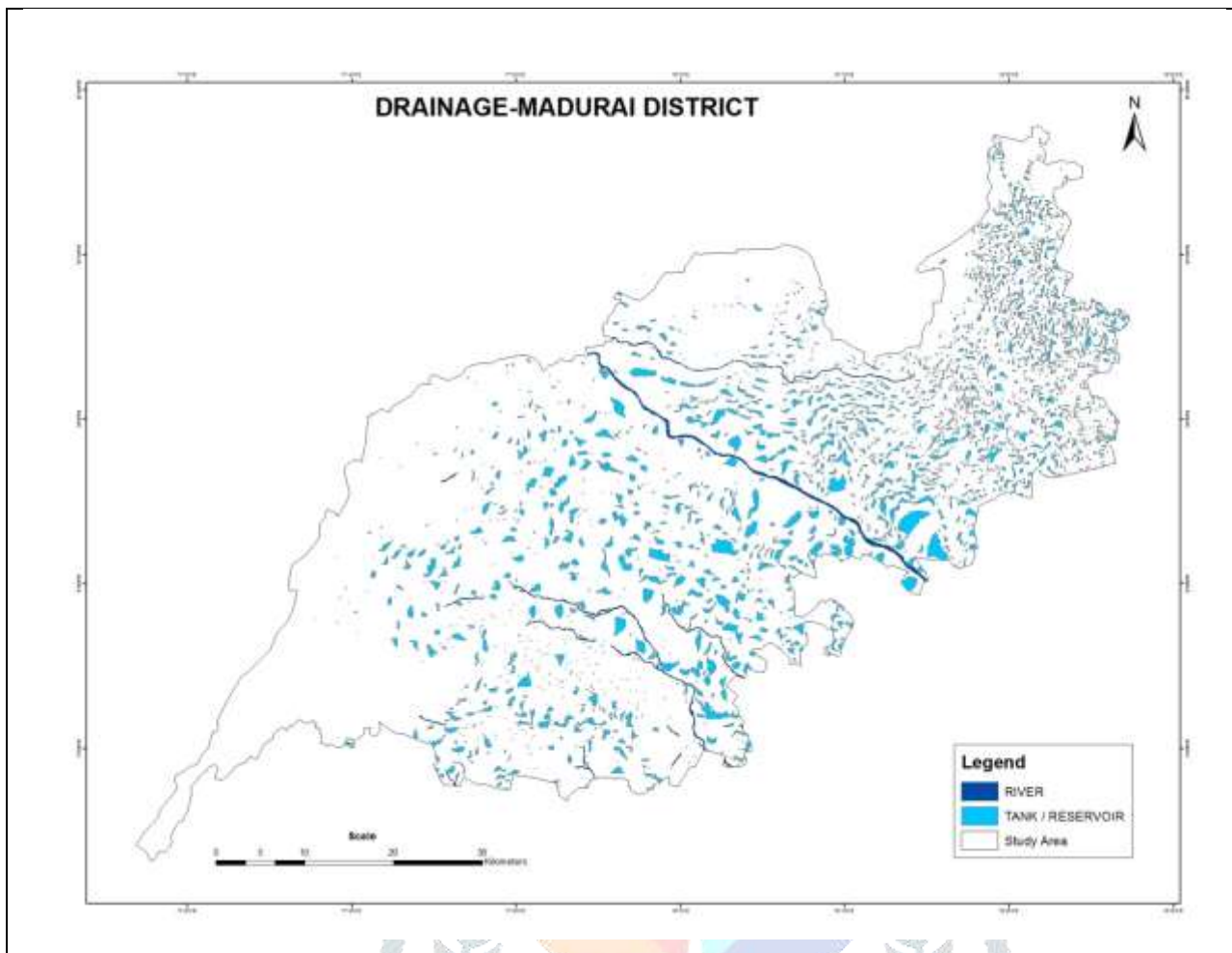
2. STUDY AREA

Madurai district is situated 450 kms away from Chennai on southern part of the State. It is one of the major and important district in the south Tamil Nadu. The district covers an area of 3,710 sq.kms and is bounded by Dindigul district in the North, Sivaganga district in the East, Virudhunagar district in the South and Theni district in the West. Vaigai river pass through Madurai city. Madurai city has an area of 52 km², within an urban area now extending over as much as 130 km², and it is located at [show location on an interactive map 9°56'N 78°07'E / 9.93° N78.12°E. It has an average elevation of 101 meters above mean sea level. The climate is dry and hot, with rains during October December. Temperatures during summer reach a maximum of 40 and a minimum of 26.3 degrees Celsius. Winter temperatures range between 29.6 and 18 degrees Celsius.



3. DRAINAGE

The major river flowing through Madurai district is Vaigai river. The Vaigai river originates on the eastern slopes of the Varushanadu hills in Theni taluk at an altitude of 5000 feet. The Vaigai river traverses about 43kms in hilly area and reaches plain terrain where two tributories namely Suruliyar and Theniar join Vaigai river before it reaches Vaigai Reservoir. Below Vaigai Reservoir, the following tributories namely Varaganadhi, Manjalar, Marudhanadhi, Kondamari Odai, Sathaiyar Odai, Vandiyur surplus courses and Uppar Odai join Vaigai river. After traversing about 194 kms from Vaigai Reservoir, the Vaigai river enters Ramanathapuram big tank which enters into the sea at Palk Bay.



4. AIM AND OBJECTIVE

The aim of this study is to produce a land use/land cover map of Madurai district so as to detect the changes that have occurred over a given period utilizing change detection technique. The following specific objectives are listed to reach the aim.

- * To create a land use/land cover classification.
- * To Quantify the Land use and land cover (LULC) changes for the year 1997 to 2017 Utilizing multi-temporal satellite imagery for Madurai district.
- * To analyze change detection of Madurai District from 1997-2017.

5. METHODOLOGY

The base map has been prepared from SOI toposheet on 1:250,000 scale. The base map has been digitized and proper attribute data have given in the ArcGIS 10.3. Visual image interpretation technique has been used for the satellite data using ERDAS imagine 2014. data for the year 1997, 2017 Landsat image have been collected for the study. The changes of Land use/Land cover have been studied carefully by comparing

these two Landsat images and Land use/Land cover strategies have been suggested for the sustainable Land use development of the study area.

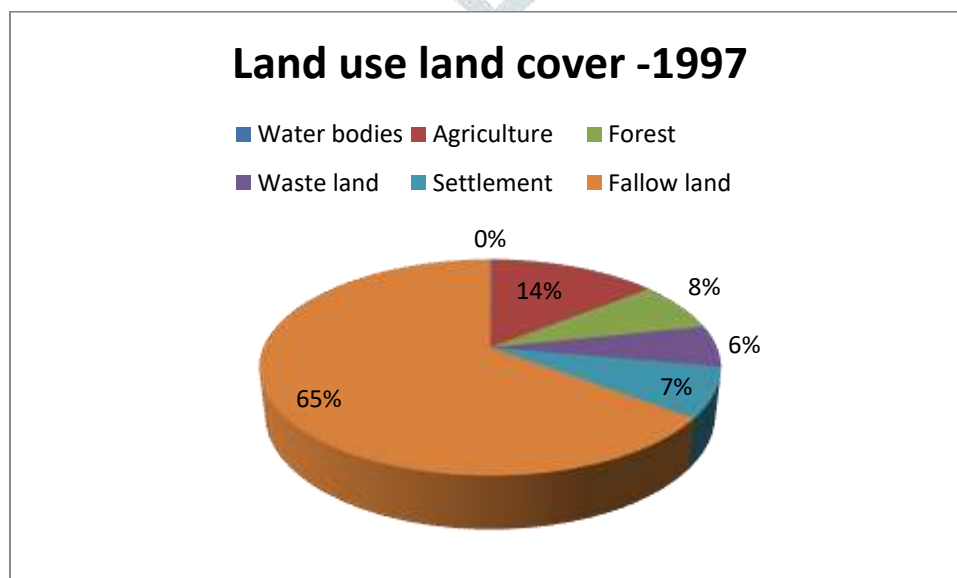
6. DATA ACQUIRED AND SOURCE

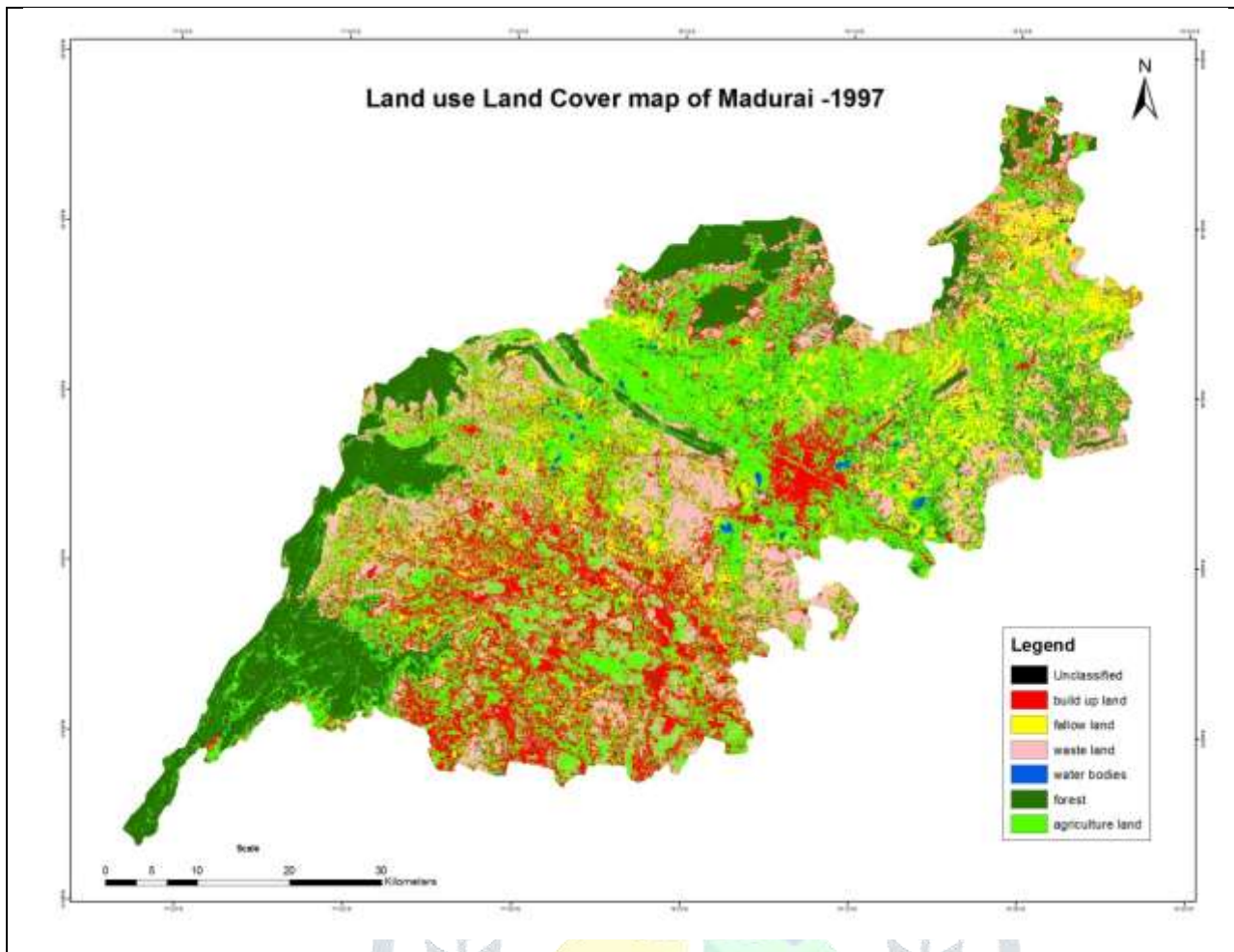
For the present study, LANDSAT data of SMadurai district were acquired for three years namely, 1997, and 2017. All the imageries belong to the month of February. All the LANDSAT images have been taken from USGS. The 1997& 2017 image is a LANDSAT 4-5 TM having 30 meters of resolution; LANDSAT 8 OLI & TIRS image of 2017 has resolution of 30 meters. All the satellite images were brought to Universal Transverse Mercator (UTM) projection in zone 44N. Topographic sheet ND-44-10a and ND-44-14 were also collected.

7. RESULTS AND DISCUSSIONS

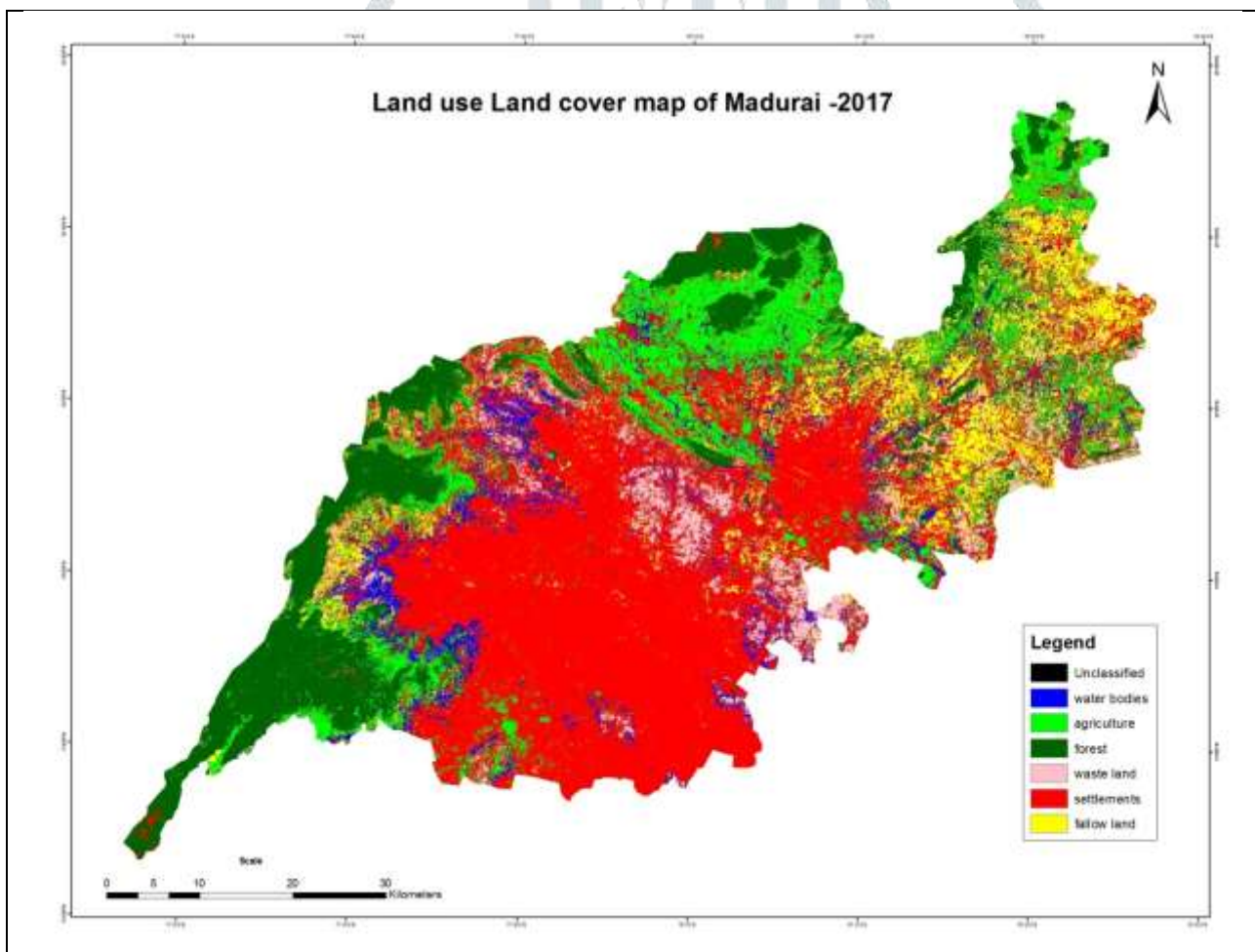
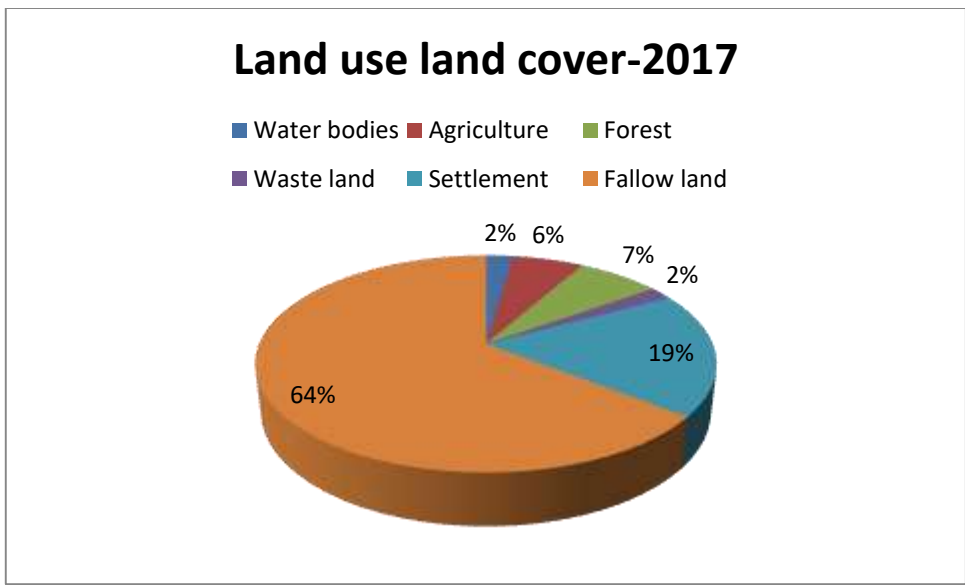
The general area utilization or land use of a range delineates a thought of general overall usage of Assets, characteristic or social. In this paper, changes in the land use and land cover of Madurai district are assessed from the contrasts between two years of period (1997-2017) in figure-1 and figure-2

LAND USE LAND CLASSIFICATION 1997		
Class name	Area in hectare	Area in percentage
Agriculture	1453328	14%
Forest	766672	8%
Settlement	766190	7%
waste land	640847	6%
Fallow land	6673939	65%
Water bodies	13754	-





LAND USE LAND CLASSIFICATION 2017		
Class name	Area in hectare	Area in percentage
Agriculture	2447132	6%
Forest	2858678	7%
Settlement	7647384	19%
waste land	800672	2%
Fallow land	26543337	64%
Water bodies	935757	2%



7.1 LAND USE CHANGE DETECTION

The land use change detections for the period from 1997 to 2017, and over all land use changes from 1997 to 2017 are analyzed under GIS environment. All land use features such as crop land (wet/dry crop); forest land (dense forest and scrub forest), fallow land included the land with / without scrub, barren

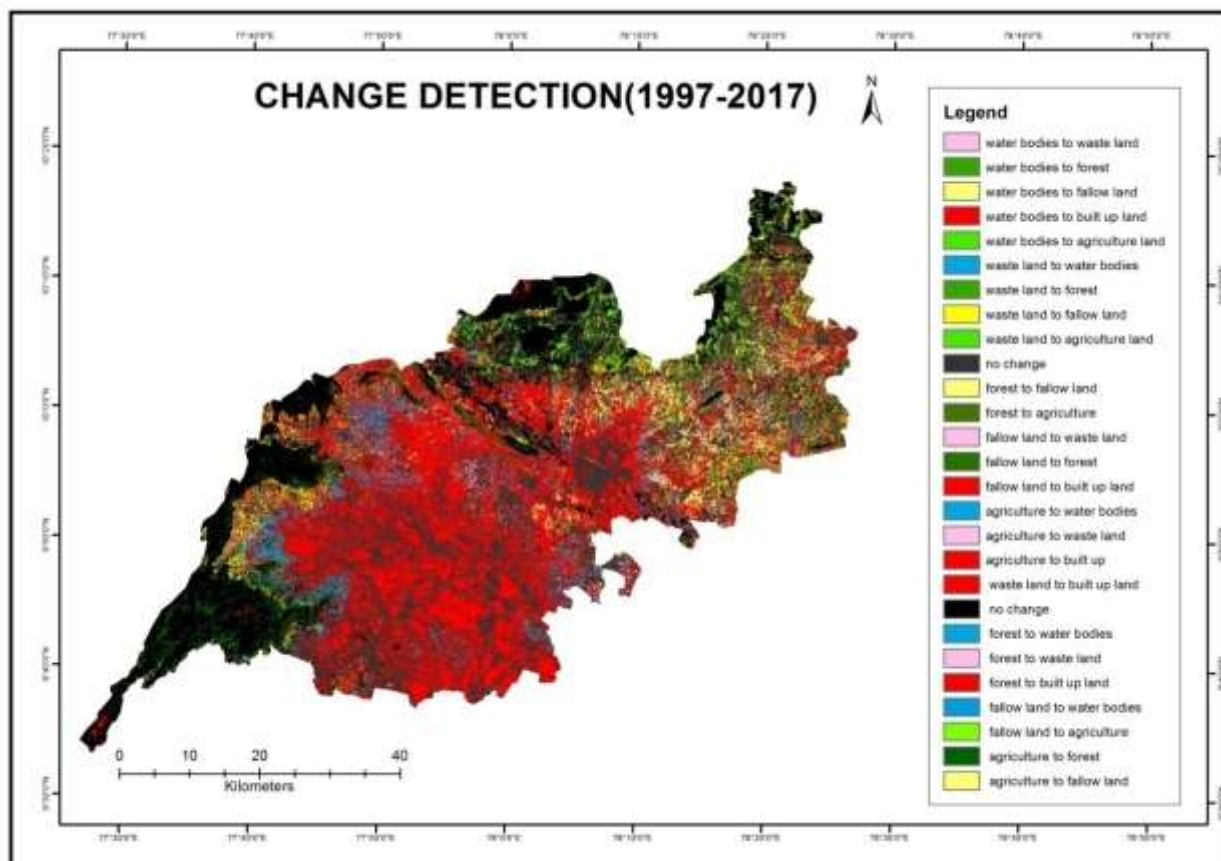
land included stony waste, barren rocky, alkalinity, water bodies (tanks, river and canal), and others (layout, commercial land and quarry) are individually assessed to know the changes in spatial distribution in this area. The changes in the land use over the period deflect either development activity or vagaries of natural phenomenon.

7.2 Land Use Change Detection (1997-2017)

Analyzed the land use change detections from 1997 to 2017 reflect that changes especially in the wet and dry crops gained 6% respectively. A cultivation practice has continuously decreased in the past two decade this was mainly due to human population growth. Built-up land has increased 19% due to high growth rate of human population. There was a tremendous change in built-up land. Nearly 2% of waste land was decreased.

LAND USE LAND COVER CHANGES - (1997 to 2017)

Class name	1997 area in %	2017 area in %	Changes
Agriculture	14%	6%	-8
Forest	8%	7%	-1
Settlement	7%	19%	12
waste land	6%	2%	-4
Fallow land	65%	64%	-1
Water bodies	0%	2%	2



8. CONCLUSION

The past and present land use patterns assessed and compared the changes detection analysis under GIS environment for the period 1997 to 2017 in Madurai district. During the year 1997 and 2017, it was observed that the following land use categories have its extent i.e. built-up land 19%, agricultural land 6% and forest 7% at the same time there was decreasing trend in the waste land 2%, fallow land 64%, and water bodies and forest land 7%. Over all land use detection is assessed for the period 1997 to 2017. From the analysis it observed that built-up land have increased a considerable extent (built up land due to developmental activities in Madurai district. From the 3 decay observation the future trend of Madurai in buildup land will be increased in the 2017. In this study, utilizing satellite images of 1997 and 2017 land use changes were assessed in the Madurai district of Tamil Nadu. This paper inferred that satellite data has the unique ability to recognize the changes in the land use rapidly and precisely. The high resolution satellite data, for example, LANDSAT 8 are great source to give data precisely. Accurate land cover change data are important for understanding principle elements causes and ecological results of such changes.

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