

# GEOSPATIAL APPROACH IN CHANGE DETECTION ANALYSIS OF WATER BODY ENCROACHMENT ACTIVITIES, USING REMOTE SENSING AND GIS-(1990,2000,2015)

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**Abstract :** Environmental change detection is very mandatory to understand the relationship of human activities with the environment and its importance to manage the change that has been take place due to their activities. Due to the Human activities in the Melur to Kariyapatti National Highways of Madurai district lots of ecological imbalances has been occurred from last 10 years. In the present paper an attempt has been made to understand the changes occurred due to Industrialization and urbanization activities in Melur to Kariyapatti National Highways of Madurai district of Tamilnadu through the Geo spatial techniques.

**IndexTerms - Arc GIS.**

## I. INTRODUCTION

The **National Highways network** of India is a network of trunk roads that is owned by the Ministry of Road Transport and Highways. It is constructed and managed by the National Highway Authority of India (NHAI), the National Highways and Infrastructure Development Corporation (NHIDCL), and the public works departments (PWDs) of state governments. NHAI was established by the National Highways Authority of India Act, 1988. Section 16(1) of the Act states that the function of NHAI is to develop, maintain, and manage the National Highways and any other highways vested in, or entrusted to, it by the Government of India. These highways as of December 2018 measure over 131,326 km (81,602 mi).<sup>[1]</sup> The Indian government led by PM Modi has vowed to double the highway length from 96,000 to 2,00,000 km.<sup>[2]</sup> As of June 2018, 27 km per day of highway construction has been achieved which is unprecedented in Indian history.<sup>[3]</sup>

In India, National Highways are at-grade roads, whereas Expressways are controlled-access highways (mostly six-lane or above) where entrance and exit is controlled by the use of slip roads (ramps) that are incorporated into the design of the highway. The at-grade national highways do not have shoulder lanes.

While National Highways constitute 1.8% of Indian roads, they carry 40% of the traffic.<sup>[4]</sup> The majority of existing National Highways are two-lane roads (one lane in each direction), though much of this is being expanded to four-lanes and some to six or more lanes. Some sections of the network are toll roads.

Bharatmala, a centrally-sponsored and funded road and highways project of the Government of India<sup>[5]</sup> with a target of constructing 83,677 km (51,994 mi)<sup>[6]</sup> of new highways, has been started in 2018. Phase I of the Bharatmala project involves the construction of 34,800 km of highways (including the remaining projects under NHDP) at an estimated cost of 5.35 lakhcrore (US\$74 billion) by 2021-22.<sup>[7]</sup>

## II. OBJECTIVES OF THIS STUDY

- Site selection
- Unsupervised classification technique in satellite image
- To identify the water body changes
- To evaluate land use categories along the road side

## III. DIGITAL IMAGE PROCESSING:

Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems.

## IV. CHANGE DETECTION:

Change detection or change point detection tries to identify times when the probability distribution of a stochastic process or time series changes. In general the problem concerns both detecting whether or not a change has occurred, or whether several changes might have occurred, and identifying the times of any such changes. Specific applications, like step detection and edge

detection, may be concerned with changes in the mean, variance, correlation, or spectral density of the process. More generally change detection also includes the detection of anomalous behavior: anomaly detection.

## V. LITERATURE REVIEW

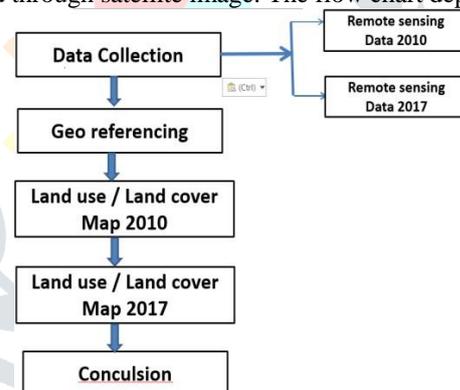
T.Subramani (2014)-Landsat images of TM and ETM+ of Panamarathupatti lake salem city area are collected from the USGS Earth Explorer web site. After image pre-processing, un-supervised and supervised image classification has been performed to classify the images in to different land use categories. Five land use classes have been identified as Urban (Built-up), Water body, Agricultural land, Barren land and Vegetation. Classification accuracy is also estimated using the field knowledge obtained from field surveys. The obtained accuracy is between 73 to 80 percent for all the classes. Change detection analysis shows that Built-up area has been increased by 372.28%, agricultural area has been decreased by 65.16% and barren area reduced by 60.98%. 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 the city.

The LULC maps were produced properly for eight successive periods of times and for seven class categories, including 2008 and back to 1951.

This study explored a future LULC change simulation using a CA-Markov model in combination with GIS technology and predicted the subsequent changes in ESV by using land use data and the modified ES coefficients of the studied landscape. The validation of our model with the actual data of the base year (2010) shows an overall satisfactory result, revealing that CA-Markov is an appropriate model for predicting future LULC change. The results of the predicted future LULC area changes indicate decreases in farmland, wetland, and water bodies, but increases in construction land, woodland, and grassland. From the temporal patterns of the changes between 2010 and 2020, wetland decreases at a higher rate, followed by farmland and water bodies. Furthermore, the patterns of LULC change over the three decades show that wetland decreased at an average rate of 14%, followed by farmland (13%) and water bodies (2.8%). However, at the expense of these LULC categories, construction land is expanding at a higher average rate (48%) than other LULC types. As a consequence, with the current trend in land management, these three LULC types with high ecological values have been continuously declining, leading to losses in the environmental and ecological values of the region.

## VI. METHODOLOGY

The studies of monitoring urban residential growth of Madurai city were first started with a topographic map prepared in and comparing this topographic map with satellite image. For past 10 decades, constructional activities increased depending on population growth and due to opening of more industry, with the construction of airport and establishment of the university, an increasing residential construction was determined through satellite image. The flow chart depicting the study area are illustrated.



FLOW CHART OF THE PROCESS INVOLVED IN DIGITISATION

## VII. SOFTWARE USED

### 1. GOOGLE EARTH:

Google Earth is a geo browser that accesses satellite and aerial imagery, ocean bathymetry, and other geographic data over the internet to represent the Earth as a three-dimensional globe. Geo browsers are alternatively known as virtual globes or Earth browsers.

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### 2. GLOBAL MAPPER:

Global Mapper is a geographic information system (GIS) software package currently developed by Blue Marble Geographics that runs on Microsoft Windows. The GIS software competes with ESRI, Geo Media, Manifold System, and MapInfo GIS products. Global Mapper handles both vector, raster, and elevation data, and provides viewing, conversion, and other general GIS features. Global Mapper has an active user community with a mailing list and online forums.

### 3. ARCGIS :

ArcGIS is a geographic information system (GIS) for working with maps and geographic information. It is used for creating and using maps, compiling geographic data, analysing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database.

The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web.

**4. ERDAS IMAGINE:**

Erdas Imagine is an image processing software package that allows users to process both geospatial and other imagery as well as vector data. Erdas can also handle hyper spectral imagery and LiDAR from various sensors.

Erdas also offers a 3D viewing module (Virtual GIS) and a vector module for modelling. The native programming language is EML (Erdas Macro Language). Erdas is integrated within other GIS and remote sensing applications and the storage format for the imagery can be read in many other applications.

Leica Geo systems also purchased ER Mapper to add to their mapping software. Imagine is tightly woven into the GIS fabric more than other image processing software packages and that is the advantage of this package.

**VIII. RESULT AND DISCUSSION**

**1. DIGITAL IMAGE PROCESSING (DIP)**

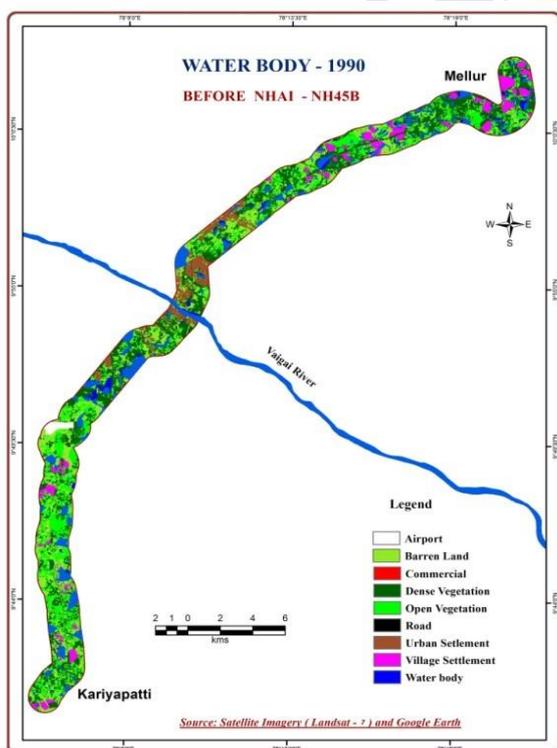
Digital Image Classification uses the spectral information represented by the digital numbers in one or more spectral bands. Classifies each individual pixel based on this spectral information. Also known as spectral pattern recognition. The objective: To assign all pixels in the image to particular classes or themes (e.g., water, coniferous forest, deciduous forest, crops, bare soil, etc.)

**2. CHANGE DETECTION AREA**

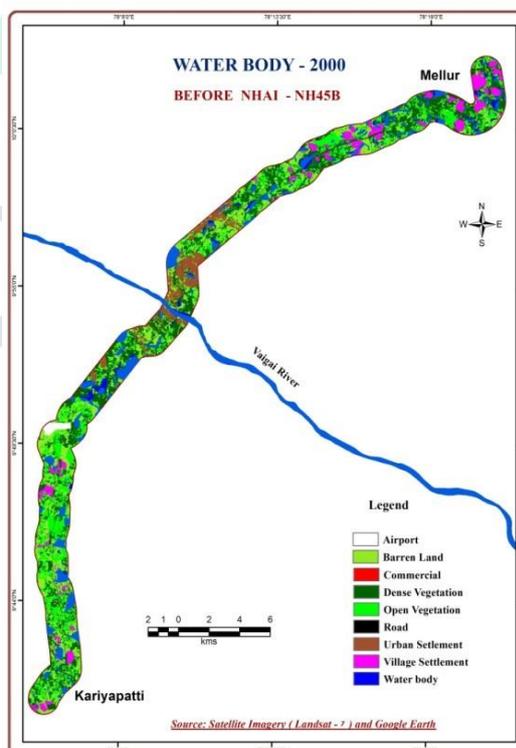
Land use generally refers to the document of how much a region is covered by forest wetlands impervious surfaces agriculture and other land and water types. Water types include wetlands or open water. Land use shows how people use the landscape whether for the development purpose or for the conservation purpose or for construction of newer structures.

To achieve the study of two different land-cover and land use classes were analyzed. These values quantify the percentage change in each land cover category. The change from to makes post classification change detection so unique. The other task in the detection of the suburban expansion as described in the post classification change detection process. In order to determine the “national highway roads” the images for 1990,2000, 2010, and 2015 were classified.

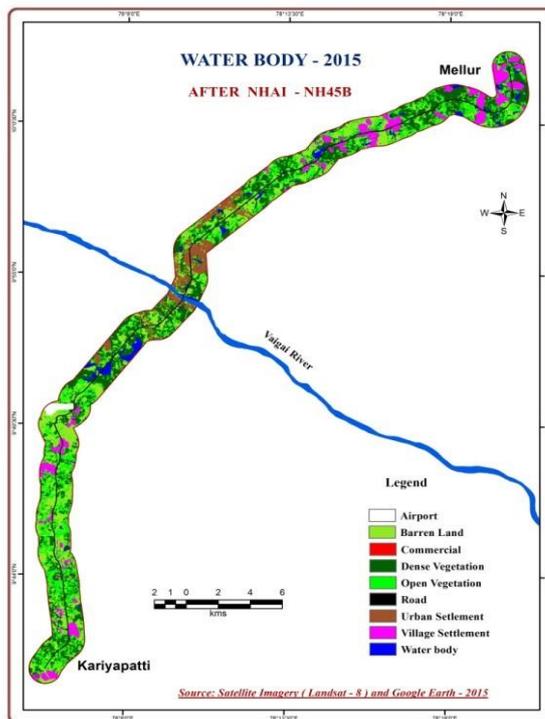
The results indicate a moderate growth of the towns in the study area. The town is recorded with moderate growth of towns in the study area. The intra-regional variations in the growth and mainly associated with acceleration of the economic activity transportation administrative and government interventions. Tow expansion is being attributed to the commercial and industrial activities



Water body – 1990



water body - 2000



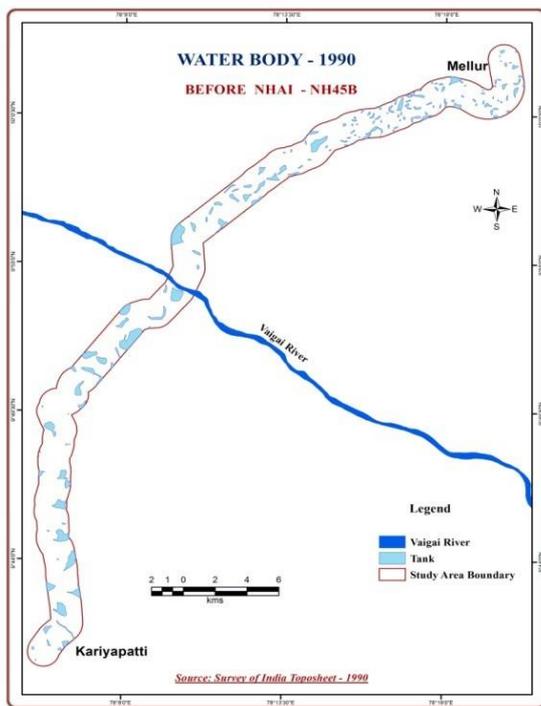
Water body – 2015

**IX. HIGHWAY ROAD CHANGE DIRECTION:**

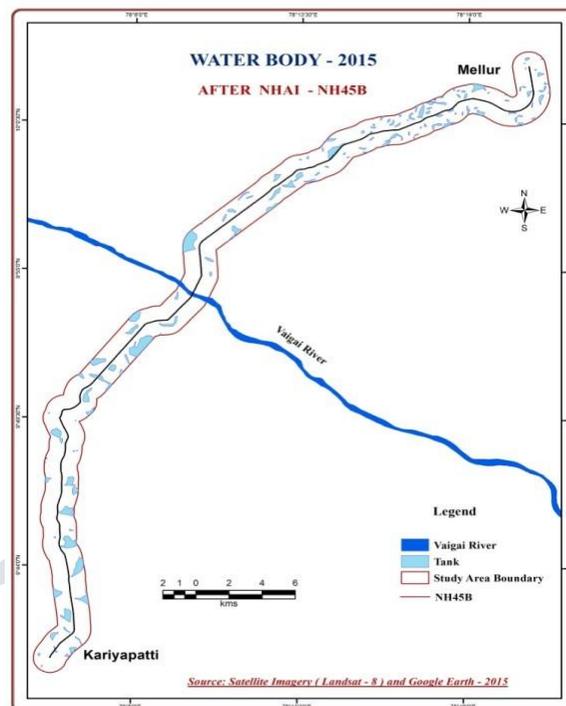
Defining the dynamic phenomenon and predicting the future sprawl is greater challenge than the quantification of sprawls. Although different sprawl types were identified and defined there has been an inadequacy with respect to developing mathematical relationships to define them. This necessities characterization and modeling of the urban sprawl which will aid in the regional planning and sustainable development. The below urban sprawl images show the most spread urban areas during the different decadal points with red color and the green color is for the least spread.

Features identification

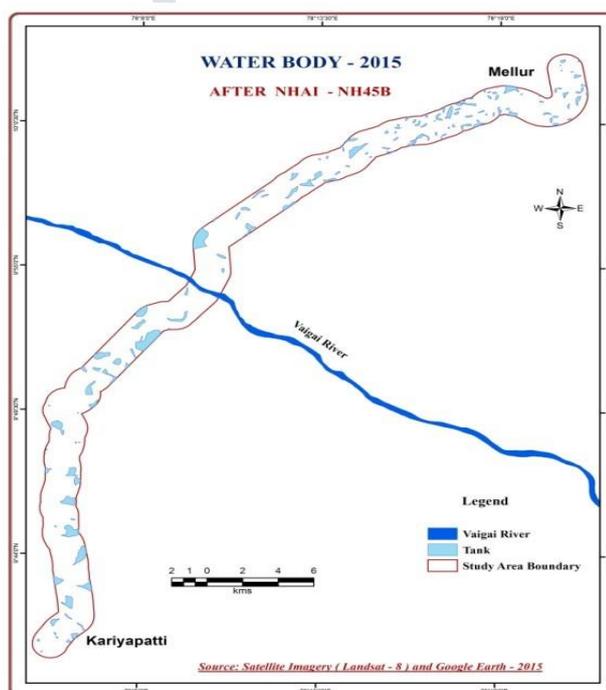
S.No	Classification	Area in Hectare		
		1990	2000	2015
1	Water body	641.44	641.44	393.03
2	Dense Vegetation	5618.12	4362.12	3896.73
3	Open Vegetation	2365.4	2590.4	2748.78
4	Barren Land	1899.3	2854.32	3230.19
5	Village Settlement	1001.21	1060.42	1095.93
6	Urban Settlement	711.91	720.64	729
7	Commercial	1.02	1.22	1.35
8	Airport	90.45	90.5	91.8
9	Road	21.85	29.64	163.89
		<b>12350.7</b>	<b>12350.7</b>	<b>12350.7</b>



Water body – 1990



water body - 2015



Water body - 2015

## X. CONCLUSION

The present study shows that satellite remote sensing based land cover mapping is very effective. The high resolution satellite data such as LISS III data and Landsat TM are good source to provide information accurately. It clearly defines the change in the area on the three decades 1km around the suburban railway track line in the Chennai city. By the use of software like ERDAS 9.1, GLOBBAL MAPPER, ARC-GIS. The water bodies, airport and coastal area, railway are not have any changes (1990,2000,2015) In the three decades. The vegetation and barren land are decreased through the three decades. The settlement increases in the decades.

## REFERENCES

- **Tamilenthi, S., Punithavathi, J., Baskaran, R. and ChandraMohan K, (2011),**Dynamics of urban sprawl, changing direction and mapping: A case study of Salem city, Tamilnadu, India, Achieves of Applied Science Research, 3(1), pp 277-286.
- **Chennai Metropolitan Development Authority (2007) Draft Master Plan –II for**Chennai Metropolitan Area – 2026, Chennai Metropolitan Development Authority, Chennai.

- **Demography World Urban Areas and Population Projections: 5th Comprehensive Edition** (Revised), April /db-worldua2015.pdf, dated 20.02.2010.
- T. Subramani and V. Vishnumanoj (2014), "Land Use & Land Cover Change Detection and Urban Sprawl Analysis of Panamarathupatti Lake, Salem", International Journal of
- K. Kavitha, C. Prakasam, A. Shanthakumari., 2012, Land Use Land Cover Change Detection In Madurai District, Tamil Nadu, India: Using Satellite Remote Sensing, International Journal of Physical and Social Sciences.

