

MONITORING OF FOREST DEGRADATION USING GIS AND REMOTE SENSING

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ABSTRACT

Forests are the terrestrial ecosystem of the earth and 30% of the land is covered by forest. Nowadays, most of the people cut down trees and they export the wood into another country for economic benefits. Tree stores the huge amounts of carbon, are essential for the cycling of nutrients, water and air quality and for other countless human services. The degradation and deforestation is one of the environmental disturbance caused by human beings. Assessment of deforestation is necessary in the world, because 46% of the forest trees have been cleared in the past 12000 years. The forest area around the world were cut down up to 2.3 million square kilometres between the year of 2000 to 2012. During this year the original forest area 16 million square kilometres were reduced to 6.2 million square kilometres. Forest is converted into the plain land for construction homes, industries, etc. Deforestation causes the environmental problems like landslides, extinction of animals, birds and it reduces vegetation. Many countries put for the law of conservation of forest to reduce deforestation, but people still disobey the law. The forest administration uses GIS to produce the forest resource map. This work is mainly concentrate on reducing deforestation using Geographical Information System technology.

Keywords: conservation, deforestation, ecosystem, forestresource, GIS.

I.INTRODUCTION

Deforestation is the removal or cutting down of tress where the land is there after converted to non-forest use. Deforestation includes conversion of forest lands into farm lands, urban use. In addition to that some precious tress such as sandal wood, teak and red wood are cut downed illegally for commercial purposes. Almost 30% of the land area is covered by forest area. The removal of trees without sufficient reforestation causes a drastic change in climate, carbon releasing, global temperature.(et.al, ROSERO-BIXBY, L. & PALLONI, A.(1998). Population and deforestation in Costa Rica.Population and Environment, 20(2), 149-185)Theimportant effect due to absence of reforestation is damage to habitat, biodiversity. Geographical Information System is an information technology that has been used in publicpolicy making for environmental, forest planning and decision making. GIS has integration of both hardware and software tools which are useful to monitoring, analysing and displaying all form of geographical related informations.(et.al, ValentinaCamaran, "How to

Effectively Analyze Deforestation in the Amazon Basin Through the use of Binary and fieldwork Data", GIS Application environment, GISDevelopment.net, 1991).Tree stores the huge amounts of carbon, are essential for the cycling of nutrients, water and air quality and for other countless human services. The degradation and deforestation is one of the environmental disturbance caused by human beings. Assessment of deforestation is necessary in the world, because 46% of the forest trees have been cleared in the past 12000 years. The forest areas around the world were cut down up to 2.3 million square kilometres between the year of 2000 to 2012. During this year the original forest area 16 million square kilometres were reduced to 6.2 million square kilometres. Salem district has more mineral deposits like Quartz, granite, bauxite, Iron ore, limestone, and magnesite.(et.al,Warnecke,L.,Nanni,R.V.,Neodovic-Budic,z.,and Stiteler,W.,2002"Remote sensing and geographical information Technology in the nation's 50 state forestry organizations."GeoManagement

Associates Inc.,Syracuse,New York). To control and decrease the forest degradation the government should know where, when, why, and how such deforestation occurs and what measures government has been taken to solve the problem. It seems that technological advancing Geographical Information System especially in the form of earth observing satellites, it make easier to analyse the impact of the deforestation. Deforestation also causes landslides.

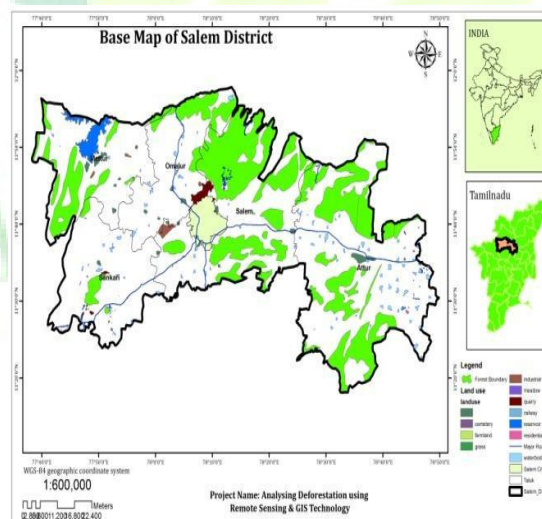
The main objective of this is to analyse and monitor forest area in and around Salem as a change detection of deforestation.

II. STUDY AREA

The location of Salem according to Survey of India is 11.669437° N and 78.140865° E at the elevation of 278m and area 5228 Km^2 . This is surrounded by hills on all the sides. The Nagaramalai to the north, the Jarugumalai to the south, the Kanjamalai to the west, and the Godumalai to the east.

The agricultural land, built-up land with and without vegetation, Dense and open forest, dense shrub, plantation and water bodies comprising mainly reservoir, lakes, river and its tributaries and numerous ponds. The major land cover types that dominate the area are viz..

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Map1: Base map of Salem

The above map represents the forest areas in Salem. The areas covered with green colour gives the detail about forest and high dense trees areas. Water bodies are marked in blue colour and mining industries are marked with brown colours.

III. METHODOLOGY

A. DATA COLLECTION

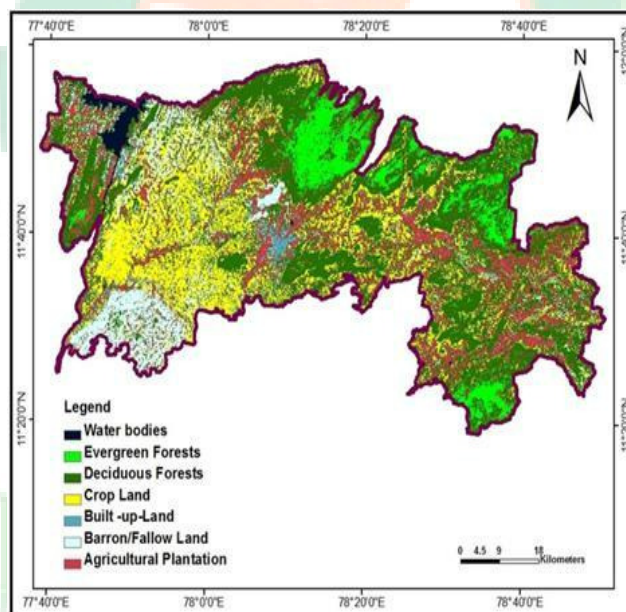
Images: Landsat satellite images.

Software: Arc GIS 10.3.

Landsat MSS and Landsat ETM images are downloaded from USGS earth resource observation systems data Centre and Landsat MSS images are provided by commercial data providers. In this study we downloaded map of the years 1974 and 2014 to analyse. These images are free sources and anyone can use it. Both primary and secondary data's are collected for this study.

Primary data includes information from toposheets provided by Survey of India. Landsat MSS, Landsat ETM, Multi spectrum satellite images from Indian Remote Sensing Satellite. Secondary data comprises of population growth, the corporation map of this region was obtained from Town and Country Planning, Salem, Tamilnadu, India.

The map or the satellite image that gives the detail about forest and other information such as agriculture land, water bodies, constructed areas, waste lands is given in the below map of Salem district.



Map 2: Map denotes forests in Salem

B.PROCESS

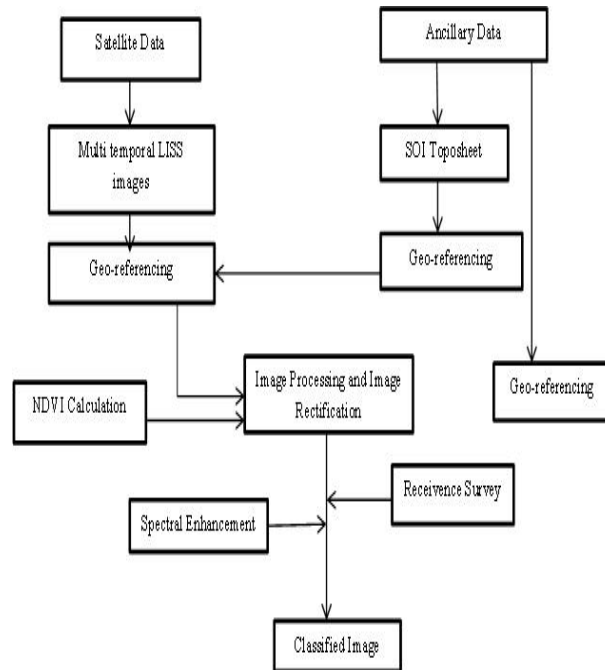


Fig 2: Paradigm for monitoring of forest

Geometric rectification of the data was carried out with the help of scanned Survey of India (SOI) toposheets for assigning geographical coordinates to keep pixel of the image. Supervised image classification is a method in which the analyst defines small areas, called training sites, on the image which are representative of each desired land cover Areas were calculated using ARCGIS 10.3 software and compared changes for both images.

The data was loaded onto the computer. Radiometric and correction was applied for removing radiometric defects and improving the visual impact of satellite data.

The delineation of training areas representatives of a cover type is most effective when an image analyst has knowledge of the geography of a region and experience with the spectral properties of the cover classes. The image analyst then trains the software to recognize spectral values or signatures associated with the training sites.

C.NDVI DIFFERENCING CHANGE DETECTION

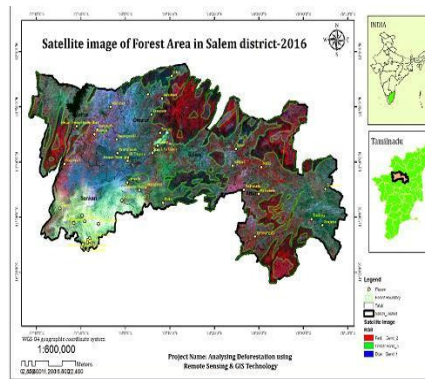
The Normalized Difference Vegetation Index (NDVI) is a simple numerical indicator that can be used to analyse remote sensing measurements, typically but not necessarily from a space platform, and assess whether the target being observed contains live green vegetation or not.

$$NDVI = (\text{near I.R} - \text{Red}) / (\text{near I.R} + \text{Red}).$$

IV. RESULTS AND DISCUSSION

In the below classified images dense forest cover is represented by dark green colour and degraded forest is represented by light green colour. ARC GIS 10.3 software was used to compute areas of the dense forest and degraded forest that resulted from the supervised classification approach.

In the map given below the green boundary region denotes the forest. Places are mentioned by dots. The suitable colours are given by a process false colour composite (FCC). It is formed by the combination of primary colours red, green and blue. Other than the forest area the map shows constructed areas, water resources.



Map 3: Processed image of Salem

Satellite	RIS IC
Sensor	LISS III
Scale	1:50000
Temporal Resolution	5 days
Spatial Resolution	5.8(PAN),23.5m,70.5m

Table 1: Particulates needed for processing the image

V. CONCLUSION

The study was processed by using the GIS technique for the detection of deforestation. The forest covered area is seen as one of the major threats to sustainable development. This implies a decline in vegetation. It thus confirms the change detected through post classification analysis. With the framework of this study, for the detection of possible land covered water areas in Salem city was analysed. The study attempts to map and monitoring forest areas with the help of this study its came to know that forest areas are decreased than which were in 19th centuries. This study give awareness about deforestation and use to increase reforestation.

VI. REFERENCES

1. ROSERO-BIXBY, L. & PALLONI, A. (1998). Population and deforestation in Costa Rica. Population and Environment, 20(2), 149-185.
2. Valentina Camaran, "How to Effectively Analyze Deforestation in the Amazon Basin Through the use of Binary and fieldwork Data", GIS Application in environment, GISDevelopment.net, 1991.
3. Santilli, M., P. Moutinho, S. Schwartzman, D. Nepstad, L. Curran and C. Nobre. Tropical Deforestation and the Kyoto Protocol, Climatic Change (2005); 71: 267-276.
4. Warnecke, L., Nanni, R. V., Neodovic-Budic, z., and Stiteler, W., 2002 "Remote sensing and geographical information Technology in the nation's 50 state forestry organizations." GeoManagement Associates Inc., Syracuse, New York.
5. Singh, A. Digital change detection techniques using remotely-sensed data 1989; Int. J. Remote Sensing: 10(6):pp.989-100.
6. Lu, D. Mausel, P. Brondizio, E and Moran, E. Change Detection Techniques, International Journal of Remote Sensing 2004; 25(12): pp: 2365-2407.
7. U.S. Environmental Protection Agency. Inventory of U.S. greenhouse gas emissions and sinks (2006); 1990-2004: EPA 430-R-06-002. U.S. Environmental Protection Agency.
8. Houghton, R. A. Revised estimates of the annual net flux of carbon to the atmosphere from changes in land use and land management (2003); 1850-2000: Tellus 55B: 378-390.

