

Land Use Land Cover Changes in Longai Reserve Forest of Karimganj District (Assam) from 1988 to 2010 (A Geospatial Approach)

Paper Submission: 16/03/2020, Date of Acceptance: 28/03/2020, Date of Publication:29/3/2020

Abstract

Forest land is one of the most precious natural resources which need to be utilized according to its potential. Due to over utilization and mismanagement of land resources, the problem of land degradation in the forest is on the rise. In the present study, remote sensing and GIS technique have been implemented to study the land cover and land use changes in Longai Reserve forest. To analyze the land use/land cover change dynamics multi data satellite imageries and, the Survey of India topo- sheet were used for the analysis. Satellite imagery of Land sat TM of 1988 and IRS LISS image 2011 were also used to analyze the land cover change dynamics in Longai Reserve forest. The result depict that there is drastic shift in the vegetation pattern in this particular Reserve forest. This shift in the vegetation pattern in Longai Reserve forest has resulted in the decline of the Gibbon and other wild life population.

Keywords: Land Use Land Cover, GIS, Satellite Imagery, Topo- Sheet, Remote Sensing, Gibbon

Introduction

Forest land is one of the most precious natural resources which need to be utilized according to its potential. Due to over utilization and mismanagement of land resources, the problem of land degradation in the forest is on the rise. Increase in human population has added pressure on forest land for settlement and extracting of means of livelihood leading to its degradation. It is a global issue needs proper management and planning. On slough increase in human population need to be checked in order to leave the forest land for the left out beasts.

The model of land use/land cover changes in a particular locality are the consequence of natural and socio-economic factors and their utilization by man and hence,meticulus information in this regard is imperative for the selection, planning and implementation of land use so as to meet the growing demands of basic human needs and welfare. This can also be meaningfully used for improving the status of environment and wildlife in an area at large.

At present conservation of biological diversity is a challenge for the biologists especially for the ecologists and environmentalists. Since last few decades, various tools and techniques are being employed for the conservation of the biodiversity, but at present advanced aids like Remote Sensing (RS) and Geographical information system (GIS) are implemented for the conservation and restoration of the biodiversity.

Whenever remote sensing integrated with GIS (Geographical information system) is employed in the study of land use/land cover, it proved to be an effective tool for the analysis of land use and land cover changes at macro, meso and micro level. This will potentially help to improve the management of critical habitat of wildlife. Now this technique has been widely used in the tropics for generating priceless information on forest cover, vegetation types and land use changes (Forman, 1995). Remote sensing and GIS technique has been incorporated in the present study to assess the land cover and land use change in and the longai Reserve Forests of Karimganj district for the period of 1988 to 2011.



Anup Dey

Associate Professor & H.O.D
Dept. of Zoology,
Karimganj College,
Karimganj, Assam, India

Over View of The Study Area

SISTERS OF CHARITY : NORTH EAST INDIA

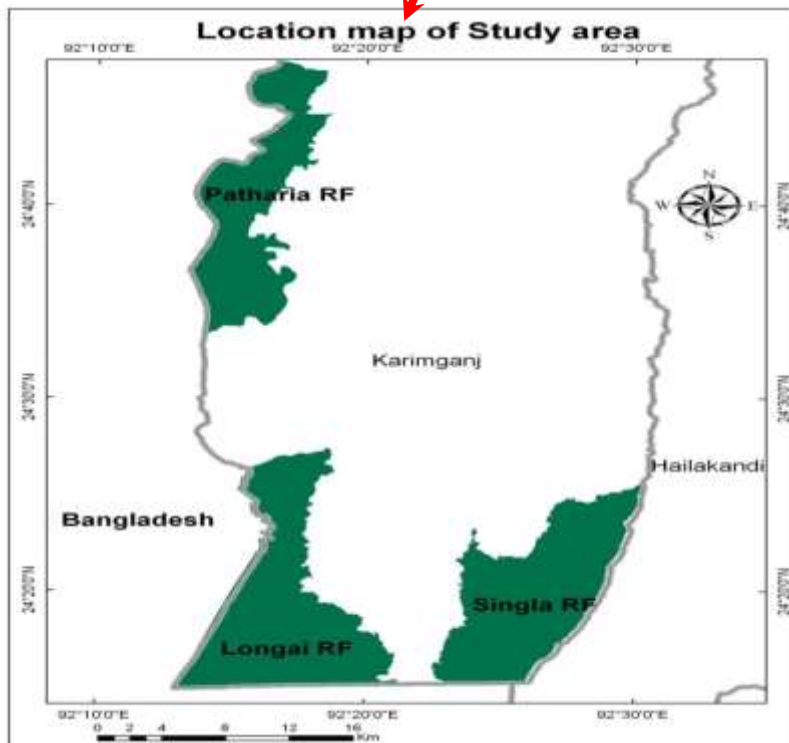
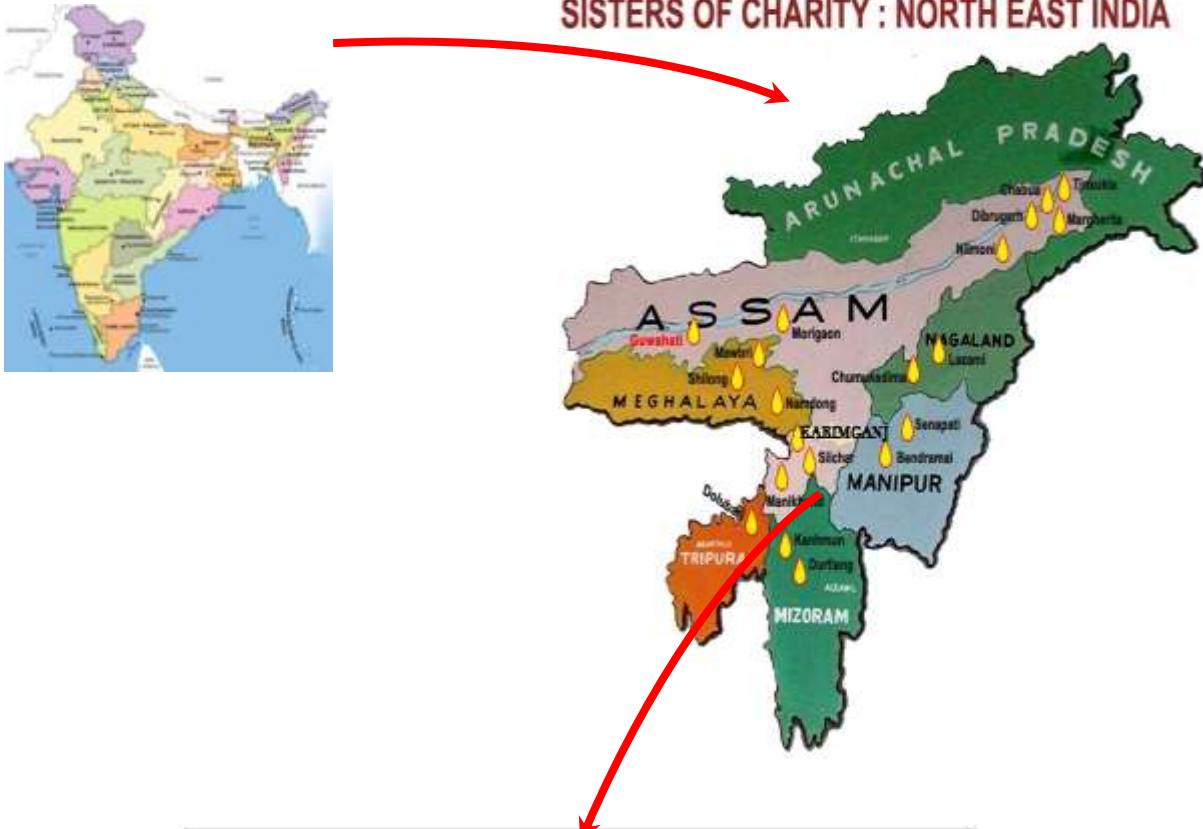


Figure 2.1: Map of Study Area

Materials and Method

To analyze the land use/land cover change dynamics in the Longai Reserve forest multi data satellite imageries were used. In addition, the Survey of India topographical sheet nos. 83 D/2,83 D/6 and

83 D/7 at 1:50,000 scale and maps available with State Forest Department were used to delineation of forest boundary and to generate baseline information for the study area.

Table. 1 Datasets used in the study

Data Type	Path/Row	Date of acquisition
Landsat TM	136/43	10-11-1988
IRS LISS III	112/55	6-9-2011
Survey of Indian toposheets	No. 83 D/2, 83 D/6 and 83 D/7 (1:50,000 scale)	1974
Maps of Forest Dept.	-	1985

Satellite imagery of Land sat TM of 1988 and IRS LISS image 2011 were used to analyze the land cover change dynamics in the Longai Reserve forest. Land sat MSS data of 1970 was used in the study but the resolution and data quality was not good for interpretation. The open source Landsat TM of 1987 was downloaded from the NASA's Global Land Cover Facilitors (GLCF) website (www.glfapp.uniacs.umd.edu) and satellite imagery of 1998 and 2011 were procured from National remote Sensing Centre (NRSC), Hyderabad. The imageries were projected to UTM-WGS 84 projection system using Landsat ETM image as reference. Sub-pixel image to image registration accuracy was achieved through repeated attempt. Dark pixel subtraction technique were employed for the Radiometric correction of all the images .Then re-sampling of IRS P6 LISS III imagery was processed at 30m pixel size like other imageries(Land Sat TM 1988) Further subset operation of satellite imageries of 1988 and 2011 was carried by generating an area of interest (AOI) vector layer of forest boundary of Longai Reserve Forest was digitizes from the published maps of Department of Forest and Environment, Govt. Of Assam at 1:50,000 scale.

After the completion of sub setting, the images of the study area were processed through spectral enhancement technique using ERDAS image 9.2 software. Principal component analysis (PCA) was then carried out to all the image and the images were transformed into three principal components. At first PCA allows redundant data to be compacted into fewer bands, whereby, the dimension of the data was reduced. The band of PCA data are non-correlated and independent, and are often more interpretable than the source data. After generating the hybrid PCA images, on screen digitization technique was implemented to assess the land cover change dynamics in the Longai Reserve Forest reserve forest from 1988 to 2011. After classifying all the images of 1988, 2000 and 2011 the post classification comparison method was employed to detect the change in land cover types in, Longai Reserve Forest.

The method consists of overlaying, cross operation for the comparison of two images and classification. The cross operation helps to analyze the extent and nature of the changes observed, ie, the transition between different land cover classes and the corresponding changes in the landscape under study. Applying the above method finally, land cover change analysis of Longai Reserve forest was obtained.

Thematic components: Various thematic maps like Contour, drainage, places and road Network and elevation maps were prepared using the software Arc GIS 9.3, Satellite data with 1; 50,000 scale SOI (Survey of India) topo- sheets.

The land use/land cover pattern of study area has been categorized into four classes based upon the field knowledge and collected training sets of vegetation types.

The different land use/land cover classes are:

1. Semi Evergreen forest.
2. Moist mixed deciduous forest and
3. Agricultural land.
4. Water body.

Findings

The analysis and elaboration of the satellite imageries have provided the land use/land cover types and changes there in within a time period of twenty three years. The most prominent changes in LULC during 1988-2011 revealed sizable decrease in forest cover in Longai RF. In Longai RF the Semi Evergreen forest has reduced considerably mainly because of illegal tree felling, timber logging, Jhum cultivation, betel leaf plantation, expansion of agricultural land and encroachment. The data analysis also revealed that agricultural practices within the forest have increased to a significant proportion from 1988 to 2011 in Longai Reserve forest. This is because the communities living in and around the reserve forest practices Jhum cultivation within the forest area as a means of livelihood. In addition to the above, human settlement and anthropogenic activities have increased many folds during the period 1988 to 2011..

Table 2. .Land use /Land Cover from 1988 to 2011 in Longai Reserve Forest

Sl. No	LULC Class	November 1988		January 2000		March 2011	
		Area in Sq. Km	Area (%)	Area in Sq. Km	Area (%)	Area in Sq. Km	Area (%)
1	Semi Evergreen Forest	66.74	47.29	60.37	42.36	51.63	36.23 ↓
2	Moist mixed Deciduous forest	42.19	29.60	44.82	31.45	48.89	34.30 ↓
3	Agricultural land	29.47	20.68	33.33	23.38	38.30	26.87 ↓
4	Water body	4.10	2.87	3.98	2.79	3.69	2.58 ↓
	Total	142.50		142.50		142.50	

Table 3. Land use /Land cover change from 1988 to 2011 in Longai Reserve Forest

Sl. No	LULC Class	November 1988		March 2011		Net change	
		Area in Sq. Km	Area (%)	Area in Sq. Km	Area (%)	Area in Sq. Km	Area (%)
1	Semi Evergreen Forest	66.74	47	51.63	36	-15.11	11 ↓
2	Moist mixed Deciduous forest	42.19	30	48.89	34	+6.7	4 ↓
3	Agricultural land	29.47	21	38.30	27	+8.83	6 ↓
4	Water body	4.10	3	3.69	3	-0.41	0.5 ↓
	Total	105.00		105.00			

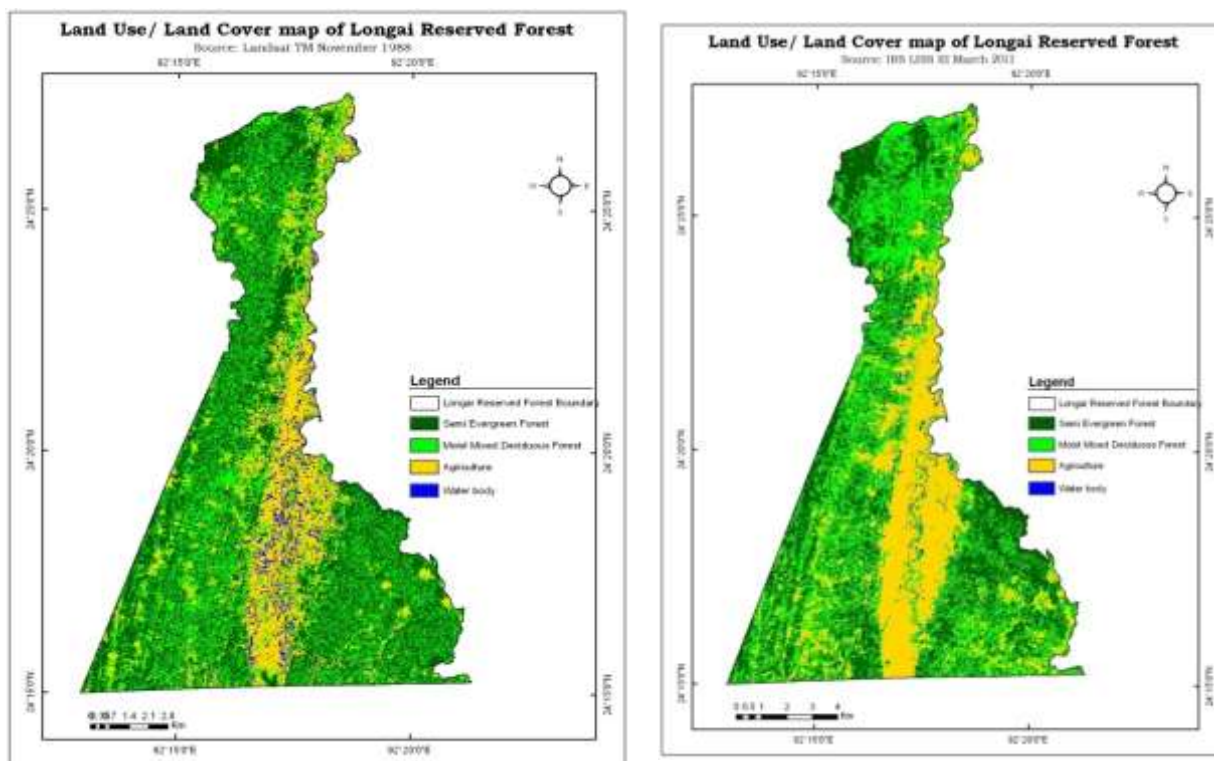


Figure.2 Comparative map showing Land Use/land Cover changes in Longai Reserve Forest (From 1988 to 2011)

Discussion & Conclusion

The evergreen forest/semi evergreen forest within the reserve forest in Longai and Singla have been observed to be converted into scrub land, agricultural land, leading to decrease in forest cover both in terms of quantity and quality. This may be mainly due to uncontrolled betel leaf and Jhum cultivation. The increasing trend of Jhum and betel leaf cultivation, built up activities and agricultural activities are the major threats to the forest cover, which needs immediate attention. By intensifying the management practices of the forest resources, the healthy environment as well as healthy habitat of wildlife species can be restored.

In the present study comparative LULC studies within a span of 24 years in Longai RF reveals that there was 47% of Semi Evergreen forest in 1988 which reduces to 42.36% in 2000 which further reduces to 36% in 2011. Similarly Moist deciduous forest also reduces from 42.19% to 34% in 2011. This reduction has been taken over by expansion of Agricultural land. But there is no remarkable change in water body. The estimated data reflects that there was degradation and destruction of habitat of wildlife in general and gibbon in particular in the study area.

References

1. Arvind, C. Pandey and M. S. Nathawat (2006). *Land use Land cover Mapping Through Digital Image Processing of Satellite Data- A case study from Panchula, Ambala and Yamuna agar Districts, Haryana State, India*
2. Burley, Terence M. (1961). *Land use or land utilization Prof. Geographer* 13(6):18-20.
3. Burrough.P.A. (1986). *Principle of Geographical information system for Land Resource Assessment.* Clarendon Press, Oxford.
4. Champion, H.G. and Seth, S.K. (1968). *A Revised Survey of the Forest Types of India.* The Manager of the Publication, New Delhi, India
5. Choudhury, A. (1988b). *A primate survey in southern Assam, India.* *Primate Conserv* 9: 123-125.
6. Ehlers, M., Jadcowski, M.A., Howard, R.R. and Brousten, D.E. (1990). *Application of SPOT data for regional growth analysis and local planning.* *Photogrammetric Engineering and Remote Sensing.* 56:175-180.
7. Jayakumar, S. and Arockiasamy, D.I. (2003). *Land-use/Land-cover mapping and change detection in part Eastern Ghats of Tamil Nadu using remote sensing and GIS.* *Indian Soc. Remote Sensing.* 31 (4):251-260.
8. Leimgruber, P., Kelly, D.S., Steininger, M.K., Brunner, J., Müller, Songer, M. (2005). *Forest cover change patterns in Myanmar (Burma) 1990–2000.* *Environmental Conservation* 32, 356–364
9. Mahajan, S. and Panwar, P. (2005). *Land use Changes in Ashwani Khad watershed using GIS Techniques, Jour, Indian Soc, Remote Sensing.* 33(2):227-232.
10. Montaya (2002). *GIS and Remote Sensing in Urban Disaster Management 5th AGILE Conference on Geographic Information.*
11. Moshen, A. (1999). *Environmental Land Use Change Detection and Assessment using with Multi-Temporal Satellite- Imagery - Zanjan University*
12. Pandey A.C. and Nathawat, M.S. (2005). *Land use land cover Mapping through Digital image Processing of satellite Data. A case study from Panchkula, Ambala and Yamunanagar Disriects, Haryana State. India.*
13. Shamsudheen, M., Das, G.S, and Tejaswini, N.B. (2005). *Land use/ Land cover mapping in the coastal area of north Karnataka using remote sensing data Jour, Indian Soc. Remote Sensing* 33(2):253-257.