Research Article Impact Factor: 4.226 ISSN: 2319-507X
Khadri S. F. R., IJPRET, 2016; Volume 5 (2): 285-295 IJPRET

INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

SPECIAL ISSUE FOR
INTERNATIONAL CONFERENCE ON
"INNOVATIONS IN SCIENCE & TECHNOLOGY: OPPORTUNITIES & CHALLENGES"

ASSESSMENT OF LAND USE/LAND COVER VARIATION IN AKOLA TALUKA, MAHARASHTRA, INDIA USING REMOTE SENSING AND GIS TECHNOLOGY

KHADRI S. F. R[1], RAJESHWARI B. PANDE[1], CHAITANYA B. PANDE[1], RAJAN JHAMBRE[2]

1. Sant Gadge Baba Amravati University, Amravati, Maharashtra, India
2. Erallo Technologies Inc, E20, Taylor Street, Littleton, MA 01460, USA

Accepted Date: 07/09/2016; Published Date: 24/09/2016

Abstract: *Land Use and Land Cover development is mutually supportive and is highly complicated activity. Most of the Land Use and Land Cover issues lie with land related activities as land is a scarce and highly valuable commodity. GIS is a useful and powerful analytical tool for Land Use, Land Cover and urban management. This is reflected even in the field of Land Use and Land Cover development of the study area. The main purpose of this study is to venture out the possibilities of GIS application in Land Use and Land Cover with respect to land safety and sustainable management. The satellite data of 1998 and 2015 are being used with a spatial resolution of 23.5 m and topographic data of 1970 Survey of India (SOI) top sheets with the scale of 1:50,000. In the present study, supervised digital classification method was proved to be very much useful for making land use and land cover interpretations. The results indicate the presence of five land use classes with due weightage on agricultural land. An extreme change of land use and land cover was recorded during the last 15 years of time i. e. (1998-2015). In 1998, an area of 916.98 Sq. Km. of the land was under agricultural practice, which has been decreased to 866.33 Sq. Km. in 2015. This shows 50.65Sq. K m .reduction in agricultural land during the last 15 years. The results confirm that the main reason for the drastic change in land use and land cover change might be due to the increase in the waste land and population growth and also due to the relocation of resources to urban areas from the rural areas of Akola Taluka.*

Keywords: *Remote Sensing, GIS, GPS, Land Use Land Cover Map*

PAPER-QR CODE

Corresponding Author: DR. KHADRI S. F. R

Co Author: RAJESHWARI B. PANDE, CHAITANYA B. PANDE, RAJAN JHAMBRE

Access Online On:

www.ijpret.com

How to Cite This Article:

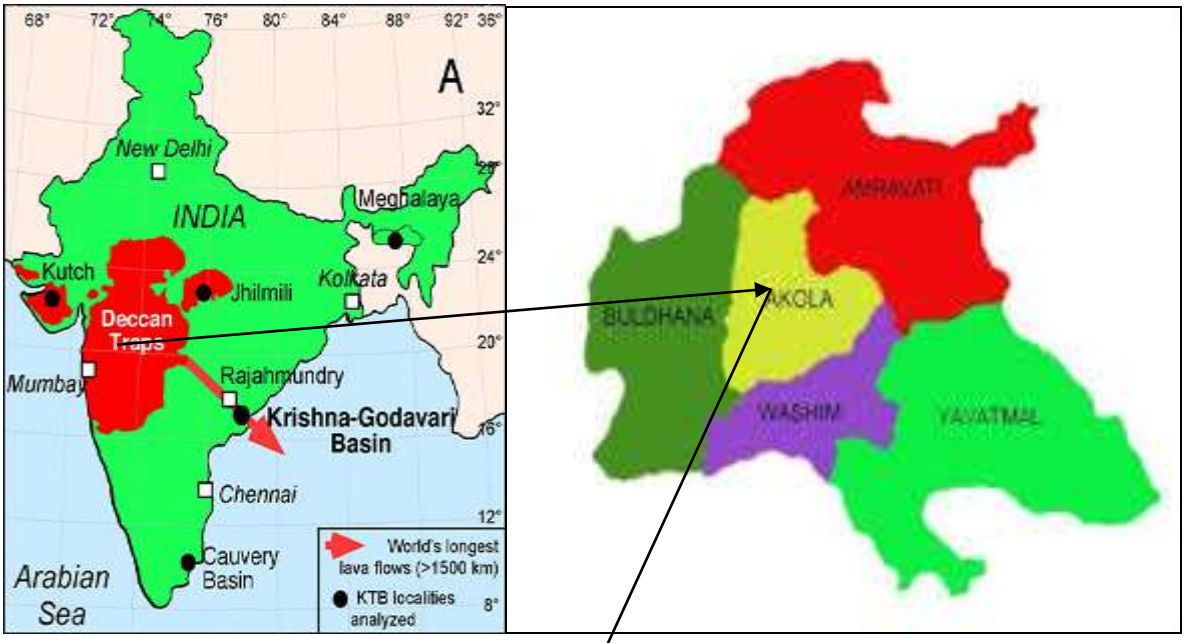
Khadri S. F. R., IJPRET, 2016; Volume 5 (2): 285-295

INTRODUCTION

The population is growing day by day so the land use and land cover areas also keep changing in due course of time. Land is becoming a rare resource due to the vast agricultural and demographic stress. Hence, material on LULC and potentials for their best use is a vital issue for the collection; preparation and application of land use and land cover changes in order to meet the growing demands for the basic human needs and welfare (Chaitanya Pande, 2014). Land is one of the major natural resources of a country. The overall development of any country not only depends on population but also due to changes in spatial scopes. Land use and land cover changes with land conversion from one class to another whereas, land cover changes can be deciphered through major variation of the earth's surface which depends on contented mankind's direct demands for the natural resources (Meyer and Turner 1992; Vitousek et al. 1997; Foley et al. 2005; Atiqur Rahman et. al. 2012).

Study Area

The study area is located in Akola District of Maharashtra, India which is situated between 69°68'23" to 23°08'21" N latitude and 73°98'29'' to 22°76'23'' E longitude (Fig. 1). The study area is covered by Survey of India (SOI) toposheets 55D/13, 55D/14, 55-H-1, 55-H-2, 55-H-5, 55-H-6, 55-H-12 and on 1:50,000 scale. The alluvial soil deposits of shallow depth occurred widely along the stream courses of the river bed consisting of gravely, sandy and clayey mixtures.



India **Akola District**

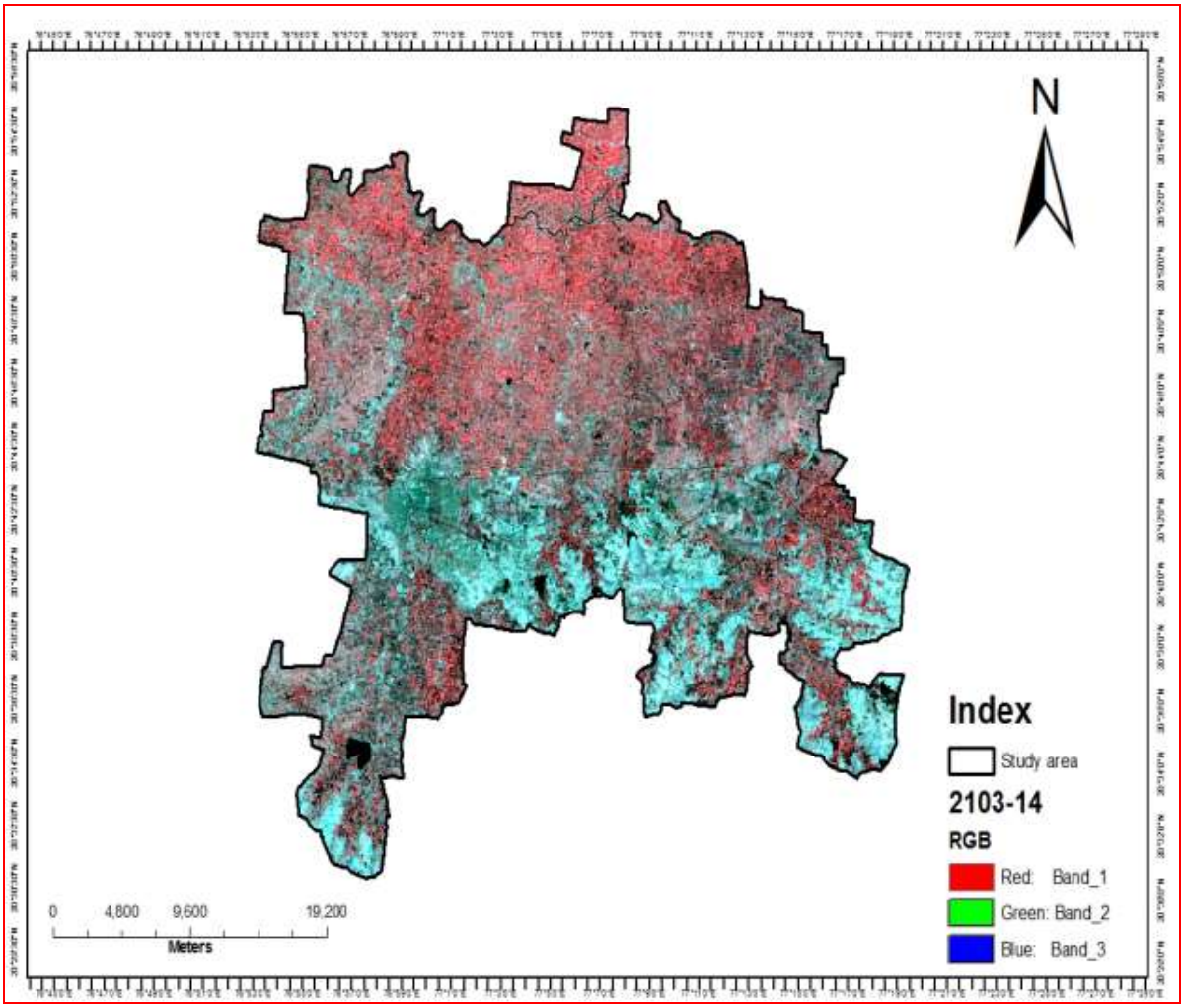


Fig. 1 Location map of Akola Taluka

Material Used:

The present study was founded on main and ancillary data sources. The study has made use of various primary and secondary data. These include Survey of India (SOI) topographic sheets (55-D/13, 55-D/14, 55-H/1, 55-H/2, 55-H/5, 55-H/6 and 55-H/12,) of 1:50,000 scales; and satellite images Landsat TM (geocoded data (for the year 2015). These (Landsat) data were visually and digitally interpreted by using the Arc GIS 10.3 v Software (for processing, analysis and integration of spatial data) to reach the objectives of the study.

Table 1: Satellite data type and resolution

S/N	Data Type	Date of Production	Resolution	Source
1.	LISS-III	1998	23.5m	www.nrsa.com
2.	LISS-III	2015	23.5M	www.nrsa.com
3.	Toposheets	1970	1:50,000	GSI

Methodology:

The methodology involves, the land use/ land cover pattern was interpreted from the topographic data for the year 1998and 2015 same has been converted as digital databases in GIS environment. Next, the high resolution Landsat TM satellite data for the year 1998 and 2014 was used for interpretation of current land use land cover pattern of the study area and generated GIS data bases. The classes were derived based on LULC classification standards of NRSC during 2013. GPS is used to distinguish waterlogged area from natural water bodies. The change detection was made using GIS overlay techniques. Finally, the derived themes were analysed and suggested the management plans for degraded and non- reclaimable zones.

In the present study, toposheets were demarcated for making land use and land cover map of 1998 and then through this vector data land use and land cover map was differentiated into raster data form in ERDAS software. The study area of supervised classification method was done from the satellite data of 2015 with the help of maximum likelihood scheme (MLC). In the study area, dissimilar land use and land cover patterns were recognised such as urban, rural, ,agricultural, forest, water body, waste land using the NRSA guidelines land use and land cover classification pattern of 2002 (Table1). Thereafter, change detection mapping has been done in ERDAS imagine software to evaluate the land use and land cover changes that might have occurred during year of 1998 to2015 (Table 2).

Table 1: Land use land cover classification scheme

CODE	LAND USE/LAND COVER CATEGORIES
1	Agricultural Land
2	Wasteland
3	Built up Area
4	Water bodies
5	River

6	Forest

RESULT AND DISCUSSION

In this study systematic study and interpretation of the land use/cover mapping using supervised classification method with maximum likelihood algorithm was applied in the Arc GIS 10.3 Software. Ground verification was done for areas in grid pattern. The error matrix and Kappa coefficient methods were used to assess the mapping accuracy. Five land use/cover types are identified in the study area viz., (i) Forest (ii) Agricultural land (iii) Waste land (iv) Built-up land (v) Water body (Table 2 Fig.2 to 6).

Table 2: Land Use and Land Cover Distribution (1998and 2015 year)

Land Use/ Land Cover Categories	1998	2015
	Area (Sq. Km)	Area (Sq. Km.)
Agricultural Land	916.98	866.35
Waste Land	18.87	145.70
Built-Up Land	41.36	68.13
Forest Land	51.88	32.87
Water Body	13.62	44.00
Total	1157.05	1157.05

Agricultural Land:

The state of Maharashtra is popularly known as cotton bowl of India". The total area under this category in the study area was 1099.91 sq. km. It covers agricultural land of 916.98 sq. km capture in 1998 satellite image. In 2015 year satellite image interpreted agricultural land cover of 866.35 sq. km. In this present study, day by day agricultural land decreases due to the human interference which in turn also drastically affects agricultural land (Fig. 2 and 5).

Built up Land:

In this present study, this category was interpreted up to Level-1 as rural, urban and industrial built up areas. The built up land covers an area of 41.36sq. Km in 1998 year which forms part of built up land including the total geographical portion of the study area. The built up area covers an area of 68.13 sq. Km in 2015 year built up land, representing the total geographical area of the study area. Hence, the total area under built up land can be computed as 68.13 % of the total geographical area of the study area, which was the fourth major land use category identified after the water bodies (Fig. 2 and 5).

Water bodies:

This covers an area of 13.62 sq. km during 1998 year among the total geographical area of the study area. The total area under this category in the study area was 44.00 sq. km in 2015 of the total geographical area of the study area. The area under canal, drainage network, river and streams are being included in this category (Fig. 2 and 5).

Forest Land:

There is a well established reserve forest in the study area. The total area occupied by this open forest, forest plantations and forest blank covers an area of 51.88 sq. km in 1998 year out of the total geographical area of the study area. The total area occupied by these open forest, forest plantations and forest blank has been drastically reduced to 32.87 sq. km during 2015 year out of the total geographical area of the study area. It has been described as an area of trees of rare species of forestry importance which has been included as endangers species within the notified forest lands (Fig. 2 and 5).

Waste Lands:

In the waste land category, mainly land with or without scrubs were included. The total area occupied by these waste land was 18.87 sq. km in 1998 year out of the total geographical area of the study area and the total area occupied by these waste land have been drastically increased to 145.70 sq. km in the year 2015 out of the total geographical area of the area indicating environmental degradation in the study area which needs to be controlled through proper environmental management (Fig. 2 and 5).

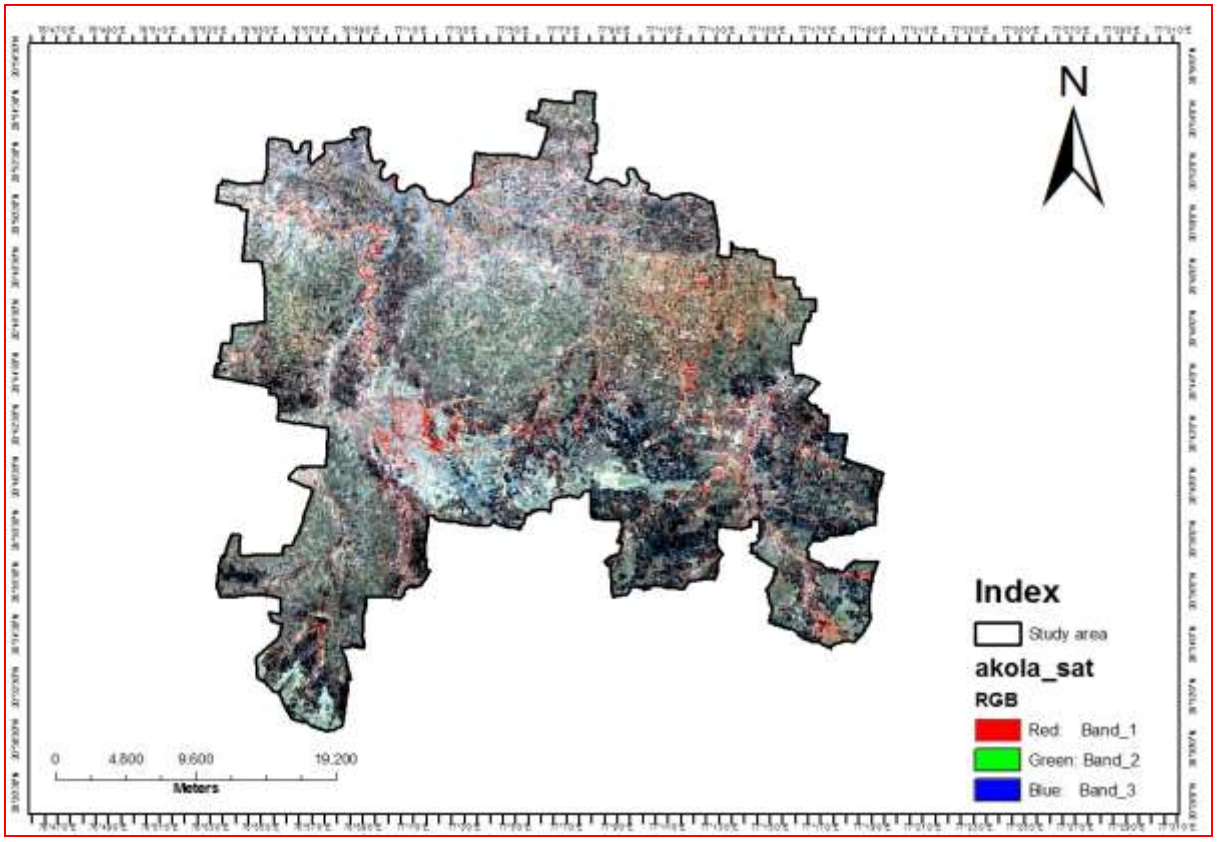


Fig. 2 LISS-III satellite Image of 1998 year

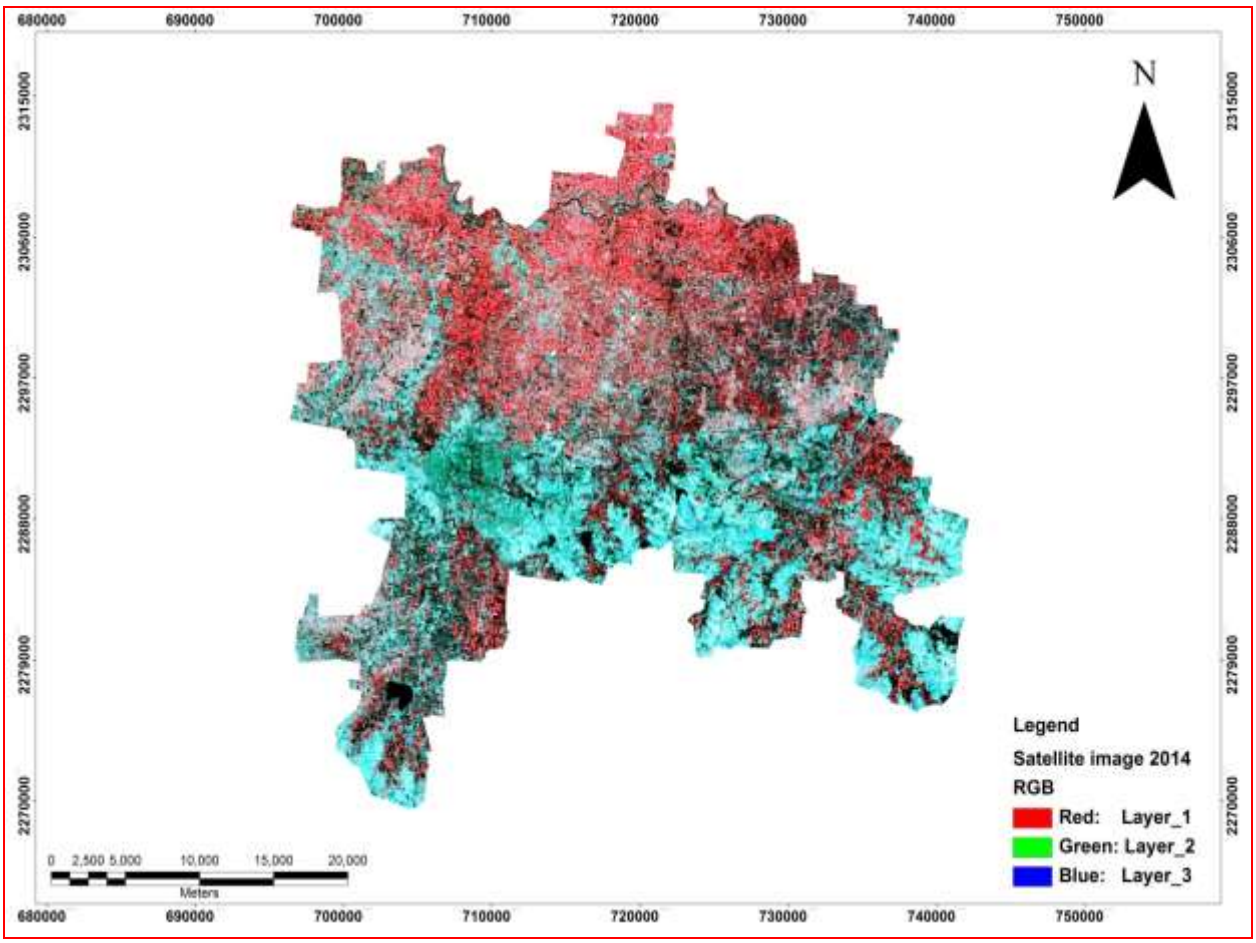


Fig. 3 IRS LISS-III satellite image of 2015 year

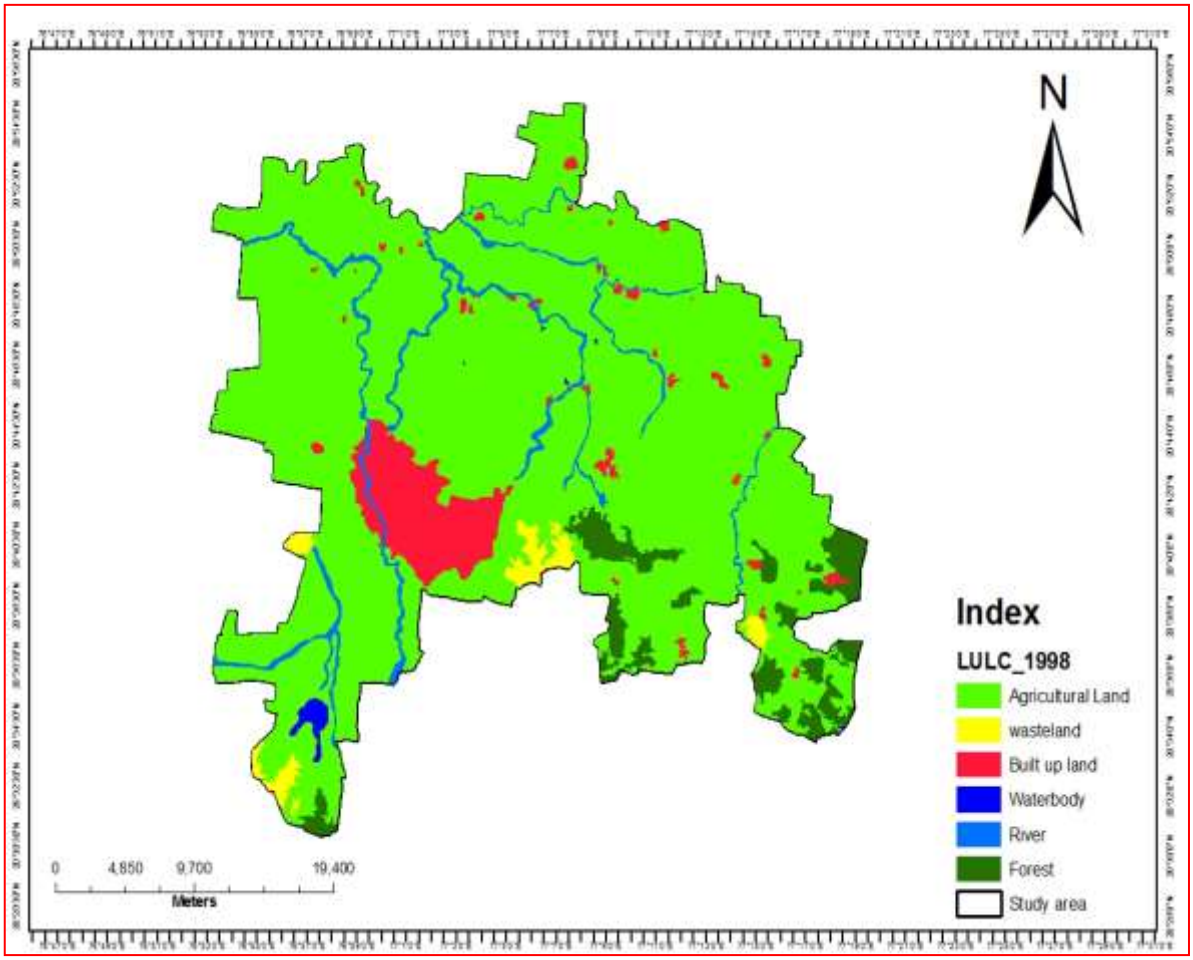


Fig. 4 Land Use Land Cover map of 1998 year

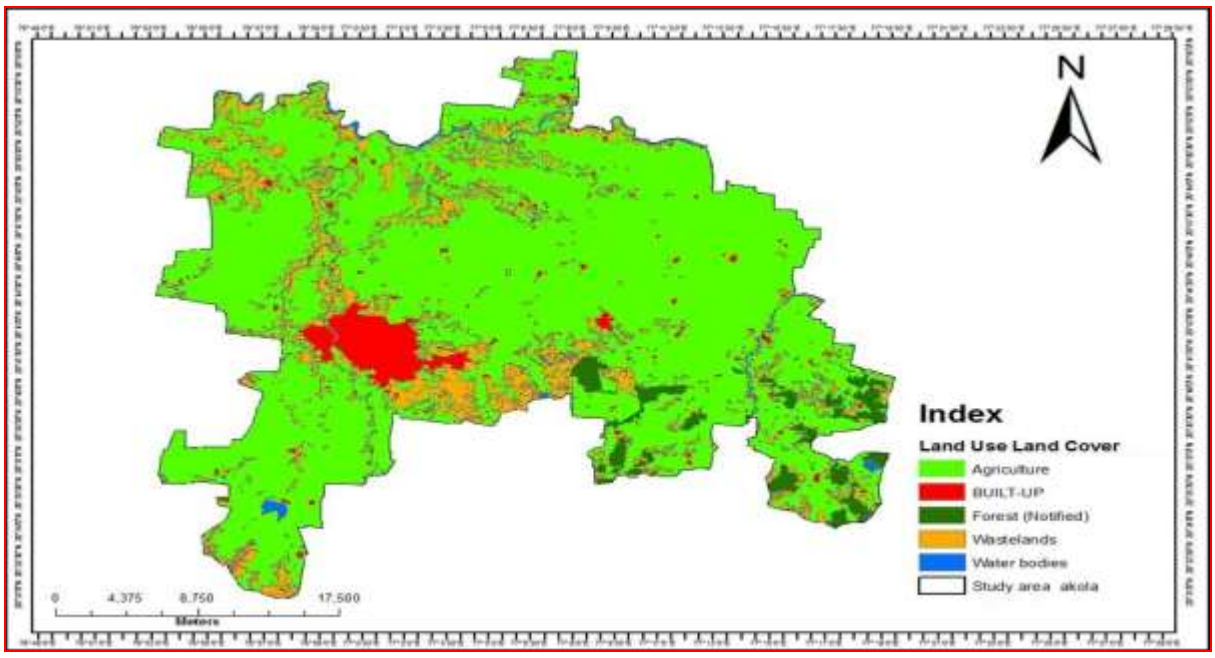


Fig. 5 Land Use Land Cover map of 2015 year

Summary and Conclusions

In this present study an attempt has been made to determine the capability of GIS and Remote Sensing techniques in interpreting the available spatial-temporal data. Attempt has made to capture as accurate as possible, the five land use land cover classes as they change through time. This basic study not only shows how to classify land use/ land cover form the given satellite imagery, but also provides easy method to calculate land use/ land cover area using visual interpretation techniques. The present study has demonstrated the potential of Remote Sensing technology for mapping the land use/ land cover status of an area. The results demonstrates during the year 1998, the ultimate utility and remarkable application of remote sensing and GIS techniques in finalising the various broad Level–I Land use/ land cover maps, agricultural land map covering 916.98 sq. km area, water bodies covering 13.62 sq. km, built up land covering 41.36sq. km, waste land covering 18.87sq. km and forest area covering 51.88 sq. km out of the total geographical Area (TGA) of the study area. However, in 2015 the area under broad (Level –I) Land use/ land cover map indicates the Agricultural land in 866.35 sq. km area, water bodies as 44.00 sq. km, built up land in 68.13 sq. km., waste land in145.70 sq. km and forest cover in 32.87sq. Km. out of the total geographical area (TGA) of the study area (Fig.6). These results are evident from the satellite data analysis for the year 1998 and 2015. Satellite remote sensing technique allows collecting up to date accurate information of land use and

land cover mapping confirming the more advantages through these techniques to monitor the changes that might have occurred in due course of time

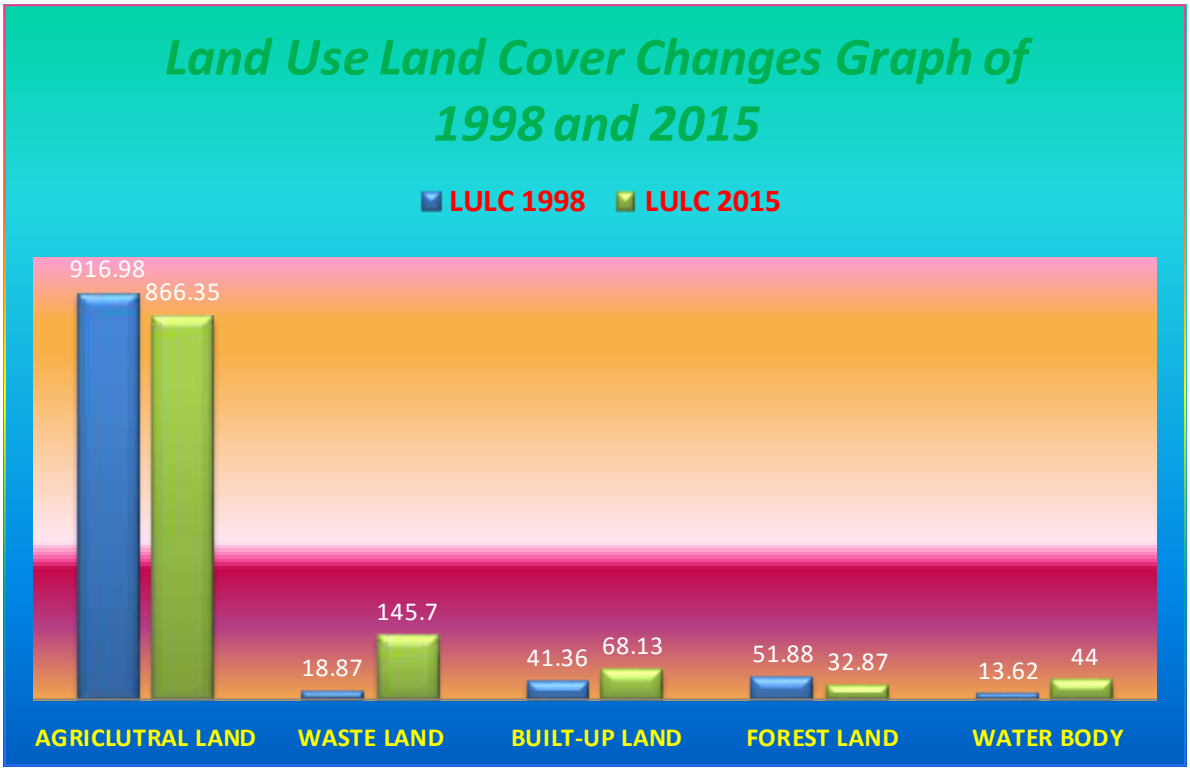


Fig. 6 Land Use and Land Cover changes Graph 1998 and 2015

REFERENCES

1. Meyer, W. B. and Turner, B. L., II. (1992). Human populationgrowth and land use/cover change. Annual Review ofEcology and Systematics, 23, 39–61. http://www.jstor.org/stable/2097281.

2. Vitousek, P. M., Mooney, H. A., Lubchenco, J., &Melillo, J.M. (1997).Human domination of Earth's ecosystems.Science, 277, 494–499.

3. Foley, J. A., DeFries, R., Asner, G. P., Barford, C., Bonan, G.,Carpenter, S. R., et al. (2005). Global consequences ofland use. Science, 309, 570–574.

4. Atiqur Rahman & Sunil Kumar & Shahab Fazal & Masood A Siddiqui (2012) Assessment of Land use/land cover Changein the North-West District of DelhiUsing Remote Sensing and GIS Techniques, J Indian Society Remote Sensing (December 2012) 40(4):689–697DOI 10.1007/s12524-011-0165-4.

5. Chaitanya Pande (2014) Change Detection in Land use / Land cover in Akola Taluka Using Remote Sensing and GIS Technique.