Peer Reviewed International Research Journal of Geography
Maharashtra Bhugolshastra Sanshodhan Patrika
ISSN : 0971-6785 {Impact Factor 3.687 (IIFS)} Vol. 33,No.2, Jul-Dec. 2016.pp 52-56

VILLAGE LEVEL LAND COVER MAPPING USING SATELLITE DATA FOR NATURAL RESOURCE CONSERVATION

Avinash N Shelar Sunil W Gaikwad

Abstract-

Land cover mapping is one of the oldest applications of remote sensing technology. Transformation of satellite data from course to fine resolution have been helped for land use land cover mapping of inaccessible remote areas all over the world which has served as a basic inventory of natural resource management. Land use land cover maps prepared using remotely sensed data are used for variety of purposes mainly, as tools for analysis, problem solving process and decision making in almost all types of natural resource management. Such maps are the basic and fundamental tool used by various analysts, planners, decision makers for rapid visualization and developmental purposes at the moment.

Key words- *Land use, land cover, Remote Sensing, Resolution*

Introduction :

Remote Sensing technology has become an integral part of planning and development practices. It is the science and art of obtaining information about an object, area or phenomena through the analysis of data acquired by a device that is not in contact with the object, area or phenomena under investigation (Lillsand and Keifer, 1999). For this purpose, different wavelength regions of the electromagnetic spectrum are used. The emerging techniques in computers offer a unique opportunity for instruction in our educational system particularly in geography. Planners and geographers in general have a history of adopting innovative approaches to learning and teaching (Lynch, Bednarz, Boxall, Chalmers, and Franch, 2008)

In the present research work an attempt has been made to study the effectiveness of remote sensing technology in the natural resources management at micro level. Village level land use information is very important for sustainable management of natural resources. Maps are the ready reckoner and visual aid for interpreting the spatial relationship. Traditional map making process was involved in an extensive field surveys. It was a time consuming and need huge manpower, also the updating of these maps was complicated. Task of map making became now easy in remote sensing and GIS environment. Now days the opportunities for mapping various themes and objects on the surface of the earth, offered by modern GIS techniques are many including three dimensional views, animations, user interaction with displays, attribute data attachment and interlinking of multiple views.An exercise has been made to study the spatio-temporal land use land cover analysis in the village Ambi of Haveli tahsil for specified time period using remote sensing and GIS techniques.

Study area-

For the present research work village Ambi from Haveli tahsil of Pune district has been selected which is located near Panshet catchment area (Fig-1). It is located in Western Ghats. River Ambi and Mose flow through the northern direction of the village. The geographical coordinates of Ambi village are 18020'70" to 18023'40" N and 73037'45" to 73039'12" E longitude. Geographical area of the village is around 8.94 sq km and population according to the census-2011 is 1704. Ambi village falls under heavy rainfall zone. People in this village are marginal farmers who depend largely on traditional farming techniques and food gathering. Geologically entire village is covered by basaltic flows commonly known as 'Deccan trap'. Soils are black, dark brown or reddish in color. The largest area is occupied by the black soils. The mean daily maximum temperature and the mean daily minimum temperature in the study area is 41.900 C to 21.40 C respectively. As far as flora of the village is concern, vegetation of three types, viz, evergreen, deciduous, and scrub are observed.

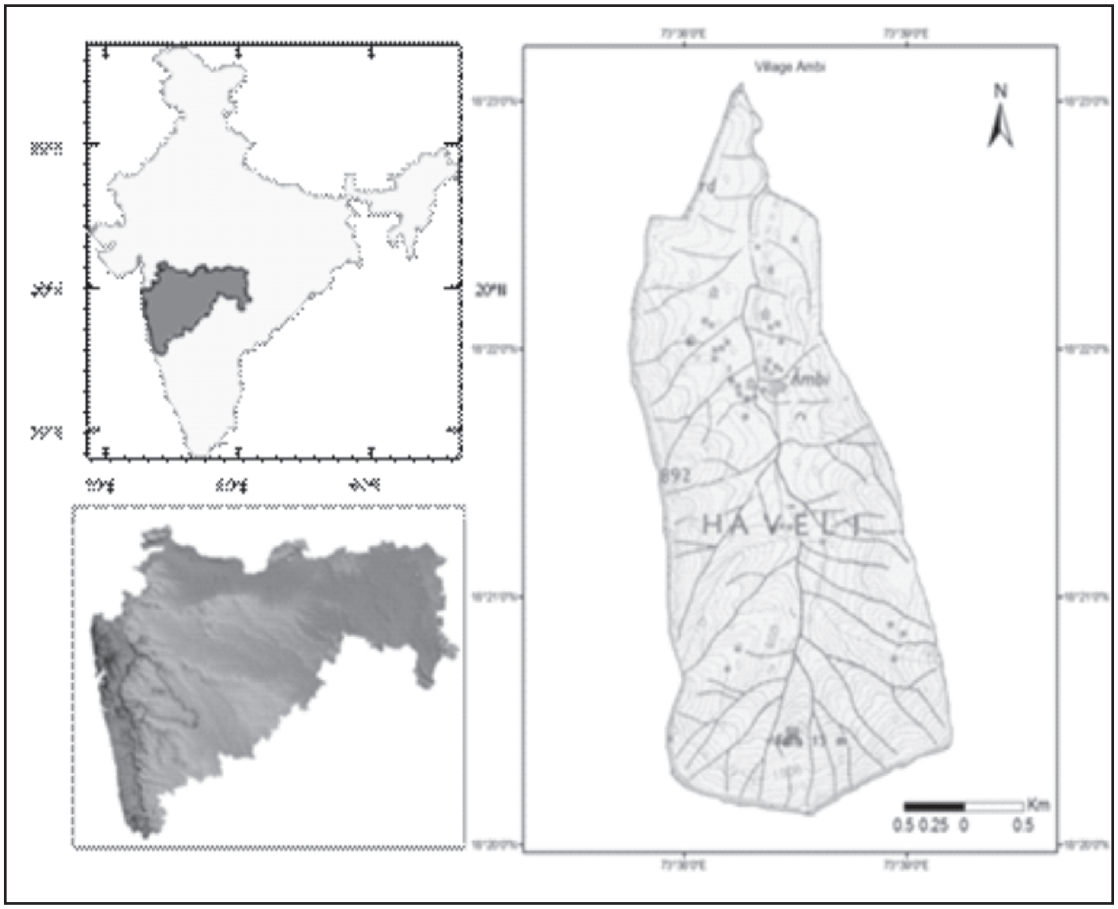


Fig.1 Location map of Study area

Objectives of the study-

· To study the spatio-temporal changes in land cover of the study area using satellite data

· To find out various reasons of degradation of natural resources and to suggest measures for conservation.

Materials and methods-

For the present research work, IRS LISS 1C (1997) and IRS P6 LISS III (2012) of 23.5 m spatial resolution along with Survey of India Toposheet No 47/F/11 on 1:50000 have been used. The digital data were geometrically corrected using toposheet with the help of Erdas imagine 9.1 image processing software. Using the toposheet, drainage pattern in the village Ambi is obtained using Global Mapper software 11.03. Satellite data is then processed in Erdas imagine 9.1 in unsupervised manner. Different land use land cover classes like agriculture, settlement, vegetation, fallow land, water body etc were identified using unsupervised classification method. This derived classes then verified during the field work.

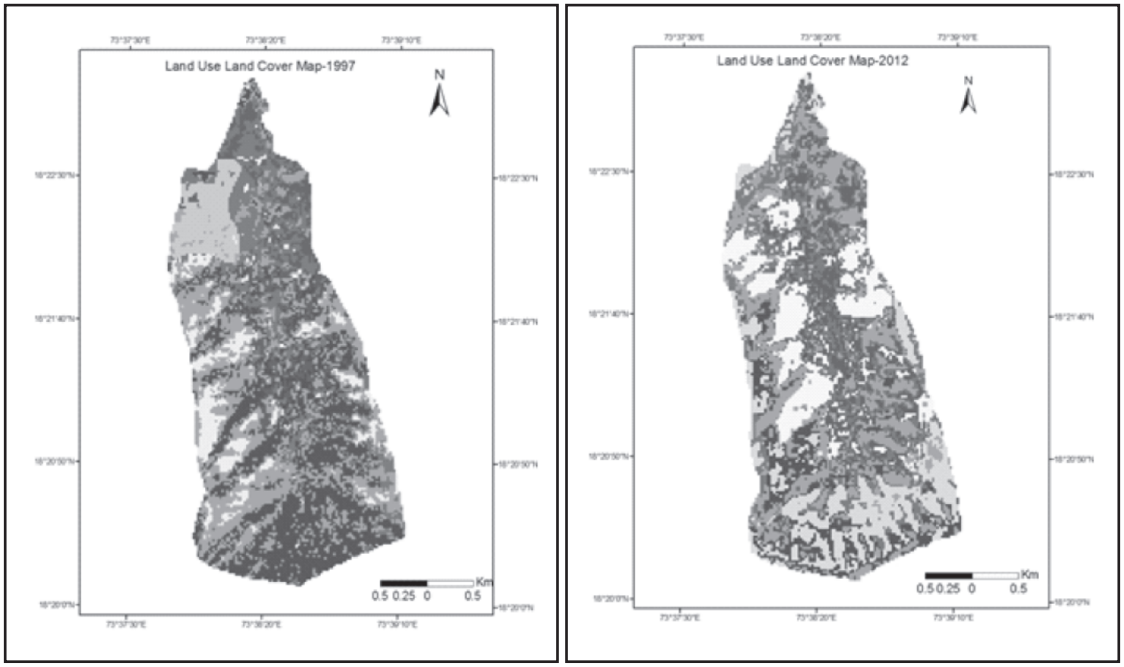
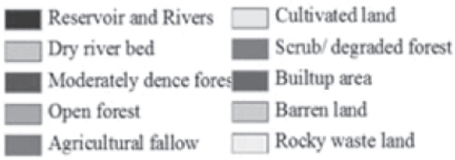


Fig.2 Classified images of the study area

Water, land and forest are the major natural resources. Daily livelihood of the rural population is dependent mainly on these resources. Classified satellite images (Fig 2) and data base generated (Table 1) shows that very small surface area of the village is under perennial water source and hasn't shown any change as village depends on rainfall.

No	LULC Class	LULC-1997		LULC-2012		Change between 1997 & 2012	
		Area (Ha)	Area (%)	Area (Ha)	Area (%)	Area (Ha)	Area (%)
1	Reservoir & Rivers	0.93	0.10	0.32	0.04	-0.61	-99.68
2	Dry River bed	0.00	0.00	0.00	0.00	0.00	0.00
3	Cultivated Land	6.62	0.74	7.08	0.79	0.46	-92.92
4	Agricultural Fallow	176.49	19.73	141.50	15.82	-34.99	41.50
5	Mod. Dense Forest	356.77	39.88	32.50	3.63	-324.27	-67.50
6	Open Forest	181.50	20.29	200.62	22.43	19.12	100.62
7	Scrub Forest	8.10	0.91	86.07	9.62	77.97	-13.93
8	Barren Land	65.32	7.30	220.00	24.59	154.68	120.00
9	Rocky Waste Land	31.16	3.48	130.33	14.57	99.17	30.33
10	Built up	67.62	7.56	76.09	8.51	8.47	-23.91
TOATL		**894.51**	**100.00**	**894.51**	**100.00**		



Most of the people in the Ambi village are dependent on agriculture. It can be observed (Table 1) that area under cultivation shows slight increase by 0.46 ha. However agricultural fallow land is decreased by 41.50%. These fallow lands are temporary and during monsoon season are used for cultivation. The study reveals that in 1997, nearly 61.08% of the area of the village was covered by all types of forests which have fallen down up to 35.68% in 2012. Within the span of 15 years forest cover over 2.2718 sq km (227.08 ha) area has been cleared. Among all the forest cover classes, tremendous change has been observed in moderately dense forest, where forests over 324.27 ha area is vanished. Loss of valuable forest in the village is mainly due to the increasing anthropogenic activities. Due to the clearing of forest both barren and rocky waste lands has been increased by 120 % and 30.33% respectively within last 15 years. Built up area also shows rise by 23.91%

During the field visits, it was observed that due to the absence of vegetation cover, soils on the sloping lands has been washed out by rainfall leaving gravel and sand on the surface. This type of soil retains very low amount of moisture. Most of the area is converted from forest area to barren lands and hills. Eroding slope and plain lands created rapid drying of soil, significant runoff, and low percolation of water to the ground. Additionally, long dry spells of eight month in each year are playing havoc with crops, livestock, water resources, and human life itself. Furthermore anthropogenic activities are having significant effect on the distribution, structure, and ecology of the forest in the study area.

Selective measures for the conservation of natural resource-

Variety of engineering and biological measures have been in use to protect the water, soil and forest. Considering the slope in the study area gully plugging and bench terracing can be applied at appropriate sites (Fig 3.). Gully plugging is one of the water conservation structures across small gully or a stream which can be applied at the upper reaches. Bench terracing can be constructed with 1:100 gradient and inward sloping which allows water to travel at a non erosive velocity. Gabion weirs or retaining walls i.e. concrete structures with weep holes can be used. Spaced planting, row planting, shelter belts, reforestation, agro-forestry, protection forestry etc are the forest management measures which can be applied in suggested forest conservation sites. Giving more priority to the native plant species degraded forest sites can be regained.

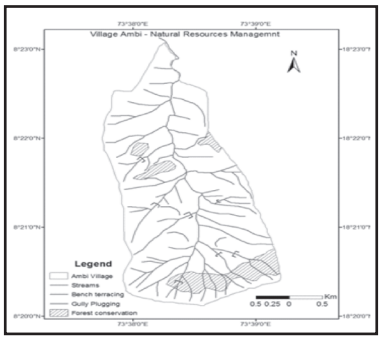


Fig 3 Suggested measures for the management of resources

Conclusion

Remote sensing and Geographical Information System (GIS) has been now extensively used to map the land cover and to project the consequences of changes. Village level mapping with the help of this technology is an effective tool for assessment as well as natural resource management. Present study confirms that village Ambi still retains ample vegetation cover compared to all other land cover classes. Proportion of barren land is considerable along with agriculture fallow which can be brought under other land cover classes like forestry and agriculture.

Although estimations derived using satellite data at 23.5 m ground resolution are good, there might have been different or may be better estimations at 5.6 m resolution satellite data. But as far as planning and management of natural resources is concern remote sensing and GIS technology is quite useful in providing real world environments.

References-

Anderson J R, Ernest E. Hardy, John T. Roach, and Richard E. Witmera- "Land Use And Land Cover Classification System For Use With Remote Sensor Data"

Fundamentals of remote Sensing, A Canada Center for Remote sensing tutorial

Khan Subhan, Ali Rehan S and Asif M- Remote sensing and GIS for sustainable Forests management plan- A case study of Bichhua forest range, chhindwara district M.P

Lillesand, T.M. and Kiefer R.W. (1987), Remote sensing and image interpretation. John Wiley and Sons. New York

Nob E P, Umamaheshwar R., Stella C and Thamaradjou "Land use and Land cover assessment along Pondicherry and its surroundings using Indian remote sensing satellite and GIS"

Panda,B.C- Remote sensing – Principals and Application

Shelar A N- (2014) Appraisal of forest resources in lake catchments of Khadakwasala irrigation project division, western Maharashtra

Shelar A N- (2014) Application of Remote Sensing and GIS in the Assessment of Vegetation Cover in Warasgaon Lake Catchment, Western Maharashtra

Sherbinin Alex de -A CIESIN Thematic Guide to Land-Use and Land-Cover Change (LUCC)

***Dr. Avinash N Shelar**
Assistant Professor,
Department of Geography MES'
Abasaheb Garware College, Pune

****Dr. Sunil W Gaikwad**
Associate Professor,
Department of Geography
S.P.College, Pune