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Land use/cover disturbance due to increase in urbanization Man River Basin of Akola Buldhana Districts, Maharashtra–India: A remote sensing and GIS based approach

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Abstract: Land use is the analysis of land according to its use in agricultural, forestry, industrial, recreational, and residential areas. The Global Land use has significantly changed in the past decades. Historically the driving forces are vital role for Land use change and population growth although there are several interacting factors involved. Urban expansion and land use/land cover change of Man River basin within the last 11 years is observed in the present study. The change was based on satellite imagery of LISS-III (2003) and LISS-III (2014), toposheet at a scale of 1:50000 and ground truth. This study mainly concentrated the Land use / Land cover change for the two time periods 2003 and 2014. The Land use/Land cover map has been prepared by using ArcGIS 10. Visual Image Interpretation technique has been adopted for identifying the features of Land use/Land cover. The result revealed that agricultural land and forest lands have been converted into built-up land. Therefore forest land has been declined tremendously. Thus it is necessary to formulate the measures for sustainable Land use/Land cover development.

Keywords:Land use/land cover, LISS-III satellite image Remote Sensing, GPS and GIS.

I. INTRODUCTION

Land is one of the critical natural resource on which most development activities are based (Kumar, 2011). Spatial information of land use/land cover types and their change detection in time series is an important means for city planning and undertaking development activities. Analyzing the spatial and temporal changes in land use/land cover is one of the effective ways to understand the current environmental status of an area and ongoing change. Urbanization is a major cause of land use changes and land conversion (Singh and Kumar, 2012). Rapid urban development and increasing population and economic growth has changed the urban landscape which is being witnessed all over the world. It is an important component to understand the human intervention with the environment (Anil et. al., 2011) which depends upon the natural setting of an area as well as the socio economic status of population.

The emergence of geospatial technology has provided an easy way to detect land use/land cover change over the time. Remote sensing is an important tool of change detection because it provides satellite data after short and regular interval, which is useful in detecting even small changes in land use/land cover. This technique has the potential to support such models, by providing data and analytical tools for the study of urban environments. Urban land cover types and their areal distributions are fundamental data required for a wide range of studies in the physical and social science, as well as by municipalities for land planning purposes (Stefanov, et. al, 2001).

II. NEED FOR MAPPING CHANGE DETECTION

The whole part of the earth like hills, different types of lands, water bodies, and built-up area comes under the land use land cover. Land has been going through tremendous transformations due to sprawls in agriculturalization, industrialization and urbanization. The changes in land use affect the ecosystem in terms of land cover, land quality and capability, weather and climate, quantity of land that can be sustained and in short the whole population and socio-economic determinants.

III. STUDY AREA

The Man river basin is situated in Akola and Buldhana Districts, Maharashtra which is located between 20°54' 59" N latitude and 76° 41'23" E longitude. The study area is covered by Survey of India toposheets 55D/7, 55D/9, 55D/11, 55D/13, 55D/14 and 55D/15 on 1:50,000 scale. The study area is occupied by alluvium and Deccan basalts which are horizontally disposed and is traversed by well-developed sets of joints. The work done so far in understanding hydrogeological factors controlling the water quality is very limited and hence, in this study an attempt has been made to understand the

groundwater regime of the Man River Basin by utilizing detailed field, stratigraphic, Geochemistry, geological, hydrogeological, hydro-geochemical, Environmental management and water resource management. The study area was drained by Man River flowing south to west with almost dendritic to sub-dendritic drainage pattern. Village map is helpful in locating groundwater samples for determining the hydro-geochemical parameters of the basin. Despite widespread acceptance of the impact hypothesis, the lack of a high-resolution eruption timeline for the Deccan basalts has prevented full assessment of their relationship to the mass extinction. However, recent research carried out by Blair Schoene et al., (2015) through Uranium-Lead (U-Pb) Zircon geochronology to Deccan rocks has showed that the main phase of Deccan eruptions initiated ~250,000 years before the Cretaceous-Paleogene boundary and that >1.1 million cubic kilometres of basalt erupted in ~750,000 years and their results are consistent with the hypothesis that the Deccan Traps contributed to the latest Cretaceous environmental change and biologic turnover that culminated in the marine and terrestrial mass extinctions. Chenet et al., (2009) have proposed that Deccan volcanism occurred in three rather short, discrete phases or mega pulses, an early one at _67.5 ± 1 Ma near the C30r/C30n transition and the two largest around 65 ± 1 Ma, one entirely within C29r just before the K-T boundary, the other shortly afterward spanning the C29r/C29n reversal. They also estimated sulfur dioxide (likely a major agent of environmental stress) amounts and fluxes released by SEEs: they would have ranged from 5 to 100 Gt and 0.1 to 1 Gt/a, respectively, over durations possibly as short as 100 years for each SEE. The chemical input of the Chicxulub impact would have been on the same order as that of a very large single pulse. The impact, therefore, appears as important but incremental, neither the sole nor main cause of the Cretaceous-Tertiary mass extinctions. The study area is occupied by alluvium and Deccan basalts which are horizontally disposed and is traversed by well-developed sets of joints (Fig.1).

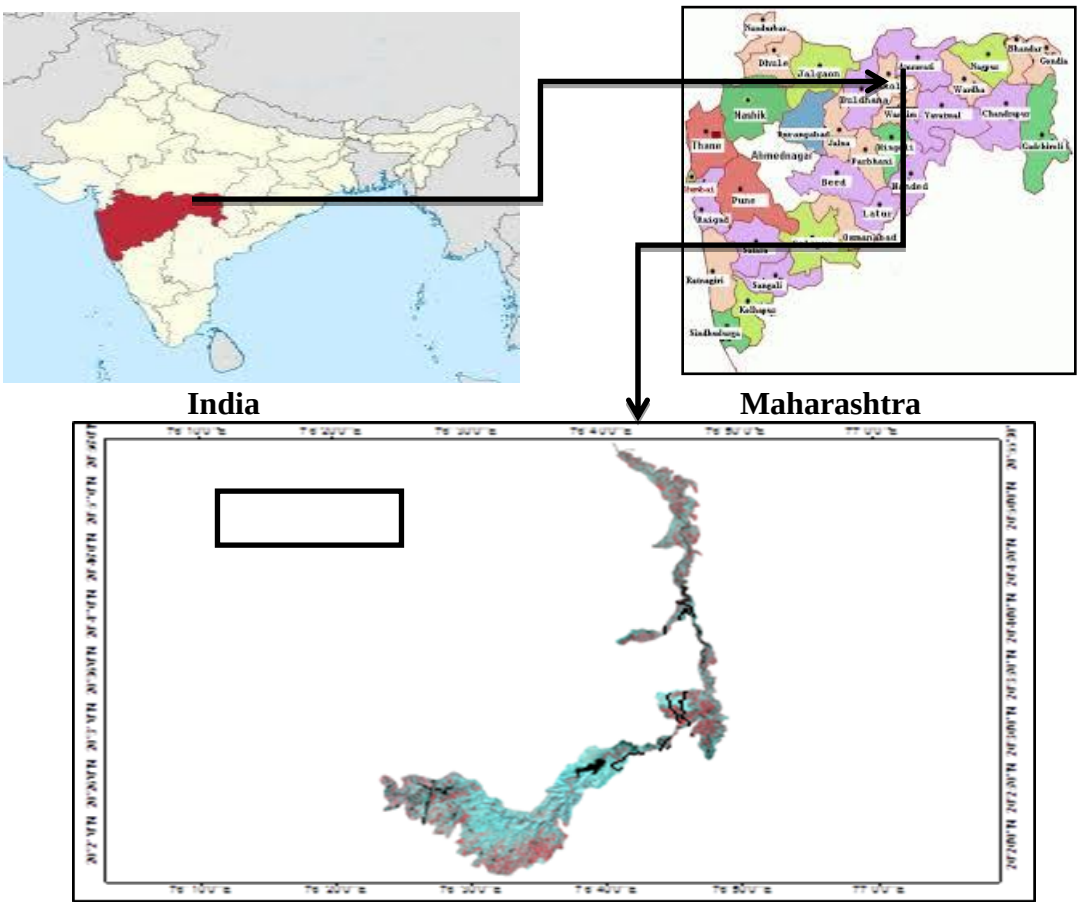


Fig. 1 Location map of Man River Basin

IV. DATA PRODUCTS

In the present study ancillary data pertaining and multi date satellite data of 2003 and 2014 (LISS III+Pan Merge) were used. Survey of India toposheets on 1:50,000 scale - 55D/7, 55D/9, 55D/11, 55D/13, 55D/14 and 55D/15.

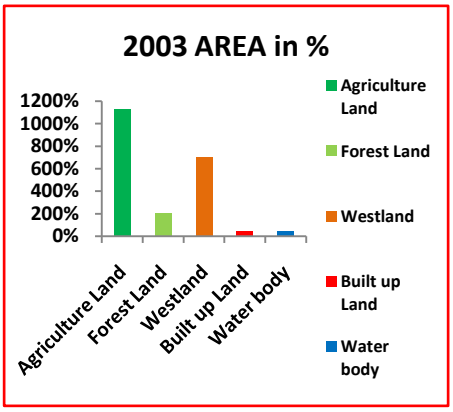
V. RESULTS AND DISCUSSION

A. Land Use /Land Cover Analysis

For this study the overlay analysis has been adopted in order to detect the changes of land use/land cover for the two study periods. During the year 2003 and 2014, there were about four classes of land use/land cover categories have been identified.

B. Land Use/Land Cover Mapping (2003)

Below map shows the Land use / Land cover of Man river basin in the year 2003. The agricultural land covers about 1125%. Forest area covered around 200% of land cover. The salt affected land i.e. Westland area is covered is about 700% of the total area. Water bodies are covered about 48% of the total area and it includes rivers, reservoirs etc., the built up land occupied is about 38% of the total area which includes villages (Rural) and Towns (Urban) of the study area (Fig.2).



C. Land Use/Land Cover Mapping (2014)

Below map shows the Land use / Land cover of Man river basin in the year 2014. Total area of Man river basin is 447.85 Sq. Kms. the agricultural land covers about 991 % Forest area covered around 125% of land cover. The salt affected land i.e. Westland area is covered is about 648% of the total area. Water bodies are covered about 30% of the total area and it includes rivers, reservoirs etc., the built up land occupied is about 64% of the total area which includes villages (Rural) and Towns (Urban) of the study area(Fig.3).

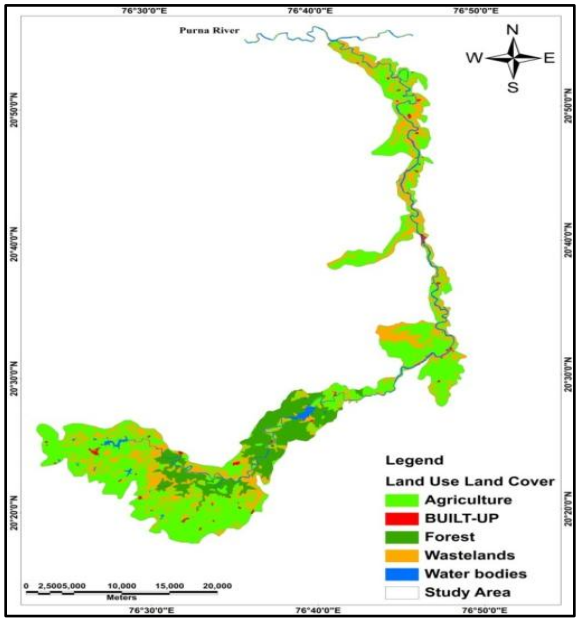
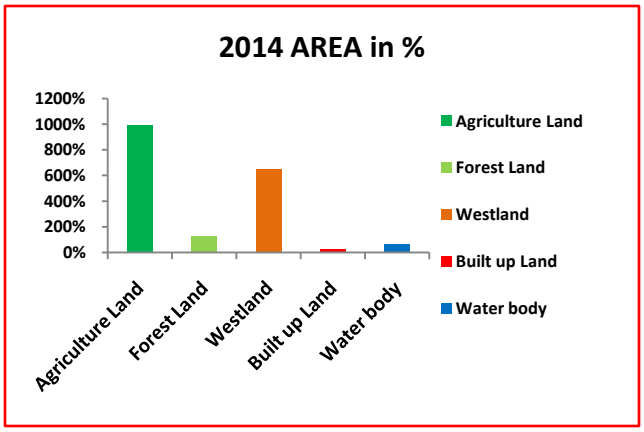


Fig.3: Land Use Land Cover map of study area (2003)



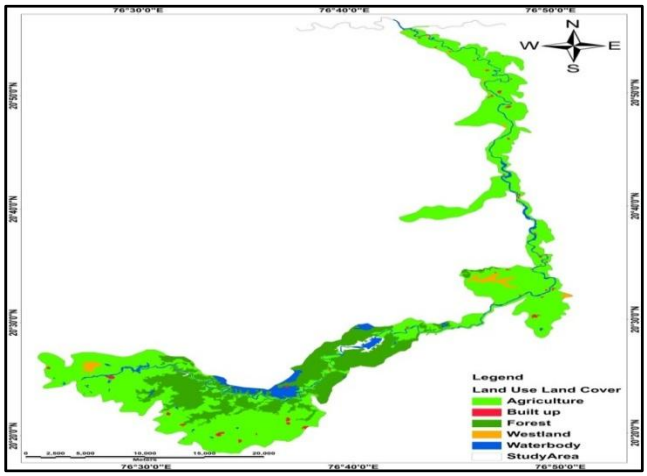


Fig.4: Land Use Land Cover map of study area (2014)

D. Land Use/Land Cover Mapping (2014)

Below map shows the Land use / Land cover of Man river basin in the year 2014. Total area of Man river basin is

447.85 Sq. Kms. the agricultural land covers about 991 % Forest area covered around 125% of land cover. The salt affected land i.e. Westland area is covered is about 648% of the total area. Water bodies are covered about 30% of the total area and it includes rivers, reservoirs etc., the built up land occupied is about 64% of the total area which includes villages (Rural) and Towns (Urban) of the study area(Fig.3).

Table 1: *Land Use /Land Cover Analysis*

LANDUSE / LAND COVER	**2003**	**2014**	**Changes during 2003-2014**
CATEGORIES	**AREA in %**	**AREA in %**	
Agriculture Land	1125%	991%	134
Forest Land	200%	125%	75
Westland	700%	648%	52
Built up Land	11%	30%	-19
Water body	48%	64%	-16

VI. CONCLUSION

Present study area the combined methodology of multi-spectral, multi-temporal remote sensing image interpretation and GIS spatial analysis to quantitatively portray the dynamics of urban expansion and land use/land cover change in Man River basin during the 2003-2014. The major land use in Man River basin is agricultural land. But the land under agriculture has experienced a declining trend in the past 11 years. Here agricultural land converted into built-up land and forestland converted into built up land. Due to this change, we lost our eco-system as well as loss of food production. The increase in an area under built up lands may lead to a lot of environmental and ecological problems. Result reveals that basin has experienced rapid changes in land use, particularly in terms of built-up area which is increased 11% to 30% over the past 11 years, Hence, there is a risk of decline in the extent of land under agriculture. So here proper land use planning is needed for sustainable land use development in the study area.

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