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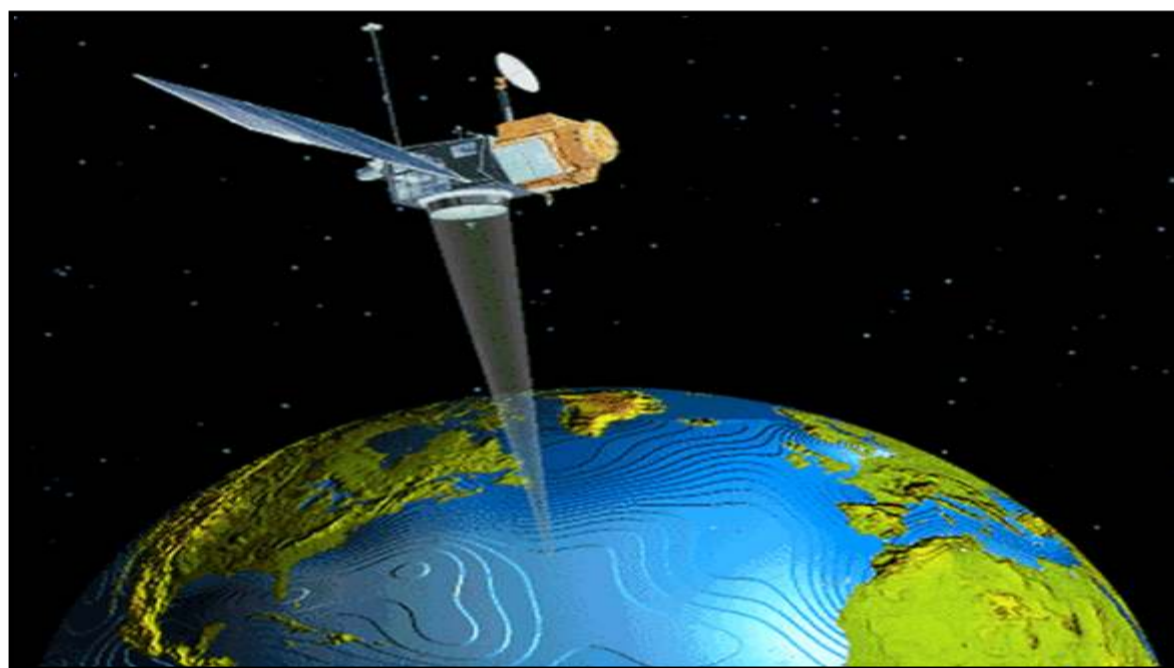
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"LAND USE AND LAND COVER OF WAINGANGA RIVER
IN MAHARASHTRA USING GIS AND REMOTE
SENSING TECHNIQUE"



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ABSTRACT:

Land use and land cover is an important component in understanding the interaction of the human activities with the environment and thus it is necessary to be able to changes. Land use and land cover inventories are essential for the optimal utilization and management of resources in a basin. Land use and land cover change detection are essential to understand the existing situation and plan for the future. How to changes and occurred this information can be help to people anticipate and plan for future changes. In this paper an attempt has been made to analyze the general land use pattern at micro level in Wainganga river basin. Land, which is finite resource, is becoming scarce due to immense agriculture and demographic pressure.

KEYWORDS: Land use land covers (LULC) change, RS and GIS

INTRODUCTION:

On the basis of the utility of the land, Land can be classified into two classes i.e., "Land use" and "Land cover". Land use is the total of all arrangements, activities and inputs that people undertake in a certain land cover type and Land cover is the observed physical and biological cover of the earth's land as vegetation, rocks, and water bodies or manmade features (FAO/UNEP, 1997) All of this integrates the sum of human activities having an influence on the environment. Land cover defined as the assemblage of biotic and abiotic component on the earth surface is a one of the most crucial properties of the earth system. Remote sensing and GIS provide different methods for analysis of land use issues and tools for land use planning and modeling. In this paper an attempt is made to study the land use and land cover in Wainganga River. According to Longley(2001), "Land covers refer to the physical materials on the surface of a given parcel of land, while Land use refer to the human activities that take place on or make use of land for e.g. Residential, commercial, industrial etc." According to liayaraja (2012) an attempted has been made to classify the reflectance characteristics of remote sensing. This information not only provides a better understanding of land utilization aspects but also plays a vital role in development of any region. The present study will be useful for further planning and management for Wainganga river basin.

Study area:

The Wainganga River rises at El 640.0 m in the Seoni District of Madhya Pradesh from the Western slopes of Maikala Ranges which is continuation of the Satpura Ranges in Central India. The Wainganga river receives numerous tributaries on either bank and drains the western, central and eastern regions of the Chandrapur, Gadchiroli, Bhandara, Gondia and Nagpur districts of Maharashtra.

The total river basin area in Maharashtra - 26,347.01 Sq. km.

Latitude extension- 19°30'N to 22°30'N'

Longitude extension- 79°00'F to 80°30'F'

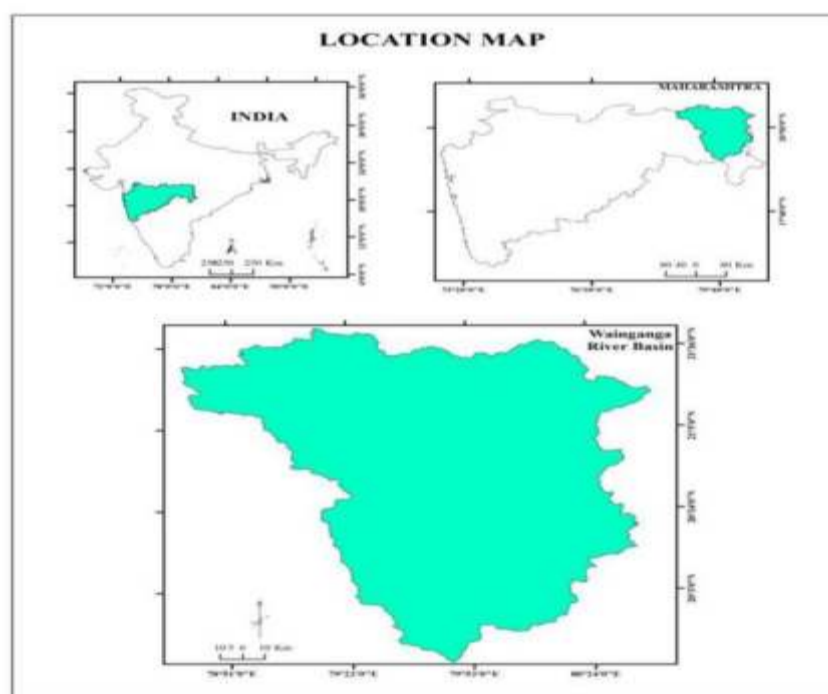


Fig No.1: Map of Study Area

The river in its initial reaches flow westwards and thereafter southwards in M.P. State and continues to flow Southwards in Maharashtra State. It is joined by the Wardha River at a place called Gundapet flowing from the west, draining the major portion of the Maharashtra Plateau. There after the river is known as Pranhita River. The climate of the sub-basin is characterized by hot summer from March to May with rainy season from June to September although the area has some rains in post monsoon season also. The upper

catchment area lies in the high rainfall range of 2000-4000 mm. The Pranhita River joins the Godavari River on the left bank which drains the Eastern Coast in Andhra Pradesh and flows out to the Bay of Bengal.

Objective

- 1) To understand general land use and land cover of study area.
- 2) To prepare different land use and land cover.

Methodology

This work covers the Wainganga River catchment area. The Land use and land cover data have obtained from one inch topographic map of Survey of India (1:63360 or 1:250000). They are toposheet No. 55J, 55K, 55N, 55O, 55P, 56M, 64B, 64C, 64D, 65A. Includes sorting of data, digitization of various layers, preparation of maps, statistical analysis and with the help of GIS & RS technique land use and land cover classification through supervised classification method based on the field knowledge. Arc GIS 9.3 are powerful tool for extracting the land use and land cover layers from toposheet and satellite image.

Result and Discussion

Land use and land cover change is one of the most visible results of human modification of the terrestrial ecosystems and it has a significant impact on the local, regional and global environment (Weng, 2002). Analysis through remote sensing techniques of the study area having a total area of 26,347.01 km helped the authors identify and map a total of ten classes. These classes include Rocky land/ open space, dense Forest, water bodies, agriculture, sparse vegetation, fallow land, open Scrub, barren land, settlement, gravel land (Fig.2) The Wainganga watershed composition and distribution of land use land cover classes of image include rocky land /open space, dense Forest, water bodies, agriculture, sparse vegetation, fallow land, open Scrub, barren land, settlement, gravel land. The major land use categories in the Wainganga River's basin includes build up land (1.89%) and agricultural land (14.17%) that comprises of generally kharif, rabi and double crop system in the region. Forest cover (65.75%) comprises of dense forest (15.03%), sparse vegetation (23.01%), open Scrub (27.71%) and recent plantations. Deciduous or dense

forest largely spreads out in the region in the east of the all Wainganga river basin area. Forest cover comprises of deciduous forests, degraded forests, forest blanks and recent plantations. Water Bodies (2.11%), barren Land (9.48%), fallow Land (4.19%), gravel Land (0.52%), rocky Land or open Space (1.88%) can also be found in the region. Waste land with or without scrub and barren rocky/stony waste can also be found in the region.

Land use and Land cover map 2015

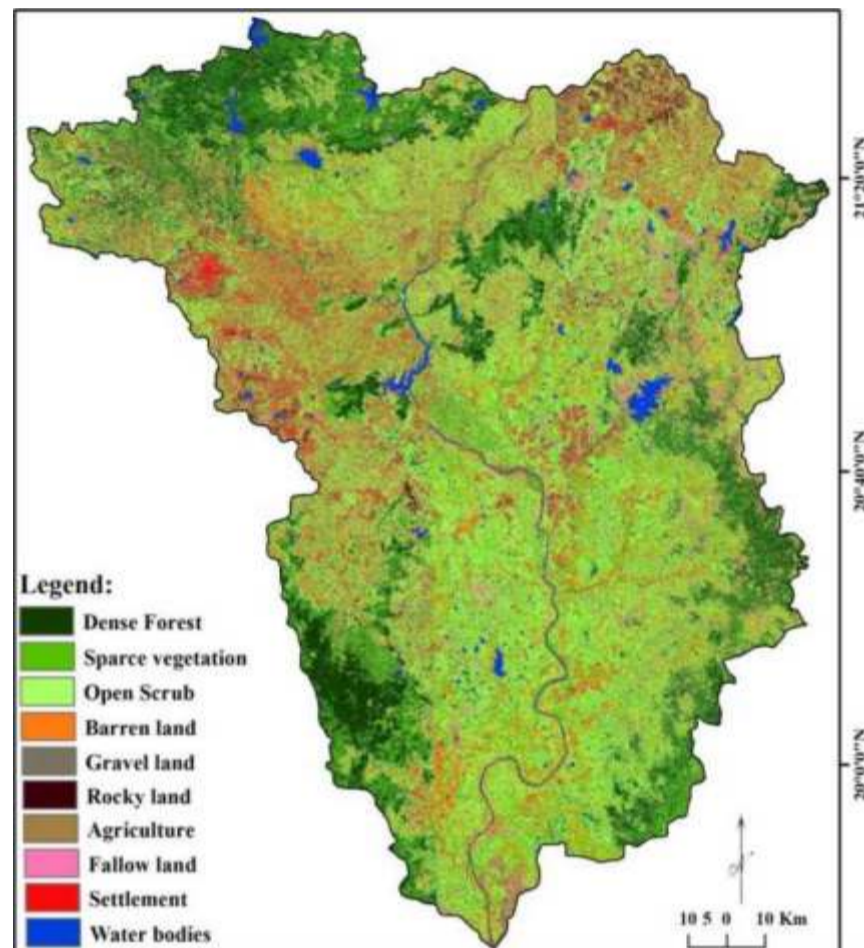


Fig No. 2: Land Use map of Wainganga sub-basin in 2015

Water bodies :

Water body includes the river's lakes and water reservoirs of the study area. Wainganga river is the main river of the study area. Some of the tributary are meet on the left side of the Wainganga river i.e. Bagh, Gadhavi, Satti, Topagrhi, Khobragarhi, Phuar, Pohar, pal and Kathani and also right side Pench, Kanhan, Ambi, Maru, Haman, Andhari, Mai, Patahri, Sur and Bawanthandi. In the year 2015, the total area under this category was 2.11%.

Forest

Forest class includes the natural deciduous and scanty vegetation cover in this area. In 2015 the area under dense forest was 3960.89 km which was 15.03% of the study area. Majorly in the north side of the found is dense forest. Sparse vegetation is observed along the Wainganga river. The Wainganga river basin has 62.07% of its area under forests, including those owned by the States and communities. Has the highest forest cover area in State of Maharashtra, then Madhya Pradesh and Chhattisgarh. The major vegetation category observed in the Wainganga river basin area and the study area is scrub land. The major vegetation in the area is scrub and dense mixed forest. The vegetation in the area is categorized as southern dry mixed deciduous forests. The density of forests is low. Human

interferences in the area have resulted in degradation of forests, especially areas in vicinity to settlements or villages. The main tree species observed in the area are Arjun, Ain, Bija, Mahua, Garadi, Ghoti, Mowai, Teak, Palas, Pipal, etc. drier localities, with lesser moisture content, Palas and Khair species are observed. According to Eco-sensitive zone notification of the MOEF, a substantial area of land around the periphery designated as a 'Buffer Zone' of the protected areas will now be considered as part of the Eco-sensitive zone. Although the notification does not recommended any change in land use, there would be certain restriction on development activities like industries, thermal power plants, mining etc. which may have detrimental impact on national park and eco-sensitive areas. Most of the Schedule tribe communities are currently engaged in subsistence agriculture, shifting cultivation or collection of minor forest produce like as Bamboo, Moha, Teak, Arjun, Hirada, Amla, Charoli, Behda, Nimb, Karanja, palas etc. as an economic activity.

Table No. 1: Wainganga Sub-basin LULC in 2015

Land use & Land cover 2015			
Sr.No	Land use / Land Cover Category	Area in sq.km.	Total Geographical Area (%)
01	Rocky land/ Open space	495.49	1.88
02	Dense Forest	3960.89	15.03
03	Water bodies	558.21	2.11
04	Agriculture	3735.03	14.17
05	Sparse vegetation	6063.82	23.01
06	Fallow land	1101.28	4.19
07	Open Scrub	7299.50	27.71
08	Barren land	2497.43	9.48
09	Settlement	497.46	1.89
10	Gravel land	137.90	0.52
Total		26347.01	100%

(Source: Calculated by authors)

Fallow Land

In 2015, the area under fallow was 1101.28 km which was 4.19% of the study area. With the proportionate increase in built up and agriculture land (along with extensive irrigational practices) the area under this criteria is very less and found some city region.

Barren Land:

Barren class includes the bare exposed earth surface without vegetation. Barren land is seen in the areas of rugged topography. In the year 2015, the total area under this class are 2497.43 km². In this area almost the entire part of central portion of the study area came under this category. Barren land paved the way of human habitation, dry farming and pasture.

Built up Land:

Built up land is an area of human habitation developed due to non-agriculture use and that has a cover of building, transport and communication, utilities in association with water, vegetation and vacant land (Suryawanshi, 2011). Built up area is total area in 2015 is 497.46 km². The settlements are mostly concentrated along the river and the agriculture area while they become sparse in the uplands and forested areas. Bhandara and Gondia are significantly dense in terms of human settlement. The settlement pattern in Gadchiroli is quite peculiar owing to the tribal communities in the district. The main towns in the Gondia, Bhandara, Gadchiroli, Tumsar, Brahmapuri, Tiroda, Pauni, Umred, Ramtek etc. Most of these towns are barely within a 5 km distance from the Wainganga river. The major industrial zones in the Wainganga sub basin are in Mauda, Tiroda, Tumsar and Pauni. The major industries include rice mills, dal mills, sugar industries and a thermal power station.

Agriculture Land:

The major part of the Wainganga River Basin is covered with agriculture land according to 14.17% of the total area and 2.11% of the basin is covered by water bodies. Population of the Wainganga river basin area mainly depends upon agricultural activity. Well drained flat topography and various means of irrigation in basin region make it a dependable agricultural zone where the rice crop seldom fails. The south west monsoon from June to October brings fruitful heavy rains to the river basin region. Kharip and rabbi are the main agricultural seasons in the region nonetheless, more cultivation is observed in kharip as compared to rabbi crop. Rice is generally drilled in the field by the end of June. Rice and tur is the largest cultivated crop in kharip season. The chief rabbi crops are wheat, jowar, linseed, gram and lac. Black gram, horse gram and green gram are the important pulses grown in the basin region. As many as 70 different varieties of rice are recognized here with slight difference in the method of cultivation of each. Transplantation and broadcast sowing are the two important methods of cultivating rice in the region. In transplantation method, the seed is sown in one place and the seedling after it has grown a little is transplanted to another place. The field where rice is transplanted needs to be leveled so that the low embankment receives equal amount of water. In case of broadcast rice cultivation, the soil is generally ploughed before arrival of monsoon (Singh

R.L., 1971). The seeds are sown by hand. Planting of wheat and gram commences from the last week of September to mid-October and it is harvested during February to March. In addition to gram, rice, and wheat, a variety of vegetables, fruits and condiment crops like tomatoes, beans, brinjals, chillies, cauliflowers and tamarind are planted in July and picking starts during October to March. These indicators have been derived from data collected in 2015 and although rice continues to be the main crop in the region but certain changes are being observed in the cropping pattern of the region that have occurred in last ten year.

CONCLUSION

The above analysis suggest that and the framework of present discourse for the detection of possible land use and land cover changes monitoring and evaluation in Wainganga river using topographical map and land use & land cover survey is easily realized. Here proper land use planning is needed otherwise we lost our natural resources. The study shows that natural landscape covered with vegetation are destructed and use for cultivation and building roads, homestead. Land use and land cover change is a major issue of global environment change and therefore land use and land cover mapping is essential component to maximum utilization of resources.

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