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LAND USE/LAND COVERS MAPPING IN MAHESH RIVER BASIN OF AKOLA & BULDHANA DISTRICT (MH), INDIA USING GEO-INFORMATICS TECHNIQUES.

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Abstract: The present paper attempts to assess various categories of Land use/land covers in Mahesh River Basin using remote sensing and GIS techniques. The present study area is located Mahesh river basin lies between 76° 46'11'' E and longitude 20°40' 36" N latitude covered by survey of India Toposheets. The Mahesh River basin which is a major tributary of Mun River lies towards the western and southern part of Akola and Buldhana district.The basin area is demarcated from the survey of India Topographical maps were used, it covers an area about 328.25 sq.km. The result of the study shows that a wide range of spatial variations in geomorphic features has been caused by differential erosion and sedimentation works of various geomorphic processes, which were operating in the past. Land cover is a basic parameter which evaluates the content of earth surface as an important factor that affects the condition and functioning of the ecosystem. Land use/land cover (LULC) changes are major issues of global environment change. The satellite remote sensing data with their repetitive nature have proved to be quite useful in mapping land use/land cover patterns and changes with time. Attempts have also been made in present investigation to analyses and map-out the Land use/ land covers based on the geomorphic analysis and field observations. The cultivated land is largely confined in the flood plain area and rocky wasteland is found in pediment zone. Forest is marked near the denudation hill.

Keywords: Remote Sensing, GIS, GPS, LULC, Satellite image

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INTRODUCTION

The spatial dimension of the land resources in view of its utilization/surface cover pattern and analysis forms the essential components of planning and management for all sorts of human activities. Land use/land cover mapping and analysis using modern techniques of data reception and medicine of explanation are now being well practiced for betterment of land resources management. The term "land use" and land cover (LULC) are often used simultaneously to describe maps that provide information about the types of features found on the earth's surface (land cover) and the human activity that is associated with them (land use) (Shetty et.al. 2005). In other words, Land use refers to man's activities on land, which are directly related to lands utilization, land cover denotes the vegetational and artificial construction covering the land (K.N.Joshi, 1996:125). The development of any land area depends on the physiographical factors like drainage, slope, soil condition, land capability, erosion, rainfall condition, and distribution of water bodies besides others. Since both land use/land cover are closely related and are not mutually exclusive, they are interchangeable as the former is inferred based on the later on the contextual evidence. Planners compile, classify, study and analyses land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirement, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

The Indian experiences on use of satellite data for land use/land cover analysis have mainly been the outcome of studies conducted at National Remote Sensing Agency (NRSA) in collaboration with different agencies (Nagaraja, Ravi Shankar and Saxena 2004:88). In fact, satellite remote sensing data are currently being used very effectively for mapping and monitoring the land use/land covers that have assumed a great significance by putting imprints not only on detection, recognition and identification of these features but also favoring spatial analysis at different scales. This also provides the information for managing dynamics of land use and meeting the demands of increasing human population. Information on environmental status through land use studies. The land use or land cover data sets are generated from the digital image classification of satellite images.

These processes include impact of climate, geologic and topographic conditions on the distribution of soils, vegetation and occurrence of water. For better development and management of the watershed areas, it is necessary to have timely and reliable information on geomorphological as well as environmental status. The land use/land cover map, using satellite data. The type and level of information to be extracted from these data largely depends on the expertise of the analyst and what he is looking for‟ in the data (Joseph, 2005:349).Mention may

be made for some of such organizations as National Atlas and Thematic mapping Organization (NATMO), National Bureau of Soil Survey and Land Use Planning (NBSS & LUP), All India Soil & Land Use Survey (ALS &LUS), National Sample Survey, Survey of India, Town and Country Planning Organization. Land use/land cover mapping using remote sensing data are largely being done by different scholars. Mention of a few works may be made as presented by Srivastva and Narayan (1974), NageswaraRao and Vaidyanathan (1981), Raghavaswamy (1982). In present investigation the mapping of land use/ land cover of Mahesh River Basin has been attempted by using IRS P6 LISS III imagery and selective field visits.

1. Study Area

The Mahesh River basin is situated in Akola and Buldhana Districts of Maharashtra which is located between 76° 46'11'' E and longitude 20°40' 36" N latitude covered by survey of India Toposheets no. 55 D/9, 55 D/7, 55D/11,55D/13,55D/14and 55 D/15on 1:50,000 scale. It can be approached from Amravati by road transport which is about 120 Km. The Mahesh River basin which is a major tributary of Man River lies towards the western and southern part of Akola and Buldhana district. The total area

Covered by Mahesh River Basin is 328.25 Sq. Kms.

2. Methodology and Data

Remotely sensed data and GIS techniques have largely been used in the identification, demarcation and mapping of land use/land covers of Allahabad district. Homogeneity of tone, texture and pattern etc. and identification keys were taken into consideration to prepare the land use/land covers was delineated. The primary and secondary data used in the present investigation can be listed as: (i) Survey of India (SOI) Sheet No. 55 D/9, 55 D/7, 55D/11,55D/13,55D/14 and 55 D/15 (1:250,000). (ii) IRS P6, LISS-III with spatial resolution of 23.5 m. Attempts made first to prepare the base map of area under study using Survey of India (SOI) toposheet, various process such as, import, georeferencing, mosaicing and subset creation etc. were applied. At the second step, the identification, demarcation and mapping of land use/land covers were attempted through pre-field visual image processing of satellite imagery using photo elements (tone, texture, shape, size, association, and pattern) and geotechnical elements. All surface water bodies (reservoirs, lakes, and tanks) will be mapped from SOI map, and updated for recent constructions with reference to recent satellite data. The classified map will have standard feature codes (Table 1). Field visits have organized both for collection of 'ground truth' to aid and finalize interpretation, and to estimate the classification accuracy.

The interpretation process was continued till the classification conforms to output data accuracy specifications. After completing the pre-field interpretation, the detailed information was transferred on base map by selecting numerous control points and using ARC GIS 10.1 Software. Selective field checks were done to assess the validity of the pre-field image interpretation. In the last, incorporating the ground truth information using ARC GIS 10.1 software did finalization of image-based maps

Table 1. Land Classification Schema for Land Cover

Sr. No.	Land Classification
1	Built Up
2	Agricultural Land
3	Forest
4	Waste Land
5	Water bodies

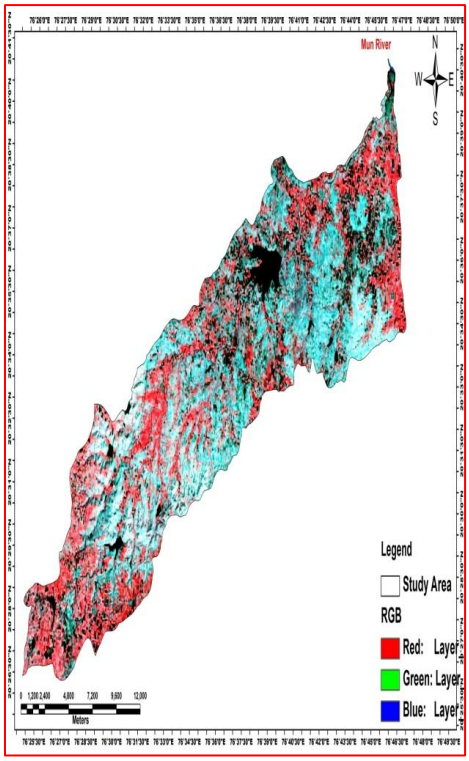

Fig.1 Location Map of Mahesh River Basin.

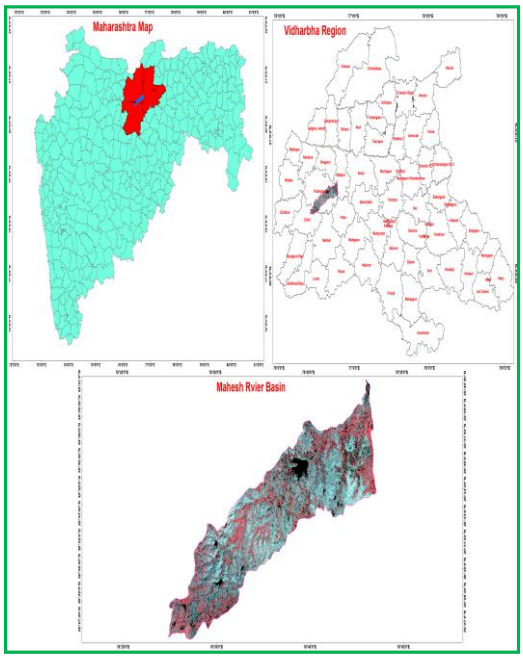

Fig.2. Show Satellite Image of Study in 2014 year

3. Result And Discussion

The land use and land cover classification system adopted in this study is oriented towards the traditional and Digital system of classification (revenue record based) but in new frame and style to accommodate the information received from satellite imagery. This may be facilitate for easy and logical comparison of facts from both type of data, i.e., data received from traditional secondary sources such as revenue records and remote sensing satellite data can be related to system for classifying land capability, vulnerability to certain management practices, and potential for any particular activity or land value, either intrinsic or speculative. On the basis of remotely sensed data, the Mahesh River Basin is divided into five major land use categories: (i) Land under forest (ii) Waste land (iii) Agriculture land (iv)Built-up land (v) Water body (Fig.3). Land use/land cover statistics generated using remote sensing techniques for the Mahesh River Basin is shown in Table 2.

Table 2. Land Use/Land Cover Classification in square km. (2013) GIS Analysis Based on IRS P-6 LISS III Satellite Imagery.

Sr. No.	Land Classification	Area Covered in Sq. km
1	Built Up	3.11
2	Agricultural Land	181.90
3	Forest	27.53
4	Waste Land	109.03
5	Water bodies	6.68
Total Area		**328.25 Sq.km.**

(i) Agriculture Land

The total agricultural land accounted for 181.90 sq. km. of total geographical area of the Mahesh River Basin. Under this category, the major land use units identified are crop lands that is areas with standing crops as on date of satellite pass (Kharif, Rabi, Two crops, more than two crops and zaid crops), fallow lands (current fallow), horticulture and agriculture plantation. Crop lands are widely distributed throughout the Basin area, however their prominence being confined to low lands where water sources and other edaphic conditions are favourable. The crop lands are also observed on the gently sloping plateau regions or flat uplands.

(ii) Forest Land

In area under study, forested areas are marked 27.53 sq. km of total geographical area. On open forest and Dense forest can be marked on satellite imagery with dark tone. Land under forest can be observed in patches. In Mahesh River Basin, forest divided into two categories dense and open forest and dense forest surrounded by open forest.Due to unfavorable soils conditions, rugged terrain and climatic factors only dry deciduous forests are seen in Akola and Buldhana district.

(iii) Built-up Land

Built up land is composed of areas of intensive with much of the land covered by structures and it covers an area of 3.11 sq. km. Included in this category are cities, towns, villages, industrial and commercial complexes and institutions. The transportation facilities in the study area are roads and railway line. The highway roads are present in the area are routes between, Balapur.

(iv) Wasteland

In this study major problem of scrub land and the total area of wasteland are covered are109.03. These lands are subject to degradation, erosionor thorny bushes. Such areas are identified from theirYellowish tone and their association with uplands, and their irregular shapes. Land with scrub found in the western part of the study.

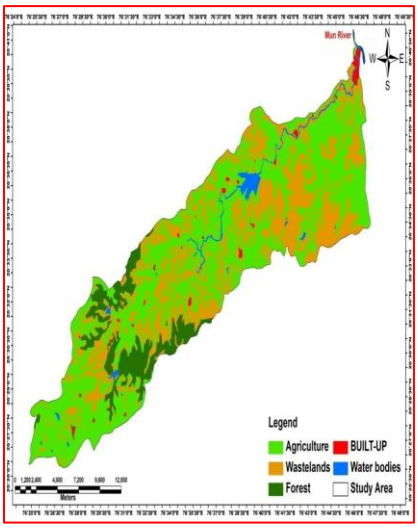

Fig.3 Final Land Use Land Cover Map of Mahesh River Basin in 2014.

(v) Water Bodies

In area under study, water bodies areas are marked 6.68 sq. km of total geographical area. The water bodies include both natural and man-made water features namely Streams, lakes, Canals, tanks and reservoirs. The water features appear black in tone in the satellite image. The shallow water and deep water features appear in light blue to dark blue in colour. Tanks with plantation are identified by the square/rectangle shape and red colour tone. Tanks without plantation are recognized by the shape and light blue to dark blue tone.

4. CONCLUSION

The present study show remote sensing provides a very powerful database for identifies and delineating the geomorphic feature and land use/ land cover while GIS provide a convenient tool for making a computerized mapping. The extraction of information from satellite imagery is largely based on the interpreter knowledge about image analysis and area under study. The remotely sensed data of IRS-LISS III with 23.5 m resolution is proved to be very suitable for delineation of geomorphic features in the Mahesh River Basin. The scope of the present study is

quite significant as geomorphic features present a platform for all shorts of human activities and socio-economic development in the area under study. It is expected that the findings of the investigation will undoubtedly be of use to planners and local bodies to implement suitable land use plans in the watershed, thereby achieving eco-preservation and enabling the restoration of degraded land units to the maximum possible extent. Local people must be made aware of the consequences of conversion of paddy fields. Land and water management activities must be conducted only after detailed land use planning, sand mining from rivers should be regulated and further expansion of agricultural.

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