"LAND CAPABILITY OF THE BHAUNAK RIVER BASIN, MAHARASHTRA: USING REMOTE SENSING TECHNIQUE"

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ABSTRACT:

Bhaunak river is a northern tributary of river Tapi, covering an area of 240.5 sq.km. It lies between 21°5'N to 21°15'N latitude and 75°30'E to 75°45'E longitudecovering part of Jalgaon districted of Maharashtra. This river basin is selected for the study of the land system, land forms, soil, landuse, erosion susceptibility and hydrogeomorphology using IRS-IB Geo-coded and LISS- data on the scale 1:50000. An important landforms are identified and classified into denudational, fluviodenudational and fluvial. Important soils of Bhaunak river basin are piedemont soils , courser soils , deep alluvial soils and black soils. The majour part of the basin is under the cultivation of cash corps like banana, sugar cane and cotton. The foothills of Satpura mountain is bare as most of the forest is cleared. Which leads to accelerate erosion of foothill zone. On the basis of hydrogeomorphological studies the basin is divided in to four categories of ground water potential zones. The piedmont zone, alluvial plain and valley fills have good potential of ground water. Taking into consideration above parameters Bhaunak river basin has been divided into five classes of land capability.

Keywords: Hydro-geomorphology, Fluvio-denudational, Piedmont zone, Land capability.

INTRODUCTION:

To meet the growing demand of food it is important to utilize a precious land resource. In a country like India agriculture is a backbone of economy where landuse planning has a great significance. In the utilization of land, the climate, physiography and geology plays an important role.

River basins are to be considered as an important spatial unit for the study of water and land. The planning of land development and readjustment is usually carried out in a number of successive phases namely land evaluation, socio-economic analysis, land classification and land development programmes effectuation (Krishnaiah Y.V. 2011).

Ali Mohamad (1969) has taken an account of land classification on the basis of slope, erosion susceptibility, salinity, water table, land use, soil texture and soil fertility.

Shafi (1969) also studied methods of land use planning, land classification and land capability. Dent F.J. (1986) studied land suitability classification, Klingebiel and Montgomery (1986) also highlighted methods and techniques of land capability classification. Krishnaiah (2011) also studied land capability classes of Papagni river basin of land system, landforms and hydro-geomorphology using remote sensing techniques. Some other attempts includes Raju and Vaidynathan (1978), Kanthetal (2010).

OBJECTIVE-

- To identify the hydrogeomorphic units of the basin.
- To demarcate potential ground water recharge zones of the study area.
- To make evaluation of land capability on the basis of slope, relief, soil, landforms, hydrogeomorphic units etc.

THE STUDY AREA –

- Bhaunak basin forms sub basin of river Tapi and is located on the northern bank of river Tapi. It is a small basin occupies a drainage area of 240.5 sq.km. It lies between 75°30’ to 75°45’ E longitudes and 21°5’ to 21°25’ N latitudes covering part of Jalgaon district of Maharashtra (Fig.1). The river rises in Satpura mountains and flows in southern direction and joins to river Tapi. The catchment area is occupied by hard rock formation and alluvial formation. Northern part of the basin is formed by the piedmont zone (Borse & Agone, 2013).

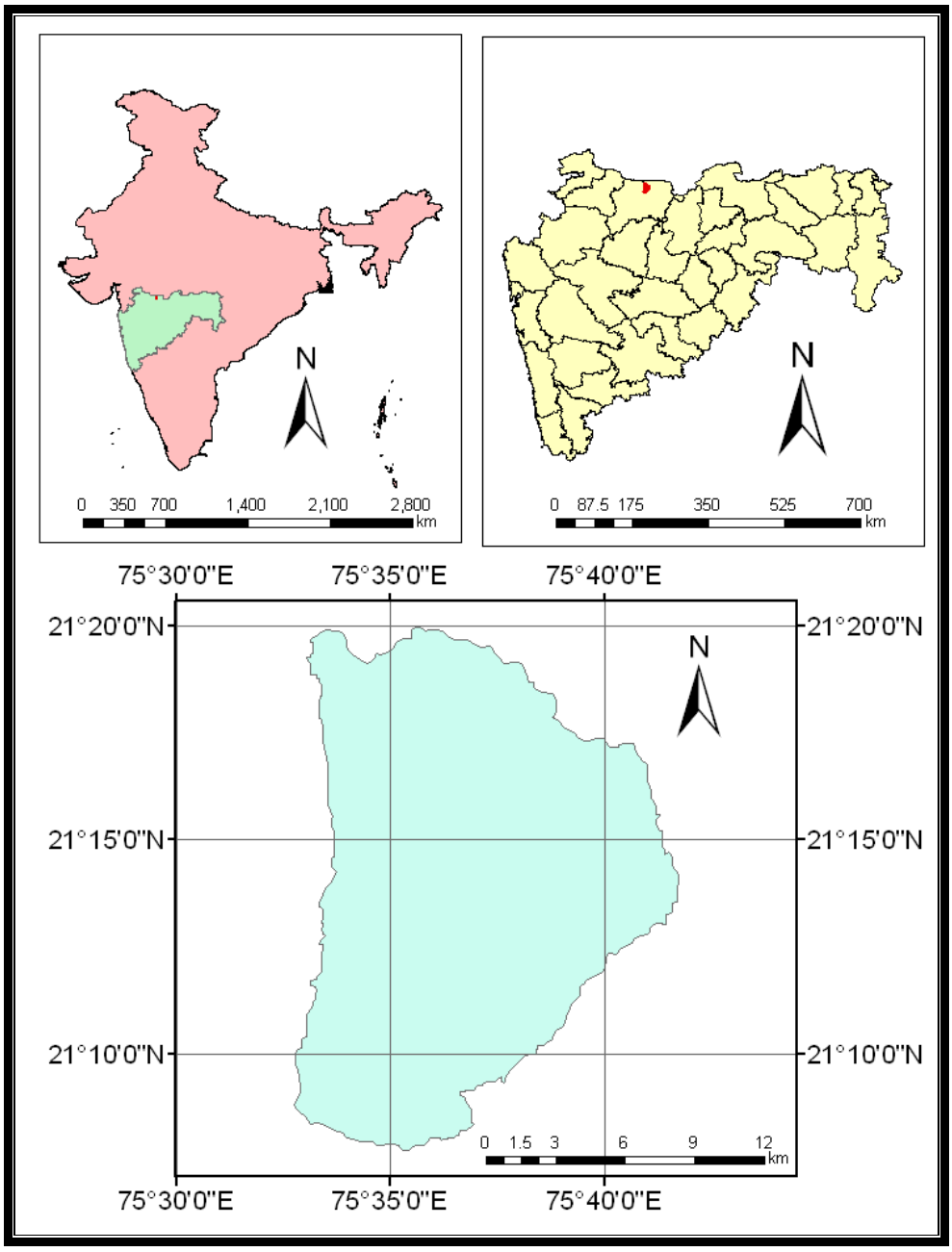


Fig.1: Location Map

METHODOLOGY –

The study of various aspects of Bhaunak basin is carried out with the help of IRS – 1B Geo-codded LISS-III data and survey of India (SOI) topographical map on scale 1:50000. The relief and slope analysis of the basin is carried out with the help of SOI toposheets. The hydrogeomorphic units, soils, landuse and erosion intensity are interpreted from IRS -1B Geo-coded data on scale 1:50000. Which is also supported by the field chakes.

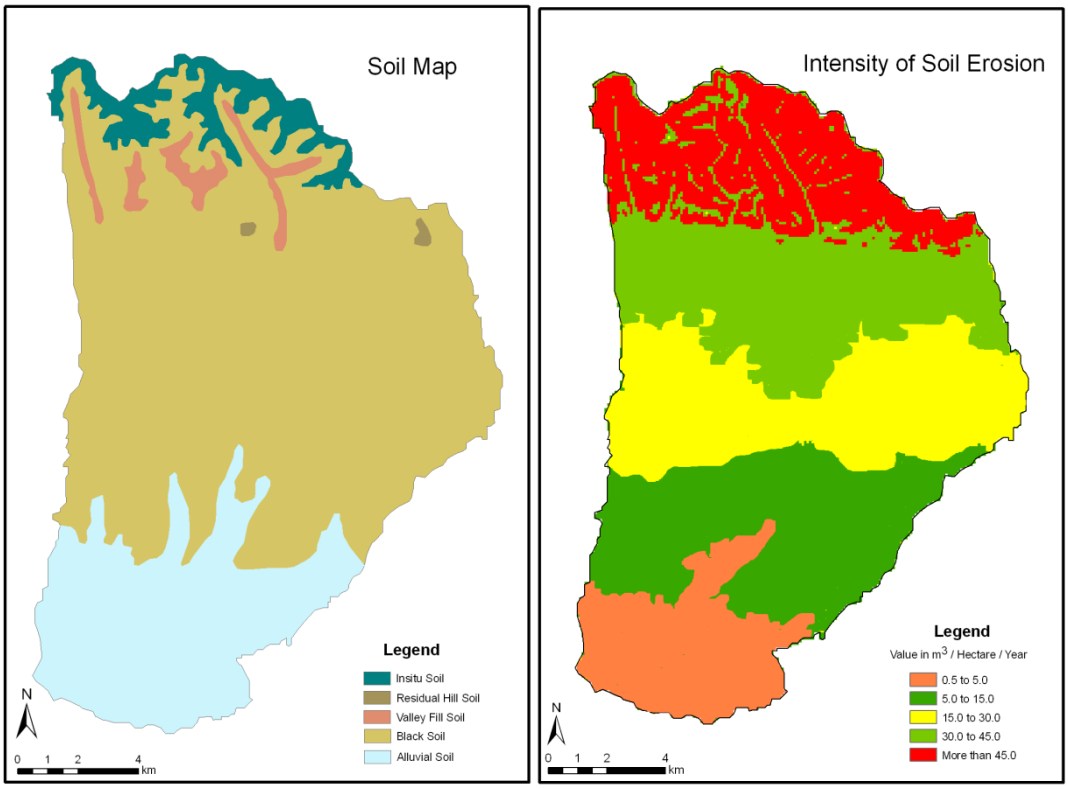
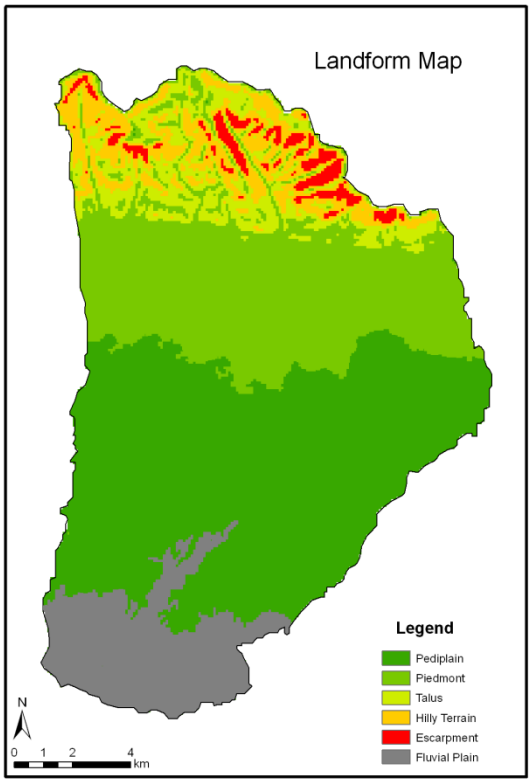


Fig.2



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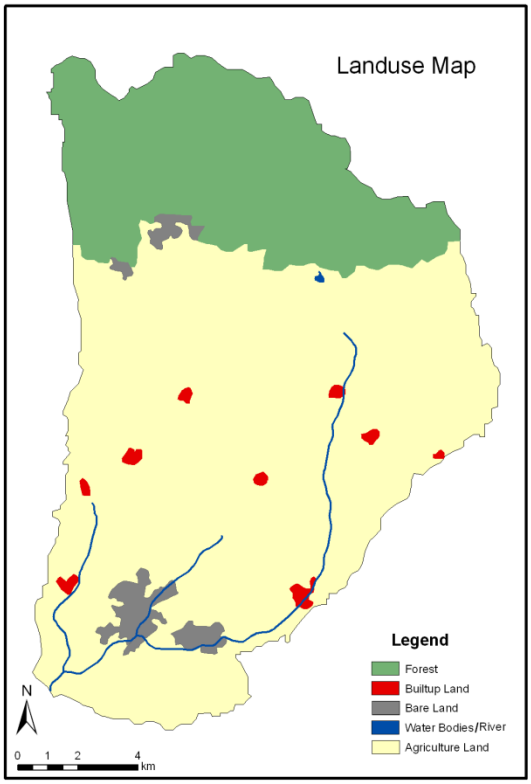

Fig.4

RESULTS AND DISCUSSION –

Slope-

The slope analysis of basin has been calculated with the help of Wentworth (1930) average slope method. The study area is sub divided in to six categories of slope. The first category of the slope is found in the black soil plain, alluvial plains, valley fills. The second slope category ranges from 1 to 7° which founds in the belt of alluvial deposit. The third category of slope varies from 7 to 14°. They are found in the lower part of the basin particularly in the peni plain. The fourth slope category ranges from 14 to 17°, which covers the upper part of the basin.

Soils-

The important soils of Bhaunak basin are black cotton soil, alluvial soil, valley fill soil, piedmont soil, weathered soil etc.. The deep black soil occurs along the southern part of the basin where as thick alluvial soil occurs along the flood plain of river Tapi. It contains the finer sedimentary deposits. Over the piedmont zone there is accumulation of coarser soil mixed with pebbles, gravels, sand, silt and clay in loose form. The valley fill soils also occur in some patches. The insitu soil occurs on the slopes of Satpura Mountains (Fig.2).

HYDROGEOMORPHOLOGY-

The Bhaunak basin is divided into five hydrogeomorphic units. They are excellent, very good, good, poor, and run off zones. The alluvial plains are the zones of excellent ground water potential. The valley fills are areas with very good ground water potential. The piedmont zone has a good potential, whereas the weathered foot hill zone is a region with poor ground water potential. The hill slopes are the zones with surface runoff (Fig.3).

LANDUSE-

The study of landuse of Bhaunak basin was carried with the help of IRS 1B Geo-coded data and LISS III data. The categories of land use identified are cultivated land (wet), cultivated land (dry), waste land, fallow land, scrub forest, ravines. The cultivated land (wet) is found in the alluvial plains which is under well irrigation. The dry cultivated land founds over the piedmont zone. The patches at the foot hills are the wet land and fallow land(Fig.4).

Table-Land Capability of the Bhaunak River basin

Sr. No.	Class	Land Units	Slope	Soil Fertility	Ground Water Potential	Present Land use	Erosion Susceptibility	Land Development Activity
1.	**I**	Alluvial Plains	<2°	Very Good	Excellent	Cultivated land, Banana, Cotton, Vegetables	Low	--
2.	**II**	Valley Fill	<2°	Good	Very Good	Cultivated Land	Low	--
3.	**III**	Shallow Weathered Pediplains	2-5°	Moderate to Good	Good	Cultivated Land, Wet and Dry Banana, Cotton, Corn.	Moderate	--
4.	**IV**	Pidmont Zone	<5°	Moderate	Fair	Cultivated Land, Wet and Dry, Banana, Cotton, Corn.	High	--
5.	**V**	Badland Zone	2-5°	Good	Good		--	Leveling
6.	**VI**	Hill Terrain	>15°	Poor	Run off	Forest, Shrubs	--	Afforestation Contour Bunding

LAND CAPABILITY-

On the basis of physical characteristics the basin is divided in to six land capability classes which are Class-I (alluvial plains), Class-II (valley fill), Class-III (shallow weathered Pedi plain), Class-IV (piedmont zone), Class-V (badland zone) and Class-VI (hilly terrain)(Fig.5).

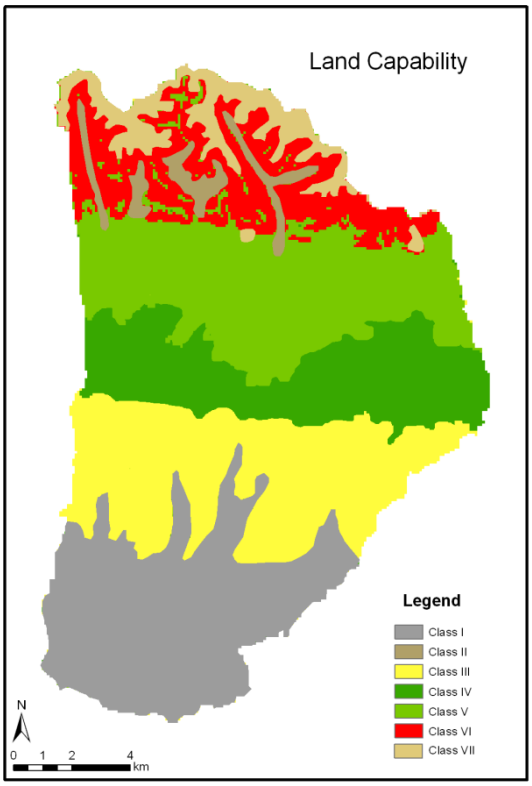

Fig.5

Class-I-

This unit of Class-I composed of sediments deposited by river Bhaunak. The slope is less than 2°. This zone has an excellent potential of ground water. This is a belt of highly fertile soil. Due to over exploitation of ground water this zone is facing a problem of recharge and specific yield of ground water. This zone is under the cultivation of cash crops like banana, sugar cane, and cotton.

Class-II

This class of land comprises the valley fill of tributary streams of Bhaunak river. The slope is less than 2°. The potential of ground water is good. In this zone the recharge of ground water is also good. This is a fertile part of basin.

Class -III

The class III land is composed of shallow weathered pediplains. The slope is between 2 to 5°. The soil fertility is moderate to good and the intensity of soil erosion is low. The major crops cultivated are banana, cotton and corn.

Class-IV

The class IV consists of piedmont zone. The slope is more than 5° the fertility of soil is moderate. The ground water potential is fair. The erosion susceptibility of land is high. The important crops grown are cotton, bajara, jawar, etc. The land development activities which could be carried out are land leveling, land mulching and land bunding.

Class-V

The class V land consist of bad land zone the slope varies from 2 to 5°. The soil fertility is good. The ground water potential is good and the intensity of soil erosion is high. The crops cultivated are cotton, banana, jawar, etc. The land development activities could be taken are land leveling and contour bunding.

Class-VI

The class VI land is comprised of hill terrain with slope more than 15°. This is a run off zone where soil fertility is poor. The recharge is low. There is a high intensity of soil erosion. The major crops cultivated are dry crops. There are scrubs, culturable waist land and degradable forest. The land development activities that could be taken up includes contour bunding, land terracing and leveling.

CONCLUSION:

The analysis of land capability based on physical aspects using S.O.I. toposheets, IRS-1B Geo-coded and LISS-III data on the scale 1: 50000 revealed that the whole basin could be divided in to six major classes. Such as Class-I (alluvial plains), Class-II (valley fills), Class-III (shallow weathered plains), Class-IV (piedmont zone), Class-V (badland zone), Class-VI (hilly terrain with slope more than 15°). Among the six classes, the class-I and class-II lands are very productive lands. They are used for cultivation of banana, sugarcane, cotton and vegetables. The class III and class IV are moderately fertile lands and can be used for cultivation of crops like banana and cotton. The class V is occupied by badland topography but after leveling this land is also productive. The class IV land is of hills and cannot be used for cultivation of crops but it is suitable for pastures.

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