Identification of Geological and Geomorphological Landforms in Rampur Baghelan Block Using Remote Sensing and GIS

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Abstract— In this Paper Abstract has been researched to study of Identification of Geological & Geomorphological landforms in Rampur Baghelan Block using Remote Sensing & GIS Techniques. Study area of Rampur Baghelan Block is about 874 Sq.km.This study is carried out by using LISS III Satellite image and Toposheet 1:50000 Scale. From this, the thematic maps (Geomorphology, Geology, and Drainage) are created. The Geomorphological features like Gullied, Hill, Mesa, Pediment, Pediplain, Plateau Remnant, Quarry, Residual Capping. Similarly the Geological features like Laterite, Limestone,Sandstone,Shale were analysied In the same way, the drainage pattern of Rampur Baghelan Block is create and pattern was runoff of the entire block flows in northeast direction.

INTRODUCTION

Tons which part of the large Ganga basin is flowing across the Rampur Baghelan.The major economical sources of study area is agriculture. Geologically the area belongs to a series of Vindhyan system which has been divided into Lower Vindhyan and upper Vindhyan system.Lower Vindhyan system has only or series, namely Samaria series in which calcarean rock is predominant while Upper Vindhyan constitute three series, namely-Kaimur,Rewa and Bhandher series.All the series of upper Vindhyan are dominated by arrenacom and intercalation of argilla clan rocks. This study helps us to know to about the Erosional, depositional and types of rock formations around the Rampur Baghelan.The analysis is carried out using Visual Image Interpretation Keys by Remote Sensing. It is digitized and evolved by using ARC GIS software.

OBJECTIVES

To identify the Geological and Geomorphological land forms in Rampur Baghelan Block using Remote Sensing & GIS.

STUDY AREA

The present area falls within the hard rock terrain of Vindhyan Supergroup groundwater resource assessment is almost need of present day because any development activities are totally based on the water resources.Rampur Baghelan block of Satna district is one of them Rampur Baghelan is located between 24^{o} 30' 6" N to latitude and 81^{o} 02' 54" E longitude. It occurs in the survey of India toposheets 63H/2 and 63H/3 and covers an area of 874 Sq km. Major part of the area is in

Satna district but adjacent part of Rewa district is also included to do. Rampur Baghelan block comes in flat land with gentle undulations of about 291-303m above mean sea level (MSL) Satna district of Madhya Pradesh. The main river of Rampur Baghelan block is Tons river which accounts for most of drainage runoff of the entire block flows in northeast direction. Tons which part of the large Ganga basin. It flows northerly in the investigated area and shows north south and trend which seems too joined controlled.(fig.1)

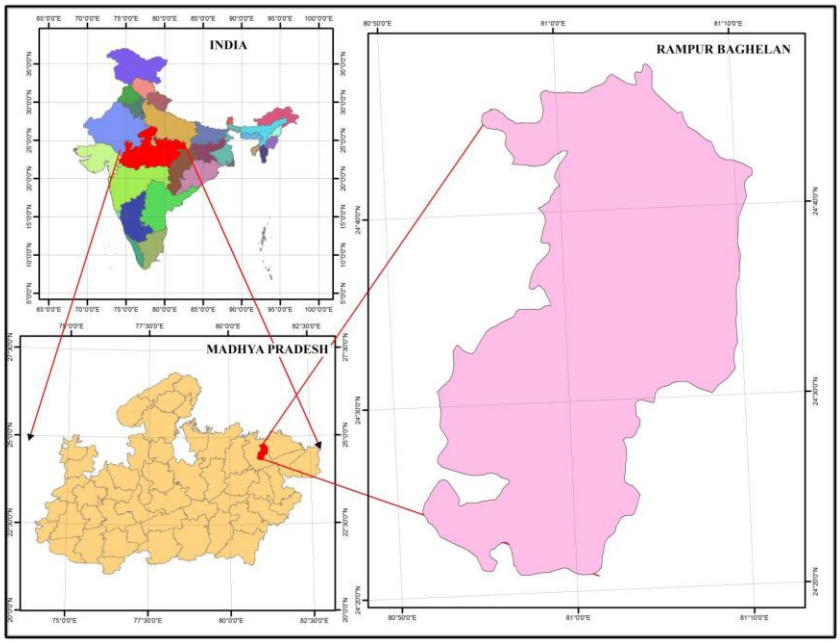

Figure 1: Study Area

MATERIALS AND METHODS

The study is based on visual image interpretation of Satellite Image. The Thematic maps are generated from the IRS P6 LISS III images and survey of India Toposheet No. 63d/13, 63h/1, 63d/4, 63h/2, 63d/15, 63h/3. The analysis is carried out on the basis of tone, texture, size, shape, drainage, pattern and association and Geomorphology features were obtained. The pattern is used to analyses the drainage pattern. The geological data is obtained from Geological survey of India. All thematic features are analysed using Arc GIS 9.3.

RESULT AND DISCUSSION

GEOLOGY

Geologically, the study area occupying northern limb of Vindhyan basin is a part of the Bhander group of the Vindhyan supergroup. The dominant rocks developed in the area are Laterite, Limestone Sandstone with intebeds of shale and siltstone, shalesirbu shale. The area is placed in the hard rock province from groundwater point of view (Karanth, 1987). The parameters of rock are obtained from Geological Survey of India and IRS P6 LISS III as reference the geology map were generated using Arc GIS software.(fig. 2)

BHANDER LIME STONE

This unit is hard and compact but jointed and fractured. Along the joints and planes of stratification “Grikes” and “Solution Cavities” get developed through the process of dissolution of country rock by circulating groundwater. Often cavities are filled with yellow coloured plastic clay known as “Terra-Rosa”. Cavernous Lime stone hold good quantity of ground water, but quality may be slightly hard. General Yield Potential of Bhander (Nagod) Lime stone is 3 to 12 Liters/ second.

SIRBU SHALE

Sirbu shale is younger unit of Upper Vindhyan having very thick horizon along Syncline axis. In low-lying topographic areas and in the weathered mantle occurrence of ground water is in limited quantity yet enough to sustain dug wells for domestic / drinking purposes. The brownish red variety is more productive than the grayish shales. Due to its impervious nature lot of small ponds are constructed in Sirbu shales which holds water even during summer season in Maihar and Amarpatan Blocks. These ponds are also used for production of water- Nuts in abundance. General yield potential of Sirbu shale is 1 to 3 Liters / second.

UPPER BHANDER SANDSTONE

Upper Bhander sand stone is youngest unit of Vindhyan System hard and compact in nature and it forms hilly track in western part of the district. “Parasmaniya Plateau”. Flagstone is also farming part of it at several places and flagstones mines are operative in the area. Normally ground water occurs under Phreatic conditions in shallow weathered and jointed rocks. Presence of joints and fractures provide secondary porosity so much so the feasibility for limited occurrences of ground water and its development through Dug wells / Dug-cum Bore well are reported to exist.

LATERITE

Laterite is occurring as capping over hillocks on Kaimur / Rewa sand stone which is not important from ground water occurrence point of view. Alluvial unit comprising fine to medium sand with admixture of silty clay and gravel offers considerable primary porosity. Though its area is limited in the district but alluvium of recent age is an important aquifer of the area being developed through open wells and shallow tube wells in the area. Two strips of alluvium is also occurring in the district, at foothills of both limbs of sand stones.(*District groundwater information booklet, Ministry of Water Resources ,Central Ground Water Board, North Central Region ,Government of India 2013)*

Table.1: Stastics of Geology

Landform	Area (Sq.km.)	Area in %
Shale	638.03	73
Limestone	215.64	24
Laterite	5.37	0. 61
Sandstone	14.96	1.7
	874	**100**

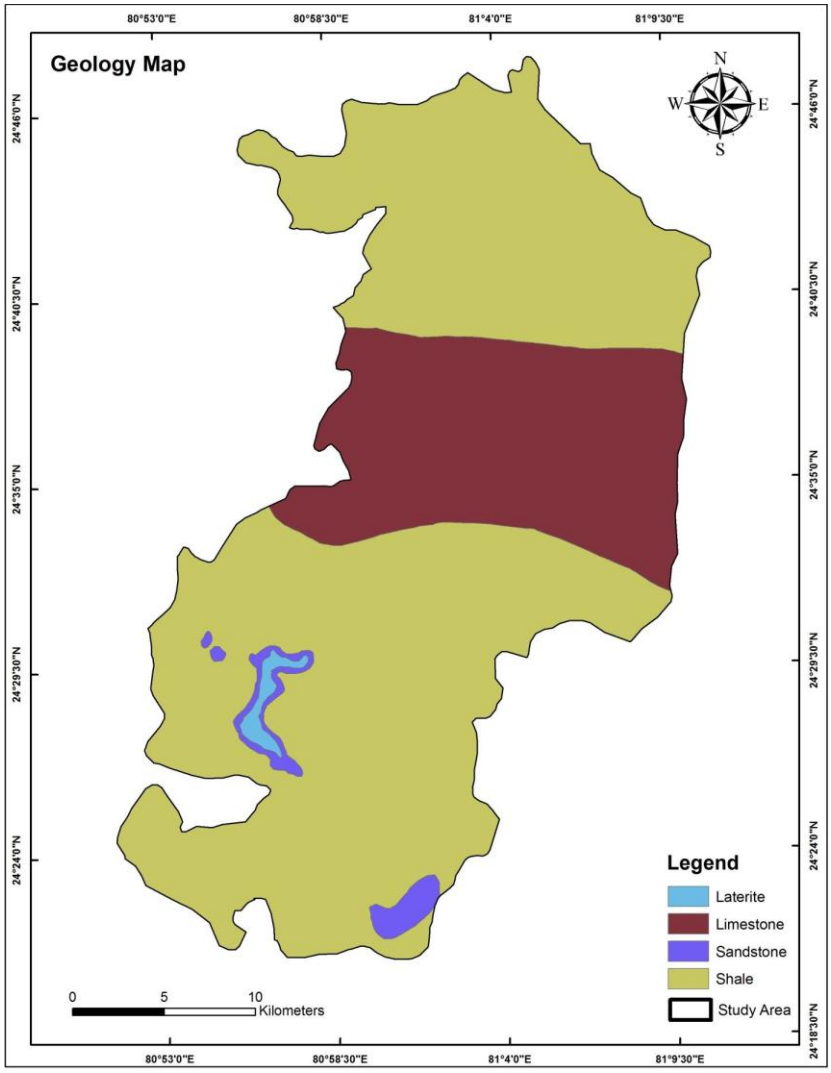

Figure.2: Geology Map

GEOMORPHOLOGY

The geomorphological units are highly helpful for selecting the artificial recharge sites (Ghayoumian, 2007). In the present investigation, the classifying various landforms based on geomorphology, such as Gullied, Mesa, Plateau Remnant, Quarry, Residual Capping, Residual Mound and Scarp were identified and its groundwater potential zones were demarcated (Jagadeeswara Rao et al., 2004). Major Geomorphological units found in the study area were Structural Hill, Gullied, Residual hill, Pediment and Pediplain/ Buried Pediplain.Following geomorphic units and their component have been identified and mapped. Geomorphology features were obtained to use visual interpretation from the satellite image IRS P6 LISS III and ARC GIS 9.3 software.(fig.3)

Table.2: Stastics of Geomorphology

Landform	Area (Sq. km.)	Area in %
Gullied	2.03	0.23
Hill	6.19	0.71
Mesa	7.85	0.90
Pediment	97.51	11.14
Pediplain	716.09	81.81
Plateau Remnant	31.76	3.63
Quarry	2.13	0.24
Residual Capping	10.44	0.98
Total	874.00	100

GEOMORPHOLOGICAL MAPPING

The geomorphologic map of entire project area has been prepared mainly through Liss III satellite data on 1:50,000 scale. Some physiographic details have been transferred from toposheets to the base map along with the interpreted units through satellite data. Geomorphology is the science of studying the external expression and architecture of the planet earth. The major geomorphic units identified in this area are Accumulation Gullied (2.03 sq.km), Hill (6.19 sq.km), Mesa (7.85 sq.km), Pediment (97.51sq.km), Pediplain (716.09.km), Plateau Remnant (31.76sq.km), Quarry (2.13 sq.km), Residual Capping (8.58 sq.km). (Table no 2 and Fig.3.

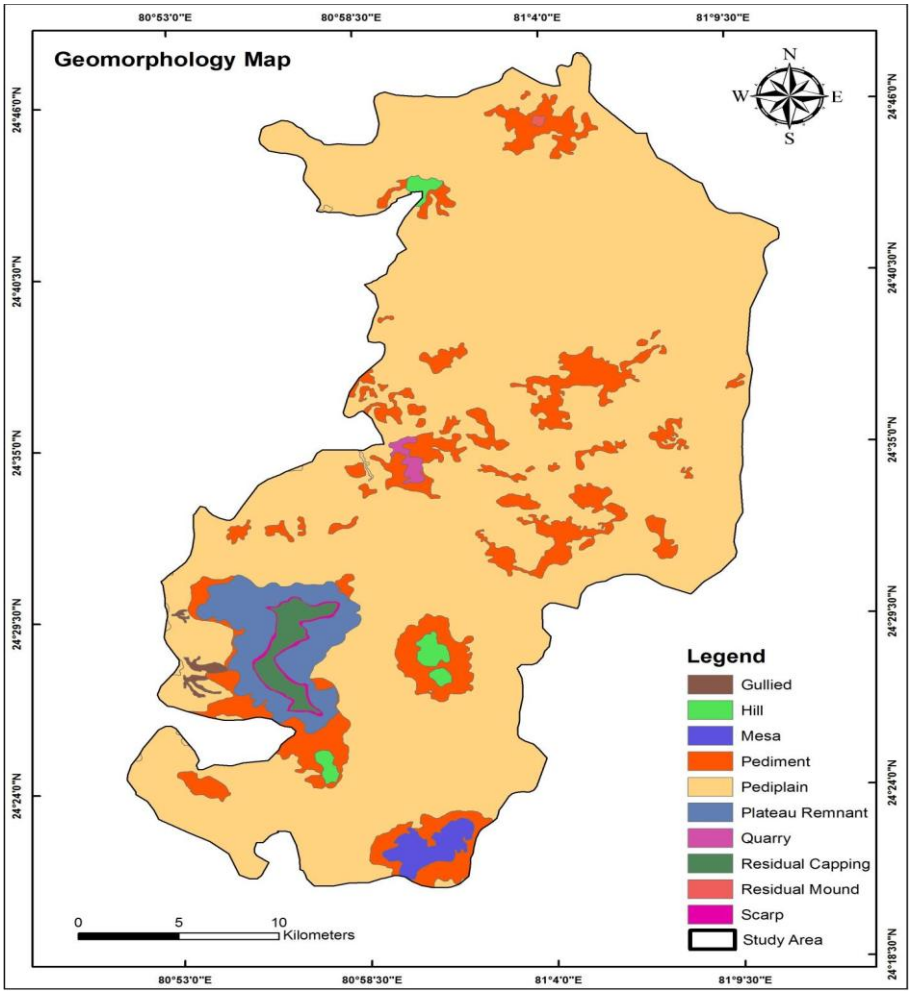

Figure.3: Geomorphology Map

DRAINAGE

The arrangement of streams in a drainage system constitutes the drainage pattern, which in turn reflects mainly geomorphology, structural/ or lithologic controls of the underlying rocks. The major tributaries of Tone River. Most of the area has dendritic and trellis pattern. In dendritic pattern, controlling factors are homogeneous with equal resistance, compact and hard rocks. Whereas, in trellis pattern, sub tributaries perpendicular to main stream developed along strike and dip direction reflects the structural controls.(fig 4)

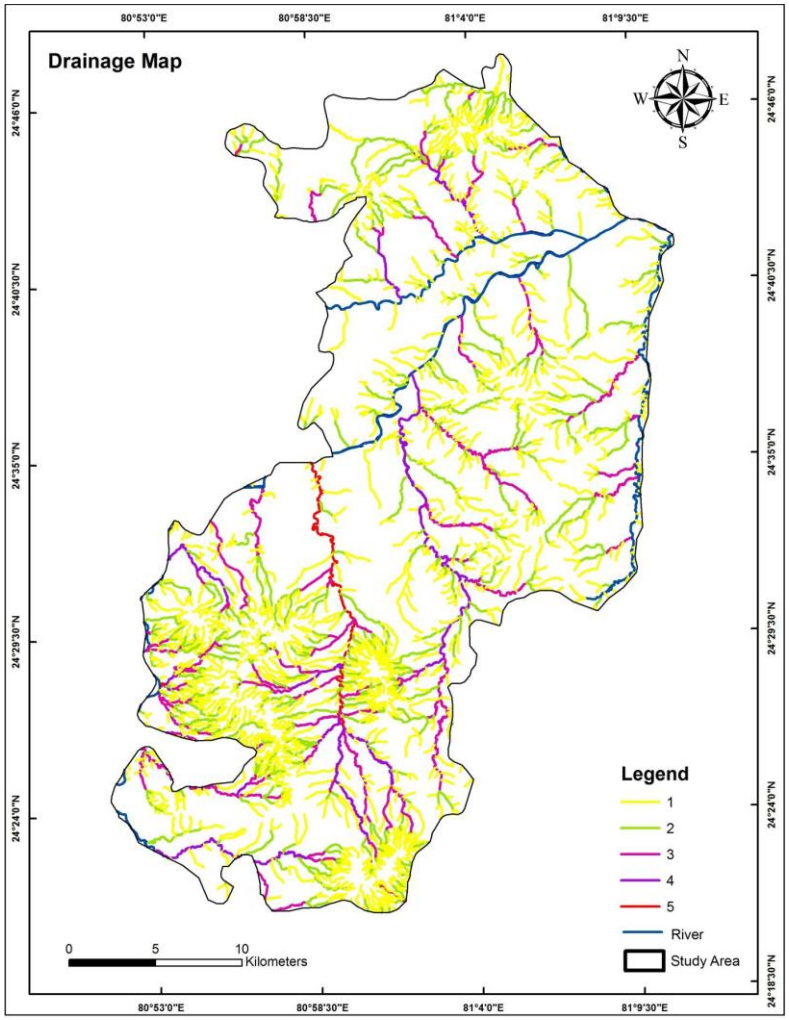

Figure.4: Drainage Map

CONCLUSION

The study is carried out to identify the various landforms from different thematic maps. The spatial data were collected from satellite image IRS P6 LISS III. The data were analysed by using GIS software. The reference of geomorphological features the Rampur Baghelan Block lies in the eastern coast of Satna; it is a deltaic region and part of coastal area. Hence the Block has the geomorphological features like Structural Hill, Gullied, Residual hill, Pediment and Pediplain/ Buried Pediplain. These features can be used to identify the flood zone and also the drainage pattern is identified as dendritic pattern, controlling factors are homogeneous with equal confrontation.

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