International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 3 Issue: 2 125 – 129

Geomorphological study of AmravatiTehsil, District Amravati, Maharashtra using remote sensing and GIS techniques

Khadri, S.F.R
Department of Geology
Sant Gadge Baba Amravati University
Amravati-444602 (MS), India
email:syedkhadri_62@yahoo.com

Sachin Thakare and Parag Armal
Department of Geology
Sant Gadge Baba Amravati University
Amravati-444602 (MS), India
email:sachthakare.neeri@gmail.com

Abstract: Remote Sensing and GIS Techniques are very useful for the study of geomorphological mapping. Geomorphology is the science of evolution of landforms in term of its lithology, structureand basin geometry and morphometric factors. Various Geology and Geomorphological factors play a major role at different levels in the occurrence movement and potential of ground water in rock terrain. Geomorphological units are classified on basis differential erosion processes.

This Study has been carried out to investigate geomorphologic part of Amravati Tehsil, AmravatiDistrict, Maharashtra. Landforms are interpreted on the basis of interpretation element keys namely such as- tone, texture, size, Shape, color etc and extract the specific information from the satellite images. In this work with the help of topographic sheet prepared drainage map, contour map, digital elevation map, slope map and with the help of satellite data prepared the land use land cover map.The present study has helped in understanding the geomorphological characteristics of the region with proper understanding of the landforms and their role in water resource management. Over all, this study will help in improving the hydrogeological conditions of the area for the sustainable development of the region.

Key Words:Remote Sensing, GIS, Geomorphology, Satellite, Topography.

----------*******----------

I. INTRODUCTION

The characteristics feature of Maharashtra lies in the fact that some 80 present of its area is covered by the younger basaltic volcanic rocks is horizontal or near horizontal layers burying beneath it the older rock striate that are several rock hundred million years old. Consequently the topography that dominates Maharashtra is related to erosion mainly by fluvial process acting over the Deccan basalt layers. These forms are modified by epigene or exogenous processes, which include erosion and depositional activities of water, wind and ice. Applications of Geographical Information Systems (GIS) to geomorphological research have been increasing since the 1990s with the propagation of "Desktop GIS"(Burrough and McDonnell, 1998)Increasing availability of Digital Elevation Models (DEMs) at various resolutions has facilitated this trend. GIS and DEMs have enhanced the cartographic representation of landforms, which is not a mere description of topography but a useful support for building scientific hypotheses at an early stage of research.Now, new trends have emerged that integrate field work with modern technologies such as GIS, GPS, remote sensing and elevation models, which further strengthens the study of relationship between the land-forms and the processes that created them. Geomorphologic studies were carried out through detailed remote sensing analysis and detailed geomorphologic of the study area with the aim to establish the elevation or geomorphic parameters to those of watershed management Morphometric analysis of the Mahesh river basin was used Remote Sensing and GIS technology(Neha Nagraj, 2012).

II. STUDY AREA

Amravati tehsil is the headquarters tehsil of the Amravati district lying between 20^0 41' and 21^0 12' N. and 77^0 32' and $78^0$2' E. with an area of Amravati Tehsil is 890sq.km^2. It lies in the fertile valley of Berar (Varhad) but the almost uniform characteristics of this valley are broken by a low

range of stony and barren hills which cropping up in the immediate vicinity of Amravati camp, now incorporated in the town, extends over the eastern border of the tehsil. The tehsil is bounded on the north by the Achalpur tehsil of Amravati district and the Murtizapur tehsil of Akola district, and in the east and south it borders upon the Chandur tehsil almost touching with its north-eastern extremity, the river Wardha. The tehsil is compact in shape though it narrows towards the north.The climate is on the whole healthy, though trying in the months of April, May and June on account of the extreme heat. The only rivers of any importance are the Purna and the Pedhi: the former separates Amravati from Daryapur on the western border and contains a supply of water throughout the year. The Pedhi running through the center of the tehsil also has a perennial supply- Many of the villages are dependent on wells for drinking water.

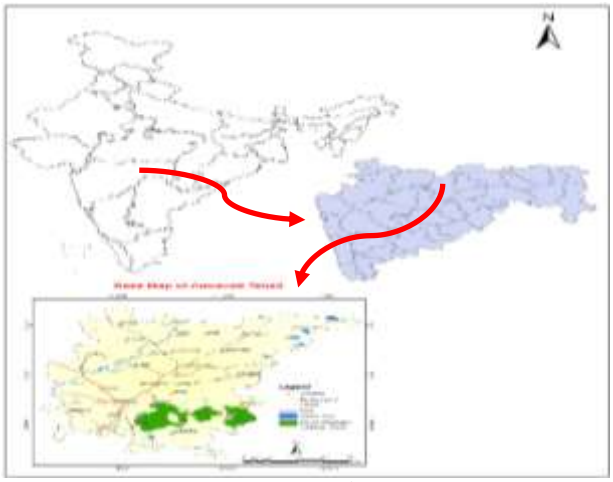


Figure1. Location map of the study area

II. MATERIALS AND METHOD

Data Used

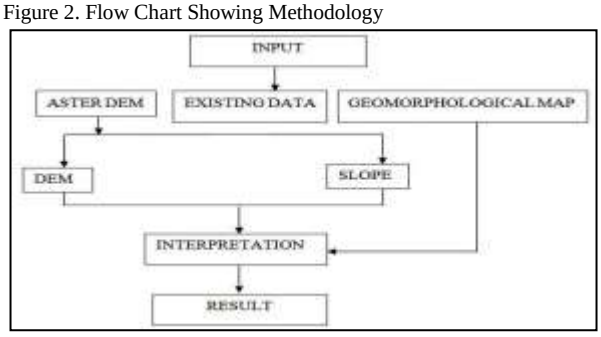
a) Toposheet Approved by Survey of India Having 1:50000 scale
b) Satellite Imagery LISS data having 23.5m resolution
c) Erdas Imagine Remote sensing Software
d) ARC GIS Software

III. METHODOLOGY

Interpretation

The input data is used as SOI Toposheet with 1:50000 scale and Satellite LISS III data having resolution 23.5m for the present study area. DEM map is representing the altitude of the study area ranging from 345 to 598 m above MSL. Aspect map which is generated in ARC GIS software from the input data to know the topographical slope direction and geological features of the area. Slope map is also generated to know the intensity of slope.

Figure 2. Flow Chart Showing Methodology



IV DIGITAL OR (TIN) ELEVATION MODEL

Digital elevation models suggest the most widespread methods for extracting important elevation and topographic information. DEMs are used for visual analysis of topography, landscapes and landforms other than modeling of surface processes(Welch 1990). A DEM model of the study region has been generated by using the DEM data. It is a vector topological network of triangular facets generated by joining the irregular points with straight-line segments(Felicísimo A.M, 1994). These are irregularly spaced triangles that represent a surface as contiguous non-overlapping triangular elements.A DEM model can be used to calculate flow direction of watershed areas, as well as a variety of other applications. It represents the surface as a set of contiguous, non-overlapping network of triangles by storing the topological relationships of the triangles.

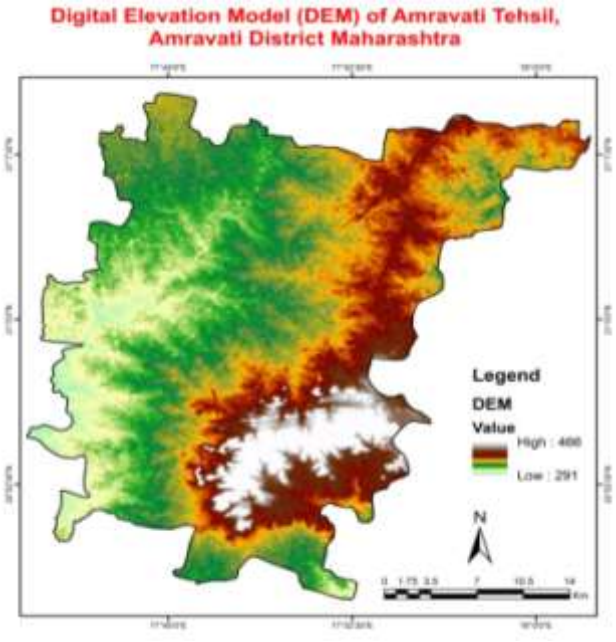


Figure 3. Digital Elevation Model (DEM) Of Amravati Tahsil, Amravati District, Maharashtra.

The triangles vary in size according to need based on the roughness of the terrain. The DEM creates triangles from a set of points called mass points, which always become nodes.

Z is the vertical elevation value that is relative to a given datum for a set of x, y points(Bernhardsen 1999, Bolstad and Stowe 1994, Welch 1990, Burrough and McDonnell, 1998). They composed of samples array of elevations for a number of ground locations at equally spaced intervals DEM of the study area indicates that the slope trends towards north from south. Shaded relief images can help to identify the information about geomorphometric features, rock types and structures of an area.

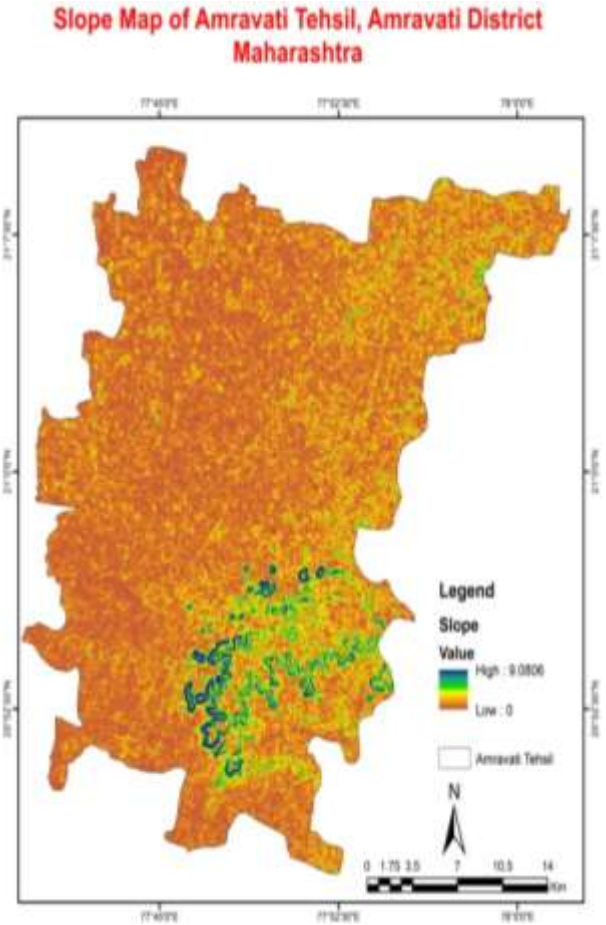


Figure4.Slope map of Amravati tahsil, Amravati District, Maharashtra

V. RESULTS AND DISCUSSION

A. Geomorphology

Geomorphology as a science developed much later than geology although several aspects of geomorphology are embedded in geological processes. Geomorphology deals with the genesis of relief forms of the surface of the earth's crust(D.P. Rao, 2002). Geomorphological mapping and necessary supporting data are crucial to developing countries that are usually under severe environmental and demographic strains. Approaches and methods to map the variability of natural resources are important tools to properly guide spatial planning. In this paper a comprehensive and flexible new geomorphological combination legend that expands the possibilities of current geomorphological mapping concepts. The piece-by-piece legend forms a "geomorphological alphabet" that offers a high diversity of geomorphological information and a possibility for numerous combinations of information(D.P. Rao, 2002). This results in a scientific map that is rich in data and which is more informative than most previous maps but is based on a simple legend. The system is developed to also be used as a basis for applications in GIS.

B. Alluvial Plain

An alluvial plain is a relatively flat landform and created by the deposition of highlands eroded due to weathering and water flow in study area. The sediment from the hills is transported to the lower plain over a long period of time. It identified on the imageries dark reddish moderate to fine texture due to agriculture activities. Alluvial deposits of the area constitute gravel, sand, silt or clay sized unconsolidated material(Ajay singh Tomar, 2012). The area under alluvial plain cover in geomorphological map.

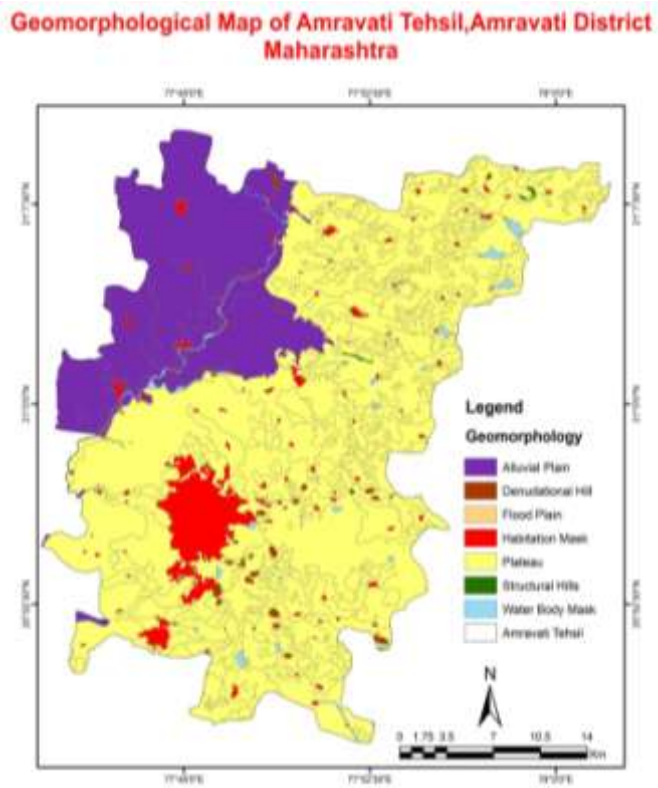


Figure 5. Geomorphological map of Amravati tahsil, Amravati District, Maharashtra

C. Denudetional Hills

Denudetional hills are the massive hills with resistant rock bodies that are formed due to differential erosional and weathering processes(Ajay Singh Tomar, 2012). These hills are composed of Vindhyan sediments which are fractured, jointed having no soil cover moderate to steep slope. On the satellite image, these landforms were identified by light or dark brownish with mix green color due to thick forest cover.

D. Structural Hills

Structural hills are representing the geologic structures such as- bedding, joint, lineaments etc. in the study area(Ajay Singh Tomar, 2012).They are located in the eastern parts of the study area having greenish and reddish tone with rough texture on the satellite image. The area under structural hills covers in geomorphological map.

E. Flood Plain

A flood plain is an area of land that is prone to flooding. People realize it is prone to flooding because it has flooded in the past due to a river or stream overflowing its banks. A floodplain or flood plain is an area of land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high discharge (Goudie,2004) It includes the floodway, which consists of the stream channel and adjacent areas that actively carry flood flows downstream, and the flood fringe, which are areas inundated by the flood, but which do not experience a strong current. In other words, a floodplain is an area near a river or a stream which floods when the water level reaches flood.

Aflood plain usually is a flat area with areas of higher elevation on both sides. The areas under flood plain cover in geomorphological map.

F. Habitation Mask

A habitation Mask is an area of land that is occupied by human being. It is human settlement area. It is defined as an area of human habitation developed due to non-agricultural use and that which has a cover of buildings, transportand communication utilities in association with water, vegetation and vacant lands(Ajay Singh Tomar, 2012). The area under habitation mask covers in geomorphological map.

G. Plateau

A plateau is an elevated land. It is a flat topped table standing above the surrounding area. A plateau may have one or more sides with steep slopes. The area under plateau cover in geomorphological map.

H. Water Body

It is an area of impounded water, areal in extent and often with a regulated flow of water. It includes man-made reservoirs/lakes/tank/canals, besides natural lakes, rivers/streams and creeks. The area under water body covers in geomorphological map.

VI. SUMMARY AND CONCLUSIONS

In this study an attempt has been made to delineate various geomorphological parametersto facilitate the hydro geomorphological parameters for deciphering the groundwater potential zones in the study area. Various output maps have been prepared using remote sensing and GIS techniques which have proved to be an essential tool in interpreting the various geomorphological aspects to develop the terrain evolution models. This present study has helped in understanding the geomorphological characteristics of the region with proper understanding of the landforms and their role in water resource management. Over all this study will help in improving the hydrogeological conditions of the area for the sustainable development of the region.

VII ACKNOWLEDGMENT

The authors are thankful to the Hon'ble Vice-Chancellor, Sant Gadge Baba Amravati University for providing the necessary research facilities

VIII. REFERENCES

[1]. Ajay Singh Tomar and U.C. Singh," Geomorphological Mapping using Remote sensing and GIS A Tool for Land Use Planning around Shivpuri City M.P.IOSR Journal of Computer Engineering (IOSRJCE) ISSN: 2278-0661 Volume 5, Issue 1 PP 28-30,"2012.

[2]. Bernhardsen, T., Geographic Information Systems*: An Introduction*, John Wiley & Sons. 1999.

[3]. Bolstad P.V., and Stowe. An Evaluation of DEM Accuracy: Elevation, Slope, and Aspects. Photogrammetric Engineering and Remote Sensing. 60 (11) 1327-1332,"2002.

[4]. Burrough and McDonnell,Principles of Geographical Information Systems. Oxford: Oxford University Press," 1998.

[5]. Rao,D.P ," Remote Sensing application in Geomorphology. Hyderabad Tropical Ecology 43(1): 49-51," 2002.

[6]. Felicísimo A.M. Parametric Statistical Method for Error Detection in Digital Elevation Models. ISPRS Journal of Photogrammetry and Remote Sensing 49 (4) 29-33,"1994.

[7]. Goudie, A. S. Encyclopaedia of Geomorphology, vol. 1. Routledge, New York. ISBN 0-415-32737-7," 2004.

[8]. Krishnamurthy J and Srinivas G, Role of geological and geomorphological factors in groundwater exploration: a study using IRS LISS data, International Journal of Remote Sensing 16(14), pp 2595–2618,1995".

[9]. Neha Nagraj Geomorphological Study of walgaon-Achalpur Region, Amravati District Maharashtra Using Remote Sensing and GIS Techniques. International Journal of Science, Environment and Technology, Vol. 1, No 5, 2012, 473 – 478, "2012.

[10]. Welch R. 3-D Terrain Modeling for GIS Applications. GIS World. 3 (5) 26-30,''1990