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GEOMORPHOLOGICAL DEVELOPMENT OF THE FLUVIAL TRACTS OF DHEBEWADI PLATEAU, SHAHUWADI TALUK, AND PANHALA TALUK WITH RESPECT TO MORPHOMETRIC PARAMETERS

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Abstract
The drainage network of Dhebewadi Plateau, Shahuwadi Taluk and Panhala Taluk together occupies an area of approximately 1800 sq.km. in the districts of Satara and Kolhapur, Maharashtra. The area lies between Long. 73°40′ E to 74° 10′ E and Lat. 16° 35′ N to 17° 15′ N, covering SOI toposheet nos. 47H/13, 47H/14, 47L/1, 47L/2, and 47G/14. This area consists of many small watersheds. The stream orders of all the basins range from first order to seventh order. The morphometric analysis has been carried out to study the drainage pattern, landuse pattern and basin development. The geomorphic parameters like stream order, stream length, basin area, stream frequency, drainage density, bifurcation ratio etc. have been calculated to understand the drainage behavior, morphological characters and structural fabrics of the basin.

Keywords: drainage network, stream orders, morphometric analysis, drainage behavior.

Introduction

The drainage network of Dhebewadi Plateau, Shahuwadi Taluk, & Panhala Taluk together occupies an area of 1789.53 Sq. Km. in the districts of Satara and Kolhapur, Maharashtra **(Fig.1)**.

The major fluvial tracts which can be identified as major rivers in the study area are Warana river, Kasari rivers, Kumbhi river and Dhamni river. From those, Warana river basin is the largest one and located in the northest part of the study area. Kasari, Kumbhi, & Dhamni river basins are also major ones and Dhamni river basin is at the southest part and Kasari & Kumbhi river basins are at the center of the study area. Apart from these, many minor small basins of different tributaries of all those major rivers are part of this area.

In this paper, an attempt has been made to analyze the evolutionary status of all those basins together, i.e., the Warana, Kasari, Kumbhi & Dhamni river basins and basins of tributaries of those major rivers.

Geology of the area:

The following summary of geology of western Maharashtra including Dhebewadi Shahuwadi Taluk is based on Sahasrabuddhe (1964), Chitale (1986), Khanapurkar(2015) & Khanapurkar et al(2015):

The oldest rocks in western Maharashtra *are* represented by Precambrian granites, gneisses and metasediments. These are overlain by the Early Paleozoic sandstones and quartzites. All the older rock units are unconformably overlain by the Deccan Trap Basalt lava flows of Late Cretaceous to Tertiary age. The rocks older than basalt crop out only extremely rarely. In most parts of western Maharashtra the Deccan Basalts are overlain by clays and/or laterites. The bauxites are included within laterites. Deccan Trap basalts are the oldest rocks exposed in the study area in western Maharashtra, and are capped by laterites and bauxites.

Methodology

The numerous studies have been conducted to investigate and understand the evolution of the basin. Remote sensing, geomorphological and morphotectonic studies, using GIS techniques mainly involved to identify the regions of neotectonic activities. The geomorphometric analysis of dendritic drainages of this region has been made by the Strahler's Method.

Drainage basin analysis

A drainage basin is a geomorphic unit, bounded by an area which contributes water and sediments to particular stream channel or to a set of stream channels that dissects the area. Direct measurements of the inputs and outputs in the drainage system are most complicated. But the nature of the system can be ascertained from the measurements of various dimensional and dimensionless parameters.

The form and processes of drainage basin are related to its drainage network, basin geometry and altimetric character. These various aspects of the drainage basin can be mapped and measured quantitatively with the help of morphometric analysis of the drainage basin.

Drainage Analysis by Strahler's Method:

For drainage analysis, the anomalies are obtained for the various parameters such as-
1) Stream Order, 2) Stream Number, 3) Stream Length, 4) Basin Area, 5) Drainage Density, and 6) Bifurcation Ratio.

1) Stream Order(u): In the Strahler's system of stream ordering all initial channels with no branching are termed as the first order streams. When two first order streams merge together they give rise to second order stream; two second order streams merge together to give rise to a third order stream and so on**(Fig.2)**.

2) Stream Number(Nu): The number of streams from each order are measured and given in the table**(Table.1)**.

3) Stream Length(Lu): The total lengths of the streams of each order are measured. It is observed that the mean lengths increase with the increase in stream order. Strahler suggested that the stream lengths of given orders are inversely proportional to the stream order. Stream length is computed with the help of GIS techniques.

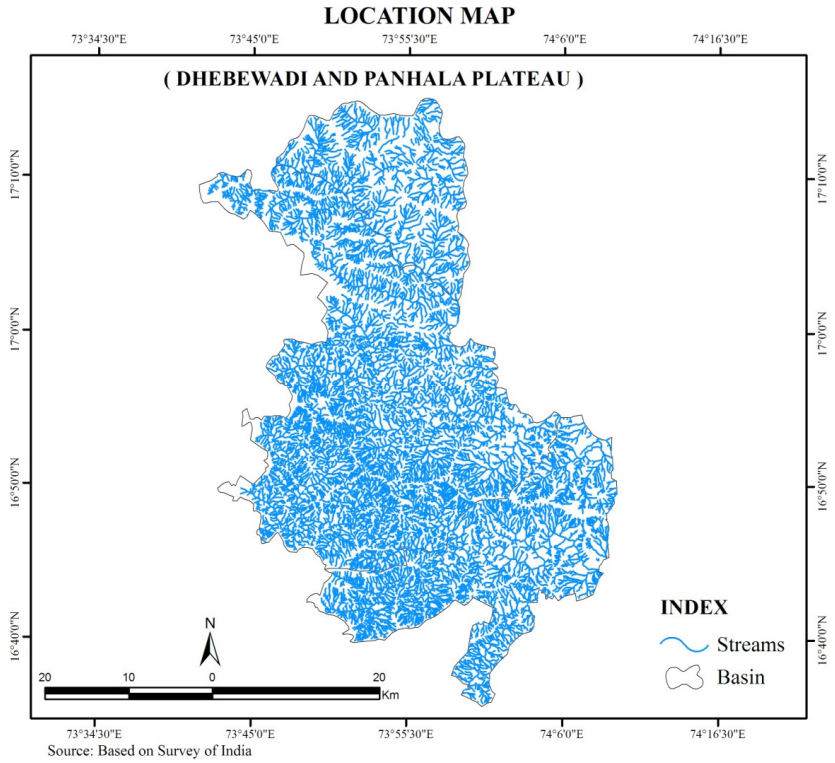
4) Basin Area(Au): Basin area is computed through GIS techniques.

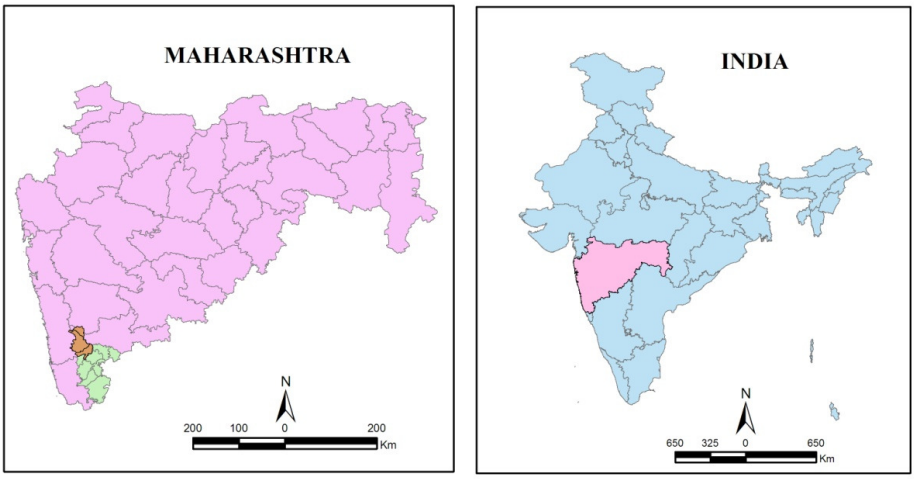
5) Drainage Density(Du): Drainage density is defined as the total length of the stream channel per unit area. i.e. Du=Σu/Au.

6) Bifurcation Ratio(Rb): The term bifurcation ratio was first introduced by Horton(1945). It means the ratio of the number of streams of any given order to the number of streams of the next lower order. Bifurcation ratio changes significantly with the changes in geological characters of the regions(Strahler,1964).

Table.1. Drainage Basin Analysis Data.

Sr. No.	Stream Order (u)	Stream Number (Nu)	Bifurcation Ratio(Rb)	Stream Length(Lu) In Km.	ΣLu	Basin Area (Au)	Drainage Density (Du)
1.	I	5846	--	3432.03	5389.894Kms.	1789.53 Sq.Km.	3.012/Km.
2.	II	1392	4.199	1085.399			
3.	III	308	4.519	433.221			
4.	IV	66	4.666	195.424			
5.	V	16	4.125	137.446			
6.	VI	5	3.2	70.255			
7.	VII	2	2.5	36.119			





Source: Based on Survey of India

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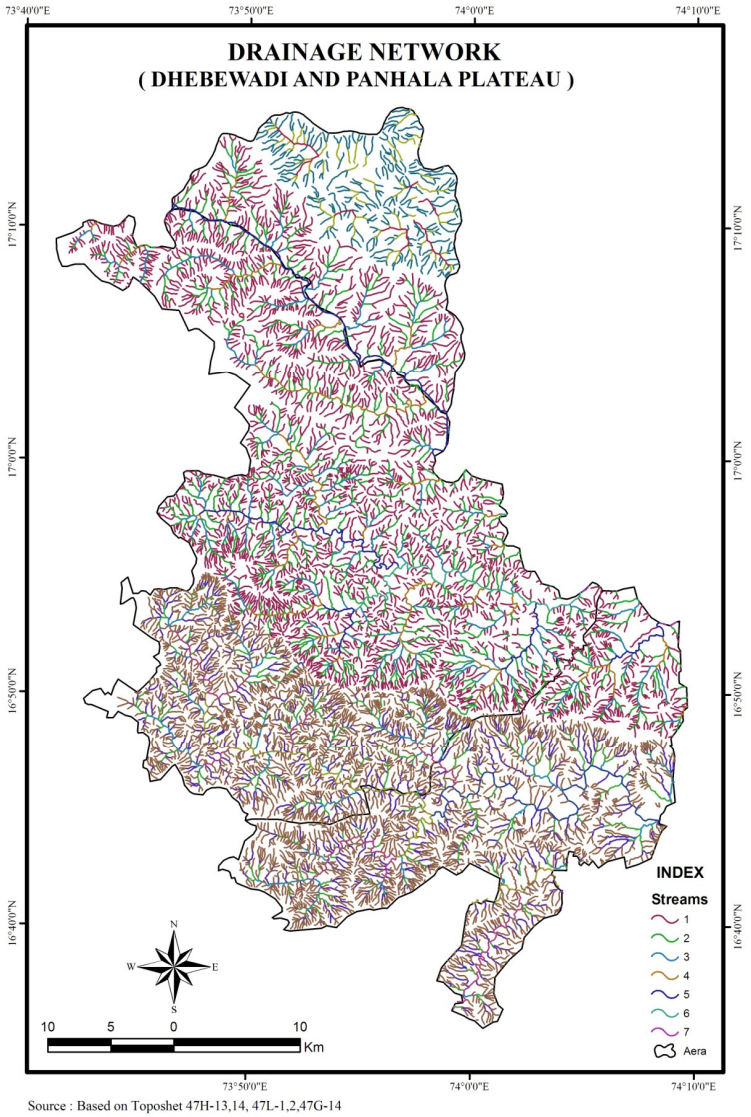
Figure 1. Map showing location of the study area.



Source : Based on Toposhet 47H-13,14, 47L-1,2,47G-14

Figure 2. Map showing drainage network of the study area.

Conclusion:

Integration of remote sensing and GIS allows reliable, most accurate and most updated database on land and water resources. It has been found to be very useful tool in combination of spatial data and very useful deriving geomorphic parameters(A.J.Shirke ,et.al,2012). Accordingly, this area has enough high drainage density, high relief and almost straight slopes allowing quick disposal of water indicating high rate of erosion, but it is retarded due to hard rocks.

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