

GEOGRAPHICAL ANALYSIS OF DRAINAGE DENSITY IN SIPNA WATERSHED OF MELGHAT REGION OF AMRAVATI DISTRICT

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Abstract

The origin and development of human civilization can be found in the valleys of rivers. In the early times, humans started living along the banks of rivers to fulfill their daily needs. Generally, it is found that the invention of agriculture by humans was 8 to 10 thousand years ago. It is found that the concept of 'river basin' has developed from the concept of land development. Present paper reveals the analysis of drainage density in the Sipna river watershed area in the Melghat region of Amravati district.

Keywords - Drainage Density, Sipna, River, Basin, Relative

Introduction

Planning, harvesting, interception of surface runoff and infiltration of rainwater has been a major objective in recent times for development and management of river basins and watersheds. The main purpose of this management is to increase the groundwater level. This will meet the drinking water for human and water useful for various purposes.

'River basin' is a broad concept and the concept of catchment area has been popularized in geography to divide large river basins into catchment areas from a planning perspective for their overall development and management.

Objectives

The main objectives of the present research paper has follows,

1. To study the watershed wise drainage density in the study area.
2. To study the relative drainage density in the study area.
3. To analysis the area under various relative drainage density in the study area.

Data Source & Research Methodology

Present research work is based on the both sources primary and secondary data, also based on the graphical analysis.

Base map and drainage of the study region is created with the help of Survey of India's Toposheet numbers 55 G/2, 55G/3, 55 G/6, 55 G/7, and 55 C/14 of Scale 1:50,000. The relief map is created in GIS software with the help of toposheets.

Watershed wise drainage density is calculated by using following formula, suggested by Horton, R. E (1945).

$$Dd = \sum LK \div AKk$$

Dd – Drainage Density (Per Sq.Km.)

$\sum LK$ – Total Stream Length in Watershed (Km.)

AKk – Area of Watershed (Sq.Km.)

Relative drainage density is calculated by measuring the length of rivers in per sq.km. area. The isopleth are drawn in GIS software. Results are shown in the table and also presented on the map.

Study Area

Sipana watershed in Melghat region is geographical located in between $21^{\circ} 22' 11''$ North to $21^{\circ} 39' 14''$ North latitude and $76^{\circ} 51' 37''$ E to $77^{\circ} 26' 16''$ E longitudes. The valley of this river includes some villages in the two tehsils of Dharani and Chikhaldara and also the study headquarters of the tehsil headquarters Dharani. The total area of the study area is 1277 sqkm, the north-south section length of the region is 32 km and the east-west maximum length is 62 km (Figure No 1).

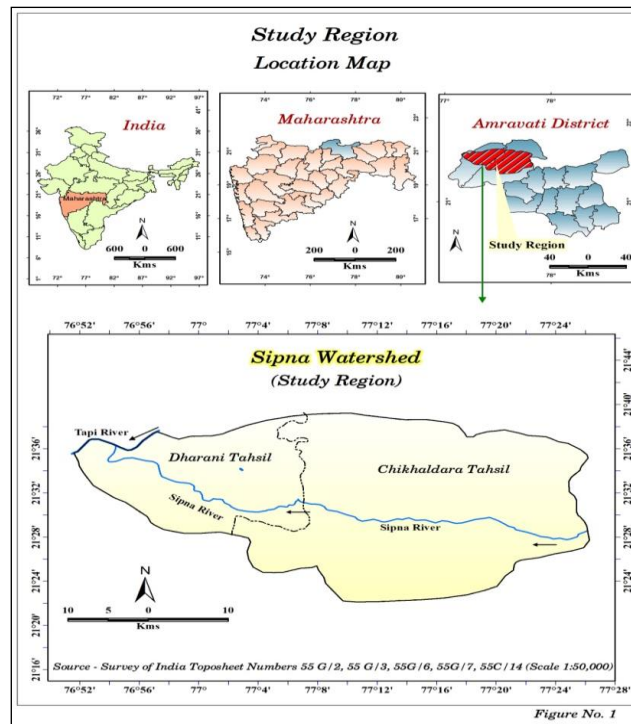
Watershed wise Drainage Density

According to the above formula, the total and sub watershed area wise drainage density in the study area is shown in the following table no.1.

Table No. 1 Sipna Watershed – Drainage Density (Per Sq.Km.)

Sr. No.	Watershed Name	Drainage Density (Per Sq.Km.)
1	Bhauvar	0.95
2	Chichpati	0.91
3	Batori	0.81
4	Kaupati	0.71
5	Keli	0.53
6	Tarora	0.66
7	Ambadoh	0.59
8	Mili, Mini, Micro (Combine)	0.54
Total Watershed		0.72

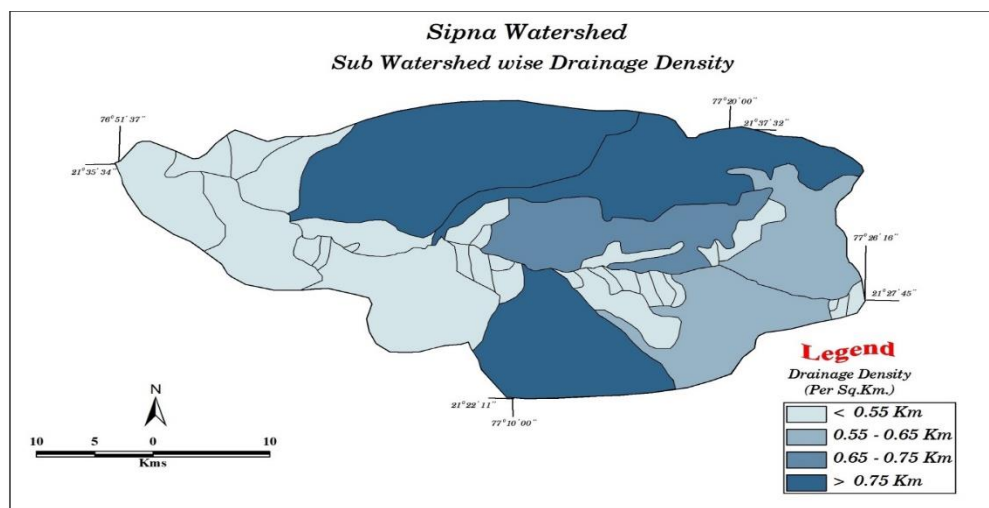
Source – Calculated by Author



The drainage density per Sq.Km. of the entire catchment area is 0.72 Km. This density is moderate because the length of the river course is moderate compared to the area of the region.

Drainage density is highest in two sub watershed areas namely Bhauvar (0.95) and Chichpati (0.91). The area of these two sub watershed areas and the length of streams in their area are more than other sub watershed areas.

Batori (0.81), Kaupiti (0.71), and Tarora (0.66) sub watershed have between 0.60 and 0.90 Km. of river flow per Sq.Km., whereas in other sub watershed areas this density is found in between 0.50 to 0.60 Km.



Relative Drainage Density of Sipna River Watershed

A study of drainage density in Sipna river catchment area reveals the pattern of flows and the density of river flows in per Sq.Km. area. But since the regional diversity of this region is not studied, the relative river density of this catchment area has been calculated. This relative density is calculated using Isopleth. For that, an attempt has been made to explain the drainage density by taking the Isopleths by measuring the length of the streams in every Sq.Km. area. Table no. 2 shows the relative drainage density of Sipna river watershed area along with its area and percentage.

Table No. 2 Sipna Watershed – Relative Drainage Density (Per Sq.Km.)

Relative Drainage Density (Per Sq.Km.)	Area (Sq.Km.)	Percentage %
< 2 (Low)	612.27	47.98
2 to 4 (Moderate)	562.16	44.06
4 to 6 (High)	91.77	7.19
> 6 (Very High)	9.8	0.77
Total	1276	100%

Source – Calculated by Author

Low Relative Drainage Density (< 2)

Relative river flow density is found to be less than 2 Km. per Sq.Km. in most parts of the study area. This stream density region covers an area of 612.27 Sq.Km. of the study area and its proportion to the total geographical area is 47.98%.

This area in the study area is mainly found in Mili, Mini, Micro watersheds because these areas are small in size and the number of river flows is less. This area of low relative density is more prevalent in Keli and Ambadoh sub watershed areas, whereas in other sub watershed areas, drainage density is found to be less in the outer boundary areas.

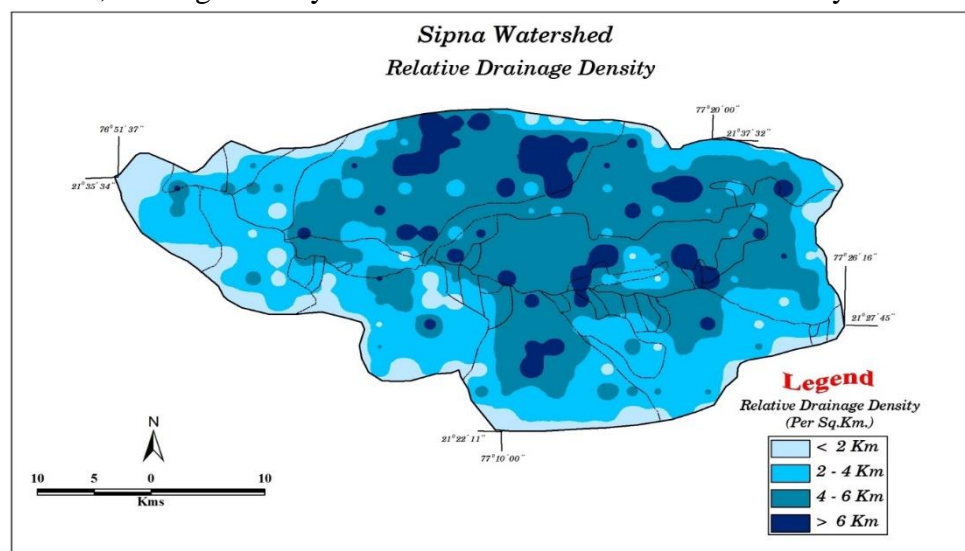


Figure No. 3.3

Moderate Relative Drainage Density (2 to 4)

The relative drainage density is between 2 and 4 per Sq.Km. in an area of about 562.16 Sq.Km. in the Sipna river watershed area. That is, nearly 44.06% of the area has river channels of 2 to 4 Km. length for every Sq.Km.

This area of medium drainage density is higher in the catchment area of the upper reaches of the Sipna River. It is observed that its area is more in the upper sub watershed areas of Bhauvar, Chichpati and Kaupati and in the lower sub watershed area of Batori.

High Relative Drainage Density (4 to 6)

The area of 4 to 6 Km. streams per Sq.Km. in the study area is 91.77 Sq.Km. and it is found to be 7.19% of the total geographical area. Areas of high density are also more prevalent upstream of the Sipna River as this region is steeper and receives more streams.

Very High Relative Drainage Density (Above 6)

Only 9.8 Sq.Km. areas (0.77%) of the study region have very high drainage density. Areas of extremely high river density are found in the northern and western parts of the Bhauvar watershed and in the central parts of the Chichpati and Kaupati watersheds and in the Tarora watershed where the Tarora meets the Sipna River. No other watershed shows such high drainage density.

Findings

Drainage density is found to be higher in areas where river flow length is longer. If the length of the river decreases, this is found to decrease. Overall, drainage density is low compared to the area of Sipna river catchment area and the length of streams flowing through this catchment area is short.

High relative drainage density area is more common in Bhauvar sub watershed area as this catchment area is larger in size and number of streams is also higher. It is followed by high density areas in the upper Chichpati and Kaupati and the lower Batori sub watersheds. In other sub watershed areas this area is very less and high density is not found in Mili, Mini, Micro areas.

Streams with a length of more than 6 Km. per Sq.Km. are found only in the upper reaches of the Sipna River.

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