

Geographical Characteristics of Vel River Basin

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Abstract

Maharashtra is one of the 28 states in India and area wise it is the second largest state. Geographically Maharashtra extends from latitude 15°44' N to 22°6' N and longitude 72°36' E to 80°44' E and triangular in shape which occupies 9.36% land of India. Maharashtra has 36 districts in which Pune district is one of the important district. The present study region (Vel basin) totally occupied in this district. Pune district 100% drained by Bhima river basin. Bhima is the main river in this district and it has many tributaries like Pushpavati, Aar, Meena, Ghod, Vel, Bhama, Indrayani, Pavana, Mula-Mutha, Valaki, Gunjavani, Nira, Karha, and Sudha etc. The main characteristic of Vel River is that it is Plateau River.

Introduction

Most of the rivers originate on the mountain but Vel River is exceptional for this. Therefore, geographical study of Vel River has been studied in this paper. Vel is a tributary of Bhima River. The Vel River basin totally occupied in Pune district. The Vel River therefore lacks a catchment in the high rainfall Western Ghats Zone, unlike the Bhima, Mula-Mutha and Indrayani. It is very important to study the geographical characteristics of Vel River because this river originates at plateau region.

Objectives

1. To study the geographical characteristics of Vel River Basin.
2. To study the climatological characteristics in Vel River basin.

Study Area

The Vel River is a tributary of the Bhima with most of its catchments in the semi-arid zone in upland Western Maharashtra. The Vel River, with a length of 64km has its source about 15km upstream of Peth, on the 700m denudational surface. This surface forms the divide between the Bhima and Ghod River.

The Deccan Plateaus characterized by a "stepped" character, flat surface at different elevations are separated from each other by "steps". These flat surfaces have been formed by denudational processes and have been separated from each other by episodic uplift. The Vel River originates on one of the most extensive of such surfaces (Dikshit 1970; kale and Rajguru 1988) at approx. 700m amsl. In the Vel basin two lower surfaces at 600m amsl and 540m amsl are present. Around Talegaon, the 540m level forms an extensive surface while the divides are around 600m. The 600m level also forms a surface well developed near Pune. The Vel River therefore traverses three surfaces (700m, 600m, and 540m) from its source to confluence. Talegaon Dhamdhere is on the Vel, about 8km from its confluence with the Bhima.

Geographically, the Vel River extends between 18°35' N to 18°45' N latitudes and 74°5' E to 74°15' E longitude (Fig. No. 1). The highest attitude is 1078m. The Vel river flow from west to east direction and its total area is 266 sq.km. The basin is underlain by basalt rock and at Talegaon Vel alluvium dominantly sandy. Near the Bhairav Temple the Vel has a rocky bed with a minor knick point, the bed rock has well develops potholes and flute marks. After this knick point the river enters a stretch with bedrock bank on the left side. After Talegaon village it again either side, this bedrock incision may also be a relict feature related to rejuvenation when the present base level was established.

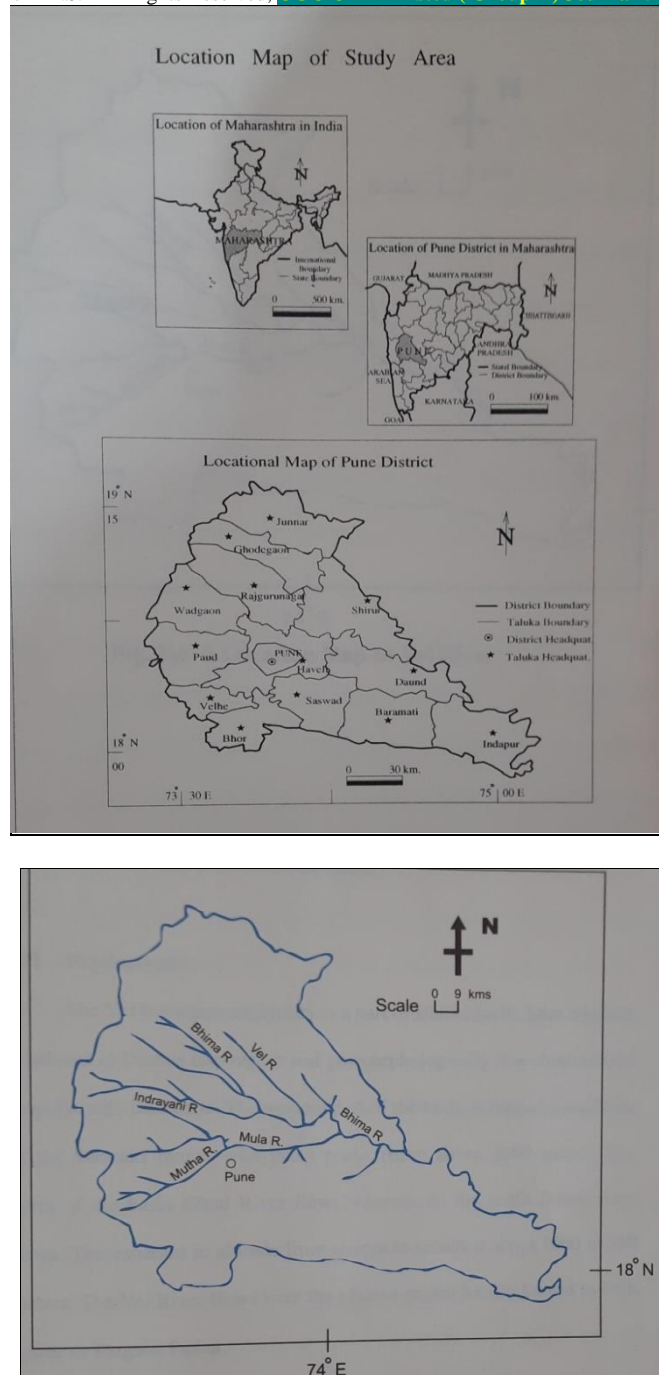


Fig. No.1 Location of Vel river Basin

Physiography

The Vel basin geographically is a part of Bhima basin, litho logically it belongs to Deccan trap region and geomorphologically it is characterized by polycyclic landscape. The western part of the basin is rugged comprising of the Sahyadri ranges with many peaks rising above 1000 meters. The north of the basin Ghod River flows whereas on the south Bhima river flows. The variation in altitude from source to mouth is about 1000 to 540 meters. The Vel River flows over the plateau region locally known as Peth pathar or Pargaon Pathar.

The drainage pattern of Vel is dendritic and it is fifth order stream ranges with many peaks rising above 1000 meters. The north of the basin Ghod River flows whereas on the south Bhima river flows. The variation in altitude from source to mouth is about 1000 to 540 meters. The Vel River flows over the plateau region locally known as peth pathar.

The entire watershed of Vel River has a single geological formation consisting of the Deccan trap or basalt. It consists of basic igneous rocks formed from lava, which formed through numerous fisher

eruptions, lava flows were horizontal, therefore step like topography is formed. The rocks have varied specific gravity and colours like gray, dark gray, grayish pink etc.

Drainage Network

The drainage pattern of Vel is dendritic and it has elongated shaped basin. It is fifth order stream the small stream join other in the first stage and other relatively large streams also join each other into make the net. By analyzing the development of drainage network greater understanding of the landscape as a whole may be achieves. This is possible when there are definable relationships between the form of drainage and the processes at work within basin.

Here the topography and the rock formations are rugged. So the development of each stream is very difficult because the development depends upon the volume and velocity of the water. Instead of these, the most of its catchment in the semi-arid zone in upland Western Maharashtra. These small streams are unable to erode their courses in this area and a large number of first order streams are present in this area. This area has 430 first order streams, and each stream is not very large. All these streams together have a total length 297.31km. The average length of the first order streams is 0.69 km. so the development of the small streams is yet not very significant. The total second order streams are go and all these having a total length of 80.65 km. The mean length of these second order stream is 0.896 km. The third order streams are not many in number and its length of each stream is more than other order streams. The third order streams having a total length 49.75 km. and they are 26 in number. The mean length of the third order stream is 1.91 km. The total length of fourth order streams is 14.4 km and they are 4 in number. The mean length of the fourth order stream is 3.6 km.

Total length of the all streams is 506.11 km. and their number is 550. So the mean length of a stream in the basin is 1.24 km. nearly. So the development of drainage basin is not very much advanced.

The drainage density in this basin is 1.90. Stream frequency within basin area is decreasing from 1" order stream to 4th order stream. The first order stream having more frequency in the basin than any other stream order. The basin has broadly a dendritic drainage pattern. Only three main streams join to the main river course. The drainage network map of Vel basin has shown in fig no.2

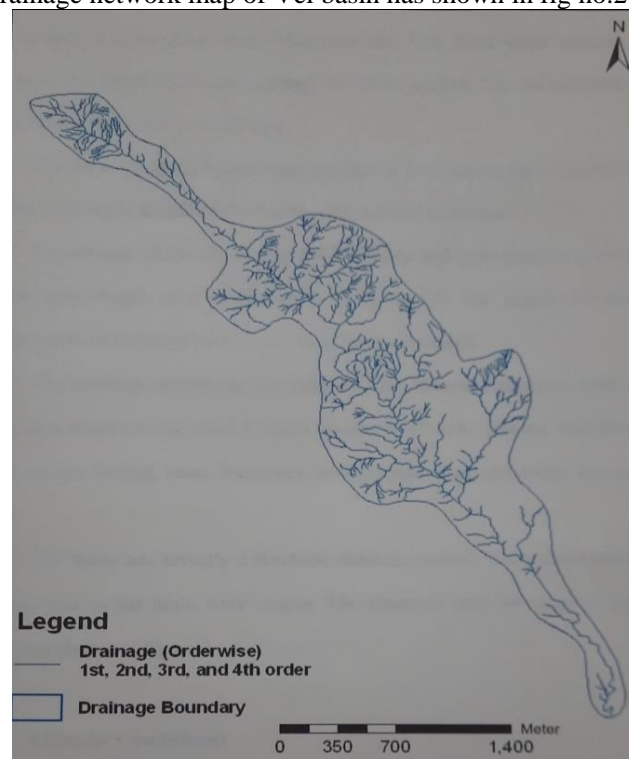


Fig. no. 2 Drainage Network of Vel River Basin

Climatic Conditions:

Generally Pune district has a dry and invigorating climate. But east of the Pune it is different from other parts by the Pune district. This basin fall in the rain shadow belt of Sahyadri. The region belongs to tropical sub- humid in the west to semi-arid in the east with three distinct season's viz., summer, rainy and winter. Actually basin have semi-arid climate because it lacks a catchment in the high rainfall Western Ghats zone.

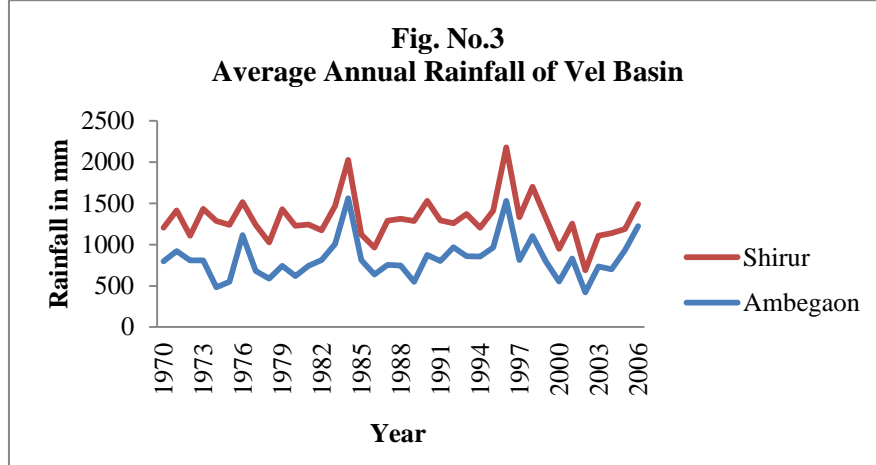
a) Rainfall:

Overall part of the rain is from the southeast monsoon, which begins about the middle of the May and lasts till the end of October and rest of the year it is almost dry, therefore Vel is a seasonally flowing river. Annual mean rainfall decreases from west to east. Vel basin lies between 513 mm to 1223 mm isohyets. The 1223 mm isohyets is in source region. As per the data available from IMD (Indian Meteorological Department, Shivajinagar, Pune) the Vel basin was receiving 533.2 mm in 1998 to 1198.1mm in 2007. In the Vel basin from the source height rainfall gradually decreases towards the mouth. It is about 513 mm to 1223.3 mm marked with July maximum. These figures are average of last thirty eight years of rainfall. Table no. 1 shows the average annual rainfall of Vel basin of two stations i.e. Ambegaon and Shirur respectively. These values are shown with graphically in fig no. 3. According to this graph it is clear that the Ambegaon tahsil receives more rainfall than Khed and Shirur It means the source area of Vel basin has more rainfall and this rainfall has been decreasing from source to mouth.

Table no. 1 Average rainfall of Vel basin

Sr.No.	Year	Ambegaon	Shirur
1	1970	798.1	407.2
2	1971	921.1	493.2
3	1972	810.7	297.0
4	1973	810.7	624.2
5	1974	484.3	801.1
6	1975	550.1	688.8
7	1976	1115.9	401.5
8	1977	679.2	562.0
9	1978	589.0	437.7
10	1979	743.8	685.9
11	1980	620.3	609.1
12	1981	741.9	502.6
13	1982	812.7	360.1
14	1983	1006.4	461.5
15	1984	1561.4	467.2
16	1985	812.7	308.8
17	1986	638.1	326.7
18	1987	754.4	535.8
19	1988	746.9	567.2
20	1989	548.6	739.0
21	1990	875.9	654.3
22	1991	799.6	493.3
23	1992	969.4	288.0
24	1993	861.2	510.5
25	1994	854.1	349.0
26	1995	963.4	449.0
27	1996	1531.2	649.9
28	1997	812.7	519
29	1998	1105.4	598
30	1999	794.3	528.4
31	2000	552.3	394.4
32	2001	832.1	422.8
33	2002	421.8	266
34	2003	735.1	374
35	2004	698.3	438.9
36	2005	933.51	254.6
37	2006	1223.3	269.1
38	2007	1198.1	356.7

Source: Indian Meteorological Dept. Shivaji Nagar, Pune



Therefore source region has good vegetation cover while other part of Vel basin has no more vegetation. There are most land is covered with barren land. Although there are totally yellow colour in toposheet but actually after field work it is seen that the most of the middle to lower part of the basin is covered with barren land. The rainfall affects on the erodibility capacity of river. Therefore the erosion rate is low in upper reach part of the basin due to dense vegetation cover. Whereas the aridity increasing due to low rainfall from middle reach to lower reach region of the basin, but the erosion rate is more in this region because of aridity. Therefore the channel size become more broad than source region.

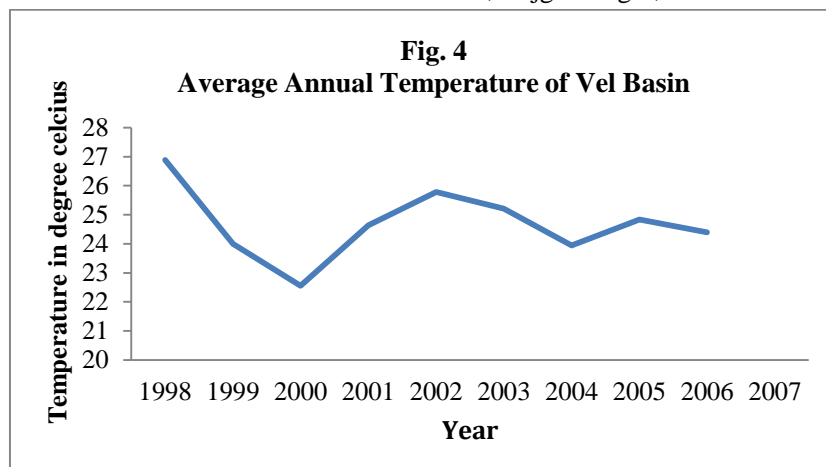
b) Temperature:

The region has different temperature in different season. The mean temperature is lowest in December. It rises steadily thereafter until the maximum is reached in May. The mean maximum temperature is 31.96° C. whereas the mean minimum temperature is 16.8° C. during last ten years.(1998-2007). The table no. 2 shows the average mean annual temperature of Vel basin. The fig no.4 shows the average annual temperature of Vel basin. According to this graph it can be concluded that the temperature rate is increasing from year by year.

Table no. 2 Average mean annual temperature of Vel basin

Sr No.	Year	Maximum	Minimum
1	1998	32.83	20.94
2	1999	31.43	16.56
3	2000	32.11	12.99
4	2001	32.50	16.78
5	2002	32.69	18.88
6	2003	32.22	18.19
7	2004	31.11	16.78
8	2005	31.38	18.29
9	2006	31.43	17.36
10	2007	32.41	17.7

Source: Garlic Research Centre, Rajgurunagar, Pune



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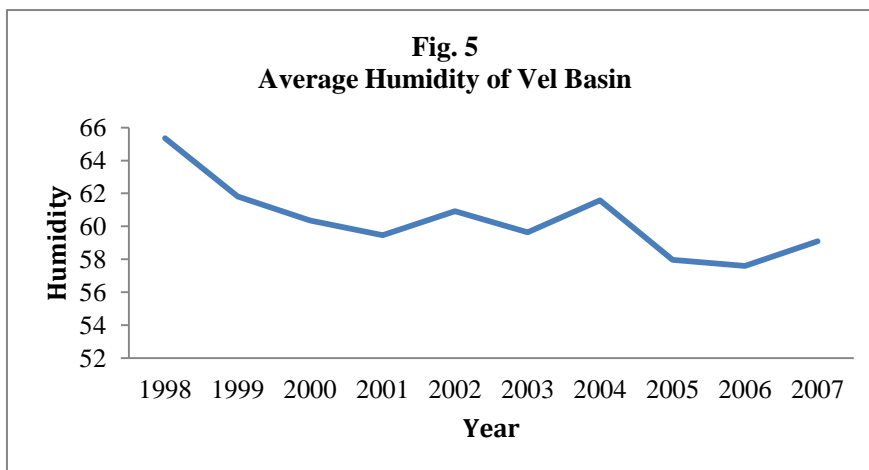
c) **Humidity:**

The region situated as it is on the leeward side of the ghats, is much drier than places on the coast line. Even in monsoon months of June, July, August and September, the mean monthly relative humidity never exceeds 82 %. The diurnal variation of temperature or humidity is high as least in the monsoon months. The relative humidity is high in the morning but is considerable reduced in the evening in winter and summer months. On a few days in the month of May and some times also early in the June, before onset the monsoon. The mean annual maximum humidity of Vel basin is 74.61% and minimum is 41.31% during last 10 years. The variations in humidity have been shown with graphically in fig no.5. According to this graph the humidity increased in 1998 and decreased in 2007.

Table no. 3 Average mean Humidity of Vel basin (in %)

Year	Maximum	Minimum
1998	84.7	46.02
1999	78.41	45.23
2000	78.2	42.53
2001	75.62	43.32
2002	78.48	43.35
2003	76.03	43.25
2004	78.45	44.71
2005	74.61	41.31
2006	73.49	41.69
2007	75.61	42.56

Source: Garlic Research Centre, Rajgurunagar, Pune



d) **Evaporation:**

Evaporation rate is maximum in May and minimum in July month. The mean annual evaporation rate in last 10 years is 5.64 mm.

Soil:

The major soil type observed is black cotton of varying depth, developed from basalt rocks. Generally all region having same clay type soil only the rate of salt and lime contents in soil is different. This rate is high at the lower reach part of the basin. It means it is high at Talegaon Damdhare.

Natural Vegetation:

The Vel basin bears dry deciduous type of natural vegetation with patches of shrubs over plateau surface. The forest cover is rather danced in the upper reaches of Vel basin. There are many trees and bushes like Neem, Nilgiri, Babul, Sag, Cactus, Thorny bushes and thorny trees, etc.

Land Use or Land Cover:

In response to changing slope, soil, and rainfall natural vegetation of the region is observed to vary from ever green, deciduous forest to scrub land and pastures. Agriculture is the main land use in the area. Well irrigation is the major source of irrigation for irrigated lands. The agricultural area can be distinctly

class as single crop fields. Double cropped fields are on the interflaves of tributary rivers of the Vel. There are mainly Jowar, Bajra, Maze, Potato, sugarcane, onion, garlic, grains etc. crops are seen. Polyhouses are also seen there. Besides these Subabhul plantation is also observed near Bhaodi Village in the Vel basin.

Geology:

The principal geological formations outcropping within the Vel basin are Deccan basalt of Late Cretaceous to Early Eocene period covered by black soils. The present day landscape has been formed over the last 60 myr years after the eruption of Deccan Trap near the Cretaceous Tertiary boundary. Tectonic forces play a major role in forming the landscape over long time scales while climatic change leaves its imprint over shorter time scales. There are no faulting in this region.

The rock is dark gray to greenish gray in colour. Brownish to purplish and greenish tints are also found in this area. Generally the relief of this region is varies from place to place. The maximum contour is 1078 m. A high relief implies gently to steeper slope as the vertical distances increase from the river beds.

Conclusion:

The rocks exhibit a tendency to spheroidal weathering by the exfoliation at roughly concentric shells, and hence ratherly rounder weathered masses called "boulder" are very common. These are seen generally scattered along the foot hill of the hilly terrain throughout the Vel basin. It means they are seen in upper reach part of the basin. In this area the physical factors are more dominant for the weathering. The rainfall and the fluctuation of climatic conditions are help to physical weathering. Due to variation in temperature and rainfall. exfoliation weathering is more. The humidity and the temperature are combine help to weathering. Due to humidity the oxidation take place in the rock and the special weathering stand. Due to this weathering the boulder formation is common in this area. The boulders are found in the upper reach or along the foot hill zone of the river basin. The biological weathering is also observed in the upper reach part of the basin. It is help to erosion process. However, the rate of erosion in the upper reach part of the basin is very low because the rainfall is high in this zone; consequently vegetation cover is better in this zone. So it helps for controlling the erosion of soil and rock material. But from the middle reach part the erosion rate increased due to aridity although the rainfall is low.

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