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ANALYSIS OF FLUVIAL LANDFORMS IN VEL RIVER BASIN

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Abstract

The geological works of fluvial processes or rivers are called three- phase work comprising erosion, transportation and deposition. The fluvial landforms are divided into two major groups. These are Erosional landforms and Depositional landforms. Erosional and depositional landforms in Vel River Basin are studied in the present paper. The significance of this study is to understand the geological characteristics and fluvial landforms in the Vel Basin.

Key Words: erosional landforms, depositional landforms, geological characteristics

Introduction:

Geomorphology is the study of fluid agents that erode, transport and deposit mineral and organic matter. The important fluid agents are running water on surface and underground. The landforms either carved out (due to erosion) or built up (due to deposition) by running water are called fluvial landforms (both erosional and depositional) and the running water which shape them are called fluvial processes which include overland flow (surface runoff) and stream flow.

1**) Erosional landforms:**

Weathering is a preparatory stage and may make erosion easier, but it is not prerequisite to nor necessarily followed by erosion. The erosional work of the rivers depends on channel gradient, volume of water, velocity and thus kinetic energy, water discharge, river load (tools of erosion) etc. The quantity, size and caliber (angularity) of erosional tools largely control the nature and magnitude of fluvial erosion.

Before studying the erosional fluvial landforms of Vel River it a be necessary to understand the processes of fluvial erosion which are discussed as following:

Erosional Landforms in Vel Basin

The important landforms created due to the erosion work of Vel or running water in its catchment area are as follows

Hill slope Erosion:

l Rills and Gullies
2 Knick points
3) Potholes
4) Pools and Riffles
5) Structural Benches
6) Meanders
7) Flutemarks

Hill Slope Erossion:

The raindrops falling on the ground splash up the soil particles at the Point of impact. This method of splashing particles in love This moved loose materials carried away by river the form of rill, gully of stream

A) **Rills**:

As water flows down the surface of a hill slope there will be concentrations of flow due to topographic irregularities (Horton, 1945). All some critical distance from the divide, depending on infiltration and resistivity of the surface, slope steepness and runoff intensity erosion of a small channel will be developed.

Rills may also be initiated on random bare or sparsely vegetated spots where soil is loosened by raindrop impact and removed by a surge, or wave train, as water moves down the slope. The loss of the topsoil reduces productivity and soil deposition of silt causes sedimentation of stream, dams and reservoirs, which deteriorates water quality and damages aquatic habitats.

Rill erosion is commonly seen on agricultural land developed for vegetation. Texture contrast soils and poorly managed pasture areas more susceptible.

Such type of rill erosion is seen on the hills observed in the Vel basin. This feature has been shown in photo no.3. These rills are not very identifiable because the rate of erosion is not very high due to less rainfall in this region.

B) **Gullies:**

As divides between rills are lowered or obliterated, cross-grading occurs by which water is diverted across disappearing rills laterally into a developing main channel. Diversion of the flow into one large channel increases its erosive and grading ability. Thus one rill many become enlarged enough to be called a gully. Gullies are observed in upper reach part of the Vel Basin.

Longitudinal profile analysis:

Longitudinal profile or valley thalweg means longitudinal course of var from its source to the mouth. It is an important aspect while studying Handlern Longitudinal profile generally indicates the flow of the river pending open the gradient in the thalweg. The thalweg gives the idea about ite gradient varying the river descends from its source towards the lower sternches. It is the visual representation of the natio of the fall of a roits length over a groen mach or configuration of the channel hottom begininal view. The longitudinal profile is a product of denodation pes and Sthology. The shape of the longitudinal profile reflects the ution history of the area, locations in climate, and de river gradients. The longaudinal profile the evolutionary stages of landform Arvekoprons and it changes with time and the nature of the gradient. Thus, analysis of longitatinal profile is important to understand the demadatina ichronology of the landform development

The longitudinal penfile of Val River has been drawn as shown in ig 15. The topographical maps (1:50 000) of survey of India have fere muat the the analysis of longitudinal penfiles. The general profile of main course f Vel River is concaving upward. Some breaks of low magnitude are seen in the profile at an altitude of 900 meters, 770meters and 680 meters.

Upper part of the river is mainly areas of collection of water and erosion of the land surface, while the lower part of the river is a area of deposition with in gradation. The course material and the boulders having various size are mainly at upper part of the river. The small boulders like cobbles, gravels, pebbles and sand are seen in the middle part of the river. The fine material like debris load of a river is much finer-grained, and the velocity required to carry it can be much lower. However, the profile is probably the result of the balance of the capacity and competence. Here the river ability to transport a load depends upon the gradient of the river. Its volume and the fineness of the particles comprising the load, also it depends upon channel width and depth, bed roughness and channel pattern. Here the lithology and the rock type are the effective factors to develop the longitudinal profile. So here the gentle gradient is more in length and steep gradient is less in length only at the upper part of the river.

3) **Knick in longitudinal profile**:

The breaks in channel gradient cwned by rejuvenation (either due to spt or fall in sea level) are called knick points or heads of These breaks is channel pradim or knickpoints denote dien dope of elevation in the longitudinal profile of the rivers and allow the water to fall down vertically giving birth to waterfalls of varying dimensions. These knickpoints are seen in Vel basin at live stations. These are t Karwadi, Petch, Wadgaon, Bhairav temple at Talegaon Dhamdhere and Upper part of Talegaon village. These stations of Knickpoints are shown as roughly in longudinal profile.

4) **Potholes**

Potholes are circular or oval-shaped depressions in rocks. They are Formed by fluvial abration. Potholes appear kettle shaped like depressions in the rocky beds of the river valleys, which are usually cylindrical in shape and drilled into the rock by turbulent high velocity flow (Alan Clowes and Peter Comfort, 1982).

Potholes are observed at one place in the channel of Vel River, near the Bhairav temple. The Vel has a rocky bed with a minor knickpoint and this bedrock has well developed potholes. In Vel River, cracks were created on the upper surface of knickpoint (River bed channel). Running water eroded these cracks and troughs were formed. Later, the geomaterial or cutting like boulders, angular rock fragments

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were trapped in the trough. When the velocity of the river water increases water enters the trough and starts moving in circular manner along with the boulders and angular rock fragments. The speed of circular motion depends upon the speed or velocity of river flow.

During the time of floods the velocity increases and so the speed of the circular motion of water. The boulders and angular fragment material starts drilling and grinding the rock bed of Vel, which results into deepening of the trough. As the trough becomes deep its shape changes and looks like a pot. Thus known as potholes. Potholes develop in rivers channel bed.

The diameter depth of potholes present in the Vel Basin has increased since last many years. Many potholes are observed below Bhainev Temple. The diameter of potholes ranges between 0.1948 meters to 0.5230 meters. Moreover, depth varies from 0.3268 meters to 2.1385 meters. Potholes gradually grow larger and coalesce to form an inner channel. This single inner channel generates the flow conditions required to erode the bedrock during large floods Rocky boulders usually flank the inner channel, which may display depository piles of course sediment on top (Gupta 1999).

5) **Pools and Riffles**:

If the longitudinal profile is broken into a series of irregular steps of alternating steep and gentle reaches known as riffles and pools respectively. A pool is characterized by a water surface profile less than the mean stream gradient and by finer bed material, whereas a riffle has a water surface slope steeper than the mean stream gradient and is composed of coarser bed material. As discharge increases the difference in water surface slope over riffles and pools becomes less pronounced. Variations of width, depth and velocity along a channel occurs because of pool-riffle sequences. Riffles are wider and shallower than pools. The pool and riffle sequence are seen in Vel River channel after knickpoints.

5) **Flutemarks**:

Flutemarks is also one of the important erosional feature seen in Vel River. These flutemarks are developed due to erosion in bedrock. Such type of flutemarks is developed in rocky bed of Vel River at near Bhairav Temple.

6) **Structural Benches**:

The step-like flat surfaces on either side of the present lowest valley floors are called terraces. These terraces formed due to differential erosion of alternate bands of hard and soft rock beds are called structural benches or terraces because of lithological control in the rate of erosion and consequent development of benches.

The Vel River basin has four structural benches. The first level is al source region (Matewadi), second level is at Kolharwadi, third is at Wafgaon and fourth is at Shikrapur. The rough sketch of structural benches has been shown in fig no. 18.

7) **Meanders**:

River meanders refer to the bends of longitudinal courses of the rivers. Meandering is most pronounced in the regions characterized by even surface and gentle slope, alluvial deposits and sufficient stream discharge.

Meanders are looping changes of direction of a stream caused by the erosion and deposition of bank materials. These may be somewhat sine wave in form. Typically, over time, the meanders don't disappear but gradually migrate downstream. If some resistant material slows or stops the downstream movement of a meander, a stream may erode through the rock between two legs of a meander to become temporarily straighter, leaving behind an arc-shaped body of water termed an ox bow lake or bayou. A flood may also result in a meander being cut through in this way.

The meanders are developed in the Vel River channel. The neanders are seen at the lower part of the river, at the confluence region.

Depositional landforms:

The major depositional landforms seen in Vel basin are as following:

1) Sand bars
2) Slack water deposits
3) Alluvium

1) **Sand Bars:**

Sand bars are generally developed due to the decreasing capacity of river erosion and increase in deposition process. A sliool is a somewfiat lincar landform within or extending into a body of water, typically composed of sand, silt, or small pebbles. Alternatively formed sandbar or sandbank.

The sand bars are seen in Vel River channel at Wafgaon. The length of sand bar is from 10 m to 14 m and the width is from 4m to 6m.

2) **Slack Water Deposits:**

Slack water deposits are also a one of the important feature seen a Vel basin. Numerous rock shelters and alcoves along the river provide sites conducive to deposition of flood sediments and protection from weathering. The semi-arid climate of the drainage basin is conducive to flash-flood generation (Butter and Marsell, 1972), allowing rapid formation of slack water deposits from high sediment concentration discharges. These deposits are also used to augment historic and gauging record accounts of large foods.

Aonding to M. 1. Saner and W.D. Erskine (1993) Slack Watior Depenins (SWD) are typically fine-grained sand and silt, which accumulate rapially Inuts suspension during large floods in areas where flow velocities are locally reduced. However, the higher-level SWDs were too thin and hioturtuted sy be clearly differentiated from locally derived colluvium Heavy mineral analysis of the very fine sand fraction of these high level SWDs identified minerals (epidote and pyroxene) that were not present in the surrounding bedrock. Epidote and pyroxene were derived from distant sources and were emplaced by at least one palaeoflood. A radiocarbon date of 3756 72 years BP was obtained by tandem accelerator mass spectrometry on small fragments of charcoal contained in the high-level 5WDs. Therefore, at least one palaeoflood larger than any historic flood occurred during the late Holocene SWDs indicated that the largest palaeoflood had a peak height at least 8.0 m higher than the 1867 flood.

Floods carry fine sediment high in the water column and deposit it in cases on lodges and in the mouths of tributaries. These slack water dropouts can be used to indicate the height of floods. This slack water deposit can be used to indicate the height of floods. This SWDs lies-10 m above the channel bed and extends-75 m up the tributary.

Such type of slack water deposits is observed along the Vel river bed. The width of slack water deposits from 6 to 15 m and the height is from 1 m to 4 m. The size of particles is different that is from 0.25 mm to 1 m in diameter.

3) **Alluvium:**

Alluvium is the fine-grained sediment deposited by rivers. It consists of mud, silts and sands, and is usually very fertile. Alluvium is deposited in river beds, on floodplains and in estuaries.

On the bank side of Vel River we observed various layers of alluvium. There seen the deposition of recent and old alluvium. The old gravels are seen at the bottom side, the layer of sand is in middle part and clay soil is at top part.

Conclusion

The fluvial landforms seen in the Vel basin are rills, gullies, potholes, knickpoints, structural benches, meanders, flutemarks, slack water deposits, sand bars, and alluvium. These features are developed due to the erosional and depositional activities in the basin.

Besides these, one of the important characteristics of Vel River is that this river is ungraded in character even near its confluence because potholes and flutemarks such features are also seen in this zone. The rate of headward erosion is active in source region therefore it can be concluded that there are some possibilities of river capture in this zone.

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