

## **Background Information and Attributes**

### **Geology, Rock & Soil**

In general the area consists of succession of hills and valleys, which are extension of main series of Satpuda range. In this tract main ridge of Gavilgad hills runs East to West. The area of Project Tiger lies in the North of this ridge. The highest point is Vairat, which is about 1178 meter above M.S.L. Numerous spurs, branch from this ridge towards the north where these have flat tops locally known as “*ballas*” (Plateau) of considerable size. The ridges usually have abrupt slopes and form narrow valleys below locally known as “*Khoras*.”

### **Drainage**

Area is drained by Khandu, Khapra, Sipna, Gadga and Dolar rivers which are tributaries of TAPI. Main ridge of Gavilgarh hills forms a water divide between TAPI and PURNA rivers.

### **Geology**

Geologically the Melghat Tiger Reserve area is the Deccan trap and underlying rock is basalt in one form or another. The most common form is a hard dark coloured rock, compact or fine grained, but occasionally with numerous phenocrysts. This rock usually occurs in thick layers and outcrops of it give rise to the conspicuous scarps on the hill side. Prismatic jointing is well developed and at many places fine examples of columnar structure can be seen, particularly in the beds of rivers and streams. When the hard scarp undergoes weathering, it is converted into soft earthy brown rocks with rows, representing the original columns of roughly spherical bodies exfoliating in successive concentric shells. A second form occurring in the lower hills is grey vesicular basalt, the cavities being lined with crystals of quartz and other minerals. Then there are the thick layers of basalt tuft, as off grey, dull fine grained rock that occurs occasionally representing the intervals of time that elapsed between the successive lava flows. These rock units are formed by a variety of geo activities attributed to Archaeans, Gondwana, Lameta, traps, laterites and alluvium.

### **Soils**

Soil types vary considerably; the reason attributed to this is different conditions of weathering and marked variation in rainfall within the area. Soil formation varies with rocky,

clayey, lacustrine sediments with porous, pitted, clayey to alluvium calcareous, black cotton soil covering extensive areas. Soil so derived from the weathering and disintegration of underlying rock is fertile though generally stony and has considerable variation in depth and drainage. Soil is very shallow on the steep upper slopes. It is on terraces, lower slopes and valleys that the soil has some depth. The following three categories have been recognized.

**(i) Bouldery Soils**

This type of soil covers the greater part of the reserve. This is mostly confined to the slopes. It is dark brown in color, clay like in texture and blocky in structure. It being on slopes is very well drained, in fact drainage is very excessive which results in the soil becoming absolutely devoid of its moisture content in dry season. Analysis of this soil revealed that it is rich with nutrients. Texture on slopes is clay loam to clay. In the valleys it is clay on top but sandy loam-sandy clay-loam at lower depths. The soil tends to be neutral to slightly acidic which is suitable to most species. The best forests of the Tiger Reserve grow on this type of soil in valleys and on lower gentle slopes.

**(ii) Lateritic Loam**

Lateritic loam generally occurs on hill tops and plateau and is noticed around Chikhaldara, Vairat and other parts of the reserve. This soil is very shallow and dry and has a characteristic red brown colour. This soil is poor in nutrient, which gets leached out during the rains, is very low in organic content and has very poor water retentive capabilities. Tree growth is very stunted and sparse on this soil.

**(iii) Clay Soils**

This type of soil occurs in depression and on level areas. These soils are very fertile but have poor drainage status. Open areas of such soils are liable to have frost in severe winter. Soil in general is rich in calcium and its ph is near neutral.

**Terrain**

The name Melghat itself signifies meeting of *ghats* and Reserve is located in a setting of rugged hills, steep cliffs and deep gorges. The highest ridge lies on the Southern flank of the reserve. Average height ranges between 381 meters and 912 meters above sea level, these hills and valleys have constant abrupt variations in aspect and gradient.

## **Climate**

Climate is tropical. December is the coldest month, when night temperature may go up to 5<sup>0</sup> C and May is hottest month (47<sup>0</sup> C). Due to the variation in altitude and aspect, the climate in Melghat is varying and distinct seasons are experienced during the year. Except for monsoon season, the air is generally dry.

- i) The monsoon or rainy season- from the middle of June to the end of September.
- ii) The autumn season- October to November.
- iii) The winter season - from December to February.
- iv) The summer season from March to Middle of June.

Good rainfall is received during monsoon. The rainfall in the area varies from 2250 mm to 1000 mm. Average no. of rainy days experienced is 65 to 90.

## **Temperature**

Temperature varies considerably with the altitude. The higher hill plateaus and valleys to the North of the main Gavilgarh ridge are very much cooler in summer than the southern foot hills. The plateau and the higher hills enjoy almost equitable and pleasant climate throughout the year. While valleys become cold during winter. These valleys experience some-times heavy dew and occasional frost. The average mean maximum annual temperature is 46<sup>0</sup> c and the average mean minimum annual temperature is 4<sup>0</sup> c.

## **Frost**

Frost generally occurs in the valleys of Semadoh, Raipur, Harisal and parts of Akot range. Within the tiger reserve frost damage is caused in the low-lying and open areas under cultivation or adjoining cultivation. Originally, damage is confined to young growth when leaves and tender shoots are killed. Area prone to frost is indicated by its low lying black, cotton soils, the presence of dominant Saj (*Terminalia tomentosa*) and bushes like "Dhi" (*Woodfordia floribunda*) and Samalu (*Vitex negundo*).

## **Dew and Fog**

Dew formation is very common during winter. It is important to know the period of cessation of dew formation as it is interrelated with the commencement of pinch period. But in this respect no record is available.

Fogs are known in the area. Chikhaldara, Makhala plateau, Ghatang to Kokroo experience prolonged fogs in rainy and winter seasons.

## **Winds**

Winds are generally light to moderate. There is no record of severe storm or cyclone of any consequence in the area. The stunted nature of the forest in exposed situation at high elevation is partly due to strong winds, which sometimes occur during the hot and rainy season.

## **Monitoring Of Rainfall And Temperature**

Presently weather monitoring stations in Project Tiger area are operational at Vairat, Tarubandha, Semadoh, Koktu, Bori, Jarida and Rangubeli. Establishment of other stations at Wan and Ambabarwa Sanctuaries would be worthwhile to the whole project Tiger area.

## **Hydrology and Water Sources**

### **Nature and Distribution of Water Sources**

The Gugamal National Park and Melghat Sanctuary area is well drained by many rivers. Most of the rivers are seasonal and flowing water remains there till February only. The tract has five major drainage systems viz. *Khandu, Khapra, Sipna, Gadga* and *Dolar* and these rivers contribute as the important tributaries of *Tapi* river which is a perennial river and flows along the Western boundary of the reserve between Kund and Rangubeli for about 6 kms. Numerous depressions in river beds have accumulated water at places locally called as '*dohs*'. There are small numbers of springs which are of perennial nature. Such pools and springs are very important for wild animals and live stock in the area. Water pools in such *nalla* beds and depressions are supplemented by 15 anicuts at strategic places. Few artificial water bodies like tanks near Tarubanda, Kesarpur, Gullarghat, Malur, Chaurakund, Mehriam, Chunkhadi, Ruipathar are significant additions to surface water source because of their close vicinity to habitation. Absence of large surface water bodies has avoided faunal congregations and consequent damage to habitat.

In the Wan Sanctuary there is only one major river draining the area namely, Wan River that flows from East to West. Other important surface water body in the protected area is the Wan river reservoir at Wari. The presence of Wan dam, with its watershed acts as a good source of groundwater. With the relocation of Nagartas villages in 2011, it is poised to become a major habitat of all prominent wildlife.

In the Ambabarwa Sanctuary there is no major river draining the area. The presence of base flow in various nallas confirms the fact that it is a gaining area i.e. groundwater is being discharged. Important surface water body adjoining the protected area is the Wan river reservoir at Wari. The presence of Wan dam, with its watershed acts as a good source of groundwater recharge to the formations in the area.

From the hydrological points of view the tract of Narnala sanctuary is a part of Gavilgarh range covered by the boulders and debris. Abundant supplies of fresh water are available at a depth of 3 to 5 meters from the surface. The old tanks on the plateau are important source of water.

**Water Management-** Since erstwhile core area i.e. Gugamal National Park of the Tiger Reserve only remained under the administrative control of the Directorate, concentrated efforts for creating water resources like construction of bandharas, anicuts, wiremesh structures were taken up in the area till 1999. It is only after 1999, when the remaining area of the project was transferred to the directorate under unified control, the focus for creating new water resources and taking up soil and moisture conservation measures in remaining areas shifted here. However, due to constraints of funding most of the area in the buffer zone (area handed over to Melghat Tiger Reserve after 1999) still remains or is in dire need for development of water resources. The areas like Hatru, Chaurakund, Jarida, Dhakna even part of Raipur, Semadoh, Harisal, still remain to be covered as far as development of adequate water resources is concerned. Further for want of adequate funds, cleaning of large number of existing water holes, desilting of anicuts etc. also has been lagging behind in many parts of the Reserve.

Water scarcity in summer is a major impediment that affects distribution of wildlife and thereby habitat utilization. The rivers and numerous nallahs flowing through Melghat Tiger Project are seasonal and have beds strewn with boulders. The rain water is quickly drained out through these rivers & nallahs. There are number of small pools in these rivers where water is available almost throughout the year, and these are utilized by human beings as well as animals.

There are a few springs where water continues to trickle in small quantities even in severe summer. In summer, water is available in dohs in the rivers, nallahs and from a few springs. The wild animals, therefore, descend in the valleys in the plain and the lower slopes in search of water, leaving their habitat at higher reaches unutilized. There are natural perennial water holes which have the ability to recoup their potential and storage capacity but these are very few. In order to augment water resources artificial waterholes have been created by constructing bunds, anicuts & underground bunds etc. Artificial water development attempts in the form of bore wells for fulfilling consumption needs of inhabitants in multiple use area are just at satisfactory level. Much needs to be done in this regard. Most of the natural waterholes are over burdened with domestic cattle. Wildlife populations suffer from poisoning for fishing. Major poisoning is done by using urea and pesticides. The occasional use of pesticides and insecticides and natural fish poisons like three bark or fruits and seldom use of dynamites render the water holes hazardous at times. Many water holes are tapped for fish and by the end of winter the water scarcity attains pinching situation. Augmenting water on compensatory ground i.e. making available alternative waterholes for the cattle and the wild fauna needs to be taken up on priority. Desilting of water holes, protection from poisoning, restricting use by domestic cattle and cleaning of water holes may also improve the situation. Daily monitoring of waterholes in summer, initiated since 2010, has yielded encouraging results. It needs to be continued.