Description of the Region

(Geographical extent, topography, climate, and vegetation)

The Maharashtra state is about 800 km east-west and 700 km north-south, an irregular dentate pentagon, lying between 22° 1'-16° 4' north latitude and 72° 6'-80° 9' east longitude, covering an area of 3,07,690 sq km. It is limited to the west by the Arabian Sea, making a long coastline of 720 km, by Goa and Karnataka to the south, by Andhra Pradesh on the south-east, and Madhya Pradesh on the north, and Gujarat to its north-west (Map 1).

Western Ghats or Sahyadri separate coastal strip of Konkan from rest of the plateau and thereby altitude ranges from mean sea level to about 1200 m on Western Ghats (with some highest peaks in the range like Kalsubai- 1654 m, Mahabaleshwar-1382 m) and about 200-900 m over the rest. Average rainfall in the state varies from 250 cm in Konkan to 60-75 cm in Marathwada and again increasing to 150 cm towards eastern most part of Maharashtra that is Vidarbha. It forms a large part of Indian Peninsula. Similarly temperature varies between 15°C-47°C. Relative humidity fluctuate between 15% to 90%. Nearly 21% of the geographical area is under forest.

Physiography


Konkan, a narrow coastal strip of the west of Sahyadris, varies between 27-48 km in breadth and 800 km in length from Goa to Tapi Basin. The average height of the region is 6-9 m from mean sea level. It comprises 5 districts- Bombay, Raigad, Ratnagiri, Sindhudurg and Thane.

Deccan is lying to the east of Sahyadris which is approximately 563 km long. The average height of Sahyadri hills in Deccan is 1200 m and the highest range at Kalsubai is 1646 m. It consists of 7 districts - Ahmednagar, Kolhapur, Nasik, Pune, Sangli, Satara and Solapur.
Map 2. Physiographical 5 divisions of Maharashtra state
Khandesh lies in valley of the Tapi river located between Ajantha and Satpuda ranges and separated from western Maharashtra by the hills of Laling and Silvari. The 3 complete districts in Khandesh are Dhule, Jalgaon and Nandurbar. Besides, Baglan in Satana taluka of Nasik district is also considered as a part of Khandesh.

Marathwada is a vast plateau to the east of Sahyadri. It consist of 8 districts of Maharashtra viz., Aurangabad, Beed, Hingoli, Jalna, Latur, Nanded, Osmanabad and Parbhani.

Vidarbha or the eastern Maharashtra comprises 11 districts viz., Akola, Amravati, Bhandara, Buldhana, Chandrapur, Gadchiroli, Gondia, Nagpur, Wardha, Wasim and Yavatmal. It stands on an upland plateau of 457 to 548.6 m elevation (M.R. Almeida, 1998). Presently, it has been divided into 34 districts.

Maharashtra is essentially a part of Western India and the northern part of the Western Ghats ranging from Parner fort on Daman-Ganga to Baba Budhan Hills in Mysore through Savantwadi and Goa is called Sahyadri. These are flat-topped mountains having a varying height of 20 to 2000 m above the sea level. These run north-south and are about 750 km in Maharashtra. These are 50-80 km broad and separate the Desh from narrow coastal strip of Konkan. It is widest, about 75-80 km, in Ulhas-Vaitarna valley in Bombay region. The Satmala range of the Sahyadri mountains starts from Saptashringi hills and extends towards Daulatabad, Aurangabad and Mannmad. There is a gap in these ranges between Daulatabad, Mannmad and Ajantha ranges, which is called Ajantha-Daulatabad-Ankai gap. Below this comes the second important range of mountains known as the Balaghat range. It starts from Harischandragad in Akola taluka of Ahmednagar district and extends up to Gulbarga, through Bidar and Osmanabad. The third mountain range running west-east is known as Shambhu Mahadev mountains. They extend further into Karnataka.

The Desh plateau rises by stages from 335-366 m and 377-610 m at different places but the major part of Maharashtra is only 91-183 m high on the Desh side. The highest peaks of the Sahyadris lie near its main axis forming watershed between Desh and Konkan. The altitude drops suddenly to 122 m on Konkan side and thence almost to sea level. Strong hill forts on the peaks and spurs of Sahyadris have been known since the
days of Kadambas. The famous among them are Sinhagad, Raigad, Pratapgad, Purandhar, Panhala, Harishchandragad, Shivneri, Daulatabad, Songa, Aguada and Fonda etc.

Two conspicuous features in the scenery of Sahyadris are the mountain passes and 'Mavals'. The mountain passes locally called Ghat (Map 4) or Bari are the connecting routs between Desh and Konkan. These are often quite narrow and lead from plains at lower altitude to higher mountain plateau and vice versa. These ghats are very zig-zag paths in the weak sectors of mountain with a scarp or cannon on one side and a valley on the other. There are 72 ghats in Maharashtra among which the famous are - Bor ghat or Khandala ghat between Bombay and Pune, Kasara ghat or Thal ghat between Bombay and Nasik, Pasarni ghat between Wai and Mahabaleshwar, Phonda ghat between Kolhapur and Kankavli, Varandha ghat between Bhor and Mahad, Fitzgerald ghat or Ambenali ghat between Mahabaleshwar and Mahad, Amba ghat between Kolhapur and Ratnagiri, Amboli ghat between Kolhapur, Ajra and Sawantwadi, Malshej ghat between Bombay and Junnar, Melghat between Gavilgad and Amravati, Aner ghat between Narnada and Indore, Gonda ghat between Mokhada and Trimbakeshwar, Parsuram ghat between Khed and Chipul, Par ghat between Poladpur and Wada Kumbharosi, Kumbharli ghat between Chipul and Patan, Katraj ghat between Pune and Bhor, Diva ghat between Hadapsar and Saswad, Chandwad ghat between Nasik and Malegaon, Ramghat between Amboli and Goa, Nane ghat between Murbad and Junnar, Bawda ghat between Vaibhavwadi and Gaganbawda, Kudal ghat between Wai and Jauli, Nandurbar ghat between Jalgaon and Surat and Ankai pass between Ajanta and Daulatabad.

'Mavals' are valleys well protected by two mountain spurs running parallel and are fed by mountain streams. They are well protected uplands, well-drained valleys, and well-watered by hill streams. They are different from the surrounding areas and provide unique climate and locations for plant growth in isolated conditions. They are something like the shoals in the Nilgiris in South India. Valleys of Mavals below Junnar are called 'Nere'. The word is derived from the Persion word Nehar, which means a tributary or a rivulet or a canal.
Drainage System

The drainage system of Maharashtra is fed by six major rivers and many small rivulets. Originating from Desh part of elevated hill stations, all of the major rivers (except Narmada) flow into the Bay of Bengal after crossing the boundary of this state whereas the small rivulets enter into the Konkan region and meet the Arabian sea. The six major river systems pass through Maharashtra are Narmada-Tapi-Purna, Wardha, Godavari, Bhima, Krishna and Hiranyakeshi or Ghatprabha.

Soil

Soils of Maharashtra are mainly formed from the Deccan Traps, generally from the augite or amygdaloidal basalt. These soils are black, dark brown or reddish in colour, and hence are called Black Cotton soils, or 'Regur' soils meaning thereby red soils. Very small proportions of soils are believed to have derived from Vindhyan and Gondwana formations. They are sandy or loamy soils, which are found at Nagpur, Bhandara, Chandrapur and at Redi and Savantwadi in Sindhudurg district.

Black Cotton soils or 'Regur' have high percentage of clay and are heavy in texture. They are sticky and plastic in nature and swell on wetting and shrink on drying. They contain adequate mineral nutrients and micronutrients and hence they provide good habitat for plant growth. It is slightly alkaline in nature and poor in humus and nitrogen. Generally deep black cotton soils are not formed at high altitudes of mountains. The black cotton soils in rain scarce zones of Ahmednagar, Solapur, Jalna, Beed and Aurangabad are saline and therefore infertile.

In Desh, two different types of soils are found. The first light brown soil in Mavals, the other deep coloured soil found on low gradients occurs in Kolhapur, Satara, Pune and Nasik districts. In this region, below the black soil, there is generally coarsely powdered sedimentary rock, which is called 'Murum' mixed sometimes with lime or 'Kankar' or salt or salinised lime and gypsum.

In high temperature areas of Deccan Trap salt accumulates on the surfaces or it remains at a certain depth in the soil and leads to salination and then to alkalization which is harmful to plant growth and affect the yield.
In Konkan the seawater periodically deposits salts and then this is washed away by fresh flooding monsoon water. These lands are known as Kharlands. The soils in Khandesh and Vidarbha have a fair amount of calcium either as nodules (Kankar), or in layers which reduces the salinity of soil.

**Climate**

The climate of Maharashtra is monsoonal. It is controlled by Arabian sea by its cooling effect and by Sahyadri mountains by its altitude. The year is divided into four main seasons. The winter season from December to February, summer season from March to May, monsoon season from June to September and postmonsoon season from October to November. On the basis of climate, the state can be classified under the following main types.

**Monsoon:** This type characterized by an annual rainfall of more than 100 cm is confined to the coastal belt and the adjoining Ghat region covering the districts of Thane, Raigad, Ratnagiri and the western hilly parts of Pune, Satara and Kolhapur districts. The mean daily temperature is above 22°C throughout the year and the mean daily relative humidity is above 50%.

**Dry climate:** This type covers the semi-arid portions of Jalgaon, Nasik, Aurangabad, Pune, Beed, Satara, Osmanabad and Kolhapur and almost the whole of Dhule, Ahmednagar, Sholapur and Sangli districts. Mean daily temperature is above 18°C throughout the year. Annual rainfall is 60 to 80 cm and is confined mainly to south west monsoon season. Mean daily relative humidity is less than 50% throughout the year.

**Tropical Rainy:** Parts of Nasik and Jalgaon districts, eastern portion of Aurangabad, Beed and Osmanabad districts as well as the remaining districts of Marathwada (viz. Parbhani and Nanded) and Vidarbha have a tropical rainy climate. The precipitation is above 70 cm and confined to the monsoon season. Mean daily temperature is above 18°C throughout the year. The average relative humidity is above 50% except during summer when it is less than 30% for 1 to 2 months.

**Precipitation**

The main form of precipitation in Maharashtra is the monsoon. Mist or snowfall is not experienced in the state. Fog is seen at certain high elevations like Khandala,
Mahabaleshwar, Panchgani, Amboli, Matheran and Melghat in the pre and post monsoon period early in the morning when the humidity is high and variation in day and night temperature is wide.

The state experiences extremes of rainfall ranging from more than 700 cm over the ghats to less than 50 cm in Madhya Maharashtra. The coastal strip and the Western Ghats exposed to the southwest monsoon receive the heaviest rains exceeding 200 cm. Rainfall over the ghats may exceed 500 cm annually. The highest rainfall at Amboli is 747.7 cm in Sindhudurg districts. The lowest rainfall area in Maharashtra runs from Daund-Baramati sector in Pune district to Indapur-Mhaswad sector to the southwest, where the annual rainfall is less than 50 cm. July is generally the rainiest month but where as in Ahmennagar, Aurangabad, Beed and Solapur where September is the rainiest month. Konkan receives 94% and Vidarba 87% of annual rainfall during the monsoon season (June to September). Madhya Maharashtra and Marthwada get 83% of the annual rainfall during the monsoon and about 11% during post monsoon months of October and November.

**Temperature**

There are three seasons viz., the wet season from July to October, the cold season from November to February and hot season from March to June. In the coastal districts, temperature is mainly controlled by sea breezes and ranges from 17°C to 28°C in winter and from 19°C to 30°C in summer. Along the crest of the ghats, the climate is much cooler than in plains, even in the middle summer. In winter, temperature ranges from 17°C to 21°C and in summer 18°C to 27°C. Along the eastern plains, the temperature not like extremes during winter and summer. At places like: Jejuri, Yawat and Pune the temperature often exceeds 40°C during the summer months.

**Humidity**

Over the coast, humidity is generally high. During June to October it is more than 80%. It is the least during winter afternoons when it may come down to 60% at most places. High humidity, in association with warm temperatures from April to October render the weather uncomfortable. The period of February to April is very dry when humidity in the afternoons may be lower than 15% on individual days. With the onset of monsoon
humidity increases rapidly and remains high till October. After October humidity markedly decreases during day time.

**Vegetation**

The floristic pattern of Maharashtra differs greatly due to factors like rainfall, temperature, humidity, type of soil and topography. The forest area recorded for the state is 63,842 sq km, which is ca 20.75 % of its geographical area.

Various authors from time to time proposed different classifications of the Indian forest types such as Champion (1936), Puri (1960), Champion and Seth (1968), etc. Among these Champion and Seth’s classification is followed.

According to Champion and Seth (1968) the forests (Map 3) in the state can be broadly classified as followed

I. Moist tropical forests
   1. Tropical semi-evergreen forests
   2. Tropical moist deciduous forests
   3. Littoral and Swamp forests

II. Dry tropical forests
   4. Tropical dry deciduous forests
   5. Tropical thorn forests

III. Montane subtropical forests
   6. Subtropical broad leaved hill forests

**I. Moist tropical forests**

**Tropical semi-evergreen forests**

The forests of this type are distributed along the higher slopes of the Sahyadri ranges usually occurring in patches as narrow strips at an altitude between 450 m and 1500 m receiving high mean annual rainfall of 200 to 300 cm. Most of the areas in this category are still undisturbed and therefore, it presents most typical indigenous vegetation with higher percentage of endemism. Foot hills of Western Ghats towards Konkan are covered by semi-evergreen forest. The common trees that form the first storey of this forest type are *Albizia lebbeck, Azantia racemosa, Bombax ceiba, Calophyllum inophyllum, Carallia*
Map 3. The different types of forest in Maharashtra
brachiata, Ficus racemosa, Mangifera indica, Syzygium cumini, Terminalia bellirica, and T. chebula.

Tropical moist deciduous forests

This type of forests are found all along the eastern side of the Sahyadri ranges where the mean annual rainfall ranges from 130 to 180 cm and mean annual temperature from 24°C to 27°C. The forests of Ailapalli subdivision in Gadchiroli districts also fall under this category. Top of Sahyadri has moist deciduous forests, which become dry towards east. The dominant species throughout and occupies major portion of canopy is Tectona grandis, and other deciduous species like Acacia chundra, A. ferruginea, Albizia lebbeck, Bombax ceiba, Dalbergia latifolia, Mangifera indica, Tamarindus indica, Terminalia bellirica, and T. chebula.

Littoral and Swamp forests

Costal areas have mostly sandy rocky beaches do not possess muddy flats and evergreen mangrove forests. There are few patches of mangrove forests along costal areas of Sindhudurg and Goa. In the low mangrove forest on soft tidal mud flats support shrubs or small trees. Tree mangrove forests are distributed in the river deltas and well protected muddy areas. The vegetation incorporates closed evergreen forest of moderate height. The representatives species of this vegetation are Acanthus ilicifolius, Aegiceras corniculatus, Bruguiera parviflora, Casuarina equisetifolia, Calophyllum inophyllum, Spinifex littoreus, Vitex trifolia, Wedelia iflora, and Xylocarpus granatus, etc.

II. Dry tropical forests

Tropical dry deciduous forests

These forests are situated on eastern slopes of the Western Ghats where the mean annual rainfall ranges from 50-150 cm and mean annual temperature from 26°C to 27.3°C. The forests of the districts of Kolhapur, Sangli, Satara, Pune, Ahmednagar, Nasik, Dhule, Jalgoan, Aurangabad, Jalna, Parbhani, Nanded, Yavatmal, Buldhana, Akola, Amravati, Wardha, Nagpur, Chandrapur, Bhandara and Gadchiroli are fully and partially covered by this type of vegetation. Acacia chundra, A. ferruginea, Albizia lebbeck, Azadirachta indica, Dalbergia latifolia, Euphorbia ligularia, Ficus amplissima, Mangifera indica, and Tectona grandis, etc.
Tropical thorn forests

Comparatively drier parts of Desh, Khandesh, Vidarbha and Marathwada, where the mean annual rainfall ranges from 35-80 cm and mean temperature from 26°C to 27°C, are occupied by this type of vegetation. These forests are blank, scattered, restricted to shallow soils and surrounded by cultivated land on all sides. These are also subjected to heavy grazing, lopping and illicit felling. The trees usually have short boles and the usual height is 6-9 m. There is an ill-defined lower storey of smaller trees and large shrubs, mostly spiny and often with other xerophytic adaptations. During rainy seasons various herbaceous plants are also found. *Azadirachta indica, Bauhinia racemosa, Cassia auriculata, Acacia leucophloea, Dolichandrone falcate, Euphorbia ligularia, Ixora arborea, Lantana camara, Mimosa hamata, and Zizyphus mauritiana*, etc.

III. Montane subtropical forests

Subtropical broadleaved hill forests

These forests are found in the higher ghats of Sahyadris, restricted to patches or narrow strips usually over 900 m altitude. The mean annual rainfall of this region is above 300 cm and the mean annual temperature is around 20°C. This soil is rich in humus and the climate is humid. Actually there is no sharp distinction between the moist mixed deciduous type and this type, the latter probably represent the post climax of the former type. Most of the forests of this type have fundamentally been altered by shifting cultivation or lopping, but where properly developed it has dense evergreen elements mixed with the deciduous elements. The trees are usually of low to medium average height (5 to 15m) with comparatively smaller girth (upto 2 m) and spreading canopies. Top storey consists of trees *A. ferruginea, Albizia procera, Bombax ceiba, Celtis tinnorensis, Cinnamomum macrocarpus, Dalbergia lanceolata, D. latifolia, Terminalia bellerica*, and *T. chebula*. The members of second storey are *Mallotus philippensis, Mangifera indica, Memecylon umbellatum, and Bambusa arundinacea*, etc.