CHAPTER II
A GEOGRAPHICAL PROFILE OF THE STUDY REGION

2.1 INTRODUCTION

The present state of Maharashtra was formed on 1st May 1960. Marathi speaking people largely inhabits it and it is an expression of their cultural, linguistic and social homogeneity. This state forming a considerable portion of the Indian peninsula occupies a central place in Western India.

Maharashtra state has three broad physical divisions i.e. The Konkan Coastland, Western Ghats or Sahyadris and Plateau Region. For administrative convenience the state is divided into six divisions namely Mumbai, Pune, Nasik, Aurangabad, Amravati and Nagpur, which together are having 35 districts and 315 tahsils.

The state of Maharashtra is the second largest state of India in respect of population after Uttar Pradesh. Since formation of the state, during the last 50 years, the population of the state is multiplied by more than 2.5 times. According to the 2001 census total population of Maharashtra is 9.67 crores, which is 9.4 per cent of the total population (102.70 crores) of India. Sex ratio in the state is 922 and the percentage of urban population to total population in the state is 42.4 per cent. The literacy level of the state is also high i.e. 77.3 per cent.

The study region lies in the southern part of Maharashtra, which is one the administrative divisions of Maharashtra i.e. Pune Division. It comprises of five districts of Maharashtra state viz. Pune, Satara, Sangli, Kolhapur and Solapur. Pune district lies in the North, Kolhapur in the South and Solapur in the East and central part of the study region is occupied by Satara and Sangli districts.

2.2 LOCATION AND ADMINISTRATIVE SET UP

For the purpose of administrative suitability the state is divided into six divisions. Out of them Pune division is selected for the present study. Thus,
an administrative unit is taken as the study area. It extends from 15° 45′ N to 19° 24′ N latitudes and 73° 0′ E to 76° 0′ 15′ E longitudes. The study region extends about 267 km from east to west and 357 km from north to south. The study region is having an area about 57,235 sq km and includes five districts, which are having 58 tahsils (Table 2.1 and Fig. 2.1).

Table 2.1
Administrative Units

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Source: Census of India, 1991

Pune division has distinctive geographic personality. Territorially, the region has crest line of Sahyadri as its western boundary. The southern fringe runs along the interstate boundary between the state Goa and Karnataka states. Nasik and Ahamadnagar districts delineate the northern area. The boundary of Solapur district separates the region from Marathawada. To the eastern side of the region lie Gulbarga districts of Karnataka. In other words, the region is surrounded by Karnataka state in the south, Konkan region in the west, Nasik district in the north and the north-eastern boundary is surrounded by Aurangabad division.
Fig. 2.1
2.3 GEOLOGY AND MINERAL RESOURCES

The Deccan Trap, which covers almost major portion of Maharashtra state (80 to 85 per cent) were erupted as horizontal lava sheets during the Cretaceous-Eocene times and are supposed to have welled out from the long and narrow fissure in the Earth crust. These formations are termed as ‘Traps’ because of their step like terraced appearance, a characteristic and a common feature in the scenery of the Deccan. The chief varieties of the traps are hard compact basalt, amygdaloidal traps and vesicular traps.

The thickness of the traps varies from place to place. Maximum thickness is observed at Mahabaleshwar amounting nearly 660 to 1000 meters, while at the southern and northern boundaries of the region in Kolhapur and Solapur districts the thickness is only 60 to 100 meters. The thickness of the individual flow varies from 5 to 30 meters.

The study pertains to a part of Maharashtra plateau, which is a part of Deccan Trap or Deccan Plateau. The Deccan Traps are formed of effusive lava flows. These basaltic rocks are fine grained with gray to black in colour. They overlie the rocks of granitic composition with extremely irregular contact zones (Umarjikar, 1984). They are formed of a number of lava flows towards the close of cretaceous. Subsequent to the bagh and lamet beds a large part of the Indian peninsula and entire study region was affected by an outburst of volcanic activity. It resulted in the eruption of lava flows and associated pyroclastic materials. These, some hundreds of meters of horizontally bedded sheets of basalt have resulted. The thickness of these beds decreases towards east. The beds obliterated all the previously existing topographical details and it gave rise to an immense volcanic plateau. Basalt and laterite are two main types of rocks in the study area.

Most of the study region is under laid by the Deccan Basalts. Therefore, the geological structure and the lithological characteristics are basically the same. The Deccan Trap covers an area about 3,00,000 sq km out of them 57,235 sq km forms the part of the study region. This formation includes a larger part of Maharashtra state and hence the continuous area of plateau
having rocks of trap formation. Southward extension of the basalt trap origin can be traced a little beyond Maharashtra. The basalt layers have almost horizontal deposition except for some local deviation. It is practically very difficult to find out any measurable dip in basalt (Jog, 1984). The basaltic rocks have tendency to form flat-topped plateaus and therefore, these are referred to as plateau basalt. This structured base is subjected to denudational agencies producing a landscape that contains many small rivers. These rivers join to form a large basin of which river Bhima and river Krishna are major ones.

With crystalline rocks of igneous origin are associated highly metamorphosed and folded sedimentary formations known as ‘Dharwar Series’. These rocks have received much attention on account of the valuable minerals and ore deposits in them. In two small exposures in Kolhapur district occur granitic bands of quartz of Dharwar age, underlying the kaladgi series. It occurs in two small outcrops near Nesri and Gadholaj. It mostly composed of quartzite, shale, limestone and breccias. Several inliners are also found in the valleys of the Vedganga and the Dudhganga in Ajara tahsil. These are mostly sandstones and shale (B. Arunachalam, 1967).

The distribution of minerals is closely related to the underlying geological formations. As far the study region is concerned Bauxite is a major mineral resource. Bauxite is associated with laterites and is located in Kolhapur and Satara districts. The vesicular cavities in the traps are filled with numerous secondary minerals.

### 2.4 Physiography

The study region is a part of the Maharashtra plateau and forms the Western Maharashtra Upland, with its local variation in relief. In the west, average height is about 900 meters above sea level. The central part of the region is, by and large, 600 meters in height, while the eastern portion descends between 450 to 600 meters (Fig. 2.2). The general slope of the region is eastward and south-eastward (Deshpande, 1971). The mountain and hill ranges in the west, river basins and undulating topography at the centre and highland
plateaus with wider river basins in the east mark the physical landscape of the region. The study region may be divided into four physiographic divisions \textit{i.e.} the western hilly region, the central undulating region, the eastern highland plateau region and river basins of Bhima and Krishna.

\textbf{2.4.1 THE WESTERN HILLY REGION}

The western boundary of the region is well defined by the crest-line of Sahyadris, commonly known as Western Ghats. It separates the Konkan costal lowland from the study region. It comprises of the main Sahyadri range with an average height of 1200 meters. This region includes western tahsils of Pune, Satara, Sangli and Kolhapur districts. Here Sahyadri runs almost continuously in north-south direction, with its major peaks, intervening saddles and several offshoots extended eastward which terminate in the central part. The leeward side of the Western Ghats is dominated by the main mountain ranges and its eastward projecting flat-topped offshoots with deep widening valleys. Ridges are narrow, and swift flowing rivers take their source from here. Harishchandra-Balaghat and Shambhu-Mahadeo are the major sub ranges of Sahyadri, Shingi, Mahadevi, Tamhini, Chikodi, Panhala, Ashta, and Bammoli are small, and low ranges which run in the northwest to southeast direction. Here number of alternate river valleys and ridges are observed.

The region is drained by, two major river basins \textit{i.e.} river Bhima in the north and river Krishna in the south with number of tributaries. The region carries some high peaks like Mahabaleshwar (1438 meters), Harishchandragad (1628 meters) with number of small peaks. The region is dotted with a good number of \textit{mesas} and \textit{butte}. There are number of passes, which provides site for roads and railways, linking the Konkan and Desh (Eastward part of Maharashtra from eastern slope of Sahyadri). The important passes are Rantodi Ghat, Kumbharli Ghat, Amba Ghat, Gagan Bavada Ghat, Phonda Ghat, Amboli Ghat and Tilari Ghat etc.

Due to differential erosion of the Sahyadri ranges seems to have carved out river valleys leaving the hard material as residual hill ranges appearing in
Fig. 2.2
series of terraces. The area presents the picture of intense erosion and ruggedness of landscape. Their height, relief, heavy rainfall, forest cover and precipitous escarpments characterise the region. Due to heavy rainfall, hydroelectricity stations like *Koyna Hydroelectricity Project* are located in the region. The region offers some attractive sites, which are being developed as tourist centres, resorts and hill stations e.g. Mahabaleshwar, Panchgani and Panhala. Some forts at the high altitudes, shows the glory of the Maratha Empire are the major features of the region. The laterite soils are infertile owing to the hilly topography; therefore, the area under cultivation is small.

Due to steep slopes, undulating topography, unaccessibility and lack of cumulative land the western hilly region is very thinly populated.

### 2.4.2 THE CENTRAL UNDULATING REGION

This region stretches from north to south and parallel to the western hilly region. It is however sandwiched between the western hilly region and the eastern highland plains. It includes central part of the region from Pune, Satara, Sangli and eastern Kolhapur district. River *Bhima* and river *Krishna* and their tributaries drain this region forming an extensive alluvial tract. The average height of this region is about 900 meters.

The region includes upper basins of river *Bhima* and river *Krishna*, and the central dry plateau lies between the two river basins. In this central zone river valleys become straight and wider, and the smaller chains of hills sinks into eastern plateau region. This area forms transitional zone between the western hilly region and the eastern plateau region. Balaghat, Harishchandragad, Mahadeo range and Phaltan ranges are the major hill ranges in this region with their undulating topography. It covers more than the three fourth area of the region. It includes Daund, Baramati and Indapur tahsils in Pune district, Khandala, Phaltan, Khatav and *Man* tahsils in Satara district, Khanapur, Jat, Atpadi and Kavathemahankal tahsils in Sangli district and Sangola tahsil in Solapur district. This region carries a thin soil that permits only kharif crops
with the rainfall about 55 mm. It is a part of Drought Prone Area of Maharashtra State.

The central undulating region as a result of above mentioned lacuna is sparsely populated.

2.4.3 THE EASTERN HIGHLAND PLAINS

The region is a part of middle Bhima basin demarcated by the southern margin of the Balaghat plateau and the northern margin of Mahadeo ranges. Karmala-Kurduwadi low divide separates river Sina from river Bhima. River Bori is a major tributary of river Bhima, drains the region eastward. River Man collects its headwaters from Dahiwadi and Mhaswad tahsils from Satara district. Running through Atpadi it meets river Bhima near Pandharpur. Entire Solapur district comes in this region. The region is always hit by drought and consequent scarcity of water every year. The advantage of the vast stretch of this fertile plain has, unfortunately, been offset by a climate of which the most important feature is scanty rainfall. This region including Pandharpur-Kurduwadi-Solapur-Akkalkot belt is well known for jowar and cotton production. However, owing to the physical constraints the region is sparsely or moderately populated.

2.4.4 RIVER BASINS OF BHIMA AND KRISHNA

Being a tributary of river Krishna, Bhima is a major river system in the study region. It drains a large area of the central and south-eastern part of the western Maharashtra plateau through its tributaries. The basin is located between Ahamadnagar plateau on the north and the Mahadeo range on the south. The Bhima-Nira confluence meets Krishna at Maharashtra-Karnataka border. The western half of Bhima basin is cut into a series of west-east narrow valleys and flat divides, while in the further east it opens out into flat undulating plain. River Bhima rises near Bhimashankar in Pune district and its basin covers about 25 per cent area of the study region particularly Pune and Solapur districts. River collects a number of tributaries like Kukdi, Ghod, Sina, on the left bank and Indrayani, Mula-Mutha, Nira and Man on the right bank.
Black soils of rather uniform depth are found in river valley, which is the most fertile part of Pune and Solapur districts in the study area (Arunachalam, 1967).

Krishna basin occupies the southern part of the study region. It extends between the Sahyadri spurs on the west and the Mahadeo range on the east. It flows on the basaltic part of Deccan Traps of Maharashtra. Its basin covers about 17 per cent part of the study region. The valley extends in the parts of Satara, Sangli and Kolhapur districts. The extreme western part of the basin is rugged, with flat-topped mesas abutted by escarpments rising several hundred meters above the valley bottoms. River Krishna has a large number of tributaries descending from the Western Ghats. Venna, Kudali, Koyna, Urmodi, Tarli, Warna, Panchganga, Dudhganga, Hiranyakeshi, Ghataprabha and Vedganga are the major left bank tributaries while the Yerala and Vasana are right bank tributaries of river Krishna, therefore, Krishna valley is the most fertile part of the study region.

Due to favourable physical factors and fertile soils this part of the study region is suitable for commercial agriculture and agro-based industries and other human activities. As a result it is densely populated.

2.5 DRAINAGE PATTERN

The drainage pattern of the area is well developed and well graded. Bhima and Krishna are master river courses of the area. Two main rivers Bhima and Krishna with their tributaries drain the entire region (Fig.2.3).

2.5.1 BHIMA RIVER

Several tributaries having their origin in Western Ghats or in its offshoots form Bhima basin. Sahyadri ranges in the west, Harishchandra-Balaghat ranges in the north and the Shambhu-Mahadeo ranges in the south bound the basin. It is one of the chief tributary of Krishna, which rises in the Khed, a sub-division of Pune district at Bhimashankar. Then river runs southeast through Pune, Satara and Solapur districts.

Bhima being a tributary of Krishna is equally important in the economy of the state. Its tributaries Ghod, Indrayani, Mula-Mutha and Nira all
emerging from heavy rainfall region of Sahyadri, are the important sources of irrigation and hydroelectric power. Each has a reservoir in the source region. The reservoirs at the source of **Indrayani** and **Mula** feed the hydropower stations installed at foothill zone of the Western Ghat escarpments. **Mutha** and **Nira** canals supply water for agricultural purposes. A major irrigation project with a dam on river **Bhima** at **Ujani** has been recently completed. This has enhanced the importance of river, which will become the lifeline of some dry districts in the study region as well as the State.

1. **River Nira**

   River **Nira** is a major tributary of river **Bhima** that joins it on the right bank near Akluj in Solapur district. It rises at Bhor in the spur of Sahyadris and runs southeast along the borders of Pune, Satara and Solapur districts with its total length of 165 km.

2. **River Man**

   River **Man** is a right bank tributary of river **Bhima**. It rises in the spur of Mahadeo range in Man sub-division of Satara district and runs through Atpadi in Sangli district and Sangola and Pandharpur tahsils in Solapur district. Its total length is 150 km. The banks of **Man** are low cultivated.

3. **River Sina**

   River **Sina** is the longest left bank tributary of river **Bhima**, which rises from Harishchandra range in Ahamadnagar district and meets river **Bhima** near Akkalkot. **Bhogavati** is a major tributary of river **Sina**. The total length of river **Sina** within Solapur district is about 60 km. It separates Marathawada and Western Maharashtra with its course.

4. **River Bhogavati**

   River **Bhogavati** is a large tributary of river **Sina**, rises in the Balaghat range near Barshi town in Solapur district. It flows through Barshi and part of Marathawada and falls into river **Sina** in Madha tahsil of Solapur district. It has a slender stream during hot season.
5. **River Mula-Mutha and River Indrayani**

River *Mula-Mutha* and river *Indrayani* are two major tributaries of river *Bhima*. They flow through a very narrow and rugged valley floor, which is of basaltic formation. Here lateral erosion is more prominent, which largely account for broad valley of river *Bhima*.

*Vel, Ghod, Mullamuri, Benethora, Kukdi, Mina* and *Pavana* are major tributaries of river *Bhima*. Most of these rivers rise on the Ahamadnagar plateau of Balaghat ranges. With all these major tributaries, the confluence of *Bhima* enters Karnataka about 40 km south of Solapur city and joins *Krishna* near Raichur in Karnataka. The total length of the stream is about 850 km, out of which about 800 km stream lies in Maharashtra.

2.5.2 **KRISHNA RIVER**

River *Krishna* is one of the major rivers of South India with its meandering course. *Krishna* flows south-eastward through the region for the distance of 364 km. It rises in the eastern flanks of the Western Ghats in the north-western corner of the region and drains it to the Bay of Bengal. It receives water from eastward flowing seasonal streams and rivers like *Koyna, Warna, Panchganga, Yerala, Dudhganga, Vedganga, Hiranyakeshi* and *Ghataprabha*. Presently river course is perennial as the water is released from *Koyna* reservoir during dry season. The black soils of the tract, assured water supply and innovative spirit of the farmers are the factors responsible for the agricultural development of the region.

1. **River Koyna**

It is a right bank tributary of river *Krishna*. It drains parts of Jaoli, Patan, and Karad tahsils in Satara district. River is harnessed by construction of dam at Koyananagar from which the water is regulated in the lower course for drinking and irrigation purpose. Koyna Hydro-Electricity Generation Project is an asset to the study region and also to the State of Maharashtra.
2. **River Warna**

River *Warna* with its source at Prachitgad in Western Ghats drains the part of Shirala, Shahuwadi, Panhala, Walwa, and Hatkanangale tahsils. River forms the boundary between Sangli and Kolhapur Districts. It stretches south-eastwards and joins *Krishna* at Haripur near Sangli city. The fertile alluvial deposits are close to the banks and are locally known as ‘*mali’*. These soils have more moisture retentively and mostly used for fodder crops for checking erosion. The alluvial tracks of river are widened in its lower course where river overflows during heavy precipitation during Southwest monsoons. River is harnessed by construction of a dam at Chandoli. The water from the reservoir is used for the irrigation purpose.

3. **River Panchganga**

Rivers *Bhogavati, Tulasi, Kumbhi* and *Kasari* constitute the course of *Panchganga*, which drains agriculturally very prosperous area of the region. The alluvial soils in river plains have been deposited by the flood water during rainy season. The construction of a dam on river *Bhogavati* at Radhanagari and Kolhapur Type (KT) Weirs at many places across rivers has facilitated the development of irrigation. *Panchganga* meets *Krishna* near Shirol in Shirol tahsil.

4. **River Yerala**

River *Yerala* with its course in the north flows southwards draining the areas of Khatav, Khanapur and Tasgaon tahsils. River though becomes dry during summer season, has abundant water supply through its subterranean surface, which in turn has encouraged irrigation.

In the south, rivers *Dudhganga, Vedganga, Hiranyakeshi* and *Ghataprabha* drain the southern part of Kolhapur district.

2.6 **SOILS**

The study of soils is essential, which determines the types and quantity of crops, soil types and their attributes in the study region. The characteristics and distribution of soils in the region are influenced essentially by nature and
Fig. 2.4

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- Lateritic Soil
- Redish Brown Soil of Hill Slopes
- Medium Black Soil
- Coarse Shallow Soil
- Alluvial Soil
intensity of weathering mode and rapidity of fluvial transport. Soil is an important resource, which provides a base for the plants with fertility and water capacity of soil, which is determined by soil texture and composition.

The soil of the study region is generally of trap origin. The region is a part of Deccan Trap, which is composed of Precambrian Crystalline Rocks, which supports variety of soils. Considering all these characteristics and facts, the soils of the region are classified in five major classes viz. Lateritic soils, Reddish brown soils, Medium black soils, Coarse shallow gray soils, Alluvial soils (Fig. 2.4).

2.6.1 LATERITIC SOILS

A continuous belt of these soils stretches in north-south direction occupying mostly Western Ghat highlands in the study region. The zone however widens in the south as compared to the northern part. Two types of laterites occur in these part i.e. coarse shallow laterites or highland laterites on the upper slopes and the medium deep laterites. They have a low nutrient status and low organic matter content. They are more resistant to erosion. The colour of these soils ranges from brown-black to red. They are rich in kaolinite and oxide clays, highly acidic, pH between 4.5 and 5.5; it is in the very high rainfall areas. Western highlands in the western part of Pune, Satara, Sangli and Kolhapur districts are occupied by these soils. This part of the study region has sparse population. Mostly it is rural.

2.6.2 REDISH BROWN SOILS

The light brown or redish brown soils occupy higher slopes of the Western Ghats. They too are the result of the intense hydrolysis and rapid soil development. They appear in a crenulated outline reaching further east on the west-east running ridges. In the valleys they are restricted to a very narrow zone, which is almost parallel to the Western Ghats.

These soils are acidic with a mean pH between 5.5 and 6.5. They are clayey soils with oxide clays and kaolinite. One of the best-suited crops to these soils is paddy, grown on terraced fields. With suitable agricultural inputs,
crops like potatoes, vegetables, strawberries grow well; even sugarcane cultivation gives good results.

2.6.3 MEDIUM BLACK SOILS

These soils are also known as black cotton soils, regur, vertisols or gurmosols. These soils cover major portion of the region (Challa, et al. 1995). They have developed on relatively flat sections of the relief. These soils vary in texture from sandy to loamy to clay-loamy and its colour is light brown to greyish black. It is characterized by the contents of free calcium carbonate which may appear as a lime bar or which may be uniformly distributed throughout the profile (Patil et al. 1991). These soils are derived from weathering of Basalt rocks. They are mostly found on pedimont plains. The depth of this type of soils is generally between 25 and 90 cm. The water holding capacity of these soils is very high that is why the presence of these soils is a blessing to the farmers in Maharashtra. These soils are very fertile and occupy large area of the study region in Pune, Satara, Sangli, Solapur and eastern part of Kolhapur district. Cotton, sugarcane and soyabean are major crops suited to these soils. These regions are densely populated.

2.6.4 COARSE SHALLOW GRAY SOILS

The areas between the foot of the hill ranges and the valley, the pedimont, sloping and undulating areas the eastward projecting off-shoots of the Western Ghats are covered by shallow to medium deep gray coarse soils. These soils occupy the central and eastern areas of the study region. These are skeletal soils, which have not yet developed B-horizon. They are moderately developed soils. Their textural composition varies, stony debris being frequent. They are freely drained soils. They have a greyish colour ranging from pinkish gray to dark greyish red. The gray colour is brought about by the lime content 2 to 8 per cent and they are alkaline, the pH is variable but can easily exceed 8.5. Due to the presence of some humus the surface horizon is gray brown. These soils are either covered by natural grasslands or used for kharif cultivation. With better or poor yields depending on the texture of the soils, slope conditions,
alkalinity and the soils moisture conditions of the growing season. They are developed to crops requiring less water like jowar, bajara and pulses. These are the moderately populated region of the study region.

2.6.5 ALLUVIAL SOILS

The lower river terraces are formed by recent alluvium with a source material drained from the upstream region or the nearby relief. Their colour is dark brown to black, but may occasionally have a reddish tinge. The deposits on which the soils are developed have a considerable depth of several meters. They are loams or clay loams, they are moderately alkaline having pH 7 to 8 and have low lime content. They have a good fertility and are well suited for the cultivation of sugarcane and other cash corps. A variety of crops is grown in this region. The agro-based industries are developed, especially sugar industry. As a result the region has very dense populated.

2.7 VEGETATION

Depending on the amount of rainfall that is received, different types of forests exist in the region ranging from arid tracts, shrubs, and timber forests to evergreen deciduous forests. Although these forests are distributed in all the districts of the study region they are confined largely to Sahyadrian hill slopes. The dry deciduous forests are found in drier climate, provides medium to small size timber. It has also been observed that the growth of vegetation is very often stunted and poor due to infertile soils and lack of adequate humus. Moreover less rainfall is a limiting factor for luxuriant growth of forests.

Natural vegetation affects the distribution of rainfall of the region, drainage pattern, topography, soils conditions, biotic factors and the extent of human interference. In the study region following types of vegetation are found. In the Western Ghats the high laterite plateau with heavy rainfall (More than 2500 mm) are covered by tropical evergreen forests. Tropical wet evergreen forests of Western Ghats are flanked on the eastern side by semi-evergreen forests. The rainfall ranges between 1000 to 2500 mm in this
area. These forests are known as tropical moist deciduous forests and found on the eastern slopes of the Sahyadris. The tropical dry deciduous forests are found in the areas, where rainfall ranges between 1000 mm and 1250 mm. Tropical thorn and shrubs cover almost the entire dry tract or the region having a rainfall of less than 500 mm.

The forests are mainly concentrated on the eastern slopes of Sahyadri, particularly in the western parts of Kolhapur, Satara and Pune districts. The most conspicuous forest products of Western Maharashtra plateau are many economically valuable species of trees like Teak, Hilda, Bamboos, Bibla, Sissum, Kindal, Tendu, and Palas etc. Timber, fuel, forages and variety of medical plants and raw materials for many industries is supplied from the vegetation of the region.

The western hilly part of the study region due to thick forest is the thinly populated part.

2.8 CLIMATE

A general weather condition over the region during the whole year varies with the season. Climate is the most important factor influencing land use, cropping pattern, economic activity as well as distribution and density of human being. It also affects transportation network and the settlement pattern. The climate of the study region is essentially of a tropical monsoon type. The variations in climatic conditions are seen during the year. The north-south orientation of Sahyadris as well as northeast orientation of Balaghat and Mahadeo ranges determines the climatic conditions of the region. The proximity of the Sahyadri to Arabian Sea restricts the coastal climate to a narrow strip on the west coast of Konkan that stands in sharp contrast to the continental climate over the entire region. Sahyadri runs across nearly at right angle to the monsoon streams forming an important climatic divide. Naturally, the windward slopes of Sahyadris and its crest gets copious rainfall while to the eastward of Ghat section, rainfall decreases rapidly over a short distance. The monsoon dominated climatic characteristics of the region has four seasons, which, over rest of India are same one, these are, (I) The Cold Weather Period
(December to February), (II) The Hot Weather Period (March to May), (III) South-West Monsoon Period (June to September) and (IV) Post-Monsoon Period (October to November).

2.8.1 COLD WEATHER PERIOD

December to February is a coolest period of the year and mainly continental tropical air prevails over the region. There is very little rainfall during this period. The mean daily minimum temperature is low in the lower reaches of the region and in between 25\(^{0}\)C to 30\(^{0}\)C. The mean daily minimum temperature is highest over the eastern part of the region. It is the lowest in the upper reaches of the region. The daily range of temperature is very high in the eastern part i.e. 19\(^{0}\)C to 29\(^{0}\)C. This is also, a season of low humidity, mean relative humidity in the morning is 43 per cent and it decreases to as low as 18 to 28 per cent in the afternoon when maximum temperature is reached. Evening winds are light and are north-easterly over the region. Throughout the entire Cold Weather Season, climate it cool and bracing, bright and variable winds, fair and sunny weather with clear skies. Local inversion of temperature develops in the enclosed regions during the early morning hours when the minimum temperature has a general tendency to reach below the dew point, then air gets saturated resulting in the formation of dew and mist.

2.8.2 HOT WEATHER PERIOD

During March, April and May is the hottest period of the year coinciding with passage of the sun over latitude. The mean daily minimum temperature during the month of May varies between 37\(^{0}\)C to 47\(^{0}\)C. The highest temperature recorded on any day at Solapur is 41\(^{0}\)C on many occasions. The lowest value of minimum temperature of 22.5\(^{0}\)C is observed at Pune. The diurnal range of temperature in the interior of the region is 19\(^{0}\)C to 20\(^{0}\)C. This is the hot season of the region. This is a period of thunderstorm activity and thundershowers account for 2 cm to 5cm of rain.
Fig. 2.5

PUNE DIVISION
AVERAGE RAINFALL

INDEX
Average Rainfall (in mm)

- 5000
- 3000
- 2000
- 1500
- 1000
- 750
- 500
2.8.3 SOUTH-WEST MONSOON PERIOD

Towards the end of May, when the weather is at its hottest, in India Southeast Trade Winds of South Indian Ocean extend rapidly across the equator into the Arabian Sea and south of Bay of Bengal. Later in the course of about two weeks they establish as southwest winds or Southwest Monsoon.

This hot humid air current frequently ushers in the group of cyclonic storms either in the Bay of Bengal or in the Arabian Sea, which are associated with heavy rainfall. On an average 75 per cent of the total rainfall of the study region occurs during this period. There is less variation in daily mean temperature because of cloudiness; temperature varies between $20^0\text{C}$ to $23^0\text{C}$, while the mean daily temperature ranges between $28^0\text{C}$ to $31^0\text{C}$ at Solapur. July is the rainiest month for western and eastern margins of the region while September account for more rain in the interior of the region.

2.8.4 THE POST MONSOON PERIOD

The southwest monsoon withdraws from the region by the first half of October and the Northeast Trades set in thereafter. There is a certain amount of rainfall during this period associated with thundershowers. October marks the transition in temperature, which remains less than $19^0\text{C}$, in the western part of the region; mean daily minimum temperature remains higher over eastern part particularly in Solapur district. Temperature increases in this month and it varies between $38^0\text{C}$ to $45^0\text{C}$. The general drying up of land and greater sunshine produce the phenomena of ‘October Heat’. Winds during this period are generally light to moderate in the interior. Day temperature shows an increase but there after both day and night temperatures drop appreciably.

2.9 AGRICULTURE

In the region under investigation i.e. Pune Division of Maharashtra, agriculture is mainstay of the economy. The agricultural landscape of the region is well marked by a significant increase in both, the area as well as the production. The diffusion of agricultural innovation has brought significant change in agricultural system of this region. In Pune Division dominance of
PUNE DIVISION
AVERAGE TEMPERATURE

INDEX
Average Temperature (°C)

Fig. 2.6
food crops is found in the western hilly area, central plateau, Bhima valley and south central region. Nearly 70 per cent of the total area is devoted to the cultivation. In the central dry plateau region jowar, bajara, groundnut and sugarcane are important crops. Bhima and Krishna valleys are agriculturally most prosperous areas of the study region. In the drought prone area of the region potatoes, onions and vegetables are the main cash crops. Sugar cane is the principal cash crop in Bhima and Krishna basins. In the study region horticulture has been developed remarkably. Rice is the staple food crop of the western hilly zone. Cotton and tobacco are the main cash crops in the eastern part of the division.

Sugarcane is most important commercial crop in the study region. It shows the pre-eminence of cash crop in the agricultural economy of Maharashtra State. Other cash crops like grapes, tobacco, banana and onion are relatively recent. In the last thirty years there have been considerable changes in agricultural practices such as the development of irrigation, provision of better inputs like fertilizers, improved seeds and diffusion of agricultural innovations.

The role of lift irrigation is significant in Krishna basin particularly in Kolhapur and Sangli districts. The sugarcane cultivation depends on lift irrigation, while in Pune district sugarcane is grown on canal irrigation. Pune, Satara, Sangli, and Kolhapur districts show high level of irrigation. In the study region Panchganga basin in Kolhapur district, Krishna basin in Satara and Sangli districts, Mula-Mutha basin in Pune district can be clearly identified as the intensively irrigated and agriculturally prosperous areas of the study region.

Overall, most of part of the study region is having the major river basin with a great irrigation facility. So the production of cash crops, basically sugarcane and other crops is comparatively high in the region. All these reasons contribute the dense distribution of population in the central belt of the study region.
2.10 GENERAL LAND USE

Landuse is basic requirement of human activity. Landuse pattern presents a geographical as well as socio-economic picture of the region. The general landuse of the study region (district-wise) is given in the Table 2.2.

**Table 2.2**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>District / Division</th>
<th>Area Under Forest (Figures in '00' Hectors)</th>
<th>Land Not Available For Cultivation (Figures in '00' Hectors)</th>
<th>Cultivable Waste Land (Figures in '00' Hectors)</th>
<th>Permanent Pastures, Trees And Grooves (Figures in '00' Hectors)</th>
<th>Total Fallow Land (Figures in '00' Hectors)</th>
<th>Net Sown Area (Figures in '00' Hectors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pune</td>
<td>1706 (10.23)</td>
<td>1671 (10.02)</td>
<td>1096 (6.57)</td>
<td>998 (5.99)</td>
<td>970 (5.82)</td>
<td>10230 (61.36)</td>
</tr>
<tr>
<td>2.</td>
<td>Satara</td>
<td>1377 (14.21)</td>
<td>1222 (12.61)</td>
<td>393 (4.06)</td>
<td>812 (8.38)</td>
<td>1081 (11.16)</td>
<td>4803 (49.58)</td>
</tr>
<tr>
<td>3.</td>
<td>Sangli</td>
<td>473 (5.50)</td>
<td>770 (8.95)</td>
<td>247 (2.87)</td>
<td>366 (4.25)</td>
<td>811 (9.42)</td>
<td>5940 (69.01)</td>
</tr>
<tr>
<td>4.</td>
<td>Kolhapur</td>
<td>1400 (17.59)</td>
<td>772 (9.70)</td>
<td>406 (5.10)</td>
<td>553 (6.95)</td>
<td>427 (5.37)</td>
<td>4399 (55.28)</td>
</tr>
<tr>
<td>5.</td>
<td>Solapur</td>
<td>260 (1.74)</td>
<td>785 (5.26)</td>
<td>402 (2.69)</td>
<td>420 (2.81)</td>
<td>2405 (16.10)</td>
<td>10662 (71.39)</td>
</tr>
<tr>
<td>6.</td>
<td>Pune Division</td>
<td>5216 (9.02)</td>
<td>5220 (9.02)</td>
<td>2544 (4.40)</td>
<td>3149 (5.44)</td>
<td>5694 (9.84)</td>
<td>36034 (62.28)</td>
</tr>
</tbody>
</table>

**Note:** Figure in parenthesis denotes percentage to total

**Source:** Socio-Economic Review and Statistical Abstract of Pune, Kolhapur, Sangli, Satara and Solapur districts (2001-2002)

The area under forest is the first category of the general landuse pattern. It is found that the average percentage of forest land is 9.02. The districts, Kolhapur (17.59 %), Satara (14.21 %) and Pune (10.23 %) are having more land under forest than regional average. It is because the western part of these districts is a part of highland of Western Ghat as well as high rainfall zone. The semi-evergreen monsoon forests are found in this part of the study area. Apart from that, Sangli (5.50 %) and Solapur (1.74 %) districts are having a very low percentage of forests than regional average, because of central plain and plateau topography and eastern part of these districts fall under the rain shadow zone.
The second category is the land not available for cultivation includes lands such as barren, uncultivable and land occupied by non agricultural uses like settlements, roads, railways, rivers, canals, etc. The regional average area under this category is 9.02 per cent. As compare to this Satara (12.61 %), Pune (10.02 %) and Kolhapur (9.70 %) districts recorded high percentage than regional average. Sangli district (8.95 %) is just behind of the regional average and Solapur districts has recorded lowest percentage under this category i.e. only 5.26 per cent.

Cultivable waste land includes the land which is suitable for cultivation but is occupied by different plants like shrubs and grass, etc. The regional share under this category is only 4.40 per cent of total geographical area. It is observed that districts in the western hilly region have more percentage under this category and higher than regional average. The highest percentage was found in Pune district (6.57 %) followed by Kolhapur (5.10 %) and Satara (4.06 %). Sangli (2.87 %) and Solapur (2.69 %) districts Solapur district recorded the lowest percentage in this category.

The next category of general landuse pattern of the study region is permanent pastures, trees and grooves, which includes land permanently occupied by pastures, trees and grooves. It is observed that only Sangli (4.25 %) and Solapur (2.81 %) districts are having very low percentage of area under this category, because of the eastern part of the districts is mainly a drought prone zone. Otherwise Satara (8.38 %), Kolhapur (6.95 %) and Pune (5.99 %) have recorded more area under pastures, trees and grooves than the regional average i.e. 5.44 per cent of total geographical area.

In the category of fallow land, region recorded 9.84 per cent area of the total geographical area. As compared to the regional average Solapur (16.10 %) and Satara (11.16 %) recorded high percentage of fallow land, followed by Sangli (9.42 %) district, which is just nearby the average. Pune (5.82 %) and Kolhapur (5.37 %) have low percentage of fallow land.

Net sown area is the last and the most important category of the landuse pattern of Pune Division. Overall region recorded 62.28 per cent of the total
Fig. 2.7
geographical area as the net sown area. Solapur (71.39 %) and Sangli (69.01) districts are well high of the regional average. Pune district recorded just nearby the average \textit{i.e.} 61.36 per cent and Kolhapur and Satara districts recorded 55.28 and 49.58 per cent respectively under this category.

The general landuse of the study region is well correlated to the population changes. If population changes take place then the changes in general landuse also takes place. The parts of the study region where the percentage of net sown area is more are well suited for the agricultural activities and for the agro-based industries also. As a result, these are the thickly populated areas.

\section*{2.11 INDUSTRIAL STRUCTURE}

Industries play an important role in the economic development of a region. It also stimulates the growth of trade, commerce and transportation. The overall impact of the development can also be seen in the development of agriculture of the region. The major industries and development of the region have confined in and around Pune, Satara, Sangli, Kolhapur and Solapur cities. In the study region there are plenty of working factories, which constitutes major share in the state. However, the western hilly region is exception to this statement with very few industrial locations. The urban centres in the region have been located by heavy and light industries but most of the sugar industries are located in river valleys.

The most spectacular aspect of industrial landscape is distinct industrial belt centred in and around Pune city. Of the industrial nodes of the region follow the major transport routes. In the study region Pune urban centre is highly industrialized and urbanized area. The second industrial zone of the region lies between Sangli, Kolhapur and Ichalkaranji. In this area agro-based industries like sugar factories, manufacturing, casting and textile industries have been developed. The third industrial region is Solapur city region, which is famous for textile industry.
In the study region, Solapur and Ichalkaranji are specialized for textile industries in Maharashtra as well as in India. The handloom and power-loom industries are located at Vita, Sangli, Kolhapur and Pune. The region has a very diversified composition of industries ranging from agricultural implements, food processing, textile to engineering, chemical, plastic, paper, automobile, transport equipment, electric goods etc. In and around Pune city major industrial units are located. The manufacturing goods include scooters, machine tools, automobile, metals, agricultural equipments, machinery, light engineering and electrical goods. The Maharashtra Industrial Development Corporation (MIDC) has developed a number of industrial areas and industrial estates with the establishment of entire infrastructure in all the districts, at tahsil level in the study region.

Industrially developed regions attract more working force and population. Thus, the industrially developed parts in the study area are more populous than the industrially undeveloped parts.

2.12 TRANSPORT AND COMMUNICATION

Transport lines are the arteries of the region. Quick and efficient transport of goods is of vital importance from the point of development of economy of the region. In the study region following classification of roads are observed in different categories in kilometres. The pakka roads are divided in to two types – (I) Black top roads and (II) Water bound macadam. The study region shares 23.02 per cent black top roads to the state of Maharashtra. The district wise distribution of roads is unequal. Sangli district shares 3.43 per cent black top roads as compared to the state. Pune and Satara districts share more than 4.00 per cent black top roads in comparison with those of the state.

The water bound macadam road distribution is also unequal. Pune division shares 18.08 per cent to state, while Solapur district shares 5.06 per cent, Satara 4.22 per cent, Sangli and Kolhapur districts share more than 2.00 per cent in comparison with the state. In the development of the region the railway facility is also significant in Pune division. The major clusters of
industries at Pune, Satara, Sangli, Solapur and Kolhapur are connected with the railway line. The growth of road and railway transport initiates the development of urban centres as trade centres. The distribution of railway route length is unequal so also categories of broad, meter and narrow gauges. In Pune division it is seen that there is large scale of broad-gauge rail route facility. The study region shares 21.84 per cent of broad-gauge of the state.

In Pune division, Pune 8.06 per cent, Solapur 6.57 per cent, Satara, 4.00 per cent, Sangli 2.09 per cent and Kolhapur 1.10 per cent broad-gauge rail route is shared out of total broad-gauge of the state. The meter-gauge type is completely absent in Satara and Kolhapur districts, where as Solapur and Sangli districts share 1.33 per cent meter-gauge rail route. The narrow-gauge facility in Solapur district is 17.75 per cent and in Sangli district it is 7.92 per cent while in other districts in the study region the narrow-gauge rail route is not there. Pune division shares 21.84, 9.81 and 25.77 per cent broad, meter-gauge and narrow-gauge rail routes respectively as compared to those of the state.

According to the different classes of road length in the division, Pune district stands first in all categories. In other districts in the study region roads are unequally distributed. The National Highway No. 4 and No. 9 traverse the study region. The road length category in kilometres shows a clear picture of the region. In the study region the district wise road length is Pune 12.21 per cent, Solapur 5.41 per cent, Satara 4.36 per cent, Kolhapur 1.55 per cent and Sangli 10.02 per cent. The length of National Highway share is 24.56 per cent. The district wise length of State Highway in the division is Pune 4.37 per cent, Solapur 4.80 per cent, Satara 3.03 per cent, Kolhapur 3.01 per cent and Sangli 2.94 per cent as compare to that of the state. The transportation facilities augment the speed of urbanisation and industrialisation, which in turn attracts the population. Thus, this factor has a direct bearing on the distribution of population in the study area.
2.13 POPULATION

The population of India as on March 2001 stood at 102 crores 70 lakhs 15 thousands 247 persons. The state of Maharashtra having population of 9 crores and 67 lakhs is the second largest state in respect of population after Uttar Pradesh.

As far as Pune Division is concerned, the total population of the region according to 2001 census was 1,99,97,778 persons of which 1,02,94,635 were males and 1,20,94,635 females giving sex ratio of 951 females per thousand males. Since almost 2 crores people are accommodated over an area of 57,775 sq km the density has been 346 persons per sq km. According to 2001 census 1,24,89,965 population of the division is in rural area and 75,70,813 population is in urban area. Literacy rate of the division is quite high i.e. 76.68 per cent. As far the male and females are concerned, it is 86.5 per cent and 66.56 per cent respectively, which is a good indication of good educational quality. If we think of work force, the number of total workers is 88,72,806 out of them 55,91,525 are male workers and 32,81,281 are females. The overall work participation rate is 45.32 per cent more specifically, 54.6 per cent of males and 35.54 per cent of females.

2.14 CLASSIFICATION OF TAHSILS IN THE STUDY REGION ACCORDING TO PHYSICAL CONDITIONS

A. Western Zone (Hilly region with heavy rainfall) includes 22 tahsils

Pune District : Junnar, Ambegaon, Khed, Maval, Mulsi, Velhe and Bhor
Satara District : Mahabaleshwar, Wai, Khandala, Satara city, Jaoli and Patan
Sangli District : Shirala
Kolhapur District : Shahuwadi, Panhala, Bavada, Ajara, Radhanagari, Bhudargad, Chandgad and Gadhinglaj
B. **Central Zone (Uplands and river basins with moderate rainfall) includes 18 tahsils**

- **Pune District**: Shirur, Pune city, Haveli, Daund, Purandar and Baramati
- **Satara District**: Phaltan, Koregaon and Karad
- **Sangli District**: Walwa, Palus, Kadegaon, Tasgaon and Miraj
- **Kolhapur District**: Hatkanangale, Shirol, Karveer and Kagal

C. **Eastern Zone (Uneven plateau region with scanty rainfall or drought-prone region) includes 18 tahsils**

- **Pune District**: Indapur
- **Satara District**: Man and Khatav
- **Sangli District**: Atpadi, Kavathemahankal, Jat and Khanapur
- **Solapur District**: Karmala, Madha, Barshi, Solapur N., Solapur S., Mohol, Pandharpur, Malshiras, Sangola, Mangalwedha and Akkalkot

The western hilly region of the study area has unfavourable physical conditions. Topographically the region is very rough and rugged, high hill ranges, steep slopes, thick forest cover, thin unproductive soils and fast flowing streams along with heavy rainfall and inaccessibility has resulted into sparse population and lack of urbanisation and industrialisation.

Central belt running in the north-south direction right from Haveli in the north to Kagal in the south covering 18 tahsils in the study region is physically and economically suitable area, with river basins, plane fertile land, thick soil cover, gentle slopes, moderate rainfall and favourable climatic conditions. This belt is most suitable for agriculture and industrial development and is thickly populated with many urban centres in it. There are ample facilities of transport and communication.

The eastern belt again including 18 tahsils has good soils but the main hurdle is of shortage of water. This part of the steady region is the rain shadow area, which receives scanty rainfall. This is a part of famine belt on the plateau.
of Maharashtra. Scarcity of water has hampered the development of the area and is unfavourable for the economic activities with a few exceptions like Solapur, Pandharapur and Barshi the area is sparsely populated.

REFERENCES


