Lesson - 4

Bharat : Structure, Relief & Physiographic Regions

Structure

It is necessary to have the knowledge of geological structure for developing better comprehension of relief and topographical features of Bharat. The rocks of our country have been formed in different eras and ages. Relief and topographical features of a country depend mainly upon geological structure. Not only this, mineral resources, soil resources, natural vegetation, underground water resources, etc. also depend upon geological structure. The geological history of Bharat extends from Archean Era to the present Quaternary Era. Therefore, Bharat possesses rocks of several systems which can be divided into four major groups -

1. Archean Era

The rocks of this era are mainly divided into two major groups (Fig. 4.1) –

Archean System - The rocks of this system are very old and crystalline in which there is an absence of fossils. There are three main regions of the rocks of this system - (a) Bengal Gneiss, (b) Bundelkhand Gneiss and (c) Nilgiri Gneiss.

Dharwar System - The rocks of Dharwar system have been deposited above the rocks of Archean Era. These are also found in conjunction with each other in some places. The rocks of the Archean era have been subjected to a long period of metamorphism and erosion. The eroded material was deposited to form sedimentary rocks. These are the oldest sedimentary rocks of Dharwar system. In the long geological history, the rocks of Dharwar system had also undergone the process of metamorphism. These rocks are mainly found in (a) Meysore-Dharwar-Bellary region, (b) Chhota Nagpur Plateau region, (c) Aravalli region of Rajasthan, (d) Punjab and (e) some areas of sub-Himalayas. These rocks possess not only several metallic minerals but also metamorphosed rocks like marble.

2. Purana Era

The rocks of this era are also divided into two major groups –

Cudappah System - The long process of erosion and the deposition of eroded materials continued to be deposited in the form of sedimentary rocks which have undergone a long process of metamorphism. These have been termed as the rocks of Cudappah System. These include the deposits of slate, quartzite and limestone. Most of the rocks of this system are found in the ranges lying between Krishna and Pennar rivers, Cudappah (Papkani river) valley, Nallamalai and Veniconda ranges, Godawari valley, Delhi system and many parts of Kashmir.

Vindhyayan System - Most of the rocks of this system are found along Vindhyachal mountains. The rocks of this system are found above the rocks of Cudappah system. These rocks are spread from Sasaram and Rohtas regions of Bihar through Chittorgarh in the Aravalli range to Vindhyachal mountains. The main deposits in the system include sandstone, shale, quartzite and limestone. These rocks provide diamonds

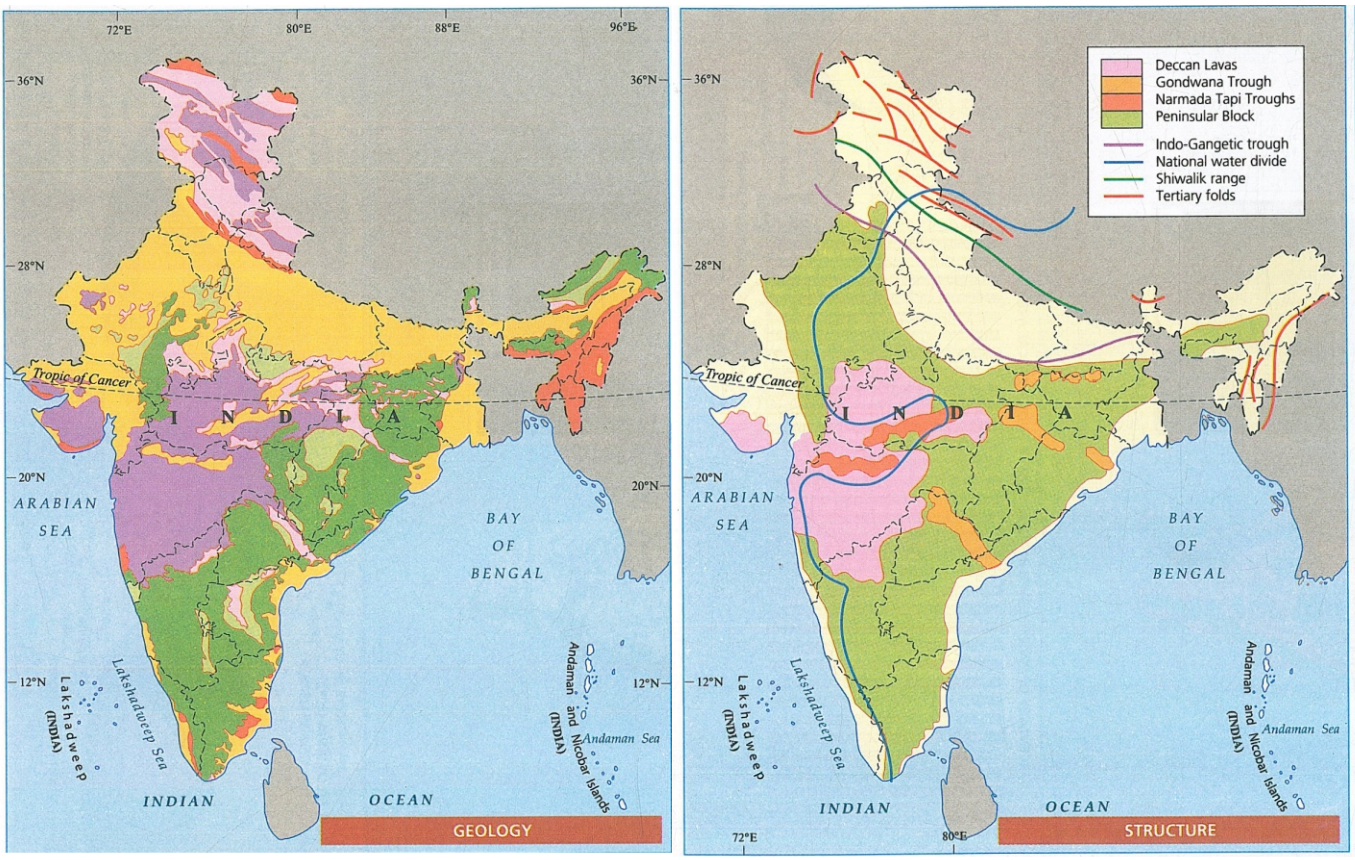

Fig.4.1 : India : Geological Structure

particularly in Panna, Anantpur and Golconda areas. The rocks of this system are also rich in the deposits of sandstone of various colours and the limestone, which is used in the cement industry.

3. Dravid Era

The rocks of this era belong to Gondwana system. These are mainly found in Damodar valley, Mahanadi valley, Godawari valley, Satpura ranges, Rajmahal hills, Kutch, Kathiyawad, Western Rajasthan, Kashmir, Spiti etc. Major extension of these rocks is in southern Bharat.

4. Aryan Era

The formation of the rocks of this era started in Carboniferous period. Therefore, these rocks are very important in terms of the carbonic minerals like coal, mineral oil and natural gas. These are the newest rocks of this system.

Relief

Bharat possesses many diversities of natural features. On one side these diversities make the

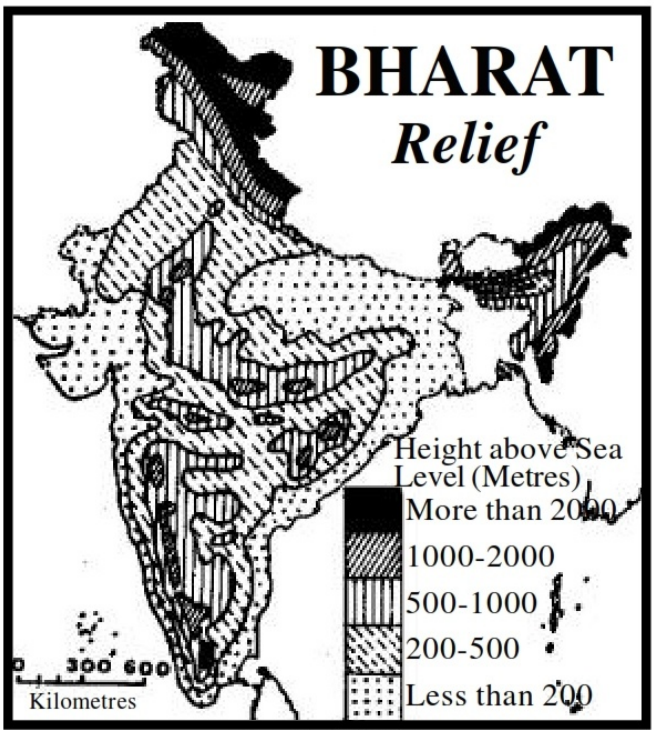

Fig.4.2 : Relief of India

Fig.4.3 : Physiographic Regions of India

natural features lively by breaking their prosaism, while on the other hand these have contributed to the development of large and attractive but adjustable variations in the demographic, life-style, diet and food habits, dresses, languages, customs and traditions, availability of resources, stages of development etc. The diversities of climate, natural vegetation, fauna etc. have also been originated due to the diversities of relief(Fig. 4.2).

Despite large diversities of relief, most of the areas of Bharat are useful for the population. Approximately 33.4 per cent area of our country is less than 200 metres above the mean sea level. About one-third of the total area of our country possesses a slope of less than 5°. Such areas are mainly spread in the Ganga-Sutlej plain, Brahmaputra valley, most of the parts of Tripura and West Bengal and coastal areas of peninsular Bharat. There is a fall of only 200 metres in a length of about 1600 km long plain extending from Delhi to Bay of Bengal. Approximately two-third area of our country is less than 500 metres above mean sea level. This huge area is suitable and convenient for human habitations, agriculture and other economic activities. Approximately 28.3 per cent area of our country lies between 200 to 500 metres, 18.6 per cent from 500 to 1000 metres, 8.7 per cent from 1000 to 2000 metres and 11 per cent above 2000 metres from the mean sea level. Approximately 20 per cent area of our country has a slope exceeding 15°.

Physiographic Regions

The presence of the diverse geographical features in Bharat is natural due to vast expanse of the country. These diversities also include a variety of topographical features (Fig. 4.3).

In order to study topographical features of Bharat in detail, these can be grouped into six regions -

(1) Northern Mountainous Region
(2) Great Plains
(3) Thar Desert
(4) Deccan Plateau
(5) Coastal Plains, and
(6) Islands

(1) Northern Mountainous Region

Himalayas form our northern boundary from west to east in the form of an extensive mountainous arc. It covers an area of about five lakh square kilometers. The region extends in a length of about 2400 kilometers and a width ranging from 250 to 400 kilometers. It is the highest mountain range of the world. The literal meaning of the Himalayas is the **abode of snow**. On an average, the slopes exceeding 5000 metres in elevation are always covered with snow. The height of snow-line in the western part of Himalayas is about 5700 meters while it is 4200 meters in the eastern section. Breadth of these newly folded mountains increases from east to west, but their height decreases in that direction. These mountains comprise several ranges. These mountain ranges circumscribe plateaus and valleys within them. The mountain ranges have a steeper slope towards Bharat and gentler slope towards Tibet. The eastern sections of Himalayas abruptly rise above the plains of Uttar Pradesh and West Bengal. Therefore, Everest and Kanchanjangha are visible from these plains because these peaks lie close to the plains. But western section of Himalayas rise gradually above the plains. Therefore, the mountain peaks are situated at a greater distance and therefore, Nanga Parbat, Badrinath, Nandadevi Peaks etc. are not visible from the plains.

Origin of Himalayas

Various hypothesis have been propounded about the origin of the newly folded mountains but the hypothesis conceiving the origin through geosynclines is more acceptable. This fact also applies to the origin of Himalayas. Geosynclines have been defined as elongated, narrow, shallow and weak bottomed water bodies by Haug, Hall, Dana, Steers etc. Millions of years ago, all the continents were joined together to form one huge landmass known as **Pangea**. Its northern part was named **Laurasia** and the southern section was named as **Gondwanaland**. Eurasian Laurasia was named as **Angaraland**. A long geosyncline named **Tethys sea** existed between Angaraland and Gondwanaland in the geological past at the place where Himalayas stand today. Rivers continued to bring and deposit large volume of sediments in the geosyncline from both sides. Although a geosyncline is defined as a shallow water body, its weak bottom continuously sinks due to the burden

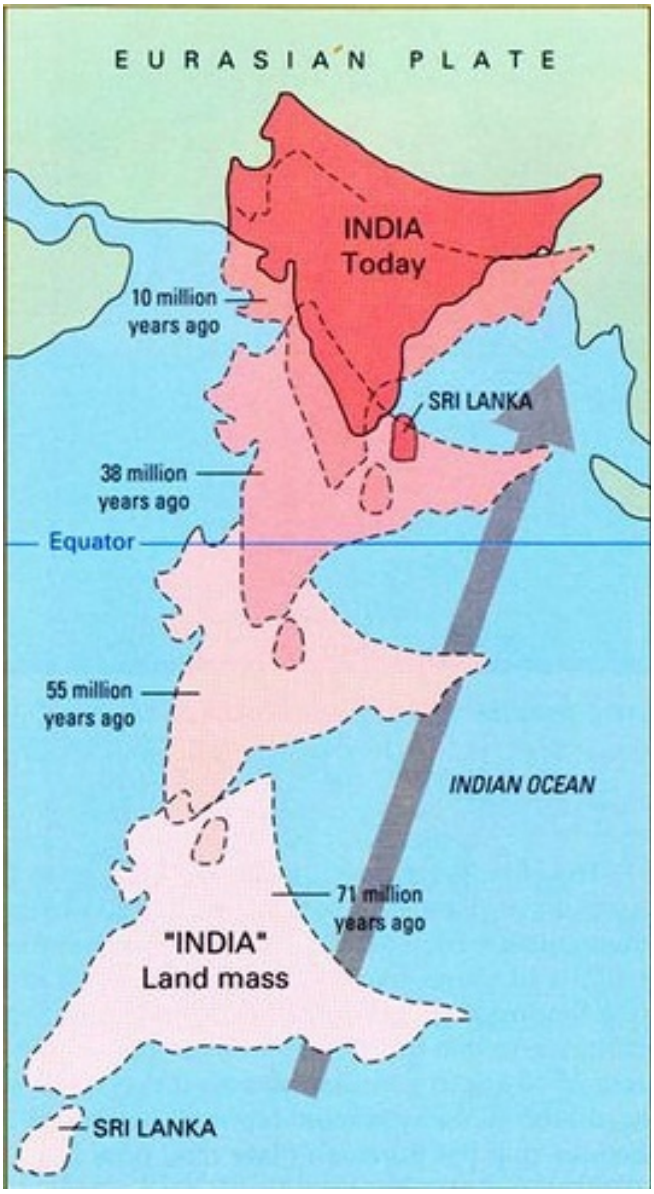

Fig.4.4 : The drifting of Gondwanaland

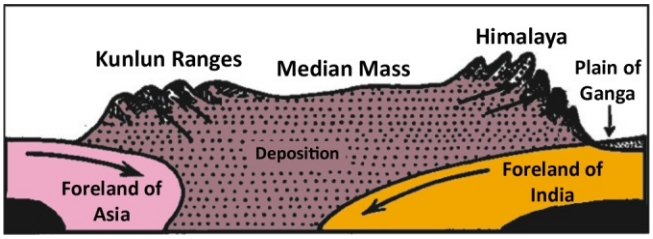

Fig.4.5 : Origin of Himalaya according to Kober

overlayed of sedimentation. Thus, the sediments were deposited in a thickness of thousands of feet in Tethys sea. Tectonic pressure on the sediments followed due to various reasons, resulting into the rise of Himalayas by folding. There are differences of opinion about the direction and causes of the pressure (Fig. 4.4).

Kober believed that Himalayas originated due to the pressure levied from both sides on the sediments deposited in the geosyncline. The land masses levying pressure from both sides on the sediments were termed as **Foreland** by Kober. The pressure of forelands causes folding in the marginal areas of sediments, while its middle section remains unaffected by the tectonic force. Resultantly, the middle section stands as a flat highland, which was termed as **Median Mass** by Kober. In the context of the origin of Himalayas, Kober's view was that both Angaraland and Gondwanaland were Forelands and Tibet plateau is a Median Mass, as explained in Fig. 3.3. Although the hypothesizing of pressure coming from both sides was also accepted by Daly and Holmes, but they differed on the causes of pressure. Continental sliding from both sides was held responsible for causing pressure on the sediments by Daly. Holmes ascribed convectional currents causing the formation of geosyncline, its continuous sinking and pressure from both sides. The process has been shown in Fig. 4.5.

Some geologists have different views about the issue. They hypothesize that the pressure came from one side only. These geologists designate the landmass levying pressure as **Hinterland** and the stable landmass as **Foreland** as shown in Fig. 4.5. But these geologists also differ about the direction of the pressure on the sediments. Some geologists believe that the pressure came from northern (from Angaraland) side while others believe it to be coming from southern side (from Gondwanaland). Theoretically, Suess believes that the pressure from one side is enough for causing folds in the sediments. He also designates the moving landmass as Hinterland and the stable landmass resisting the pressure as Foreland. According to Suess, the Foreland resists the pressure. Argand and Wegner believe that a part of the Gondwanaland drifted towards Tethys sea and Angaraland remained stable. Australian geologists - Powell & Conaghan also held that Himalayas were folded due to resistance of Tibetan block against the drifting Bhartiya sub-continent. While Wadia's view was that Himalayas originated due to the forces coming

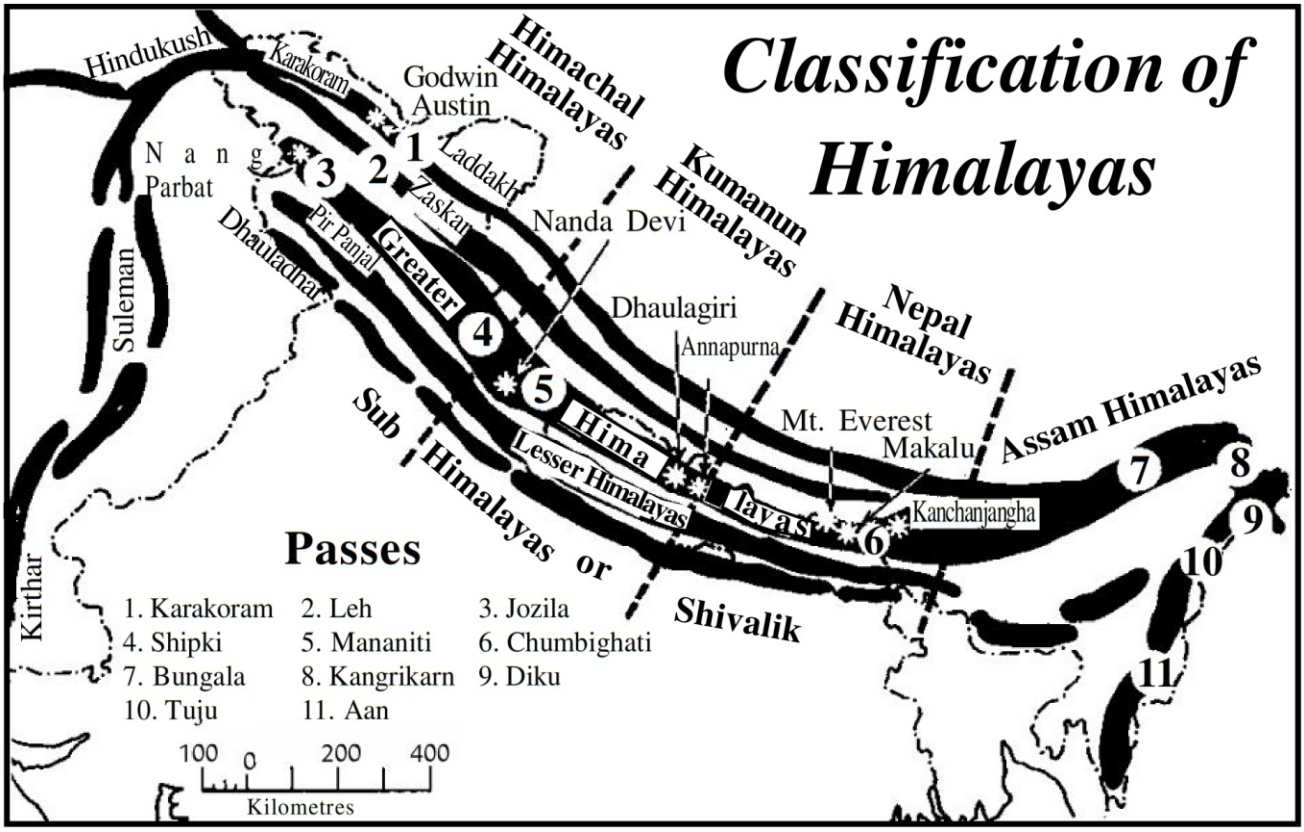

Fig. 4.7 : Classification of Himalaya

from the north and the resistance by Bhartiya sub-continent.

Geographical Classification of Himalayas

Himalayas consists of several mountain ranges. Geographically these are divided into three parts (Fig. 4.7) -

1. Greater Himalayas - It is the **northernmost mountain range** of Himalayas. It is also known as the **Main Himalayas, Himadri, Inner Himalayas, Snowy Himalayas** etc. This range extends in a length of about 2500 kms. from the bend of Sindh river in the north-west to the bend of Brahmaputra river in the east. The range spreads in the form of an arc from 73° E. to 97°E longitude. It is the highest mountain range. Its average height is 6000 metres above mean sea level and width ranging from 100 to 200 kms. There are about 40 peaks which rise above 7000 metres in the range. The highest peaks of our country lie in this range. Mount Everest (8848 metres), Godwin Austin (8611 metres), Kanchanjangha (8585 metres), Makalu (8481 metres), Dhaulagiri (8172 metres), Nanga Parbat (8126 metres), Annapurna (8078 metres), Nanda Devi (7818 metres) etc. snow covered peaks lie in this range. This mountain range is tectonically active and is still rising. The rivers descending from the range towards Bharat make narrow, deep and vertical sided valleys because the range has steep slope towards Bharat. Sindh, Sutlej, Ganga,

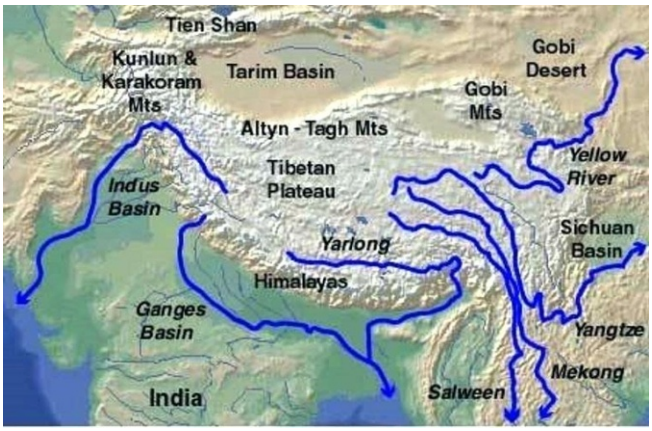

Fig. 4.6 : Himalaya, Indus, Ganga and Brahmputra plain

Yamuna, Brahmaputra rivers etc. originate in this range. Although the range produces barrier in the movement due to its ruggedness and steep slopes, Jozila, Karakoram, Shipki, Mananiti passes etc. provide the facility for transportation routes.

South-eastern branch of the greater Himalayas makes the eastern boundary of Bharat and goes upto Myanmar (Burma). Garo, Khasi, Jayantia, Patkoi, Naga, Bum and Lushai hills etc. are the parts of this range. These hills are highly inaccessible and covered with dense forest. These ranges form the eastern boundary of Bharat.

The north-western branch of the greater Himalayas lie on the borders of Pakistan and Afghanistan. Suleman, Kirthar, Hindukush and Karakoram are its main ranges. Khyber, Gomal, Tochi, Bolan passes etc. provide the facility for international trade through the land routes.

2. Lesser Himalayas - These mountain ranges are situated south of the Greater Himalayas. These are also known as Middle Himalayas or Himachal Himalayas. These mountain ranges lie parallel to the Greater Himalayas and have a width ranging from 80 to 100 kms. The average elevation of these ranges is 3000 metres but the maximum elevation goes up to 5000 metres. There are many small mountain ranges in Lesser Himalayas. Dhauladhar, Pir Panjal, Nag Tiba, Mahabharat, Mussouri etc. are its main ranges. The ranges experience snowfall for 3-4 months in winter season, but the summer season remains very pleasant and healthy. Therefore, there are many tourist places and hill stations in these ranges e.g. Shimla, Mussouri, Nainital, Darjeeling, Ranikhet etc. The higher slopes of these ranges are covered with coniferous forests and lower slopes are covered with grasslands which are known as **Marg in Kashmir** (e.g. Gulmarg, Sonmarg etc.) and as **Bugyal** and **Payar** in Uttarakhand. Lesser Himalayas are isostatically more stable and balanced. There are many examples of **river capture** in these ranges.

3. Sub-Himalayas - It is the southernmost range of the Himalayan system. It is also known as **Outer Himalayas** or **Shivalik range**. It is the newest formation in the Himalayan system. It extends from Potwar basin to Kosi river in the east. Its width varies from 10 to 50 kms. and its average height is 1000 metres above sea level. The range is given different names in different regions eg. it is known as **Doondwa** near Gorakhpur and **Churiyan** and **Muriyan** towards the east. All the rivers flow through narrow valleys or gorges in Shivalik range before entering into the plains and make alluvial fans at the base of the range. These are locally known as **Bhabar**. The southern part of Bhabar region is marshy and is known as **Tarai**. The whole region is densely forested. High valley-plains, made up of river alluvium and sand, are found in its central sections lying between Himalayas and Shivalik range. These plains are known as **Dwar** (eg. Haridwar) in the east and **Doon** (eg. Dehradun) in the west.

Regional Classification of Himalayas

Regionally Himalayan mountain system is divided into four major groups (Fig. 4.6) -

1. Himachal Himalaya - It extends from Sindh river to Sutlej river. Its total length is approximately 570 kms. It mainly extends in Jammu-Kashmir and Himachal Pradesh. Pir Panjal, Dhauladhar, Zaskar and Laddakh are the main mountain ranges of this section. Northern slopes of these ranges are highly rugged, uninhabitated and dry, while its southern slopes are densely forested. Kangra, Lahul and Spiti valleys, famous for fruit cultivation, extend in this region.

2. Kumaun Himalaya - It extends in a length of approximately 320 kms. between Sutlej and Kali rivers. It is higher than the Himachal Himalayas. Badrinath (7040 metres), Kedarnath (6831 metres), Trishul (6707 metres), Gangotri (6508 metres) etc. are the main mountain peaks of this section. Ganga, Yamuna rivers etc. originate in this section. The famous places of pilgrimage like Badrinath, Kedarnath, Gangotri, Jamnotri etc. are located in this section.

3. Nepal Himalayas - It stretches in a length of about 800 kms. from Kali river to Tista river. Since most of this section extends in Nepal, it is also known as **Nepal Himalayas** and elsewhere in Sikkim it is known as **Sikkim Himalayas**, in West Bengal as **Darjeeling Himalayas** and in Bhutan as **Bhutan Himalayas**. It is the highest section of Himalayan system where snow-capped peaks of Everest, Kanchanjangha, Makalu, Dhaulagiri, Annapurna etc. are located.

4. Assam Himalayas - This section extends in a length of about 740 kms. between Tista and Brahmaputra rivers. Kabru, Chumalhari, Jaang Sangla, Kula Kangdi, Pauhuni etc. are the major peaks of this section. Naga Hills of this section function as a water divide between Bharat and Myanmar (Burma). It is a densely forested region inhabiting many tribes.

Importance of Himalayas

Great Poet Kalidas has described Himalayas as the King of Mountains and abode of Gods. The physical features, location, extension and structure of Himalayas are very important and useful to our country, because -

1. They form natural boundary in the north and east.

2. Traditionally, Himalayas have been our northern sentry because of the unique location due to which Bharat had been conceived as safe from external aggressions. But these are no more inaccessible because of modern technological achievements. Hence, we have to be very cautious about our security on northern and eastern borders.

3. The high Himalayan wall protects Bharat from the cold polar winds.

4. The weather conditions of Bharat remain stable and experience a rhythmic change because the cold polar winds are effectively checked by the Himalayan wall.

5. Himalayas also intercept the rain bearing monsoons in Bharat itself and hence the benefit of these humid winds is received by our country.

6. It is the source of many perennial rivers which are fed by snow melted water. These rivers help in providing irrigational facilities to the extensive Ganga-Sindh plain.

7. Various waterfalls in the Himalayas are important sources of hydroelectric power generation.

8. Ganga-Sutlej plains are made up of fine alluvium deposited by the rivers descending from the Himalayas. These are extremely important economically for Bharat. Not only this, these rivers naturally rejuvenate the soil layer in these plains by flooding.

9. Different types of forests are found on varying heights of the Himalayas. These forests provide a large variety of vegetation, wood, rhizome-fruits, gum, lac and medicinal herbs etc.

10. Many Bharatiya industries are dependent on these raw materials obtained from the Himalayas.

11. Large variety of flora in the Himalayas provide congenial ecological conditions for various wild animals like lions, tigers, elephants, Bhartiya antelope, deer, bear, panthers, monkeys etc.

12. Saffron, tea, potatoes and various fruits are grown on the slopes of Himalayas and cattle rearing is also done.

13. Himalayas are storehouse of a variety of minerals. The oilyferous nature of Himalayan rocks render the possibility of mineral oil.

14. Himalayas have a tremendous tourist importance due to the beautiful natural lakes, and wholesome and charming places. Shimla, Mussoorie, Nainital, Bhimtal, Garudtal, Ranikhet, Almorah, Kasauli, Chamba, Kullu, Mukteshwar, Amarnath, Bhuwali, Kalimpong, Sheshnag, Pahalgam, Gulmarg, Sonmarg etc. attract many native and foreign tourists.

15. Besides the above mentioned materialistic advantages, Himalayas carry Pauranik spiritual importance. These have been conceived as the abode of Gods. Badrinath, Kedarnath, Amarnath, Kailash, Mansarovar, Vishnuprayag, Devprayag, Karnprayag, Haridwar, Uttarkashi, Joshimath, Gangotri, Yamnotri etc. are important places of pilgrimage in the Himalayas. Swayambhunath, Tabang, Hemis, Dhyagboche etc. are famous Baudh Monasteries in the region.

16. Himalayas are very important from the point of view of mountaineering.

17. The inhabitants of this region are stout, healthy and brave, hence they are important constituents of Bharatiya Army.

2. Great Plains

Great plains extend between Himalayas in the north and the peninsular plateau in the south. Before the partition of Bharat, it was known as Ganga-Sindh plain, but because of the partition, Sindh with it tributaries - Jhelum, Chenab and Ravi have gone to Pakistan. Therefore, now the portion of the plain remaining in Bharat is known as the Sutlej-Ganga-Brahmaputra plain because it is made by the alluvium deposited by these rivers. The arc-shaped plain extends in a length of about 2400 kms. and a breadth of 150 to 480 kms. It is a gently sloping fertile plain. It has a slope of only 10 cms. per

kilometre between Varanasi and the Delta of Ganga river. Aravalli ranges function as a water-divide in the region. Excepting Aravallis, its maximum elevation is 185 metres above sea level. There is a difference of opinion about the thickness of alluvium found in the plains, but at several places the thickness of alluvium layer exceeds 3000 metres. It is one of the most extensive, fertile and densely populated plains of the world.

Geographical Classification

Although it is popularly known as a **featureless plain**, geographically it can be divided into four groups -

1. Bhabar Region - This region extends in a belt of 8 to 16 kms wide strip between Sutlej and Tista rivers at the foot hills of Shivaliks. Rivers deposit most of the heavy debris at the foot hills when they leave the mountain stage and enter into the plain stage (because of the sudden change in the nature of slope). Most of the rivers have underground flow in the region. Long rooted trees are found in this agriculturally unsuitable region.

2. Tarai Region - It is that region lying to the south of Bhabar, where the underground drainage of rivers reappears over the surface. It is mostly covered by marshes because of the indeterminate drainage system. Dense forest, tall grasses (like Kans, elephant grass etc.) and wild animals are characteristic features of the region. Tarai characteristics are absent in its western section due to scarcity of rains. Successful attempts have been made to convert the area into agriculturally useful region for growing different crops and jute etc. by clearing the region and properly managing the drainage system of Tarai in Uttar Pradesh.

3. Bangar Region - It is that higher section of the plain which is made up of older alluvium and where the flood water is unable to reach. These are mostly found in the north-western section of Uttar Pradesh.

4. Khadar Region - These low lying plains are made up of newer alluvium. A fresh layer of soil is spread every year by flood water in this section. Such low lying plains are known as Khadar. These are mostly found in Uttar Pradesh, Jharkhand, Bihar and West Bengal.

Regional Classification

Regionally, the plain extending between Sutlej and Brahmaputra river valleys is divided into four sections -

1. The Plains of Punjab-Haryana - This section of the great plains extends in Punjab and Haryana. Its north-western section is made up by the alluvium deposited by Sindh and its tributary rivers - Sutlej, Beas, Ravi, Chenab and Jhelum. The plain lying between two rivers is locally known as **Doab**. **Bist Doab** extends between Beas and Sutlej, **Bari Doab** between Ravi and Beas, **Rechna Doab** between Chenab and Ravi, **Chaj Doab** between Jhelum and Chenab and **Sindhu Sagar Doab** between Sindh and Jhelum. Out of these only **Bist-Bari Doab** is in Bharat and the rest have gone to Pakistan as a result of the partition. Approximately 10 to 20 kms wide area on both sides of these rivers is khadar or flood prone area. Such areas are locally known as **Bet**. Several depressions have been made by the erosional process of small rivers in the plains adjoining Shivalik hills. These depressions are locally known as **Cho**. There are many such Chos in Hoshiyarpur district. The south-eastern section extending upto Ghagghar river is known as Haryana plain. The importance of Haryana plain has rapidly increased with the availability of irrigational facilities.

2. Ganga Plain - This huge, level and a very fertile plain is made up by fertile alluvium deposited by Ganga and its tributary rivers Yamuna, Gomti, Ghaghara, Gandak, Kosi, Betwa, Ken, Chambal, Son etc. It extends from Aravalli ranges eastwards upto West Bengal. It mainly spreads over eastern Rajasthan, Uttaranchal, Uttar Pradesh, Jharkhand, Bihar and West Bengal. The general slope of this section is towards the east and south-east. It mainly consists of Khadar and Bangar areas. Bangar region or the dry higher plains are covered with low knolls, which are locally known as **Bhoor**. Its eastern part is known as **Ganga-Yamuna Doab**, north-central part as **Ruhelkhand Plain** and its north-eastern part as **Awadh Plain** in Uttar Pradesh. The plain region extending on both sides of Ganga river in Bihar is known as **Jharkhand Plain** and **Bihar Plain** respectively. Jharkhand Plain is drained by Ghaghara, Gandak, Kosi rivers etc. It slopes south-eastwards. Son and its tributaries originate from Chhota Nagpur Plateau and join river Ganga after draining through Bihar Plain northwards and north-

eastwards. North Bengal Plain extends between Himalayan foot hills and Ganga Delta in West Bengal. This section is drained by Ganga and Brahmaputra rivers. The piedmont section of this region is known as **Duar**, where there are many tea plantations.

3. Brahmaputra Plain - It is a narrow and elongated plain extending between Himalaya mountains and Garo hills in Assam. It is mainly made up of the alluvium deposited by Brahmaputra river. It is approximately 650 kms long and 100 kms wide and stretches between Dhubri and Sadiya. Brahmaputra river transports large volume of alluvium which tends to be deposited by any obstacle in the flow. It causes the formation of several islands in Brahmaputra river.

4. Ganga-Brahmaputra Delta - It is an extremely level plain which does not have much height above sea level. It is a marshy area because tidal water usually spreads throughout the region. The high area lying beyond the reach of tidal water is locally known as **Char**, where settlements are found. The low area is locally known as **Bill**, where enough water is available for washing jute.

Importance of the Great Plains

1. This plain is made up of river brought alluvium, hence it is extremely fertile.

2. The soils are rejuvenated every year naturally by the spread of fresh layer of alluvium during floods.

3. The plains have a dense network of rivers. Their water is utilized for irrigation, water transport, generation of hydroelectric power and in industries.

4. Because of being level plain, it is less expensive to construct canals and dig wells. Therefore, the means of irrigation are cheap and easily available.

5. It is an important producer of sugarcane, tea and rice in its eastern section, and wheat, cotton etc. in its western section.

6. Approximately 45 per cent of the country's population lives in these plains.

7. There is a dense network of all means of transportation due to its levelness.

8. Most of the big cities, commercial and industrial centres of Bharat are situated in this region.

9. Ample various means of livelihood are available in the plains.

10. Trade facilities are easily available in this region.

11. Industrial development has also been promoted in the plains because of the availability of various facilities.

12. The plains have many tourist centres.

3. Thar Desert

Thar desert covers the whole of western Rajasthan. Some geographers include it in the study of the peninsular Bharat because the basal rocks of the desert are considered as the continuation of the rocks of Deccan plateau. Other geographers consider it logical to study the desert with the plains because of its continuity with the latter. But in reality this region possesses its own characteristics and the problems as well, therefore, it has been included as a separate geographical region.

Origin of Thar Desert

There are various views regarding the origin of Thar Desert. Some experts believe that the presence of sand in the region owes its existence due to the disintegration of local rocks. But there are indications of erosion of surface rocks by running water. Therefore, other experts believe that formerly the climate of the region would have been humid but gradually it became dry and the region was converted into a desert. Wood Fossil Park in Aakal near Jaisalmer bears the testimony to this fact. Millions of years old fossils of huge trees have been excavated in Aakal. Many geologists believe that formerly it was a very fertile region drained by many big rivers. The region was uplifted due to tectonic activities. Resultantly, the drainage of the region was diverted towards Ganga and Sindh river systems, causing dry conditions in the region. La Touche was of the view that the prevailing south-western storms in the region continuously brought sand with them and it was deposited in the region. However, the hypothesis of climatic drought is generally more acceptable.

Geographical Characteristics

The desert extends to the west and north-west of the Aravallis upto Sindh plain. International boundary between Bharat and Pakistan passes through it. Thar desert is generally a lowland area. It averages from 150 to 300 metres in elevation, 640

kms. in length and 160 kms. in width. Sanddunes are formed by the prevailing fast blowing winds in the region. These sanddunes frequently migrate in the direction of the prevailing winds. Occasionally, the sanddunes surround low lying areas between them. Such low lying areas are locally known as **Talli**. These tallies are converted into small lakes by the accumulation of rain water. Such lakes are locally known as **Dhandh** or **Rann**. Sambhar, Lunkaransar, Deedwana, Pachpadra etc are the salt water lakes in this region. Salt is prepared from the brackish water of these lakes.

The migrating sanddunes and blowing sand enable us to conjecture that Thar Desert is spreading eastwards at the rate of one kilometre per year. A row of trees and other semi-arid vegetation has been developed to check its expansion. Central Arid Zone Research Institute (CAZRI) is also taking other steps for its containment. Transformation of the desert is expected by irrigation facilities to be made available after completion of Indira Gandhi Canal. The construction work of canal is gradually progressing with the objective of taking advantage of this possibility.

Importance of Thar Desert

1. Excessive summer heating in the region develops intense low pressure which attracts south-west monsoon.

2. Cattle rearing and herding is the main occupation in the drier parts of the desert.

3. Various minerals are found in this region. Mica, Gypsum, Asbestos, Coal, Copper, Soapstone, Marble, Building Stones, Rock Phosphate, Felspar, Mineral Oil, Natural Gas etc. are the main minerals found in this region.

4. There are large possibilities of agricultural development through irrigational facilities because the soils of the region are fertile.

5. It attracts tourists due to its physiographic peculiarities. Yearly held Desert Festival of Jaisalmer bears the testimony to this fact.

6. The region has strategic importance due to its location on the international border with Pakistan.

4. Deccan Plateau

It is one of the oldest massifs of the world. The plateau extends in an area over about 1.6 million square kilometres. It is a triangular plateau extending to the south of the great plains of Bharat. It has oceans on three sides - Bay of Bengal in the east, Arabian Sea in the west and the Indian Ocean in the south. The triangular plateau has its base in the north near Vindhyachal mountains and its apex in the south near Cape Comorin (Kumari). From the highlands of the south-eastern Rajasthan upto Kanyakumari, it extends in a maximum length of 1800 kms. and its width measures about 1400 kms. The plateau averages 600 metres in elevation above mean sea level. It covers south-eastern Rajasthan, Gujarat, Chhattisgarh, Madhya Pradesh, Jharkhand, Orissa, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and partially Kerala. It is an old plateau consisting of extremely hard and crystalline rocks. The plateau slopes towards the east. Therefore, all the rivers, except Narmada and Tapti, flow eastwards and drop out in the Bay of Bengal. These rivers have dissected the plateau in many parts. There are many old residual mountain ranges in this plateau (Fig. 4.8).

Origin of Deccan Plateau

Millions of years ago, it was a part of Gondwanaland lying south of the Tethys Sea. In the course of geological history, Gondwanaland was fractured and fragmented. Its various fragmented parts took the shape of the continents of southern hemisphere. Peninsular Bharat came in its present situation by drifting north-eastwards from the fragmented Gondwanaland.

Classification of Deccan Plateau

The Deccan plateau can be divided into the following three parts -

1. Western Ghats - The western margin of the Deccan plateau rises as Western Ghats, which are also known as **Sahayadri**. Western Ghats have steep slope towards Arabian Sea and gentle slope towards the east. The Sahayadri has an average elevation of about 1000 metres above mean sea level and extends continuously from Tapti Valley to Cape Comorin. There are three major passes in the Western Ghats - **Bhor Ghat, Thal Ghat** and **Pal Ghat**. Sahayadri merges with eastern ghats in the southern section of the Deccan Plateau, where Dodabeta (2637 metres) is the highest peak in Nilgiri mountains. Annamalai, Ilaichi and Palni ranges converge in this section. Famous tourist

centres - Utakmund, Kodaikanal etc. are located in this section. Mahabaleshwar (1438 metres) in Maharashtra is also an important tourist centre. The northern section of Sahayadri is covered with lava and its southern section is made up of gneiss, schist and chernokite rocks. Most of the rivers originating from the Western Ghats flow eastwards and drain their waters into Bay of Bengal. These rivers include Godawari, Bhima, Krishna, Tungbhadra, Pennar, Kaveri, Tamraparni, Periyar, Waigai etc. These rivers make waterfalls while descending from Sahayadri. Yena falls (183 metres) near Mahabaleshwar, Shivsamudram falls (100 metres) of Kaveri and Papnasam falls of Tamraparni rivers are the major falls. There are few rivers flowing westwards and draining their waters into the Arabian Sea but these rivers also make water falls. Jirsappa (Shri Mahatma Gandhi) falls (250 metres) of Sharawati river besides the falls of Narmada and Tapti are the major water falls. All these water falls are unique natural gifts for the production of cheap hydroelectric power.

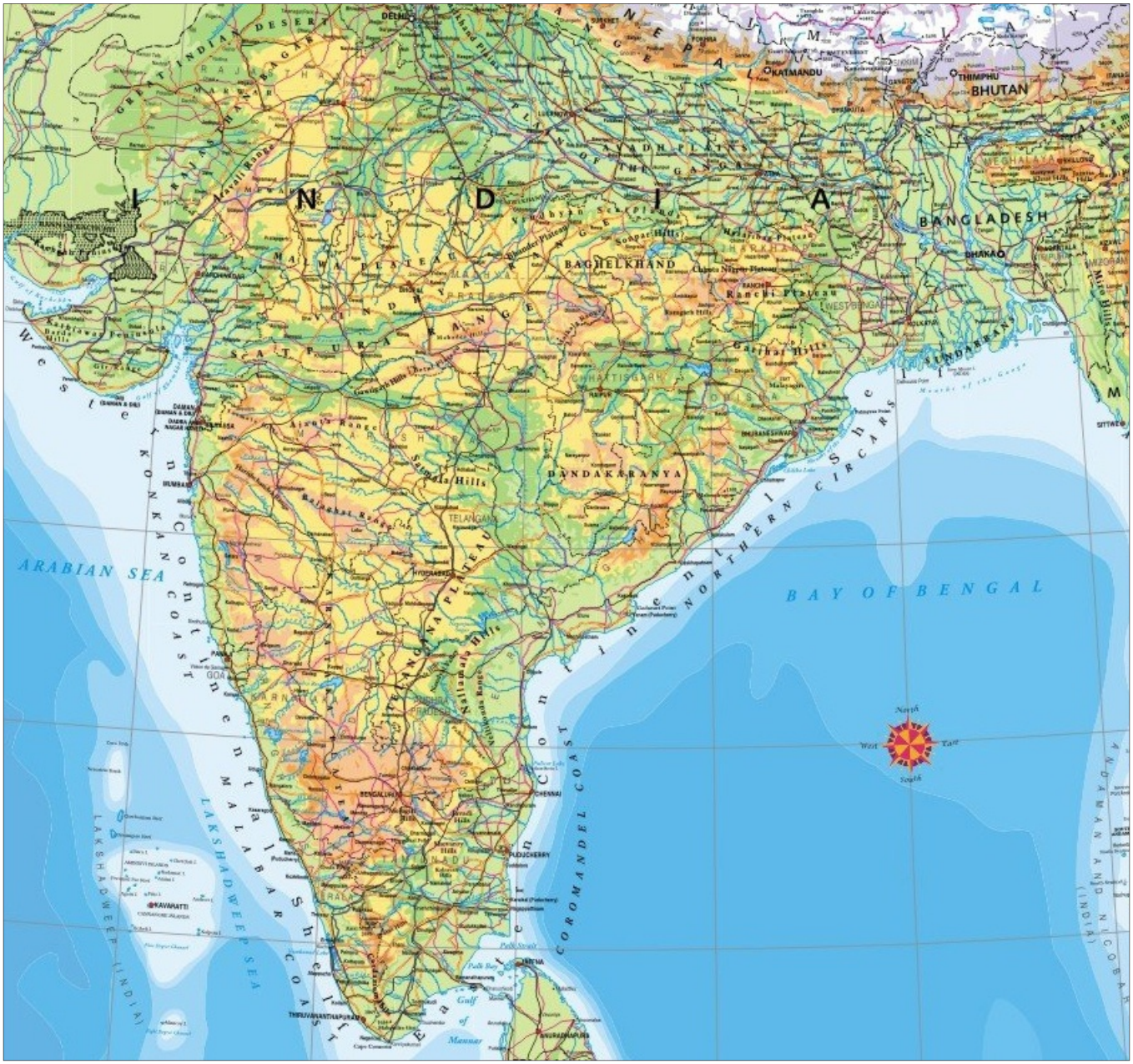

Fig. 4.8 : Deccan Plateau and Coastal Plain

2. Eastern Ghats - These ghats spread parallel to the eastern coast in a total length of about 800 kms. These are different from the Western Ghats because these are relatively low, discontinuous and lie far off from the eastern coast. Eastern Ghats spread from Mahanadi Valley in the north to Nilgiri mountains in the south. All east bound rivers have dissected the Eastern Ghats tremendously. Although the average height of the eastern ghats is 600 metres above mean sea level, Nilgiri peak rises to an elevation of 1516 metres and Mahendragiri peak to 1501 metres. Schist, gneiss, chernokite, khondlite etc. of sedimentary origin and igneous rocks have contributed to the constitution of eastern ghats.

3. Southern Plateau - The plateau is made up of very old, hard and metamorphosed igneous rocks, sandstone, limestone and metamorphosed rocks of Dharwar and Gondwana systems (including coal seams). It is an **old massif**. Huge part of the plateau surface was covered with lava by volcanic erruption. Approximately 5 lakh sq.km. area of the plateau surface is covered with black soil disintegrated from the lava deposits. This soil spreads over some parts of south-eastern Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka. Some parts of the plateau are covered with leached laterite soil which is red in colour. The average elevation of the plateau is 600 metres above mean sea level. The plateau is tilted eastwards, therefore, most of the rivers of the plateau flow in this direction. These rivers have dissected the plateau in various parts like Chhattisgarh, Mysore plateau, Railseema plateau, Telangana plateau etc. Chhattisgarh is a high, flat plateau region rising to an elevation of 300 metres. Some geologists believe that Shillong plateau is the distant most north-eastern extension of this plateau.

Importance of the Deccan Plateau

1. It is a stable block because it is an old massif related to Gondwanaland. Hence, it is almost free from seismic activities like earthquakes and volcanoes.

2. It enjoys equable climate because it is surrounded by oceans on three sides.

3. The plateau is rich in various minerals because it consists of old rocks.

4. In its major north-western section, it is covered with black soils which is very fertile. The soil is highly suitable for growing cotton and groundnuts.

5. Areas of laterite soils are suitable for growing tea, coffee and rubber.

6. It possesses valuable forest resources of Sal, teak (Sagwan), rosewood (Shisham) and Sandlewood.

7. There are ample favourable and natural conditions available for the generation of cheap hydroelectric power as the rivers make waterfalls.

8. The region has a dense network of roads because of hard surface and easy availability of stones.

9. Many basic industries like iron and steel, aluminium, ship building, arms and ammunition manufacturing etc. have been developed in the region because of easy availability of raw materials, power resources, labour and market facilities.

5. Coastal Plains

Coastal plains flank the Deccan plateau on both sides. Both the coastal plains have been formed by either the upliftment of the continental shelves or by the deposit of river brought alluvium. These coastal plain are divided into two parts (Fig. 4.8) -

(A) Western Coastal Plains & (B) Eastern Coastal Plains

(A) Western Coastal Plains - These coastal plains extend from Bay of Cambay to Cape Comorin. Their average width is 64 kms and the maximum height of the plains is about 180 metres above mean sea level. The rivers flowing in this region are short and swift. Therefore, no deposition is made by them. Southern section of the coast is characterised by long and narrow lagoons. Kochin port is situated on one such lagoon. Mumbai and Mangalore are the major ports here. Its northern section is comparatively broad particularly from the mouths of Narmada and Tapti rivers upto northern Gujarat. Its northern section is known as **Konkan** and the southern section is known as **Malabar coast**. It is a densely populated area because of the facilities of good climate, fertile soil, rich rice cropping, industrial development and trade.

(B) Eastern Coastal Plains - The plain is located between the Eastern Ghats and Bay of Bengal. It extends from Orissa in the north to Cape

Comorin in the south. It is broader than the western coastal plains. Its width varies from 160 kms. to 480 kms. The plain is divided into two longitudinal sections - (1) The lower section consisting of river deltas. It is made up of the alluvium deposited by Mahanadi, Godawari, Krishna, Kaveri rivers etc descending from Deccan plateau. This section also possesses long chain of sandy knolls made by wave action. Chilka and Pulicut lakes are surrounded by such sandy knolls. These lakes are **lagoons**. (2) The upper section consists of the residual plains made up by alluvium. This section spreads in upper valleys. These plains are partially covered with river brought alluvium and elsewhere old rocks are exposed on the surface. The northern section of the eastern Coastal plain is known as **Northern Sarkar Coast** and its southern section as **Coromandel Coast**. Chennai and Vishakhapattanam are the major ports of these plains.

Importance of the Coastal Plains

1. Rice is cultivated widely in these plains. Coconut, cashewnut, beetalnut, rubber and palm plantations are also common in these fertile plains.

2. Large quantities of fish are caught on the Malabar coast and the deltaic coast of the east bound rivers.

3. Important ports of our country are situated in these coastal plains. These ports handle import and export trade of Bharat.

4. Salt is made on these coasts from the saline ocean water.

5. Valuable atomic mineral like monozite is found on the western coast of Kerala.

6. Large number of tourists come here to enjoy the scenic beauty of this coastal region, particularly in Panaji, Vascodegama, Madgaon, Juhu, Chennai, Puri etc.

6. Islands

Although Bharatiya coasts are not indented, there are several islands found near the coasts. On the basis of the location of the island, these are divided into two parts -

(i) Coastal Islands

(A) Alluvial Islands - Such islands are found along the eastern coast. All the islands on the eastern coast except Bhasra-Mandla Islands (rocky) near Chilka Lake are made up of alluvial soil. Sagar islands near the mouth of Hooghli, Short Islands in Mahanadi-Brahmani Delta and Wheeler Islands on their mouth, Adam's Bridge between Bharat and Sri Lanka, Pamban Islands of Rameshwaram, Crocodile, Anda and Kota islands in Bay of Mannar are made up of alluvium.

(B) Rocky Islands - Such islands are mostly found on the western coast. Henre, Kenre, Boocher, Elephanta, Pegion Islands near Mumbai and Peeram, Bhensla Islands etc. on Kathiawar coast are rocky islands.

(ii) Distant Islands

The islands situated away from the coast are included in this category. These islands are also divided into two parts on the basis of their structure -

(A) Hilly Islands - Higher parts of the submerged mountain ranges stand in the form of the islands. These are called as hilly islands. Andaman-Nicobar islands situated in Bay of Bengal are the best examples of this group. Southern extension of Arakan Yoma range of Myanmar (Burma) is submerged under the waters of Bay of Bengal. The portions of the range which stand higher than the sea level stand as Andaman-Nicobar islands. Some of the islands in this category are formed by volcanic eruptions. Approximately 200 islands of different size are included in this category, which are spread upto 350 kms. away from the Bharatiya coast. Andaman islands have been separated from the Nicobar islands by Ten Degree Channel.

(B) Coral Islands - Laksha Dweep situated in the Arabian Sea, off the west coast of Kerala, are such islands. Covering an area of about 21 square kilometres, this group includes Laksha Dweep, Amindivi, Minicoy, Kavaratti, Ilayachi islands etc. All these coral islands are centres of tourist attraction due to their natural beauty.

Importance of Islands

1. Their climate remains equable due to maritime effect.

2. These are the centres of tourist attraction because of their scenic beauty.

3. They have specific biotic characteristics because of their separation from the main land.

4. They have a special contribution in providing fuel and safe harbour to the commercial ships in emergency.

5. They carry a specific strategic importance because of their location in the Indian ocean. In the light of some near and distant foreign powers intending to increase their undue influence in the Indian ocean, their naval importance has further increased.

Important Points

1. The rock structure of Bharat is geologically divided into Archean Era, Purana Era, Dravid Era and Aryan Era.
2. Many diversities of relief and topographical features - Northern Mountainous Region, Great Plains, Thar Desert, Deccan Plateau, Coastal Plains and Islands.
3. Northern Mountainous Region - extends in an area of about 5 lakh sq.kms., 2400 kms long and 150 to 400 kms. broad.
4. Geographical classification of Himalayas - Greater Himalayas, Lesser Himalayas and Sub-Himalayas. Regional classification - Himachal, Kumaun, Nepal and Assam Himalayas.
5. Many advantages of Himalayas.
6. Great plains - Sutlej-Ganga-Brahmaputra plains; the arc shaped plains are 2400 kms long and 150 to 480 kms broad. Geographical classification - Bhabar, Tarai, Bangar and Khadar regions. Regional classification - Punjab-Haryana plains, Ganga-Brahmaputra plain and delta of Ganga-Brahmaputra, importance of the great plains.
7. Thar desert - Vast dry desert covered with sanddunes; Indira Gandhi Canal carries special importance considering the prevailing dry conditions in the region; importance of Thar desert.
8. Deccan plateau - Covering an area of about 16 lakh sq.kms., it is 1800 kms. long and 1400 kms. broad, it is one of the oldest plateaus of the world. (A) Central Foreland - Aravalli range, uplands of eastern Rajasthan, Malwa plateau, Bundelkhand plateau, Baghelkhand plateau, Chhota Nagpur Plateau, Vindhyachal-Satpura ranges. (B) Peninsular plateau - Western ghats, Eastern ghats and southern plateau. Importance of Deccan Plateau.
8. Coastal plains - Western coastal plains are relatively narrow, its northern section is known as Konkan and southern section as Malabar coast. Eastern coastal plains relatively broad and continuous, its northern section is known as North Sarkar Coast and southern section as Coromandel Coast, importance of coastal plains.
9. Islands - Coastal-alluvial and rocky islands. Distant islands - mountainous and coral islands.

Exercise

Multiple Choice Questions

1. The physiographic region extending between Sutlej and Kali rivers, is –
   (A) Himachal Himalayas (B) Sub Himalayas
   (C) Kumaun Himalayas (D) Nepal Himalayas

2. Wheeler islands are -
   (A) Distant islands (B) Alluvial islands
   (C) Rocky islands (D) Coral islands.

3. The region where natural rejuvenation of soil occurs every year, is -
   (A) Bhabar (B) Tarai
   (C) Bangar (D) Khadar.

Very Short Answer Type

4. What is meant by Talli?
5. Where are Margs found?
6. Which is Konkan Coast?

Short Answer Type

7. Distinguish between Dhandh and Talli.
8. Distinguish between Eastern and Western Ghats.
9. Which are the rocky islands of Bharat?

Essay Type

10. Divide Bharat into physiographic regions and give a detailed description of Himalayan region.
11. Divide Bharat into physiographic regions and give a detailed description of great plains.
12. Divide Bharat into physiographic regions and give a detailed description of Deccan Plateau.

Skill

13. Mark the major physiographic regions in an outline map of Bharat.
14. Draw a sketch of Deccan plateau showing its sub-divisions.

Answer Key

1. (C), 2. (B), 3. (D).