Notes

9

PHYSIOGRAPHY OF INDIA

Tutor : Dear learners, you will agree that the place to which we belong has many influences on our thinking and behaiour. Let us try to know which place do we belong to?

Natasha : I belong to Hisar town. Farah is from Fatehabad and Rajinder comes from Bhiwani.

Tutor : Do you know where all these places are located?

Rajinder : Yes, they are in Haryana as well as in India. But, where is India located?

Farah : What is the need to know India's location?

Tutor : Location of a country is the key to its identity. It determines the important aspects like climate, vegetation, agriculture, resources etc. This has a deep impact on the way people of that area live, what they eat and how powerful is their voice on the world stage. Therefore, to understand the various aspects of India, we need to look into its location. Let us discuss more about it in this lesson.

OBJECTIVES

After studying this lesson you will be able to:

- describe the location of India in terms of latitude and longitude;
- describe with the help of map, the significance of the relative location of India in terms of neighbouring countries;
- illustrate the States and Union Territories with the help of political map of India;
- explain the major physical divisions of India;
- describe the drainage system in India;
- compare and contrast between the Himalayan and the Peninsular drainage system; and
- explain the importance of people's participation in keeping river clean.

9.1 LOCATION

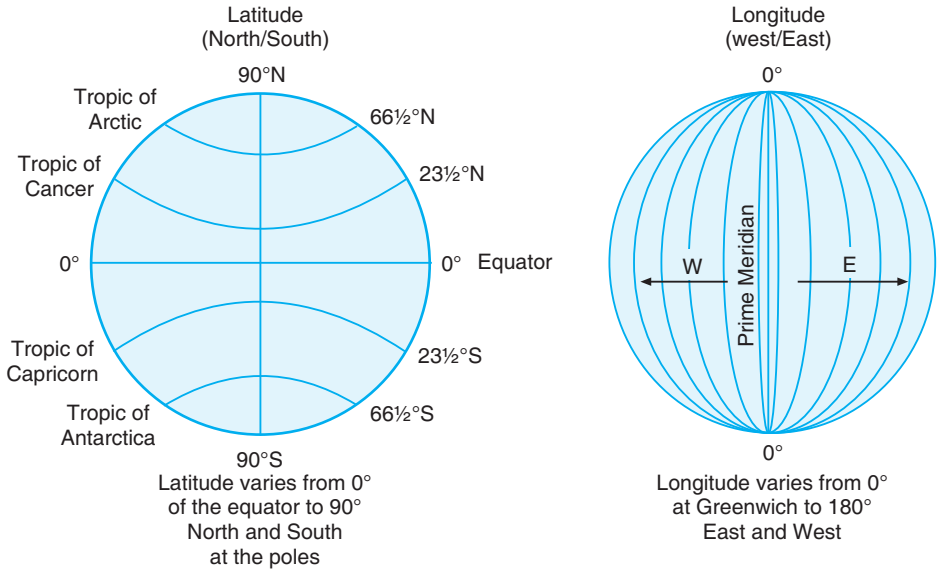
Teacher: Learners, when someone asks where India is, we can answer in two ways, in terms of absolute and relative location. Let us see what we mean by absolute location and relative location. Absolute location is given in degrees of latitude and longitude. Relative location depends upon point of reference, e.g., near, far etc.

Do you know

Latitude: Latitude is the angular distance, north or south from the equator, of a point on the earth's surface.

Longitude: Longitude is an angular distance on the earth's surface, measured east or west from the prime meridian at Greenwich.

Angular distance : The angular distance between the points from the centres is called angular distance.



Teacher: With the help of this map can you find out the latitudinal and the longitudianal location of Indian mainland.

Natasha: The Indian mainland extends between 8°4′ North and 37°6′ North latitudes and from 68°7′ East and 97°25′ East longitudes. Thus, the latitudinal and the North-south extent is 3214 km and East-west extent is 2933 km. India accounts 2.42% of the total world land area

Teacher: India lies entirely in the northern hemisphere, and eastern hemisphere. The Tropic of Cancer (23°30′ North) passes through the centre of the country. It divides the country into almost two equal parts Northward of this latitude is North India and South of it is known as south India. Similarly

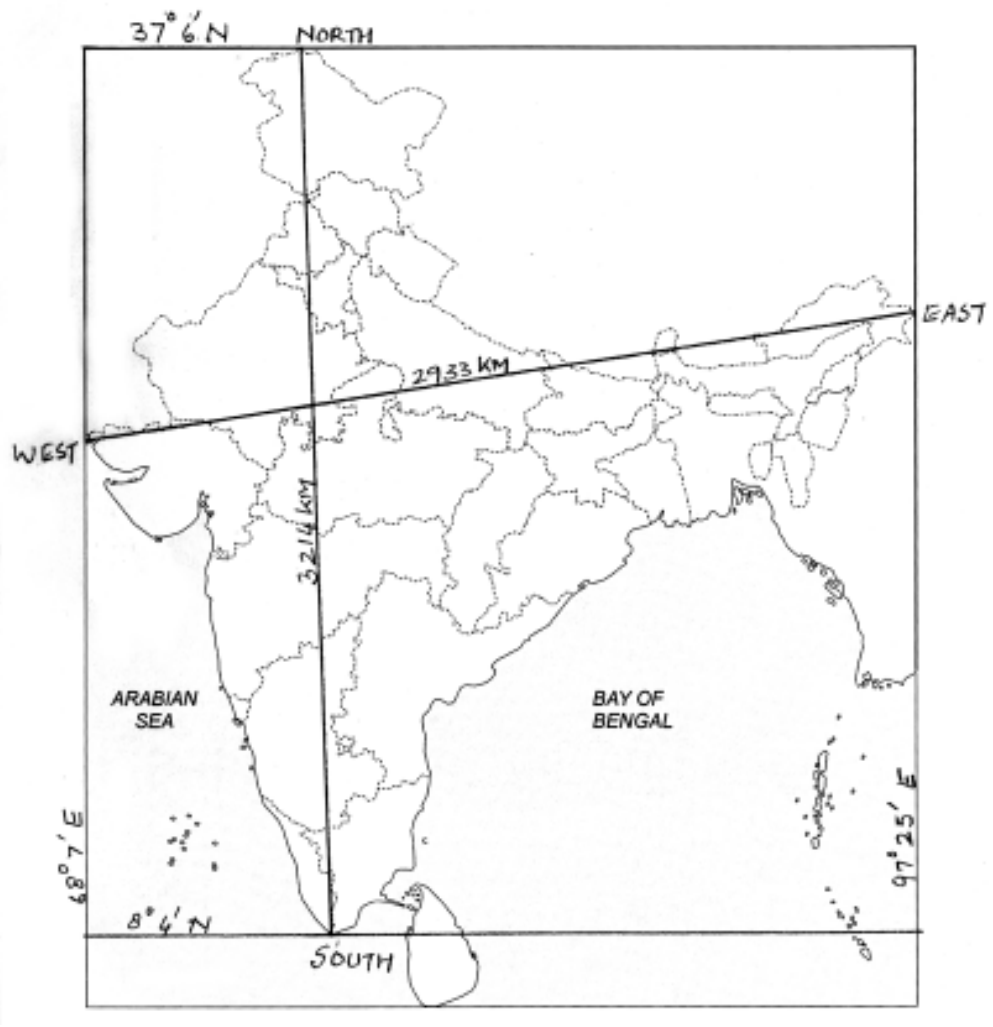


Figure 9.1 *Latitudinal and Longitudinal extent of mainland of India*

82°30′ East longitude passes almost from the middle of the country. It is known as **Standard Meridian** of India.

Teacher: Now determine the relative location of India and then record it in the space given below: Remember relative location is given in relationship to other places (north of, south of, northeast of, next to, across from).India is part of Asian continent. India is surrounded by water from three sides. Arabian sea in west, Bay of Bengal in the east and Indian ocean in the south. Towards its north west is Pakistan and Afghanistan. China, Bhutan, Tibet and Nepal lies to its north. Bangladesh and Myanmar lies to its east. Srilanka and Maldives are located in the Indian Ocean towards its south. The southern most point of the country is Indira Point (Nicobar Islands) which lies on 6°4′ N latitudes and Kannya Kumari is southern most point of Indian mainland which lies on 8°4′ N latitudes.

Do you know

The 82°30′E longitude passes through Mirzapur (in Uttar Pradesh). This is the Standard Meridian of the country. The 82°30′ East has been selected as standard Merdian because there is a time lag of almost two hours between Gujarat and Arunanchal Pradesh. Therefore, a Central Meridian is selected to determine the time for the whole country.

9.1.1 Locational Significance

Let's observe the Fig. 9.2.What do you notice? India is the largest country in terms of area and population in South-Asia. It is surrounded by ocean. India is strategically located in Indian Ocean. It commands sea routes between Europe and Africa, South-East Asia, far East Asia and Oceania. It is because of this that India shares good trade relation between many countries since ancient times. India has a good location in terms of sea and also well connected by land. Various passes like Nathu-La (Sikkim), Shipki-La (Himachal Pradesh), Zoji-La and Burji la pass (Jammu & Kashmir) have their own importance. The main India-Tibet trade route that connects Kalimpong near Darjeeling with Lhasa in Tibet passes through Jelepa La. Several passes have provided a passage to many ancient travelers. These routes are not only important for trade but also to exchange ideas and culture.

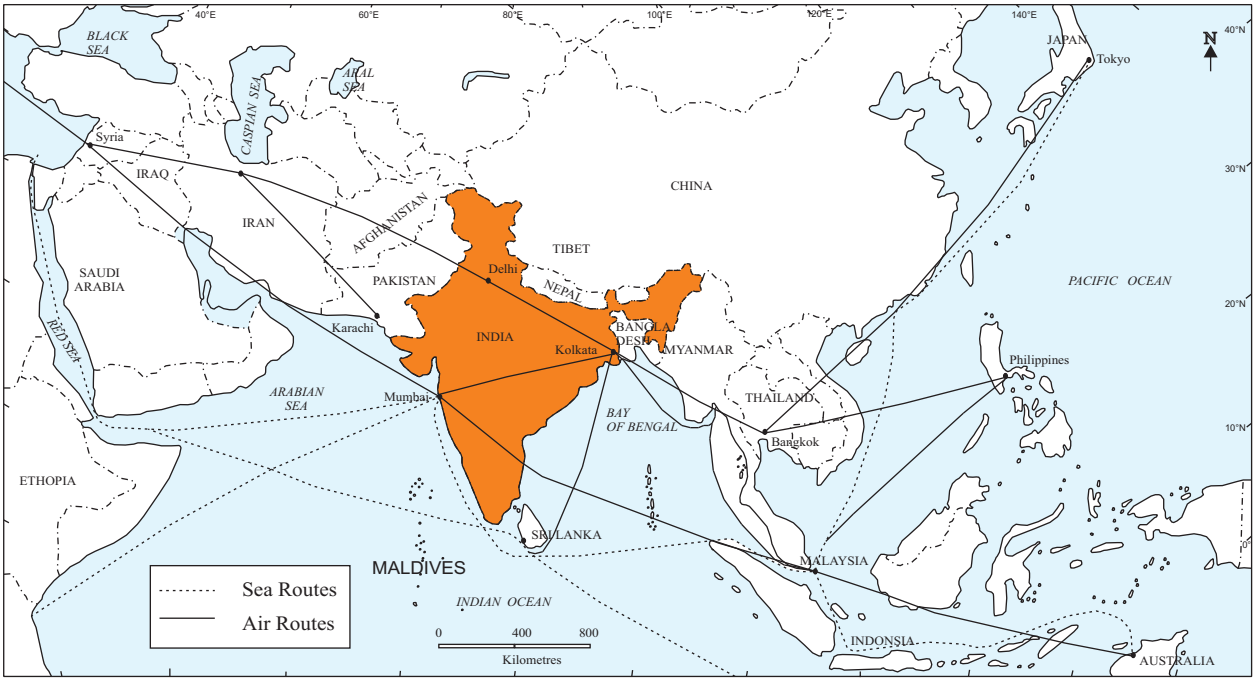


Figure 9.2 *Location of India with respect to important trade routes*

INTEXT QUESTIONS 9.1

1. Look at the map 9.2 and answer the following questions.
   (i) Find out the names of two countries lying to the eastern side of India.
   (ii) Mention the names of two seas located on the eastern and western side of India.
   (iii) Which country is connected to India by Palk Strait?
   (iv) Write the names of two countries having a common border with India.

9.2 STATES AND UNION TERRITORIES OF INDIA

India is the seventh largest country in the world. It has land boundaries of 15,200 km and 6100km long coast line. India's landmass covers 3.28 million square kilometer of area. This accounts for nearly 2.42 percent of the total geographical area of the world.

For good governance, India has been divided into 28 states and 7 union territories. Let us study the Fig. 9.3 given below.

Figure 9.3 *Political Map of India*

This map clearly indicates that each state and union territory has its own capital. It is interesting to note that while New Delhi is the capital of India, Delhi is the capital of Union Territory Delhi. Can you identify any other capital like this? Yes, it is Chandigarh which is the capital of two states Haryana and Punjab and also a Union Territory.

ACTIVITY 9.1

Find out the minimum number of states you need to across, if you want to move between the following places. (Refer Fig. 9.5)

(a) Kashmir to Mizoram (b) Punjab to Bihar (c) Delhi to Banglore
(d) Mumabi to Kolkata (e) Chennai to Raipur

INTEXT QUESTION 9.2

1. Look at the map 9.3 and answer the following questions.
   (i) Write the names of two States of South India.
   (ii) Mention the names of two states sharing international boundary.
   (iii) Write the names of two countries sharing their boundaries with Sikkim.
   (iv) Write the names of two union territories along Arabian Sea.

9.3 PHYSICAL DIVISIONS OF INDIA

Natasha : What is terrain?

Tutor : Terrain is an area of land which usually has a particular type of physical feature.

Farah : Like, Mumbai beach is sandy and Shillong is a hilly.

Teacher : Right. Do you know India is a vast country with varied land forms and topography?

Rajinder : What is the meaning of topography?

Teacher : Topography means the features of a place determined by nature. It is the description of various features and landscape on the surface of the earth.

India has the topographical diversity. This includes the Great Himalayas, the Northern Plain, the Thar desert, the coastal plains and the Peninsular Plateau. The reasons for variation in the topography could be:

- Differences in the rock formations. These landmasses have been formed in different geological periods.

- Number of processes such as weathering, erosion and deposition has modified these features to their present forms.

Weathering: Weathering is the process of gradual destruction of rocks at or near the earth's surface through physical, chemical and biological processes caused by wind water, climate change etc.

Erosion: Erosion is the process of gradual transportation of weathered rock materials through natural agencies like wind, river, streams, glaciers etc.

Weathering is distinguished from Erosion as no transportation of material is involved in case of weathering.

India is a country of physical diversity. There are high mountain peaks in some areas while in others, lie the flat plains formed by rivers. On the basis of physical features, India can be divided into following six divisions:

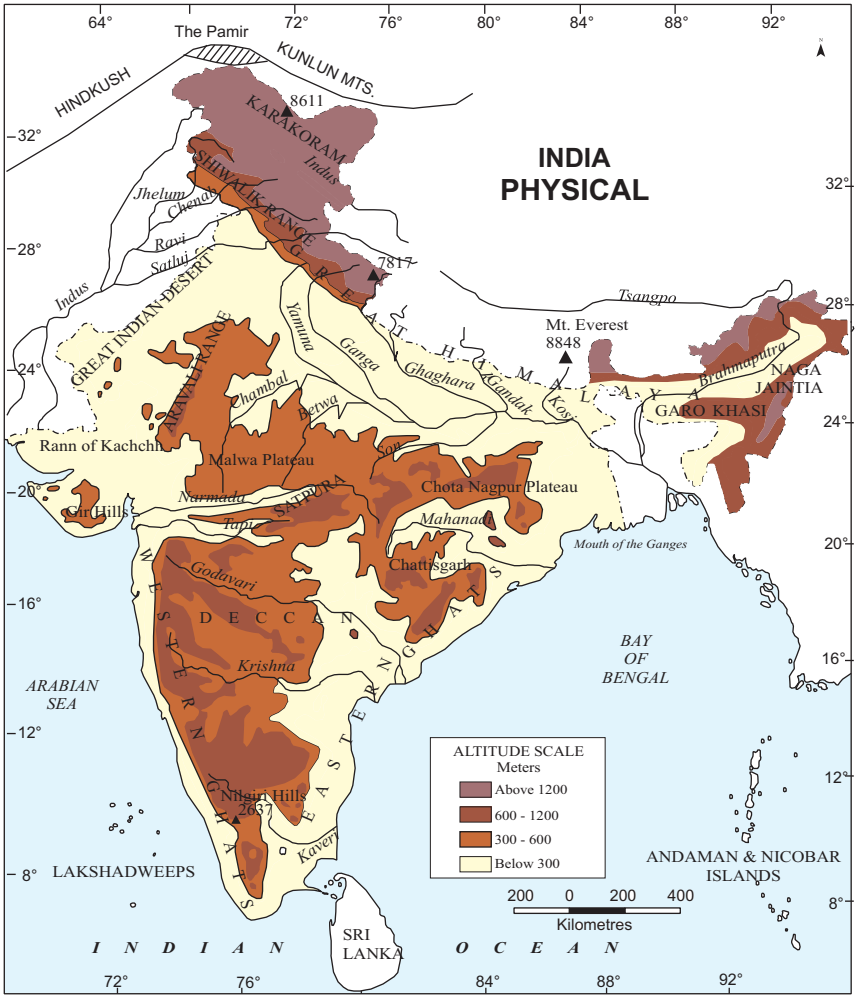


Figure 9.4 *Physiographic Divisions of India*

1. The Northern mountains
2. The Northern Plains
3. The Peninsular Plateau
4. The Indian Desert
5. The Coastal Plains
6. The Islands.

1. The Northern Mountain : It is divided into three groups. They are :

(i) The Himalayas

(ii) The Trans Himalayas

(iii) The Puranchal hills

1. The Himalayan Mountains

Himalayas are the young fold mountains. This is the highest mountain range of the world. Himalayas act as natural barrier. The extreme cold, snow and rugged topography discourage the neighbors to enter India through Himalayas. They run from west-east direction from Indus to Brahmaputra along the northern boundary of India

1. **Pass:** It is a natural gap or a route between a ridge, hill.
2. **Range:** large landmass consisting of mountains, ridges and peaks.
3. **Peak:** highest point or tip of a mountain range.
4. **Valley:** a depression or a flat land between two elevated areas.
5. **Dun:** Longitudinal valleys existing beween himachal and shiwaliks.

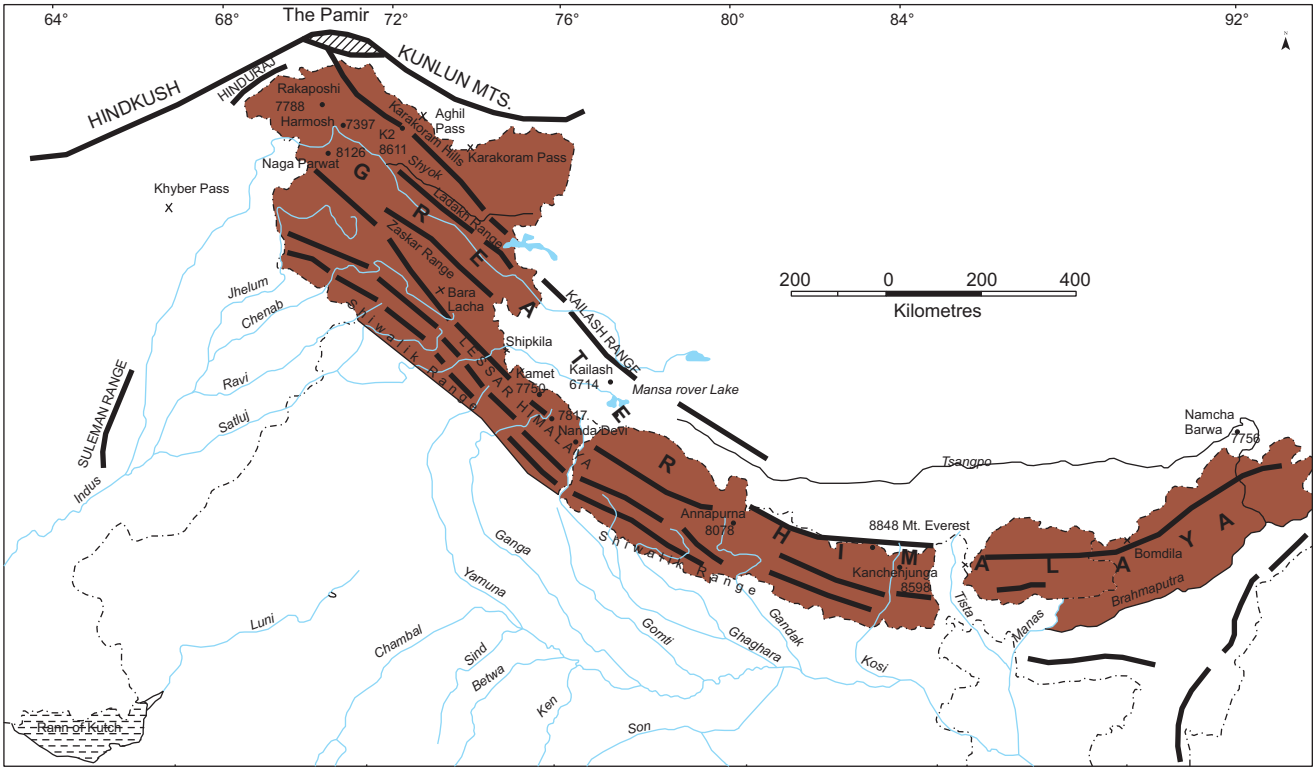


Figure 9.5 *The Himalyan Mountains*

covering a distance of 2500 KM. Their width varies from 400 in the west and 150 KM in the East (Fig. 9.5). The Himalayas may be divided into three parallel ranges:

(a) Greater Himalayas or Himadari

(b) Lesser Himalayas or Himachal

(c) Outer Himalayas or Siwaliks.

(a) The Greater Himalayas or Himadari: The Greater Himalayas comprises of the northern most ranges and peaks. It has an average height of 6000 metres and width lies between 120 to 190 Kms .It is the most continuous range. It is snow bound and many glaciers descend from this range. It has high peaks like Mt. Everest, Kanchenjunga, Makalu, Dhaulagiri, Nanga Parbat etc. having a height of more than 8000 metres. Mt. Everest (8848 m) is the highest peak of the world and Kanchenjunga is the highest peak of Himalaya in India. High Mountain passes also exist in this range, namely, Bara Lacha-La, Shipki-La, Nathu-La, Zoji-La, Bomidi-La etc. The Ganga and Yamuna rivers originates from this Himalayas.

(b) The Lesser Himalayas or Himachal: The altitude of this range lies between 1000 and 4500 metres and the average width is 50 KM. The Prominent ranges in this are Pir Panjal, Dhaula Dhar and Mahabharata ranges.It compresses of many famous hill stations like Shimla, Dalhousie Darjeeling, Chakrata, Mussoorie, Nanital etc. It also comprises of famous valleys like Kashmir, Kullu, Kangra etc.

(c) The Outer Himalayas or the Siwaliks: It is the outer most range of the Himalayas. The altitude varies between 900-1100 meters and the width lies between 10-50 KM. They have low hills like Jammu Hills, etc.The valleys lying between Siwalik and Lesser Himalayas (Himachal) are called 'Duns' like Dehra Dun, Kotli Dun and Patli Dun.

(ii) The Trans-Himalayan ranges

It extends north of greater Himalaya and parallel to it is called zaskar range. North of Zaskar range lies Ladakh range. The Indus river flows between Zaskar and Ladakh range. The Karakoram range lie extreme north of the country. K_2 is the second highest peak of the world.

(iii) The Purvanchal hills

It comprises Mishami, Patkoi, Naga, Mizo hills which are located in eastern side. The Meghalaya plateau is also part of these hills which includes the hills of Garo, Khasi and Jaintia.

INTEXT QUESTIONS 9.3

1. Write the names of the three ranges of the Himalayas.
2. Look at the map (Fig. 9.5) and find out.
   (i) In which state Nanga Parbat and Nanda Devi are located?
   (ii) Say Yes or No.
   (a) Mt. Everest is located in India……
   (b) Shipki-La pass is located in Siwalik Range……
   (c) Mansarover lake is located in Kailash Range……...
3. Mention the names of the countries in which the Greater Himalayas are situated.
4. Identify two purvanchal hills.

2. The Northern Plains

Let us try to locate and label the states lying in the Northern Plains of India (refer Fig. 9.5. The Northern Plains are located between south of the Himalayas and north of the Peninsular plateau. It is formed by the deposition of the sediments brought by three main river systems namely : the Indus, the Ganga and the Brahmaputra. From Punjab in the west to Assam in the east, this plain is about 2400 km long. Its width varies from about 300 km in the west to about 150 km in the east. It mainly includes the states of Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal and Assam. This plain is very fertile due to alluvial sediments brought by the rivers from the Himalayas. This plain is one of the largest and most fertile plains of the world. Major crops such as wheat, rice, sugarcane, pulses, oil seeds and jute are grown here. Due to proper irrigation, the plain makes significant contribution in the production of food grains. The Northern plain is broadly divided into two parts :

(a) The Western plain

(b) The Ganga-Brahmaputra plain

(a) The Western Plain

This plain is formed by the river system of the Indus. It lies to the west of Aravallis. This plain is formed due to deposits brought by the rivers like the Satluj, the Beas and the Ravi. This part of the plain has doabs.

(b) The Ganga-Brahmaputra plain

It is also formed by the deposition of the sediments brought by two main river systems, the Ganga and the Brahmaputra. The early civilizations like Mohenjo-Daro and

Harappa also called river valley civilizations, were spread over plain areas. This is because of the availability of fertile land and water through the river networks.

Doab: the alluvial land between two converging rivers. Example doab area in Punjab.

Khadar: The area flooded by rivers almost every year

Banger: The area never flooded by rivers.

3. The Peninsular Plateau

Look at the map (Fig. 9.6) given below, you will find that the Peninsular plateau is a triangular shaped table land. It is part of ancient land mass called Gondwana level. It covers an area of nearly 5 lakh sq.km. It is spread over the states of Gujarat, Maharashtra, Bihar, Karnataka and Andhra Pradesh.

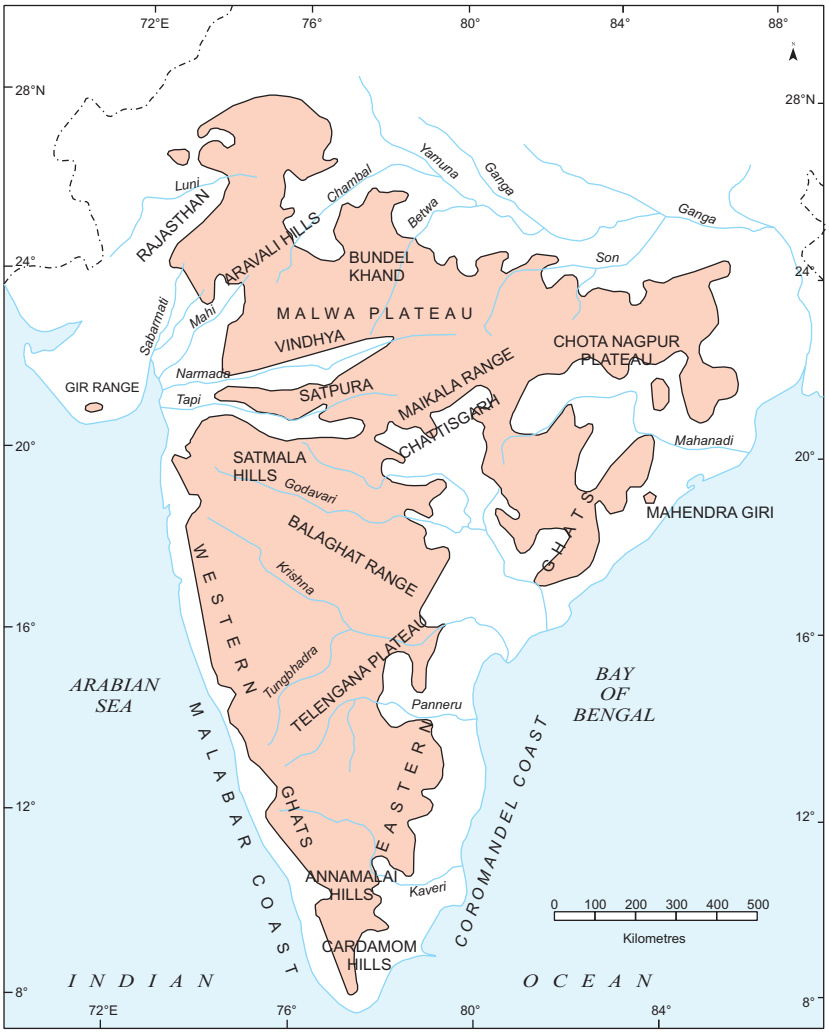


Figure 9.6 *The Peninsular plateau of India*

River Narmada divides the peninsular plateau into two parts : The central highlands and Deccan Plateau

(i) **The central Highlands:** It extends from Narmada river and the northern plains. A ravallis is the important mountain which extends from Gujrat through Rajasthan to Delhi. The highest peak of the Aravallis hills is Gurushikhar (1722m) near Mt. Abu. The Malwa Plateau and Chhota Nagpur plateau are parts of the central highlands. River Betwa, chambal and Ken are the important river of Malwa plateau while Mahadeo, Kaimur and Maikal are the important hills of chhota Nagpur plateau. The valley of Narmada is lies between the Vindhyas and the satpura which flows east to west and joins the Arabian sea.

(ii) **The Deccan Plateau:** The Deccan plateau is separated by a fault (A fracture in the rock along which rocks have been relatively replaced), from Chota Nagpur plateau. The black soil area in the Deccan plateau is known as Deccan trap. It is formed due to volcanic eruptions. This soil is good for cotton & sugarcane cultivation. The Deccan plateau is broadly divided into:

(a) The Western Ghats

(b) The Eastern Ghats

(a) **The Western Ghats:** If you look at map (Fig. No. 9.6), we will see the Western Ghats or Sahyadris lie on the Western edge of the Deccan plateau. It runs parallel to the western coast for about 1600 km. The average elevation of the Western Ghats is 1000 metres. The famous peaks in this area are Doda Betta, Anaimudi amd Makurti. The highest peak in this region is Anaimudi (2695m.). Western ghats are continuous and can be crossed through passes like Pal Ghat, Thal Ghot and Bhor Ghat. The rivers like Godavari, Bhima and Krishna flow eastward while the river Tapti flows westward. The streams form rapids & water falls before entering the Arabian Sea. The famous water falls are Jogfalls on Sharavati, Shiva Samudram falls on Kaveri etc.

(b) **The Eastern Ghats:** The Eastern Ghats are discontinuous low belt. Their average elevation is 600 m. They run parallel to the east coast from south of Mahanadi valley to the Nilgiri hills. The highest peak in this region is Mahendragiri (1501 m). The famous hills are Mahendragiri hills, Nimaigiri hills in Orissa, Nallamallai hills in Southern Andhra Pradesh, Kollimalai and Pachaimalai in Tamilnadu. The area is drained by the Mahanadi, Godawari, Krishna and Kaveri river systems. The Nilgiri hills join Western & Eastern Ghats in the south.

ACTIVITY 9.2

Trace five main differences between Western and Eastern Ghats.

1. Continuity 2. Average Elevation 3. Extent 4. Highest Peak 5. Rivers		

4. The Indian Desert

The Indian Desert lies towards the western margin of Aravali Hills. It is also called Thar Desert. It is the ninth largest desert in the world. It spreads over the states of Gujarat and Rajasthan. This region has semi-arid and arid weather conditions. It receives less than 150 mm of rainfall per year. The vegetation cover is low with thorny bushes. Luni is the main river in this area. All other streams appear only at the time of rainfall otherwise they disappear into the sand.

Figure 9.7 *The Indian Desert*

I am Thar 'The Indian Desert':

1. I remain dry most of the year. The moisture bearing winds goes parallel to Aravalli so I receive scanty rainfall.
2. I am pierced by cactus and other thorny bushes on my body.
3. If you are thirsty, you will have to walk several kilometers to reach an oasis and sinduates (small water body).

4. The sand dunes add to the beauty of my desert.
5. My people follow rich cultures and traditions.

5. The Coastal Plains

The coastal plains in India run parallel to the Arabian Sea & Bay of Bengal along the Peninsular Plateau.The western coastal plain is a narrow belt along the Arabian sea of about 10-20km wide. It stretches from Rann of Kachchh to KanyaKumari. Western coastal plains comprises of three sectors (i) Konkan Coast (Mumbai to Goa), (ii) Karnataka coast from Goa to Mangalore (iii) Malabar Coast (Mangalore to Kanya Kumari). The eastern coast runs along Bay of Bengal. It is wider than the western coastal plain. Its average width is about 120Kms. The northern part of the coast is called Northern Circar and the southern part is called Coromandal Coast. Eastern coastal plain is marked by Deltas made by the rivers Mahanadi, Godavari, Krishna amd Kaveri. The Chilka largest salt water lake in India in Odisha is located to the south of Mahanadi Delta. The coastal plains are belts for growing spices, rice, coconut, pepper etc. They are centres of trade & commerce. The coastal areas are known for fishing activities, therefore large number of fishing villages have developed along the coasts. Vembanad is famous lagoon which is located at Malabar coast.

6. The Islands

India has two main groups of Islands. There are 204 islands in Bay of Bengal called as Andaman and Nicobar islands and 43 islands in Arabian Sea called as Lakshadweep islands The Andaman & Nicobar island extend from north to south in Bay of Bengal. They are bigger in size. An active volcano is located on the Barren Island in Andaman & Nicobar group of islands. Lakshadweep islands are located near Malabar coast of Kerala in the Arabian sea. They cover an area of 32 sq km. Kavarati is the capital of Lakshdweep. These islands are formed by corals and endowed with variety of flora and fauna. These islands are important tourist attraction under water activities like snokling, such diving, deep sea diving and other sports make these island more popular.

INTEXT QUESTIONS 9.4

1. Answer the following questions briefly (not more than two sentences)

   (i) How was Deccan Trap formed?

   (ii) State any two economic activities of coastal plains.

   (iii) Why does Andman and Nicobar Islands attract more tourists?

   (iv) Write the names of the rivers which help to form the western plain.

9.4 DRAINAGE SYSTEMS IN INDIA

The drainage system refers to the system of flow of surface water mainly through rivers. An area drained by a river and its tributaries is called a drainage basin. The drainage system is related to a number of factors like slope of land, geological structure, amount and velocity of water. A river through its drainage system performs several tasks. These are excess water removal from a particular area, transportation of sediments from one place to other, providing natural source for irrigation and maintaining the water table of a region. Traditionally, rivers were useful as a source of abundant fresh water and navigation. In today's world rivers importance has risen to include hydro power generation and setting up water-based industries. These are also important tourist attraction for activities such as boating, river rafting and cliff jumping. Because of their utility, rivers are important for life and hence regarded as lifeline. Many cities are located along the rivers and are densely populated. Delhi on the banks of Yamuna, Patna along Ganga, Guwahati along Brahmaputra, Nasik along Godavari and Cuttack along Mahanadi are some examples (Fig. 9.8). On the basis of the origin the drainage can be divided in to two parts:

(a) The Himalayan drainage system

(b) The Peninsular drainage system

Tributary: A stream or river that flows into a larger river. e.g. Yamuna

Delta: A triangular shaped land at the mouth of a river formed from the deposition of silt, sand and small rocks that flow downstream in the river. eg. Ganga delta.

Estuary: A partially enclosed coastal body of water where the salty tidal water mixes with the fresh water of the river. eg. Narmada river makes an estuary.

9.5 MAJOR DRAINAGES SYSTEMS

As mentioned earlier on the basis of origin, the Indian river have been classified into two major drainage systems. Let us discuss the comparision between the two drainage systems.

Himalayan River System

1. They are Perennial rivers originating from glaciers.
2. Rivers form valleys by the process of erosion.
3. The rivers are ideal for irrigation purposes as they pass through plain fertile tracts.
4. These rivers have meandering courses which shift over time.

9.5.1 The Himalayan Drainage System

Most of the Himalayan Rivers are perennial. This means they have water throughout the year. This is because most of these rivers originate from the glaciers and snowy

peaks. They also receive water from the rainfall. The main river system in this category are:

1.	The Indus River System	Jhelum, Ravi, Beas and Satluj
2.	The Ganga Rivers System	Yamuna, Ramganga, Ghaghara, Gomti, Gandak and Kosi etc.
3.	The Brahmaputra River System	Dibang, Lohit, Tista and Meghna etc.

9.5.2 The Peninsular Drainage System

You have already studied about Peninsular Plateau. Most of the Peninsular rivers flow eastwards and enters into Bay of Bengal. Only Narmada and Tapi rivers which flow westwards of the Western Ghats. They are good for generating hydropower because these rivers form rapids & water falls. The major peninsular rivers are Mahanadi, Godavari, Krishna and Kaveri.

Figure 9.8 *Major Rivers of India*

ACTIVITY 9.3

Look at the physical and political maps of India in an atlas. Given below are four river. Find out the following informaiton and record in the table given below.

Rivers	*Main tributaries*	*Origin*	*States it passes through*	*Drains into*
Ganga				
Brahmputra				
Indus				
Satluj				
Kaveri				
Godavari				
Krishna				

ACTIVITY 9.4

Look at the Atlas and name all the cities situated along the Ganga and locate on the physical India map.

9.6 KEEPING RIVERS CLEAN

Do you know that over 97% of all the water on Earth is salty and remaining 3% is fresh water. This tiny amount has to provide the fresh water needed to support the entire population of the world. Fresh water is a precious resource and the increasing pollution of our rivers and lakes is a cause for alarm.

You must have seen a river either flowing through your town, village or elsewhere. India has a large number of rivers that are lifelines for the millions of people living along their banks. These rivers can be broadly categorized into four groups:

(i) Rivers that flow down from the Himalayas and are supplied by melting snow and glaciers. This is why these are perennial, that is, they never dry up during the year.

(ii) The Deccan Plateau rivers, which depend on rainfall for their water.

(iii) The coastal rivers, especially those on the west coast, which are short and do not retain water throughout the year.

(iv) The rivers in the inland drainage basin of west Rajasthan, which depend on the rains. These rivers normally drain towards silt lakes or flow into the sand.

Rivers have been given the pride of place in the way of life. Several cities as well as holy shrines are on the banks of rivers, and indeed, rivers such as the Ganga and the Yamuna are sacred to millions. Despite this, they are being polluted with unaccountable and environmentally threatening practices. Only sewage claims for about 70 percent pollution loads in Indian rivers. Heavy loads of biological and chemical pollutants usually enter waterways to be consumed in some manner by the downstream users. This affects the aquatic life and causes various health hazards. Along with the pollutants, the insensitivity of people towards rivers is severely adding to the problem. Urban dwellers identify vaguely with rivers. An example can be the highly contaminated blackish water of Yamuna river in New Delhi which hardly draws attention from capital's citizens.

Since, water issues are assigned to provincial governments in India, each one of them treats a river as its own, with little or no regard to the downstream effects. Ecologists and conservationists have long demanded that rivers need to be treated as one entity and work on a determined, time-specific combination of serious efforts. This could lead to an improvement of water quality of the rivers. The government has come up with ambitious river cleaning initiatives such as the Ganga Action Plan (GAP) and the National River Conservation Plan (NRCP) in the hope of improving water quality. Water harvesting is gaining popularity across the country, through which monsoon waters could be retained in the river basins. Several civic organizations and people movements are also contributing in raising awareness and sensitivity about the critical condition of polluted rivers.

ACTIVITY 9.5

1. Find out the river or natural water source in your locality. Observe the kind of activities that are happening there.
2. What kinds of human activities are causing damage to river systems?
3. Write a letter to the local authority suggesting what you and your friends like to do to stop pollution. Also mention in the letter what help would you like to have form them.
4. Organise a meeting with your friends to discuss what can be done to prevent the negative effects of the human activities

   There could be many ways of stopping pollution. Suggests the ways to check the water pollution.

INTEXT QUESTION 9.5

Answer the following question:

1. Mention the name of two tributaries joining Ganga from the north.
2. Which lake is located near Mahanadi?
3. Write the names of the states drained by river Godavari.
4. Which river is tributary of Tunghabhadra?

WHAT YOU HAVE LEARNT

- India is located between 8°4' North and 37°6' North lalitudes and 68°7' East and 97°25' longitudes. India has land boundaries of 15,200 km and 6100km long coast line. India's landmass covers 3.28 million square kilometer of area.
- India can be divided into mainly six physical divisions: the Northern mountain, The Northern Plain, the Peninsular Plateau, the Indian desert and the coastal plains and Islands.
- The Himalayas may be divided into three parallel ranges: Greater Himalayas or Himadari,Lesser Himalayas or Himachal and Outer Himalayas or Siwaliks.
- The northern plain spreads mainly in the states of Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal. The soil here is rich in nutrients and hence good for cultivation of varieties of crops.
- The Peninsular plateau stretches from the Aravali range till the southern tip of India. It is a table land made of old and metamorphosed rocks.
- The Great Indian Desert spreads over the states of Gujarat and Rajasthan. This region has semi-arid and arid weather conditions.
- The coastal plains in India run parallel to the Arabian sea & Bay of Bengal. They are called Western coastal plains and the Eastern coastal plains.
- India has two main groups of Islands. There are 204 islands in Bay of Bengal called the Andaman and Nicobar Islands and 43 islands in Arabian Sea i.e Lakshadweep islands.
- Indian River System can be divided into two main categories: The Himalayan Drainage System and The Peninsular Drainage System. The three main rivers in Himalayan system are the Indus, Ganga, The Brahmaputra. The main Peninsular rivers are Narmada, Tapi, Godavari, Krishna , Kaveri and Mahanadi.

TERMINAL EXERCISES

1. Explain the location and extends of India.
2. Dercribe any three characteristics of the Indian Desert.
3. Explain any two paints each about the three parallel ranges of Himalayas.
4. Differentiate between Himalayan and Peninsular drainge system by giving any four differences in each.
5. Give reasons:-
   (i) Northern plans have fertile alluvial soil.
   (ii) Indian desert has very less vegetation cover.

Project:

- Create a guidebook for visitors to your home region
  1. It should describe your region's unique physical and human characteristics.
  2. List elements of the physical landscape, such as climate, landforms, plants, animals, and elements of the human landscape, such as work opportunities, economic activities, recreational activities, regional language, and foods.
  3. The guidebook should include pictures/ drawings and should feature the things that you feel are special about your locality.

ANSWERS TO INTEXT QUESTIONS

9.1

1. (i) Bangladesh, Myanmmar.
   (ii) Bay of Bengal and Arabian Sea.
   (iii) Sri Lanka.
   (iv) Pakistan, Bhutan.

9.2

1. (i) Kerala, Tamil Nadu.
   (ii) Jammu and Kashmir, Arunachal Pradesh.
   (iii) Nepal, Bhutan.
   (iv) Daman and Diu, Dadar Nagar Haveli.

9.3

1. the Himadari The Himachal, and Siwalik.
2. A. Jammu and Kashmir.
   B. (a) No
   (b) No
   (c) Yes
3. India, Nepal, Bhutan.
4. Patkoi, Mizo hills

9.4

1. (i) Due to volcanic erruption.
   (ii) (i) Agriculture (ii) fishing (iii) trade and commerce (any two)
   (iii) Because Islands have developed attractive tourist activities of under water and water sports.
   (iv) Satluj, Beas, Ravi

9.5

1. Gandak, Kosi.
2. Chilka.
3. Maharashtra, Andhra Pradesh and Chattisgarh.
4. Krishna.

Notes

10

CLIMATE

Mona and Raju were excited about proposed first trip to a hill station, Shimla with their parents. While they were packing their clothes, their mother asked them to pack some woolen clothes also. They reside in Chennai, a city and capital of Tamil Nadu, a state in South India. They were really surprised as it was the month of May and it's very hot in Chennai. Their mother told that although India has monsoon climate but in Shimla, it being a hill station the weather was cool. They were little confused with a few questions in their mind like - what is weather? What is the difference between the weather and the climate? Why do we find different climatic conditions in India? You will find the answers to such questions in the following lesson.

OBJECTIVES

After completing this lesson, you will be able to:

- list the factors that influence the climate of India;
- explain the mechanism of monsoon and its various characteristics;
- recognize the cyclic system of seasons along with their unique features;
- describe the distribution of rainfall in India;
- analyse how our social and cultural life is deeply associated with the cycle of seasons; and
- describe the global environmental changes and its impact on Indian climate.

10.1 FACTORS AFFECTING THE CLIMATE OF INDIA

When Mona and Raju were in the train along with their parents they asked the questions to their parents about the difference between the weather and climate. One of the fellow passengers was a teacher, Mrs. Rupa and she explained that **climate**

is always for a large area like a country or a big region and generally it does not change, like India has monsoon climate whereas **weather** is always for a smaller area like that of your city or village where it may frequently change like raining in the morning and sunny in the afternoon. Mrs. Rupa asked them to observe the changes in the weather conditions along the way to Shimla. They realized the changes: it was hot and humid weather in the southern regions and slowly it became hot and dry in the northern plains; and they felt cool on their way when they were close to Shimla. They asked the teacher the reason for it and she explained that there are many factors which affect the climate or weather.

Do you know

Climate refers to the sum total of weather conditions and variations over large area for a long period of time (more than 30 years).**Weather** is state of atmosphere over an area at any point of time. Similarly weather conditions which last for longer duration are responsible for making a season.

10.1.1 Factors Affecting the Climate of India

1. **Location:** The places which are closer to equator have high temperature. As one moves towards the poles temperature decreases. As our country, India is located in Northern hemisphere closer to equator at 8°4¢ and 23½° Tropic of Cancer passes through the central part of India. So in south of this latitude we find tropical climate and towards the north we find sub-tropical climate. For example, Andhra Pradesh would be hotter than Haryana. Broadly speaking parts lying south of the Tropic of Cancer receive more solar heat than those lying north of it.
2. **Distance from the sea:** The southern half of India is surrounded by sea from three sides: the Arabian Sea in the west, the Bay of Bengal in the east and the Indian Ocean in the south. Due to moderating influence of the sea this region is neither hot in summer nor very cold in winter. For example the area of North India which is far away from the sea has extreme type of climate and the area of south India which is nearer to the sea has equable type of climate. We can see the variations in temperature and rainfall at different stations in the given table 10.1.
3. **Altitude:** It means the height above the average sea level. The atmosphere becomes less dense and we feel breathlessness as we go higher from the earth surface and thus the temperature also decreases with the height. For example, the cities located on the hills are cooler like Shimla whereas the cities lying in the plains will have hot climate like Ludhiana.

4. **Mountain Ranges:** Mountain ranges also affect the climate of any region to a great extent. The Himalaya Mountain is located in the northern part of our country with an average height of 6000m. It protects our country from cold winds of Central Asia. On the other hand, they check rain bearing South-West Monsoon winds and compel them to shed their moisture in India. Similarly, Western Ghats force rain bearing winds to cause heavy rain fall on the Western slopes of the Western Ghats.

5. **Direction of surface winds:** The wind system also affects the Indian climate. This system consists of monsoon winds, land and sea breeze, and local winds. In winter the winds blow from land to sea so they are cold and dry. On the other hand, in summer wind blow from sea to land bringing the moisture along with them from the sea and they cause wide spread rain in most part of the country.

6. **Upper air Currents:** Besides surface winds, there are strong air currents called Jet streams which also influence the climate of India. These jet streams are a narrow belt of fast blowing winds located generally at 12,000 metre height above the sea level. They bring western cyclonic disturbances along with them. These cyclonic winds originate near the Mediterranean Sea and move eastwards. On their way, they collect moisture from Persian Gulf and shed it in the North western part of India during winter seasons. These Jet streams shift northwards during summer season and blow in Central Asia. Thus helps in the onset of monsoons.

ACTIVITY 10.1

Temperature (T) and Rainfall (R) of some important stations

Stations		Month											
		J	F	M	A	M	J	J	A	S	O	N	D
Leh	T	–8	–7	–1	9	10	14	17	17	12	6	0	–6
	R	10	8	8	5	5	5	13	13	8	5	0	5
Chennai	T	25	26	28	31	33	33	31	31	30	20	26	25
	R	4	13	13	18	38	45	87	113	119	306	350	135

(i) Write annual range of temperature between two places.

(ii) Which is the rainiest month of the year in each stations?

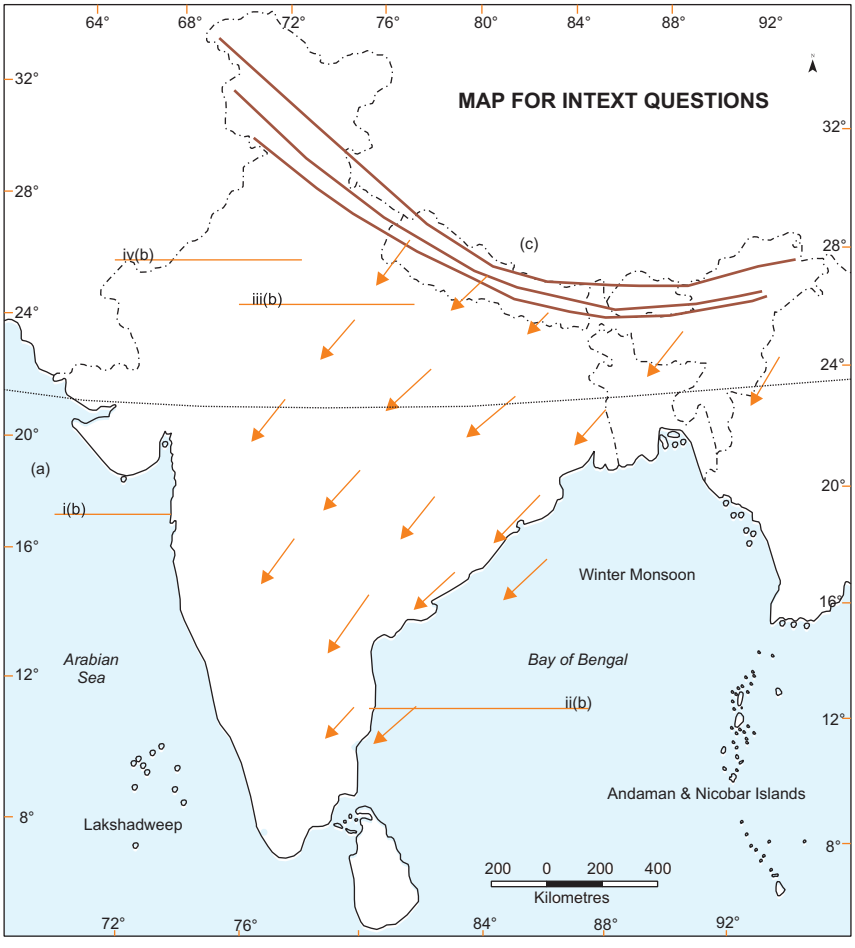


Figure 10.1

INTEXT QUESTIONS 10.1

Look at the map given above and answer the following questions:

(a) Name the important latitude drawn on the map which has divided India in two heat zones. Also tell the degree of that latitude.

(b) Name the cities located on map which are influenced by the sea and cities which are not influenced by the sea.

(c) Which mountain range protects our country from cold breeze of Central Asia?

(d) Observe the wind direction given on the map and tell why do we have dry winter season?

Mona and Raju returned from Shimla after five days stay. They were very happy and shared their experience with their friends. Few days later they were surprised to see a news headline that monsoons are coming on time. What is the meaning of

monsoon? They wanted to know the answers of their questions with the help of their teacher. Try to find out answers in the following section.

10.2 MECHANISM OF MONSOON

The word monsoon is derived from the Arabic word 'Mausim' which means season. Monsoon refers to the seasonal reversal in the wind direction during a year. During summer, the interior parts of North Indian Plains covering Rajasthan, Punjab, Haryana, and Western Uttar Pradesh are intensely hot. The daily maximum temperature in some of these parts is as high as 45° to 47° C. Table 10.1 given below indicates the climatic diversity in India. Try to understand the varying temperature that different stations in India have.

Table 10.1: Temperature (in ° Celcius) and Rainfall (in cm) of some important stations in India

STATIONS		MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
LEH	Temp.	-8	-7	-1	9	10	14	17	17	12	6	0	-6
	Rainfall	10	8	8	5	5	5	13	13	8	5	0	5
SHILLONG	Temp.	10	11	16	19	19	21	21	21	20	17	13	10
	Rainfall	14	29	56	146	295	476	359	343	302	188	36	10
DELHI	Temp	14	17	23	29	34	35	31	30	29	21	20	15
	Rainfall	21	24	13	10	10	68	186	170	125	14	2	9
JAISALMER	Temp	16	20	25	30	33	34	32	31	30	28	22	17
	Rainfall	0.2	0.1	0.3	0.1	0.5	0.7	0.9	86	14	01	0.5	0.2
MUMBAI	Temp	24	24	24	28	30	29	27	27	27	28	27	25
	Rainfall	4	2	2	2	18	465	613	329	286	65	18	2
CHENNAI	Temp	25	26	28	31	33	33	31	31	30	28	26	25
	Rainfall	4	13	13	18	38	45	87	113	119	306	350	135
THIRUVANA NTHAPURAM	Temp	27	27	28	29	29	27	26	26	27	27	27	27
	Rainfall	23	21	39	106	208	356	223	146	138	273	206	75

Do you know

- Air has weight and this weight exerts pressure on us, which is known as air pressure.
- There is an inverse relationship between temperature and air pressure, i.e. if the temperature of any area is high then the air pressure will be low and vice-versa.
- Difference in the air pressure is responsible for the attraction of the winds.

The average maximum temperature is above 33°C in the month of May at Delhi and Jodhpur. Such high temperature heats up the air of that region. Hot air rises, low pressure area is created under it. This low pressure is also known as monsoonal trough. It lies between Jaisalmer in the west and Balasore in Odisha in the East.

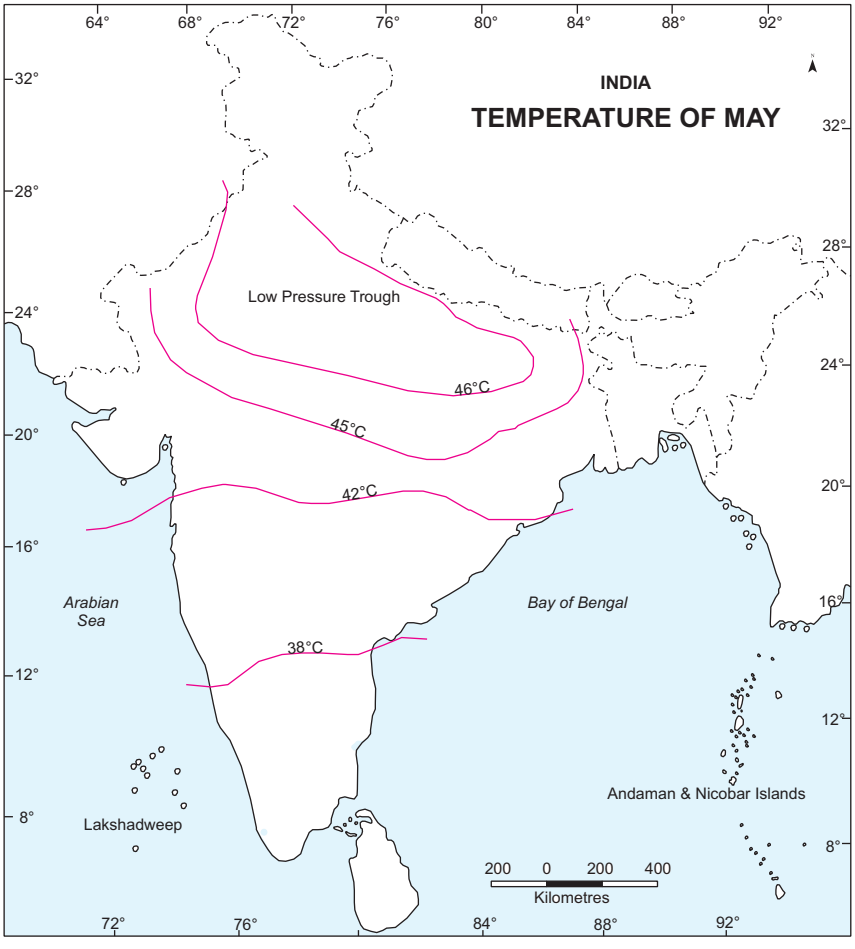


Figure 10.2 *Temperature of May*

On the other hand temperature over Indian Ocean is relatively low, as water needs more time to get heated as compared to land. So a relatively high pressure region is created over the sea. See the map 10.2 given above and try to understand the given phenomenon.

Thus, there is a difference of temperature and resultant pressure over North Central Indian Plains and Indian Ocean. Due to this difference, air from high pressure region of the sea starts moving towards the low pressure region of North India. Thus, by mid June the general movement of air is from equatorial region of Indian Ocean to the Indian subcontinent and the direction of these winds in general is from South-West to North-East. This direction is exactly opposite to that of the trade winds (North – East to South-West) prevailing during winter in India. This complete reversal

of wind direction from North-East to South West and vice-versa is known as monsoons.

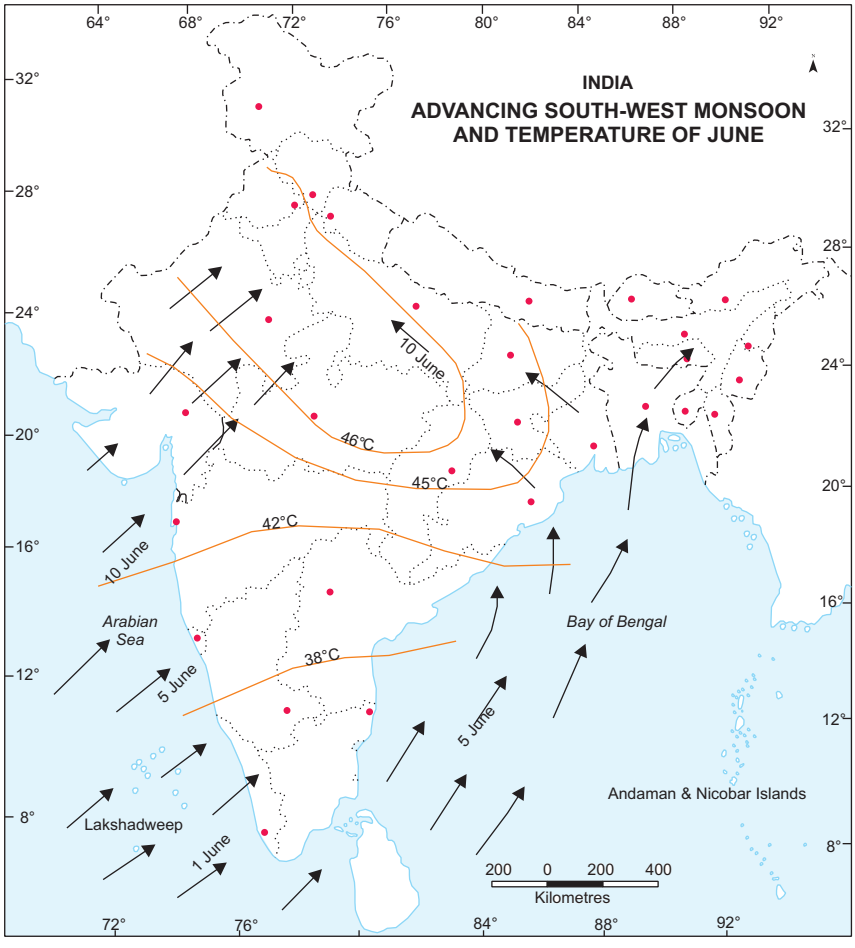


Figure 10.3 *Temperature of June*

These winds originate over warm seas. Therefore, they contain a lot of moisture. When these moisture laden winds move over the Indian sub-continent they cause wide spread rain throughout India and from June to September 80% to 90% of the total rainfall in India is confined to these four months only.

10.2.1 Characteristics of the Monsoon

1. Monsoons are not steady winds. They are irregular in nature affected by different atmospheric conditions i.e. due to regional climatic conditions. Sometimes monsoon early or some times late.
2. Monsoons are not equally distributed. Coastal areas like Kerala West Bengal and Odisha receive heavy rain fall, whereas interior regions like Haryana, Madhya Pradesh, receive less rainfall.

3. When monsoon arrives, it gives heavy rainfall which continues for several days. This is known as 'burst of monsoon'. This occurs mainly at Kerala coast where it reaches first.

ACTIVITY 10.2

Observe the picture and answer the following questions:

(a)

(b)

(c)

Figure 10.4

1. Identify the seasons in the given pictures (a), (b) and (c).
2. Arrange them on the basis of their occurrence.
3. Which season you like the most and why? Write answer in about 30 words.

INTEXT QUESTIONS 10.2

Look at maps (Fig. 10.2, Fig. 10.3) of advancing monsoon and answer the following questions:

1. Name the states which lie within the low pressure regions.
2. As the monsoon winds are coming from south-west which state they will strike first.
3. When the monsoon winds reach the Bay of Bengal, what is their direction?
4. Observe the rainfall data of the following cities and find out the average duration of monsoon in four cities. Name of the cities are:

   (a) Mumbai (c) Delhi

   (b) Jaisalmer (d) Shillong

A few months later Mona and Raju's father was transferred to Delhi. They were excited to live in the capital of India. They shifted to Delhi. New home, new school, new friends and new environment and everything was new for them. They realized

that now they were going to see the real changes of the seasons which they had read in their book. Try to discover the various seasons and how they happen in the following section.

10.3 CYCLE OF SEASONS

Our country, India, enjoys variety of seasons due to geographical locations. Now you will know about the seasons of India and their unique features. We have four seasons:

(a) Cold weather season (December – February)
(b) Hot weather season (March – May)
(c) Advancing South – West monsoon season (June – September)
(d) Post or retreating monsoon season (October – November).

You will know more about each of them in the following section.

(a) Cold Weather Season: The duration of cold weather season is from December to February. The temperature decreases from the South to the North. December

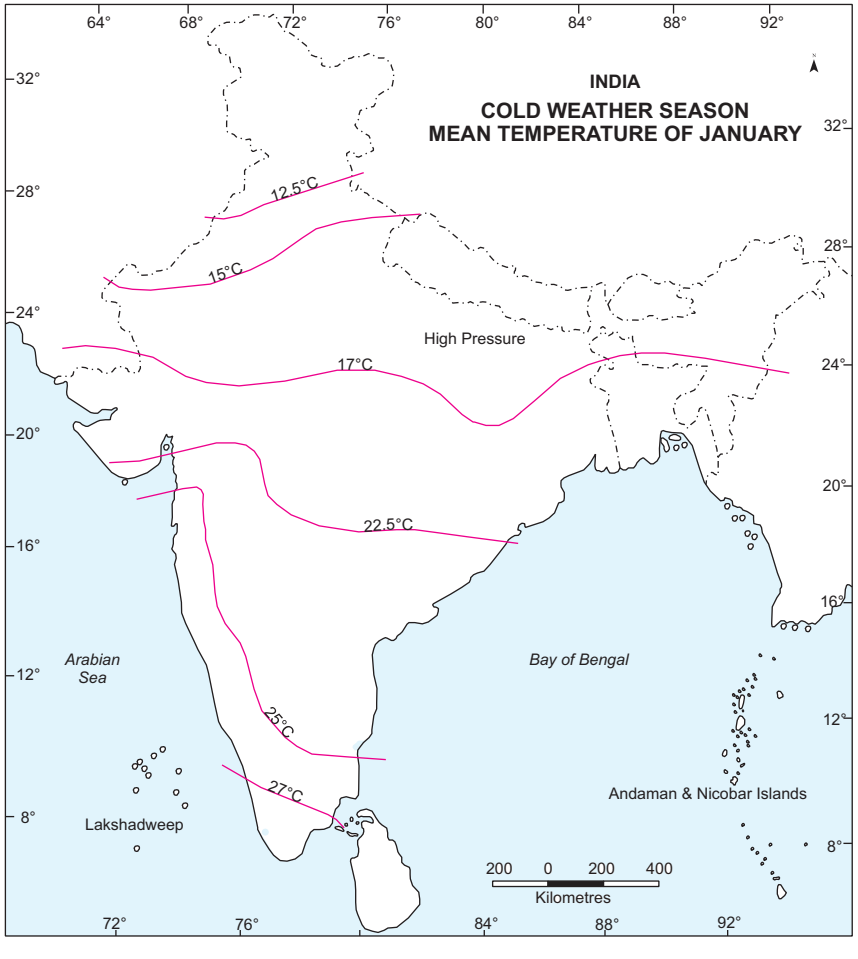


Figure 10.5 *Mean Temperature of January*

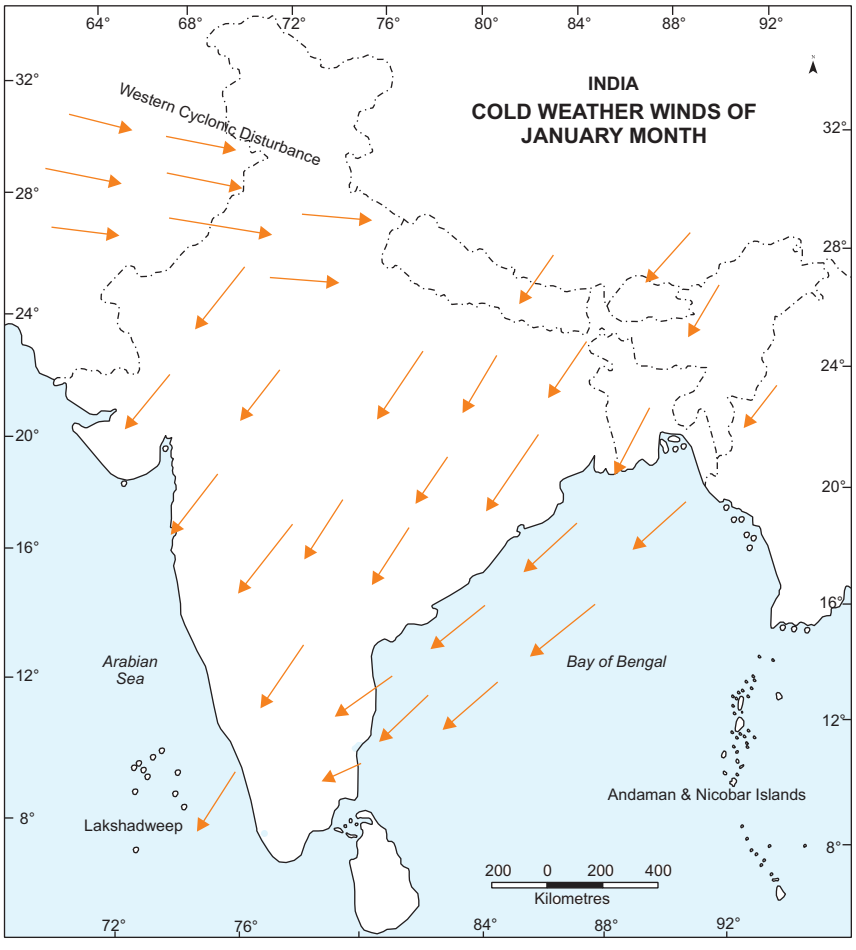


Figure 10.6 *Direction of winds in January*

and January are the coldest months and the average temperature in North is (12° to 15°C) and in South (25°C). Frost is common in the North and North-West India. There is light rainfall in this region due to Western disturbances. Higher slopes of the Himalayas experience snowfall. During the winter season, North-East trade winds prevail over India. They blow from land to sea. Hence, for most part of the country, it is a dry season. However, the Tamil Nadu coast receives winter rainfall due to these winds. A part of North-East trade winds blow over Bay of Bengal. They gather moisture which causes rainfall in the coastal Tamilnadu while the rest of the country remains dry. In the northern part of the country the weather is marked by clear sky, low temperatures and low humidity. The winter rainfall is very important for the cultivation of '*Rabi*' crops.

(b) Hot Weather Season: By the end of February the temperature starts rising. So from March to May it is hot weather season. We find high temperature in plains, western part of India and in the central part of peninsular India. In Northern plains, thus, an elongated low pressure which is called monsoonal trough created here, which extends from Jaisalmer in western Rajasthan to Jharkhand and parts of Odisha to the East. However, over Indian Ocean south

of the equator high pressure belt begins to develop in this season. In North-West India, afternoon dust storms are common. During summer, very hot and dry winds blow over North Indian plains. They are locally called '*Loo*'. Exposure to theses hot winds may cause heat or sun stroke. This is also the season for localized thunderstorms, associated with violent winds, torrential downpours, often accompanied by hail. In West Bengal, these storms are known as the '*Kaal Baisakhi'* (calamity for the month of Baisakh). Towards the close of the summer season, pre-monsoon showers are common, especially in Kerala and Karnataka. They help in the early ripening of mangoes, and are often referred to as '*mango showers'*.

(c) Advancing South West Monsoon Season: After the scorching heat of summer season people eagerly wait for the rains which can give them relief. Farmers wait for the rains so that they can prepare their fields for the next cropping season *Kharif*. June to September are the months of advancing South-West monsoon season. By the end of May the monsoon trough further intensifies over north India due to high temperature in the region. The General direction of the wind during this season is from South-West to north-east. These winds

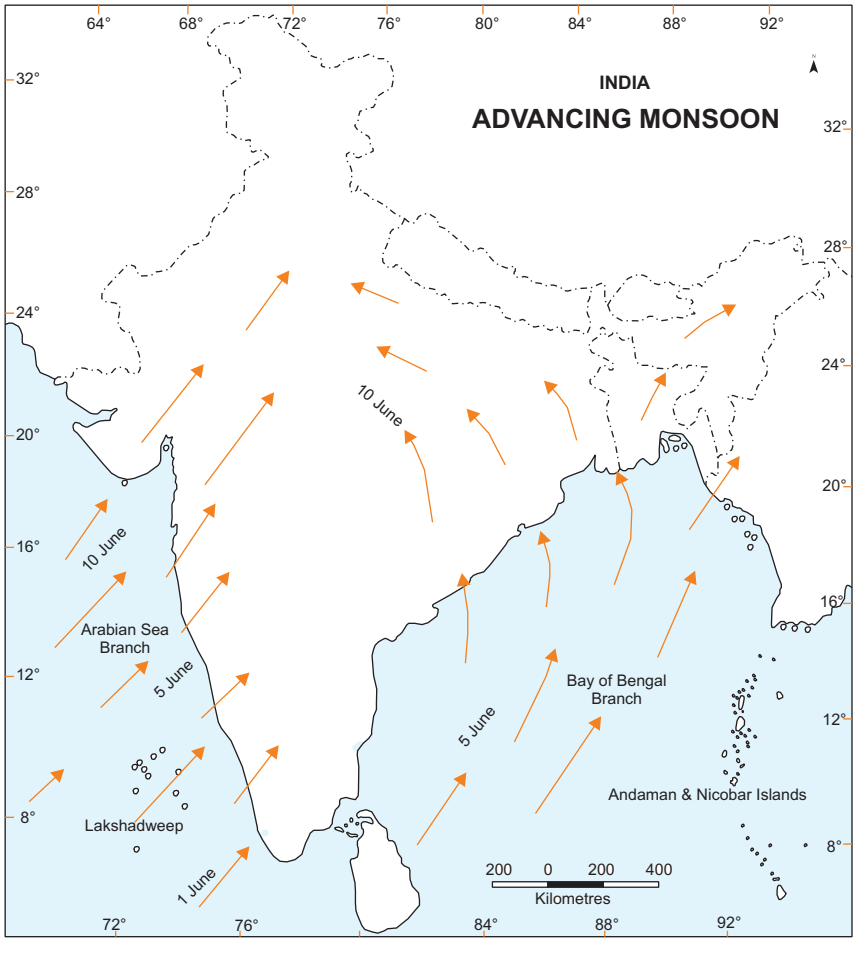


Figure 10.7 *Advancing Monsoon of India*

are strong and blow at an average velocity of 30 km per hour. These moisture laden winds first hit at Andaman and Nicobar Islands in the last week of May and Kerala coast in the first week of June with violent thunder and lightning.This South-West monsoon that flows in to India brings about a major change in its weather. Two branches of south-west monsoon originate from: (i) Arabian Sea and (ii) Bay of Bengal.

The Arabian Sea Branch obstructed by Western Ghats gives heavy rainfall on the Western side of Western Ghats. It reaches Mumbai by 10th June *(See Fig. 10.7).* When this branch crosses the Western Ghats and reaches the Deccan Plateau and parts of Madhya Pradesh, it gives less rainfall as it is a rain shadow region. Further, this branch reaches in Northern Plain by 20th June.

The monsoon winds that move from Bay of Bengal strike Andaman and Nicobar islands North-Eastern states and coastal areas of West Bengal and covers the whole of India by the 15th of july. They cause heavy rainfall in the region. However, quantity of rainfall decreases as they move towards West over the Northern plains. For examples rainfall at Kolkata is 120 cm, Allahabad 91 cm and Delhi 56cm.You must have seen that rainfall does not continue for several days. The monsoon tends to have 'breaks' in its rainfall which causes wet and dry spells. This means that monsoon rains occur only a few days at a time. Rainless dry spells occur in between. As the monsoon comes after the hot and dry summer season, the rainfall brings down the temperature. We can see this decline is from 5°C to 8°C between mid June and mid July. This is the time when many parts of India face floods also. This is mainly because of heavy rainfall and our inability to manage our water resources more systematically. On the other hand there are many areas that experience drought conditions during this season.

ACTIVITY 10.3

Collect the information from the newspapers and other sources and find out which parts of India are regularly affected by the floods and droughts. Also paste the newspaper cuttings as a sample. Identify name the reasons and collect the information about the most recent.

(d) Retreating or Post Monsoon Season: October and November are the months of post (or retreating) monsoon season. The temperatures during September-October start decreasing in north India. Monsoonal trough also becomes weak over North-West India. This is gradually replaced by a high pressure system. The South-West monsoon winds weaken and start withdrawing gradually from North Indian Plains by November. In October the weather remains humid and warm due to continuing high temperature and moist land in

month of October. In Northern plains hot and humid weather becomes oppressive at this time. It is commonly called 'October Heat'. However, towards the end of October, temperature starts decreasing, making nights pleasant. This is also the time of cyclonic storms which develop in the Bay of Bengal as the low pressure of North India shifts to this area. These storms create havoc in coastal areas of Odisha, Andhra Pradesh and Tamil Nadu, especially in the deltas of Mahanadi, Godavari and Krishna rivers.

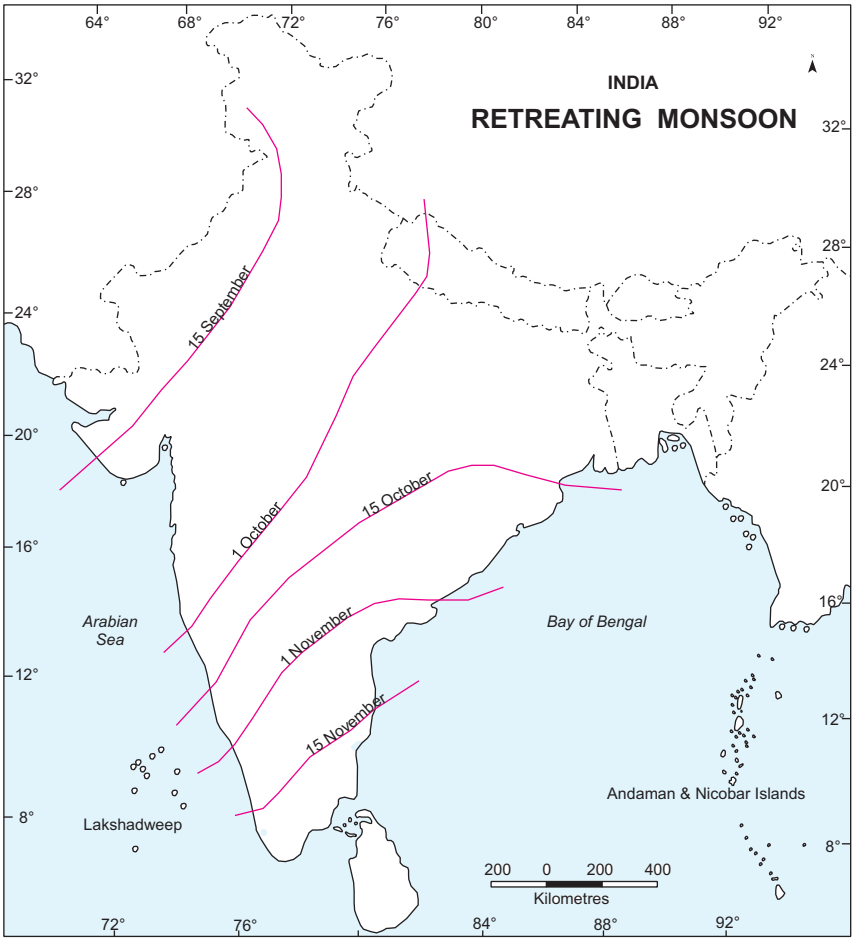


Figure 10.8 *Retreating Monsoon*

INTEXT QUESTIONS 10.3

Choose the correct answer:

(i) The hot and dry wind blowing in the northern plain in the summer are called—

(a) Kaal Baisakhi
(b) Loo
(c) Trade winds
(d) All of the above

(ii) Which mountain range acts as a barrier in the path of the Arabian Sea branch?

(a) Aravallis (c) Western Ghats

(b) Eastern Ghats (d) Raj Mahal hills

(iii) The tropical cyclones of the Bay of Bengal usually occurs during

(a) South-west monsoon (c) Retreating monsoon season

(b) Hot weather season (d) Cold weather season

(iv) Which place would be the hottest one in March?

(a) Delhi (c) Deccan Plateau

(b) Shillong (d) Punjab

(v) Monsoons are called .....

(a) Seasonal winds (c) Permanent winds

(b) Temporary winds (d) Local winds

Seasons, its cycle, causes and effects were now clear to Mona and Raju. Only one question remained unanswered. If the monsoons came in a particular area for certain duration so it means the rainfall distribution in India was uneven? Try to find the answer with the help of Rainfall distribution map.

10.4 DISTRIBUTION OF RAINFALL

Rainfall in India is highly uneven over a period of time in a year. As we move from East to West in Northern plains, we observe that in central India rainfall decreases. In peninsular region, India's rainfall decreases from coast to interior parts. In North-East India, the rainfall increases with altitude. India is the unique example of rainfall distribution with marked contrasts. Both, one of the rainiest and driest places of the world are located in India itself. Can you think why? Spatial variations in rainfall in India can be shown under the following headings. Observe the given map and find out the states under the given categories –

(a) Areas of heavy rainfall (more than 200cm): Maximum rainfall in India occurs in the western coast, sub Himalayan regions of north-east and Garo, Khasi and Jaintia hills of Meghalaya.

(b) Area of Moderate rainfall (100-200cm): Areas receiving 100 to 200cm rainfall in India include some parts of the Western Ghats, West Bengal, Odisha and Bihar and many states.

(c) Areas of Low rainfall (60 to 100cm): This is the region of low rainfall, which includes parts of Uttar Pradesh, Rajasthan, interier deccan plateau.

(d) Areas of Inadequate rainfall (Less than 60cm): This is region of scanty rainfall. The western part of Rajasthan and Gujarat, Laddakh and south central part receives a rainfall of less than 20cm.

ACTIVITY 10.4

List out the festivals of India in the table given below. Also find out which season is economically significant in your area and why?

List of the festivals	*Areas where celebrated*	*Date and month*	*Season*	*Economically Significant*

Do you see co-relation between seasons of festivals and harvest seasons. Please provide one reason.

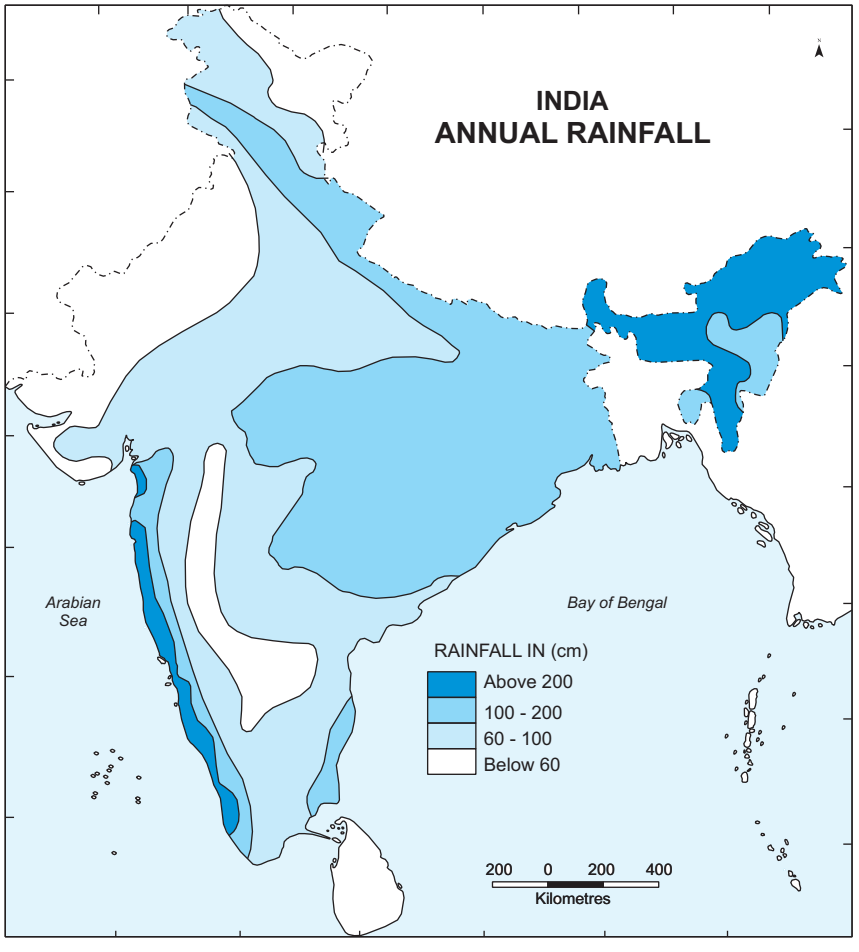


Figure 10.9 *Annual Rainfall of India*

10.5 SOCIO-CULTURAL LIFE

You are now well aware about the cycle of seasons but a second thought comes to our mind what do the relationship between the seasons and our life? Are they so important that they affect our life? The answer is 'yes'. They do affect our social and cultural life. As India is an agricultural country the main economic activity of agriculture is totally dependent on the cycle of seasons. The time of *Kharif* crop is advancing monsoon season and harvesting is post monsoon season. *Rabi* crop is grown in winter and *zaid* crop is at the end of winter season. Floods and droughts are hindrances in the economic growth of the nation as our economy is agro based economy.

All our activities are related with the seasons. As winter season comes the days become shorter and we start purchasing woolen clothes. Groundnuts, almonds and calorie rich food become very important in our diet. In spite of cold weather people celebrate many festivals like *Makar Sankranti* in many states, *Lohri* in Punjabi and *Pongal* in Tamil Nadu in the month of January. *Basant Panchami* is also celebrated in the month of February in which people pray for good harvest.Summer season is very dry but it reminds us of juicy fruits, ice creams and variety of drinks. What are the fruits available in this season? *Holi* and *Baisakhi* are the main festivals of the season.By the end of summer farmers start preparing their fields so that they can welcome the rains. This is the time when people of Kerala celebrate *Onam* which coincide with their harvest season. Post Monsoon is the harvesting time. It is also a festival time of *Dushera, Durga Pooja* and *Diwali* which are celebrated all over India.

10.6 GLOBAL ENVIRONMENTAL CHANGES AND ITS IMPACT ON INDIAN CLIMATE

After studying this lesson you must have understood that India is fortunate to have four clear seasons' summer, winter, spring and monsoon. However, these days one can notice disturbance in the cycle of seasons. This is due to global warming which is a burning topic of today's world. It has a significant political, social and economic impact that may affect almost every aspect of our lives and lifestyles. The global warming has a serious impact on world's climate and India cannot escape it. Don't you think that it is important for everybody to know about it and think how each one of us can contribute in reducing its extent?

Let us understand what is global warming. During the last decades of urbanization, industrialization and population growth the atmosphere has been polluted. Human activities increase the amount of carbon dioxide, Chloro Floro Carbon (CFC) and other dangerous gases. About 51% of the solar energy is absorbed by the earth's surface, which increases its temperature. The rest of the heat is reflected back in to the atmosphere. This helped in maintaining temperature. But now due to pollution some of the reflected heat is trapped by green house gases (GHGs), mainly carbon

dioxide. It has increased the temperature of the Earth's surface. There is evidence to show that CO_2 levels are still increasing. Many countries have signed a convention to reduce GHGs under the U.N. framework. However, the current international agreements are still not effective enough to prevent the significant changes in climate.

We already know that 70% of Indians are working in agriculture sector. Any change in temperature will have an adverse effect on agriculture. This will have a serious social and economic impact on India. After reading the chapter we can clearly see that climate plays a very important role in Human life. Our food, our festivals, and our economy everything is closely linked with the cycle of seasons. If the seasons are favourable, human life will be good and comfortable. Since the state of the weather affects agriculture, health, transportation etc it is important that all of us make some change in our lifestyle to reduce CFC and other harmful gases.

ACTIVITY 10.5

Keep a diary of events about natural calamities such as earthquakes, cyclones and geographical events. Record them with name of the event, date and their impact.

INTEXT QUESTIONS 10.4

1. Why do we find the rainfall distribution in India highly uneven?
2. Name the three regions of India receiving lowest rainfall.
3. Name the months of *Kharif* and *Rabi* season.
4. When do we have the *zaid* season?
5. Which human activities are responsible for global warming?

WHAT YOU HAVE LEARNT

- Climate of India is affected by many factors like location, distance from the sea, altitude, mountain ranges, direction of surface winds and upper air currents.
- India has a special system of reversal of winds which is known as monsoon and it comes with a system.
- India has a cyclic system of season and it has four main seasons. They are winter, summer, advancing monsoon and retreating monsoon.
- Seasons play an important role in our day to day life and affect our activities and eating habits.
- Global warming influences Indian climate also.

TERMINAL EXERCISES

1. Describe any five factors which are responsible for affecting the climate? Explain with the help of examples for each factor.
2. Differentiate between climate and weather.
3. How are winds and their directions responsible for affecting the climate? Explain by giving examples.
4. Define monsoon. Identify the main reason which is responsible for moving trade winds in opposite direction?
5. Mention any four characteristics of cold weather season.
6. List any four main features of hot weather season?
7. By giving examples explain the effects of the global warming in India. What are the causes behind it?

ANSWERS TO INTEXT QUESTIONS

10.1

(a) Tropic of cancer, 23½° N

(b)

Incluenced by sea

(i) Mumbai

(ii) Chennai

Not incluenced by sea

(iii) Lucknow

(iv) Delhi

(c) Himalayan Mountain Ranges

(d) Winds are coming from North-East. Since they are coming from land, they are dry and unable to give rain to the country.

10.2

1. Rajasthan, Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Madhya Pradesh and Chhattisgarh and parts of Odisha.
2. Kerala.

3. South to North and North-East and North-West.

4. (a) Mumbai: 4 months (c) Delhi: 4 months
   (b) Nagpur: 4 months (d) Shillong: 6 months

10.3

1. (i) (b) Loo
(ii) (c) Western Ghats
(iii) (c) Retreating monsson season
(iv) (c) Deccan Plateau
(v) (a) Seasonal Winds

10.4

1. When monsoon winds enter from the coast, they give the maximum rain there. When they reach the central or northern regions, they become dry, resulting less rainfall.
2. Regions of low rainfall –
   1. Northern leh-ladakh region
   2. Western Rajasthan
   3. South-Central part
3. *Kharif* – June and July *Rabi* – October and November
4. From the end of the winter season i.e. March to May.
5. Urbanization, Industrialization, Deforestation, burning of fossil fuels, etc.

11

BIO-DIVERSITY

You must have seen variety of grass, plants, bushes, trees, insects, birds, animals or beautiful landscape around you. We rely on this diversity of plants and animals to provide us food, fuel, medicine and other essentials without which we cannot live. These species are the product of more than four billion years of evolution. This rich bio diversity is being lost at an alarming rate largely because of human activities. However, there are many things that each one of us can contribute in preserving these species, plants, animals and other living organisms. There are lots of things which you can help in saving these precious diversities. It is very important for us to know about diversity of plants, animals and micro-organisms. In this lesson, we will learn about some of these plants, animals, their importance and distribution in India and need for their conservation.

OBJECTIVES

After studying this lesson you will be able to:

- explain the concept of bio-diversity;
- explain the status of bio-diversity in India;
- establish the significance of biodiversity;
- describe natural vegetation and wildlife in India;
- locate forests, wildlife sanctuaries, national parks, biosphere reserves and wetlands in an outline map of India; and
- recognise our role in conserving natural vegetation and wildlife in our region.

11.1 BIO-DIVERSITY

Biodiversity is a short form of biological diversity. In simple terms biodiversity is the total number of **genes**, **species** and **ecosystems** of a region. It includes (i) genetic

diversity, (ii) species diversity and (iii) ecosystem diversity. Plants and animals constitute only a small component of biodiversity. Do you know that the invisible micro-organisms constitute a large component of bio-diversity.

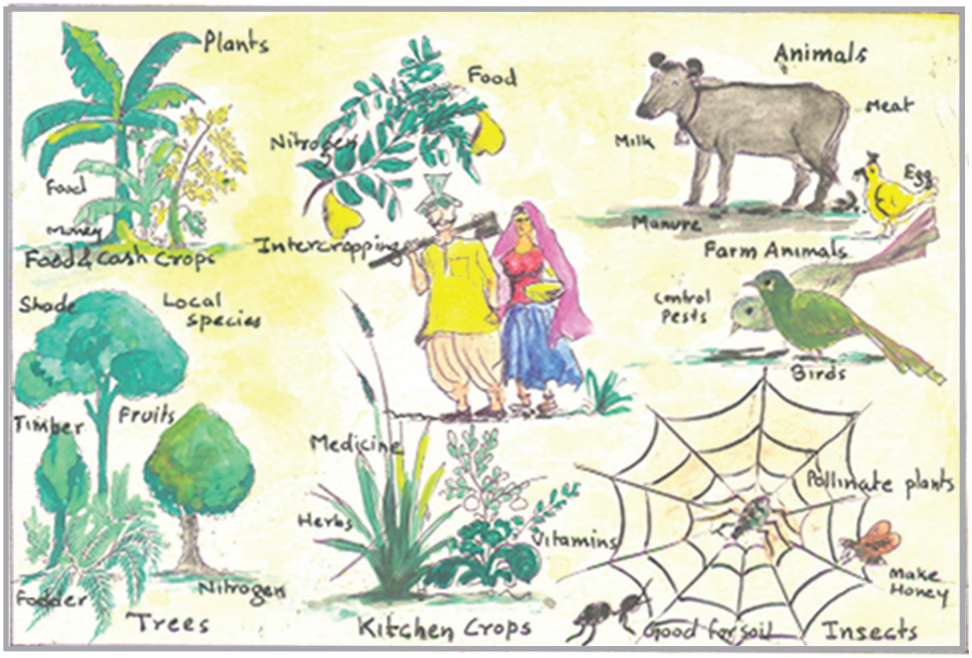


Figure 11.1 *Biodiversity*

Genes: The basic biological unit of heredity. Genes of an individual belonging to the same species are similar and genes control the characteristics of particular species.

Species: A group of very similar having some common characteristics or qualities and capable of interbreeding.

Ecosystem – Any segment of the landscape that includes biotic (living) and abiotic (non-living) components is known as ecosystem.

11.1.1 Status of biodiversity in India

Biodiversity increases as we move from the poles towards the equator. India is located between 8°4′ North and 37°6′ North latitudes and 68°7′ East and 97°25′ East longitude. Due to this position India has such rich biodiversity. Although India

has only 2.42% of the world's land area but its contribution to the world's biodiversity is approximately 8% of the total number of species which is estimated to be 1.75 million (As per Global Biodiversity Assessment of UNEP of 1995). 6% of the world species are found in India. 45000 plants species comprising about 12 % of world's flora are found in Indian forests. Two of the twelve biodiversity **hotspots** in the world are in India. They are the North-Eastern region and the Western Ghats.

- A biodiversity **hotspot** is a region with a high level of endemic species. Endemic species are those species that are found in a certain limited area.
- **Mega biodiversity**: A unique combinations of different plants and animal species which is not available anywhere else.

11.2 SIGNIFICANCE OF BIODIVERSITY

Biodiversity is fundamental to the existence of life on the earth. Its significance cannot be underestimated. There are varieties of living things that exist in a given physical environment. These are interdependent and interrelated in the form of an **ecosystem**. Do you know that plants occur in distinct groups of communities in areas having similar climatic conditions? The nature of vegetation in any area determines the animal life. When the vegetation of a place is altered, animal life also changes and simultaneously it affects mankind. Loss of any component in the system adversely affects other components of the system. We are an integral part of the ecosystem. By cutting trees and killing animals, human beings lead to ecological imbalance. How does the ecosystem get influenced by human beings? Collect some articles from the newspaper and magazines which will help you in understanding human impact on ecosystem. We must understand that all plants and animals in an area are interdependent and interrelated in their physical environment? Ecosystem is extremely valuable in different facets of human life which includes the following:

- Providing food, water, fiber, fuel etc.
- Regulating of climate and disease (For example: people are suffering from cold and cough in winters and stomach infections in monsoon etc.

11.2.1 Causes of Loss of Biodiversity

Increasing population and changing lifestyle leads to extenssive commercial exploitation of the natural resources. This results in loss of biodiversity. Consequently it is adversely affecting the ability of the nature to continue delivering the goods and services for human existence. The loss of biodiversity affects not only the physical environment but also the social, cultural, religious and spiritual well being of human life.

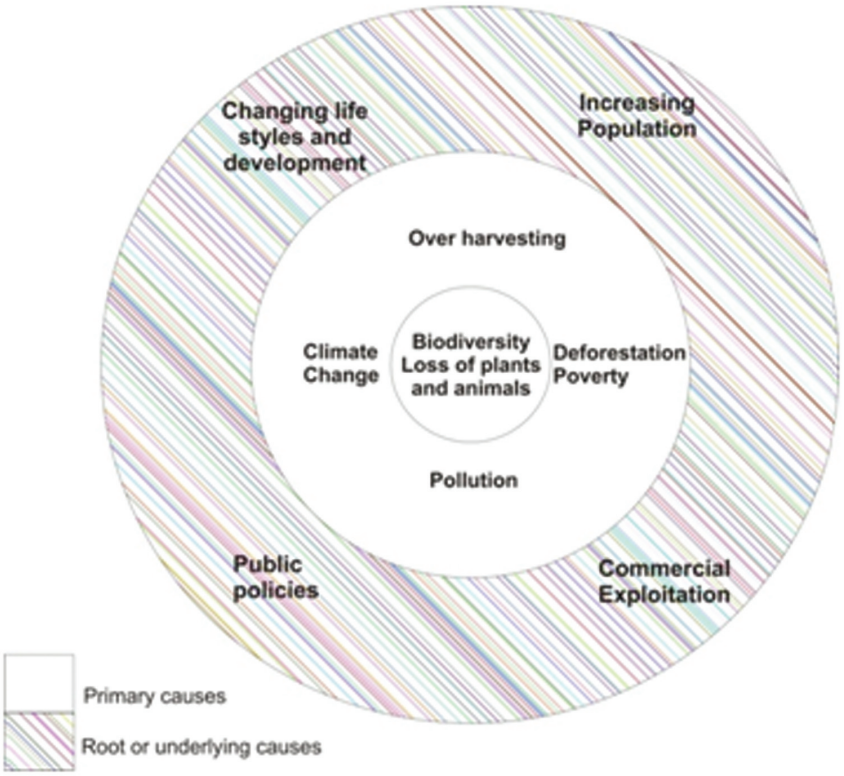


Figure 11.2 *Causes of Loss of Biodiversity*

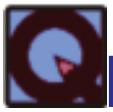
Do you know

- United Nations had proclaimed the year 2010, the International Year of Biodiversity.
- According to IUCN (International Union for Conservation of Nature), by 2010 around 18,788 species out of 52,017 so far assessed are threatened with extinction. Of the world's 5,490 mammals, 78 are extinct, 188 critically endangered, 540 endangered and 492 vulnerable. Amphibians are also in danger of extinction, 1,895 of the planet's 6,285, are the most threatened group of species.
- Extinction of individual species, destruction of natural habitats, land-use conversions, climate change, pollution and degradation is continuing at an alarming rate. Do you think this has anything to do with the extinction of various species.

ACTIVITY 11.1

Can you mention the names of three species of plants and animals/birds found in your locality and their importance for the residents of your locality? One example has been done for you.

Sr. No.	Plants	Importance	Sr. No.	Animals/Birds	Importance
1.	Neem	Give us medicine, wood ,oxygen and shade	1.	**Vulture**	Keeps environment free of carcasses and waste, restrict spread of diseases, help control a number of pest like rats
2.			2.		
3.			3.		
4.			4.		



INTEXT QUESTIONS 11.1

1. "Bio-diversity is fundamental to the existence of life on the earth" Justify the statement by giving any two reasons.
2. Explain **hotspots** in 30 words.

11.3 NATURAL VEGETATION AND WILDLIFE

In our ecosystem, vegetation and wildlife are valuable resources. We all know that plants provide us with timber, give shelter to man and animals, produce the oxygen we breathe, prevent soil erosion and natural calamities such as floods, high speed winds and help in storage of underground water, give us fruits, nuts, latex, turpentine oil, gum, medicinal plants and also the paper that is so essential for our studies. These are some of the innumerable uses of plants. Wildlife includes animals, birds, insects, reptiles as well as the aquatic life forms. They provide us milk, meat, hides and wool. Insects like bees provide us honey, help in pollination of flowers and have an important role to play as decomposers in the ecosystem. The birds feed on insects and act as a decomposers as well. Vulture due to its ability to feed on dead livestock is a scavenger and considered a vital cleanser of the environment. So life forms, big or small, all are integral in maintaining a balance in the ecosystem.

11.3.1 Natural Vegetation in India

As in any other part of the world, natural vegetation of India is also determined by climate, physiographic and soil factors. If we look at the figure 11.3, we find that based on factors of temperature, rainfall and topographic conditions, India has diverse vegetation patterns as summarized below. Dense natural vegetation found in North-Eastern region, Western Ghats and Andaman Nicobar. The Northern plain and North-Western Region supports very scanty vegetation and is under cultivation. The

Deccan region is full of scrubs and mixed deciduous forests. Natural vegetation of India can broadly be divided into the following groups:

(i) Tropical Evergreen Forests

(ii) Tropical Deciduous Forests

(iii) Thorn Forests

(iv) Tidal Forests

(v) Himalayan Forests

(i) Tropical Evergreen Forests

Trees in these forests remain green all the year round as the **climate of the region is warm** and wet throughout the year. The leaves of these trees do not fall in any particular season. Hence, they are evergreen. These forests are found in the areas having more than **200 cm of rainfall** with a short dry season. The trees reach a **height up to 60 meters or even more**. It has a dense and mixed vegetation of all kinds including trees, shrubs, climbers, creepers, epiphytes and ferns giving it a multilayered structure. Hence, their economic exploitation is not viable. The number of species of trees is very large in a small area. **Rosewood, ebony, mahogany, rubber, jack wood and bamboo are the important species** of trees found in Tropical Evergreen Forests. In India, this type of vegetation is found in the areas of heavy rainfall in **Western Ghats, upper parts of Assam and islands of Lakshadweep, Andaman and Nicobar**. Hardwood from these forests is used for furniture, handicraft etc. They prevent landslides and soil erosion.

ii) Tropical Deciduous Forests

Trees in these forests shed their leaves once in a year. That is why they are called tropical deciduous forests. These are most widespread forests of India. These forests are found in the areas receiving annual rainfall between 75 to 200 cms. As far as the physical distribution of this type of forests is concerned they are found in the entire country excluding some parts of Deccan Plateau, North-Eastern Region, Western Ghats and Eastern coast. These forests have been subject to extensive clearance by man for the purpose of cultivation. Still some patches of natural vegetation are found along the foothills of Himalayas, hilly regions of peninsular and central part of the country. On the basis of the availability of rainfall these forests are further divided into **moist deciduous** and **dry deciduous**.

(a) The moist deciduous forests are found in the areas of **rainfall between 100 to 200 cm**. These are distributed mainly in the eastern parts of the country,

Northeastern states along the **foothills of Himalayas, Jharkhand, Odisha and Chhattisgarh, and eastern slopes of Western Ghats**. **Teak, Bamboo, Sal, Shisham, Sandalwood, Khair, Kusum, Arjun, Mahua, Jamun and Mulberry are the important species** of trees found in these forests.

(b) **The dry deciduous forests** are spread in the areas receiving annual **rainfall between 75 to 100 cms** annually. These forests are found in the interior parts of the **Peninsular plateau and the plains of Uttar Pradesh, Madhya Pradesh and Bihar**. Tree **species of these forest are Teak, Sal, Peepal, and Neem**.

(iii) Thorn Forests

The areas with **less than 75 cm of annual rainfall** are characterized by the natural vegetation of thorny trees and bushes. **Climate of this part is mainly dry** with occasional wet period, so it does not support dense vegetation. They are mainly found in **North-Western India, interior parts of the Peninsular India including semi**

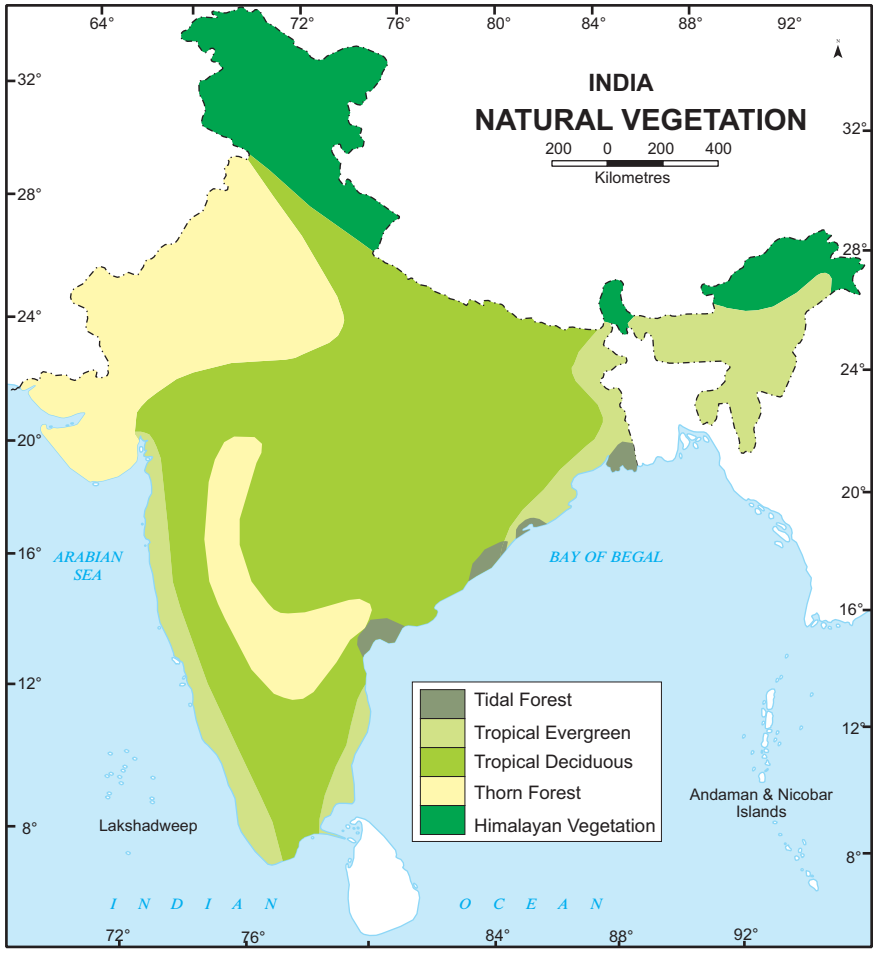


Figure 11.3 *Natural Vegetation of India*

arid areas of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Haryana, Karnataka, Andhra Pradesh and Maharashtra. Vegetation of these forests is widely distributed in the form of small trees and bushes with deep roots. The stems are succulent to conserve water. Leaves are mostly thick and small to minimize evaporation. **Acacia, euphorbias, babul, cacti, khair, date and palms** are common variety of trees in this type of vegetation.

(iv) Tidal Forests

As suggested by the name, these forests are found in tidal creeks and swamps influenced by the tides and wetland topography. These areas are characterized by mud, silt and water accumulated on the surface. Roots and branches of the trees are submerged under water for specific period of time. They are also called mangrove forests. Mangroves are practically evergreen with thick leathery leaves. Such types of forests are found in the deltas of Sundarbans, Mahanadi, the Godavari, Krishna, Kaveri rivers and in the Andaman and Nicobar Islands. Mangrove or Sundari is the common tree in sunderbans while palm, coconut, keora, and agar are other important species of tidal forest. It is interesting to know that this type of forests have remained away from the large scale commercial exploitation. These forests are located along the coasts. They provide protection against cyclones.

(v) Himalayan Forest

As is evident by the name that these forests are mainly found in the mountainous region of the Himalayas. The decreasing in temperature and increasing in altitude lead to varied types of vegetation depending upon the factors like slope of the mountain and sunrays receiving side. The ecosystem is highly fragile. Himalayan forests have been exploited in many ways in recent decades. Areas with relatively low altitude up to 1000 meters, warm climate and good amount of rainfall are characterized by dense vegetation cover. These areas look like tropical forest. Sal and Bamboo are main species in these areas. **Between the elevation of 1000 to 2000 meters evergreen broad leave Oak and Chestnut are the common species** found in these forests. In eastern Himalayas the same elevation is occupied by sub tropical Pine forests. Chir is common species found in this part. Moist temperate forest in Himalayas are found **between the elevation 1500 to 3500 meters which receives annual rainfall in the range of 100 to 250 cm. Oak, laurel, chestnut, cedar, Silver, Fir, spruce rhododendron and deodar are the main species** found in this part of Himalayas. They have been widely exploited for their timber. **Alpine forest found in Himalayas at the height of between 3000 to 3800 mts with large and extensive highland grassland and sparsely distributed pine, birch, sliver, fir and rhododendron trees.**

INTEXT QUESTIONS 11.2

1. Why are the tropical rain forests called evergreen forests? Explain in 30 words.
2. Give reasons
   (i) Tidal Forest areas along the eastern coast experienced severe destruction during cyclones in recent years because

   .....

   .....

   (ii) Himalayan Forests have been economically more exploited in comparison to Tropical Evergreen Forests because

   .....

   .....

11.3.2 Wildlife in India

You have studied earlier in the lesson that due to its unique geographical position, India is rich in wildlife. Wildlife of India is a great natural heritage. It is estimated that about 80 percent of all known plant and animal species on the earth are found in India. Many plants synthesize substances that are useful to the maintenance of health in humans and other animals. In recent decades, human encroachment has posed a threat to India's wildlife. In response to this, the system of National parks, Wildlife sanctuaries and protected areas, first established in 1935, has substantially expanded through **wildlife protection Act 1972.** Efforts are being made to protect and preserve biological diversity of our country under various programs. India has preserved vast tracts of natural habitats, birds and plants in its **551 Wildlife Sanctuaries, 96 National Parks, 25 Wetlands and 15 Biosphere Reserves** spread almost in all the states of India. Besides this, there are **33 Botanical Gardens, 275 Zoological Parks,** Deer Parks, Safari Parks , Aquaria etc. to make people aware conservation of threatened and endangered wildlife species in their respective areas. In India, for the purpose of effective conservation of natural habitat of wildlife, special schemes like **Project Tiger 1973** and **Project Elephant 1992** have been launched. These are very important as many species are at the brink of extinction. However, none of these efforts will be truly successfull unless all Indian recognize their role in conserving bio-diversity.

(i) Wildlife Sanctuaries: The main objective of the wildlife sanctuaries is to ensure maintenance of viable population of wildlife and their desired habitat. The wildlife sanctuaries in India are home to around 2000 different species of birds, 3500

species of mammals, nearly 30000 different kinds of insects and more than 15000 varieties of plants. These sanctuaries and forest reserves are home to several endangered species of animals and birds like the Asiatic Elephant, the Royal Bengal tiger, the Snow Leopard and the Siberian Crane. Many of the forest reserves and wildlife sanctuaries of India are famous for particular species of animals. For instance, the Kaziranga in Assam is known for the Indian Rhinoceros, Periyar in Kerala is famous for its elephants. India is also home to several migratory animals and birds like Olive Ridley Sea Turtles, Siberians Cranes and Flamingos.

(ii) National Parks: The purpose of establishing national parks is "to conserve the natural and historic objects and the wild life and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." By 1970, India only had five national parks. In 1972, India enacted the Wildlife Protection Act to safeguard the habitats of conservation reliant species. The two main objectives of the Act are; to provide protection to the endangered species listed in the Act and to provide support to the conservation area of the country classified as national park.

Table 11.1 Rare Species of Animals Found in National Parks

National Parks (wild life sanctuaries)	Rare species of wild animals protected
1. Dachigram (J&K)	Hangul , Musk deer
2. Corbett (Uttrakhand)	Tiger, Elephant, Panther , Deer
3. Dudhwa (U.P.)	Elephants and Tiger
4. Kanha (M.P.)	Tiger, Barasingha
5. Badipur (Karnataka)	Tiger and Barasingha
6. Periyar (Kerala)	Elephants
7. Bharatpur (Rajasthan)	Different types of water birds
8. Deset Park (Rajasthan)	Desert wolf, Fox
9. Gir (Gujarat)	Lion, Panther, Chital
10. Kaziranga (Assam)	Rhino, Wild Buffalo
11. Manas (Assam)	Elephant, Rhino, Wild Buffalo
12. Nam Dafa (Arunachal Pradesh)	Tiger, Gaur, Wild buffalo
13. Sundarbans (West Bengal)	Royal Bengal Tiger

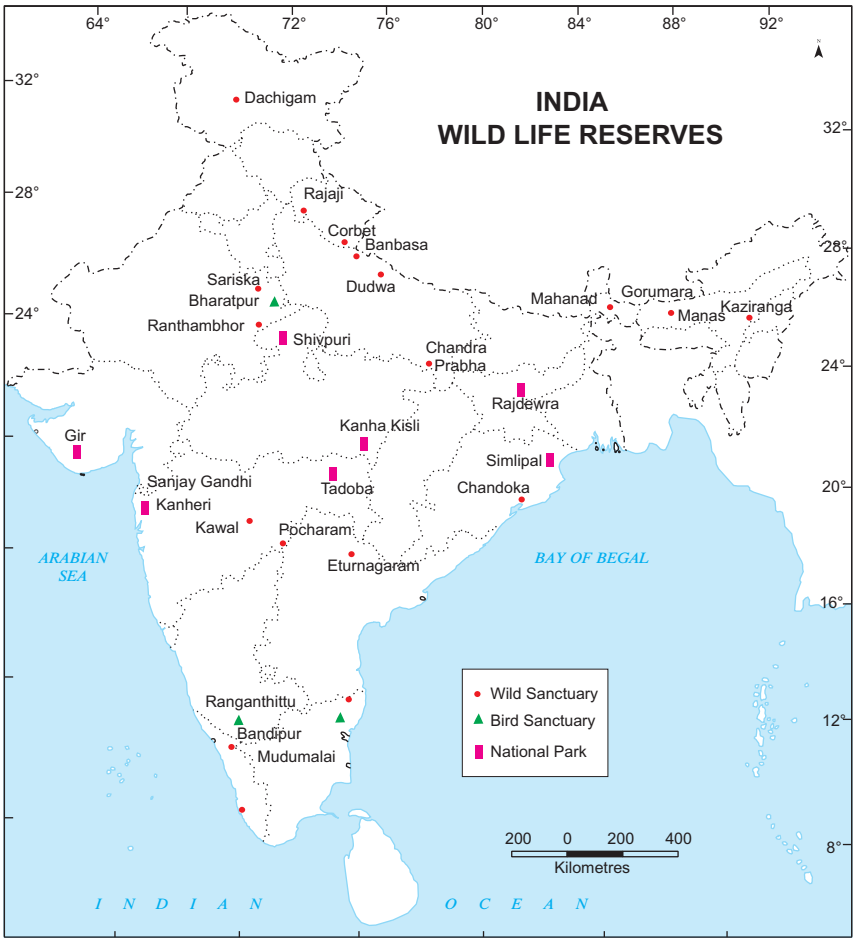


Figure 11.4 *National Park, Wildlife Sanctuaries and Bird Sanctuaries in India*

(iii) Wetlands: A **wetland** is an area of land where soil is saturated with moisture either permanently or seasonally. Such areas may also be covered partially or completely by shallow pools of water. Wetlands include swamps, marshes, and bogs, among others. The water found in wetlands can be saltwater, freshwater, and brackish. Most importantly wetlands also serve as natural wastewater purification systems. Wetlands are considered as biologically the most diverse of all ecosystems. Plant life found in wetlands includes mangrove, water lilies, cattails, sedges, tamarack, black spruce, cypress, gum, and many others. Animal life includes many different amphibians, reptiles, birds, insects, and mammals. Wetlands perform two important functions in relation to climate change. They have mitigation effects through their ability to sink carbon, and adaptation effects through their ability to store and regulate water. The Convention on Wetlands of International Importance (Ramsar Convention), is an international treaty designed to address global concerns regarding wetland loss and degradation. The primary purpose of the treaty is to list wetlands of international importance and to promote their wise use with the ultimate goal of preserving the world's

wetlands. Methods include restricting access to the majority portion of wetland areas, as well as educating the public to combat the misconception that wetlands are wastelands.

Do you know

About 25 wetlands or Ramsar sites have been identified of significance in India.

Table 11.2 Wetlands in India

No.	Name	State	Area(km²)
1.	Ashtamudi	Kerala	614
2.	Bhitarkanika Mangroves	Odisha	650
3.	Chilika Lake	Odisha	1165
4.	East Calcutta Wetlands	West Bengal	125
5.	Kolleru Lake	Andhra Pradesh	901
6.	Loktak Lake	Manipur	266
7.	Point Calimere	Tamil Nadu	385
8.	Pong Dam Lake	Himachal Pradesh	157
9.	Sambhar lake	Rajasthan	240
10.	Tsomoriri	Jammu and Kashmir	120
11.	Upper Ganga canal	Uttar Pradesh	266
12.	Vembanad-Kol Wetland	Kerala	1512
13.	Wular Lake	Jammu and Kashmir	189
14.	Harike Lake	Punjab	41
15.	Bhoj Wetland	Madhya Pradesh	32

(iv) Biosphere Reserves

Biosphere Reserves are multipurpose protected areas to preserve the genetic diversity in representative ecosystems. The Indian government has established 15 Biosphere Reserves, which protect larger areas of natural habitat (than a National Park or Wildlife Sanctuary), and often include one or more National Parks and/or preserves along buffer zones that are open to some economic uses. Protection is granted not only to the flora and fauna of the protected region, but also to the human communities who inhabit these regions. The main objectives to establish them are: (i) to conserve diversity and integrity of the life of plants, animals and micro-organisms, (ii) to promote eco friendly sustainable life in the areas, and (iii) to promote

ecological conservation, research, education, awareness and training in the life of such areas.

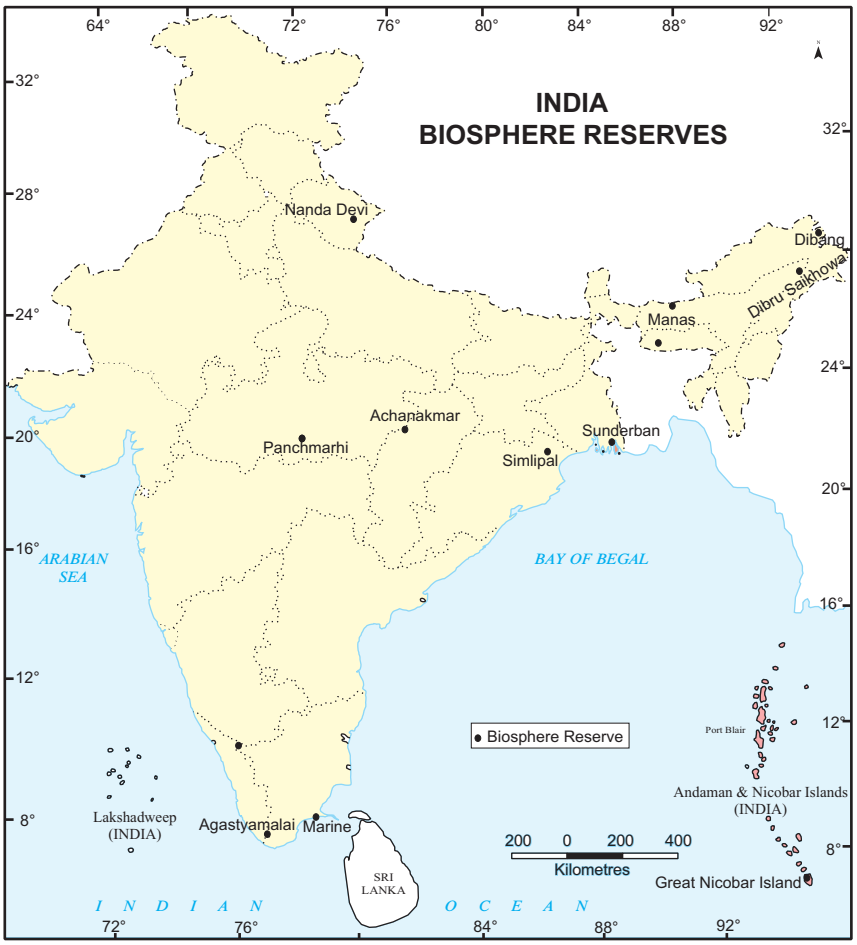


Figure 11.5 *Biosphere Reserves in India*

Table 11.3 Biosphere Reserves

No.	Name	State
1.	Nilgiri	Tamil Nadu, Kerala and Karnataka
2.	Gulf of Mannar	Tamil Nadu
3.	Sundarbans	West Bengal
4.	Nanda Devi	Uttarakhand
5.	Dihang-Dibang	Arunachal Pradesh
6.	Pachmarhi	Madhya Pradesh
7.	Simlipal	Odisha
8.	Achanakmar Amarkantak	Madhya Pradesh and Chhattisgarh

9.	Manas	Assam
10.	Kanchenjunga	Sikkim
11.	Agasthyamala	Kerala
12.	Great Nicobar	Andaman & Nicobar Islands
13.	Nokrek	Meghalaya
14.	Dibru-Saikhowa	Assam
15.	Rann of Kachchh	Gujarat

11.4 NEED OF CONSERVATION OF BIO-DIVERSITY

In section 11.1 we have described bio-diversity as the total number of genes, species and ecosystems of a region. We have also learnt that biodiversity is fundamental to our existence on the earth. We look for food, water, shelter and fibre in nature. All these are interrelated and interdependent. If any one component is disrupted, it would have multiple impacts on other components of biodiversity. If we want to conserve our natural vegetation and wildlife we need to relook at the way we exploit these. It is time to re-look at our lifestyle and bring it in harmony with nature. Vegetation is an integral part of our life. Let's see how plant life and vegetation impacts us:

(i) Vegetation is a key component of biodiversity. Without vegetation, the animals and some micro-organisms would die for lack of habitat, food and oxygen.

(ii) Plant's root systems hold the soil together, protecting it from being blown away by the wind or washed away by water.

(iii) Vegetation plays a major role in the water cycle. Plants provide a link between the ground and the atmosphere by drawing water up from the ground and releasing it through the leaves into the air as water vapour.

(iv) Vegetation is a natural barrier and slows down the flow of water over the surface of the ground.

(v) Through photosynthesis, vegetation removes carbon dioxide from the air and replaces it with oxygen. Other pollutants can also be filtered out of the air by vegetation.

(vi) Vegetation acts as a stabilising influence in the greenhouse effect. Conversely, clearing of vegetation releases high amounts of carbon dioxide – the main greenhouse gas.

(vii) Wildlife plays an important role in maintaining balanced food. This role helps in maintaining ecological balance resulting in healthy biodiversity.

(viii) The invisible micro-organism play an important role of scavengers, improving soil fertility and are of immense medicinal value.

You can now feel that conservation of biodiversity is of great significance not only to the world or national heritage but also for the survival of local people in any part

of the globe. We as a responsible citizen of the world need to understand our positive role in making responsible living choices. This would be our contribution in conserving biodiversity.

Peoples Participation in Conserving Biodiversity

(A Case Study)

Twenty-five years old Rajender Singh left his job and committed himself to rural development. With four companions he boarded a bus and travelled to a desolate village near Alwar. By this time Alwar had been opened to miners and loggers, who decimated its forests and damaged its watershed. Its streams and rivers dried up, then its farms. Dangerous floods now accompanied the monsoon rains. Overwhelmed by these calamities, villagers abandoned their Johads (water bodies). As men shifted to the cities for work, women spirited frail crops from dry grounds and walked several kilometers a day to find water. This was Alwar when Rajendra Singh first arrived in 1985. Before that he worked with nomadic tribes and tried to understand issues of natural resources management in rural areas.

Upon advice of a local village elder, he began organizing villagers to learn how to repair and deepen old johads. He initiated an awareness campaign for Gram Swawlamban, which is organised every year during the summer months for forty days in different hundreds of villages. In this campaign discussion on Gram Swawlamban, soil conservation, improved seeds, collection of herbal medicine and shramdan were the activities undertaken. Singh coordinated all these activities to mesh with the villager's traditional cycle of rituals. He played a catalyzing role in the building of 8600 johads (water harvesting structures) in 1058 villages spread over 6500 sq.km. Out of these 3500 were built by TBS and as an after effect of these the community was motivated to build the remaining 5100 structures.

Through his determination, vision, hard work and dedication, he has transformed the life of people in 1058 villages of Aravali hills. He has turned the arid land into cultivable, densely afforested large tracts making a wild life sanctuary by water management, made the dry rivers flow throughout the year. Aquatic life and bird sanctuary have flourished. Animal life has become lively, with desert beaming with life all around.

Do you know

There is so much we can do to save nature.

Think what we give back to nature in lieu of what we take away. If we cut down a tree, we should plant two small ones in its place. Buy only those products which have not been tested on animals. Do not waste paper. Try to use recycled paper.

ACTIVITY 11.2

Find out if there is any wetlands in your locality and its distance from your place of residence.

INTEXT QUESTIONS 11.3

1. Fill in the blanks correctly from the alternatives provided in the bracket:-
   (i) At present there are ..... wild life sanctuaries (441/551)
   (ii) ..... in Assam is known for the Indian Rhinoceroses. (Manas/Kaziranga)
   (iii) HarikeWetlands is located in ..... (Punjab/ Himachal Pradesh)
   (iv) ..... biosphere reserve is in the state of Tamil Nadu. (Gulf of Mannar/Pachmarhi)
2. Define Wetlands

   .....
3. Make a list of any three efforts you can make to safeguard Biodiversity of your surroundings.
   (i) .....
   (ii) .....
   (iii) .....

WHAT YOU HAVE LEARNT

- We are fortunate to have such a great biodiversity on the planet we live on.
- Being an integral part of nature, it is important for us to save it.
- People all over the world are working to safeguard this irreplaceable natural wealth and biodiversity.
- Natural vegetation and wildlife are important aspects of biodiversity.
- India is among the twelve mega biodiversity countries of the world having rich wildlife heritage and great range of natural vegetation.
- It is really important to know about the threats and the need of conservation of this natural wealth.

TERMINAL EXERCISES

1. Define biodiversity. Explain the interrelationship between natural vegetation, wildlife and micro-organisms.
2. Describe in brief the characteristics and distribution of Tropical Evergreen Forests in India.
3. Give any two differences between the moist deciduous forests and the dry deciduous forests in India.
4. State three objectives for establishment of biosphere reserves in India.
5. What are the main causes of loss of biodiversity? State any four.
6. Justify the need for conservation of natural vegetation, wildlife and micro-organisms with suitable reasons.
7. Study the table given below and answer the following questions.

Natural Parts/Wild life Sanctuary	Protected Wild Animals
1. Kaziranga	1. Tiger
2. Manas	2. Elephant
3. Periyar	3. Musk Deer
4. Corbett	4. Lion
5. Dachigram	5. Rhino
6. Wild Buffalo	
7. Panther	
8. Beer	

   (a) Match the name of the animal to the national park in which they are protected?

   (b) Encircle the animal which are not protected in any national park?

   (c) Write the name of the animal which is protected in more than one National Park?

8. Refer to Figure No.11.3

   (a) Find out the type of vegetation in your state.

   (b) Which areas have thorn forests?

   (c) Which areas have tidal forests and why are they restricted to those areas?

ANSWER TO INTEXT QUESTION

11.1

1. Biodiversity is fundamental to the existence of life on the earth because this is extremely valuable in different facets of life which includes providing of food, water, fiber, fuel etc. and regulating of climate and diseases.
2. A biodiversity hotspot is a region with a high level of endemic species. Endemic species are those species that are found in a limited area.

11.2

1. Trees in these forests remain green all the year round as the climate of the region is warm and wet throughout the year. The leaves of the trees do not fall in any particular season. Hence they are evergreen.
2. (i) Tidal forests along the eastern coast provide protection against cyclones. But in recent years due to massive deforestation, these areas have been experiencing severe destruction during cyclones in recent years

   (ii) Tropical evergreen forest has a dense and mixed vegetation of all kinds and hence, their economic exploitation is not viable whereas species in Himalayan vegetation are less dense and found in pure stand.

11.3

1. (a) 551

   (b) Kaziranga

   (c) Punjab

   (d) Gulf of Mannar
2. A wetland is an area of land where soil is saturated with moisture either permanently or seasonally. Such areas may also be covered partially or completely by shallow pools of water.
3. Some of the efforts you can make to safeguard Bio diversity of your surroundings are: (i) stop cutting trees; (ii) plant more trees; (iii) protect all animals; (iv) establishment of hospitals for injured birds or animals; (v) stop throwing garbage and polluting environment.

12

AGRICULTURE IN INDIA

In the previous lessons, we have studied physiography, climate and natural vegetation in India. Now, we will study about agriculture which is the backbone of Indian economy. In India around 70% of the population earns its livelihood from agriculture. It still provides livelihood to the people in our country. It fulfills the basic need of human beings and animals. It is an important source of raw material for many agro-based industries. India's geographical condition is unique for agriculture because it provides many favourable conditions. There are plain areas, fertile soil, long growing season and wide variation in climatic condition etc. Apart from unique geographical conditions, India has been consistently making innovative efforts by using science and technology to increase production.

In this lesson we will discuss about various types of farming, cropping patterns and establish their relationship with various geographical factors. We will also discuss some of the major issues and challenges faced by Indian Agriculture in this lesson.

OBJECTIVES

After studying this lesson you will be able to:

- explain various types of farming in India;
- describe salient features of Indian agriculture;
- list the major crops grown in India along with their utility;
- establish relationship of crops with the types of soil and climatic conditions;
- locate major crop producing areas on the outline map of India, and
- analyse challenges faced by farmers in Indian agriculture.

12.1 TYPES OF FARMING IN INDIA

You know that India has diversified topography. You have already learnt about it in the lesson on physiography of India. The country has Himalayan mountain ranges

extending from Jammu and Kashmir in the west to Arunachal Pradesh in the North-East. They have hill ranges in the form of Eastern Ghats and Western Ghats. Do you know India has one of the largest plain areas of the world in the form of Indo-Ganga plain? Central part of India is dominated by plateau area. Apart from variation in landform, the country has varieties of climatic conditions, and soil types. These physical variations along with other factors like availability of irrigation, use of machinery, modern agricultural inputs like High Yielding Varieties (HYV) of seeds, insecticides and pesticides have played their respective roles in the evolution of different farming practices in India. Some of the major types of farming are discussed below.

1. **Subsistence and commercial farming:** Majority of farmers in India practises subsistence farming. This means farming for own consumption. In other words, the entire production is largely consumed by the farmers and their family and they do not have any surplus to sell in the market. In this type of farming, landholdings are small and fragmented. Cultivation techniques are primitive and simple. In other words there is a total absence of modern equipments like tractors and farm inputs like chemical fertilizers, insecticides and pesticides. In this farming, farmers mostly cultivate cereals along with oil seeds, pulses, vegetables and sugarcane. **Commercial farming** is just the opposite to subsistence farming. In this case, most of the produce is sold in the market for earning money. In this system, farmers use inputs like irrigation, chemical fertilizers, insecticides, pesticides and High Yielding Varieties of seeds etc. Some of the major commercial crops grown in different parts of India are cotton, jute, sugarcane, groundnut etc. Rice farming in Harayana is mainly for commercial purpose as people of this area are predominantly wheat eaters. Howevr in East and North-Eastern states of India, rice cultivation would be largely of subsistence type.

2. **Intensive and Extensive Farming:** The basic difference between these two types of farming is the amount of production per unit of land. In comparison with temperate areas of USA, Canada, and former USSR, India does not practise extensive cultivation. When we use large patch of land for cultivation then we call it extensive farming. Here, total production may be high due to larger area but per unit are production is low. **Intensive Farming** records high production per unit of land. Best example of intensive cultivation is in Japan where availability of land for cultivation is very limited. Similar kind of situation can be observed in the state of Kerala in India.

3. **Plantation Farming:** It is an estate where a single cash crop is grown for sale. This type of agriculture involves growing and processing of a single cash crop purely meant for sale. Tea, coffee, rubber, banana and spices are all examples of plantation crops. Most of these crops were introduced in India by the Britishers in the 19th Century.

4. **Mixed Farming:** It is a situation in which both raising crops and rearing animals are carried on simultaneously. Here farmers engaged in mixed farming are economically better of than others.

   All classifications are based on nature and purpose of farming. It may overlap. For example: Banana is a plantation type of farming. It can also be classified as commerical farming.

Do you know

Green Revolution: It stands for a major technological breakthrough in India based on (i) improved seeds of high yielding varieties, (ii) adequate and assured supply of water for irrigation, and (iii) increased and appropriate application of chemical fertilizers for increasing agricultural production.

White Revolution: It stands for remarkable increase in milk production and establishment of a national milk grid, removing regional and seasonal imbalances. Among the technological inputs are (i) crossbreeding of indigenous cows with high milk yielding European breed; (ii) pasteurization of milk for keeping it for a longer duration; (iii) collection of quality milk from members in rural areas; and (iv) refrigerated transport system which helps sending milk to far off metropolitan centres both by road and rail.

Blue Revolution: It refers to big rise in catching of fresh water and marine fish.

Yellow Revolution: It refers to remarkably steady and assured supply of poultry products.

Pink Revolution: It refers to a considerable rise in the production of quantity of apples particularly in the states of Himachal Pradesh and J&K.

ACTIVITY 12.1

Conduct a survey within 1 km radius of your residence and find out which types of crops are grown in that specific area. Record your findings in the table given below and give reasons for the same.

Name of the crop	State	Type of farming	Reasons
Hint: Apple	HP	Commercial	Suitable climatic conditions, grown in large quantities for high demand in the market

12.2 SALIENT FEATURES OF INDIAN AGRICULTURE

(a) Subsistence Agriculture: As mentioned earlier, most parts of India have subsistence agriculture. This type of agriculture has been practised in India for several hundreds of years and still prevails in a larger part of India in spite of the large scale change in agricultural practices after independence.

(b) Pressure of population on Agriculture: Despite increase in urbanization and industrialization, about 70% of population is still directly or indirectly dependent on agriculture.

(c) Mechanization of farming: Green Revolution took place in India in the late sixties and early seventies. After more than forty years of Green Revolution and revolution in agricultural machinery and equipments, complete mechanization is still a distant dream

(d) Dependence upon monsoon: Since independence, there has been a rapid expansion of irrigation infrastructure. Despite the large scale expansion, only about one third of total cropped area is irrigated today. As a consequence, two third of cropped areas is still dependent upon monsoon. As you know, monsoon in India is uncertain and unreliable. This has become even more unreliable due to change in climate.

(e) Variety of crops: Can you guess why India has a variety of crops? As mentioned in the beginning of the lesson, India has diversity of topography, climate and soil. Since India has both tropical and temperate climate, crops of both the climate are found in India. There are very few countries in the world that have variety comparable to that of India. You would realize that when we would discuss the different type of crops in detail. Look at the table No.1 to get an idea.

(f) Predominance of food crops: Since Indian agriculture has to feed a large population, production of food crops is the first priority of the farmers almost everywhere in the country. However, in recent years, there has been a decline in the share of land used for food crops due to various other commercially most advantageous uses of these land.

(g) Seasonal patterns: India has three distinct agricultural/cropping seasons. You might have heard about *kharif*, *rabi* and *zaid*. In India there are specific crops grown in these three seasons. For example rice is a *kharif* crop whereas wheat is a *rabi* crop.

INTEXT QUESTIONS 12.1

1. Differentiate between intensive and extensive farming by giving two points of difference each.

2. Based on the salient features studied above, identify the one applicable in your area. (example : The farming is largely mechanized in Harayana and well irrigated. So that there is less dependance on monsoon.)

12.3 MAJOR CROPS OF INDIA

India grows almost each and every crop. Can you think why? If we consider the varieties of crop grown from Kashmir to Kanyakumari and western coast of Gujarat to extreme north eastern states of Arunachal Pradesh, there would be hundreds of crops. We group all these crops into four broad types. Let us discuss the main crops under each type in detail:

Table 12.1

Sl. No	Types of Crops	Meaning	Major Crops
1.	Food grains	Crops that are used for human consumption	Rice, Wheat, Maize, Millets, Pulses and Oil seeds
2.	Commercial Crops	Crops which are grown for sale either in raw form or in semi-processed form	Cotton, Jute, Sugarcane, Tobacco and Oilseeds
3.	Plantation Crops	Crops which are grown on Plantations covering large estates	Tea, Coffee, Coconut and Rubber
4.	Horticulture	Sections of agriculture in which Fruits and Vegetables are grown	Fruits and Vegetables

1. Food grains

(i) **Rice:** Rice is the most important food crop of India. It is predominantly a **Kharif** or summer crop. It covers about one third of total cultivated area of the country and provides food to more than half of the Indian population. Maximum population of India is of rice consumers. Do you know what types of geographical conditions are required for rice cultivation? If you look at rice grown areas of India, you should find that this is the only crop in India which is grown in varied conditions as illustrated below..

Some of the **geographical conditions** are as follows:

(a) **Temperature:** Rice requires hot and humid conditions. The temperature should be fairly high i.e. 24°C mean monthly temperature with average temperature of 22°C to 32°C.

(b) Rainfall: Rainfall ranging between 150-300 cm is suitable for its growth in areas of Punjab, Haryana and Western Uttar Pradesh where rainfall is less than 100 cm, rice is cultivated with the help of irrigation.

(c) Soil: Rice is grown in varied soil conditions but deep clayey and loamy soil provides the ideal conditions. Rice is primarily grown in plain areas. It is also grown below sea level at Kuttinad (Kerala), hill terraces of north eastern part of India and valleys of Kashmir.

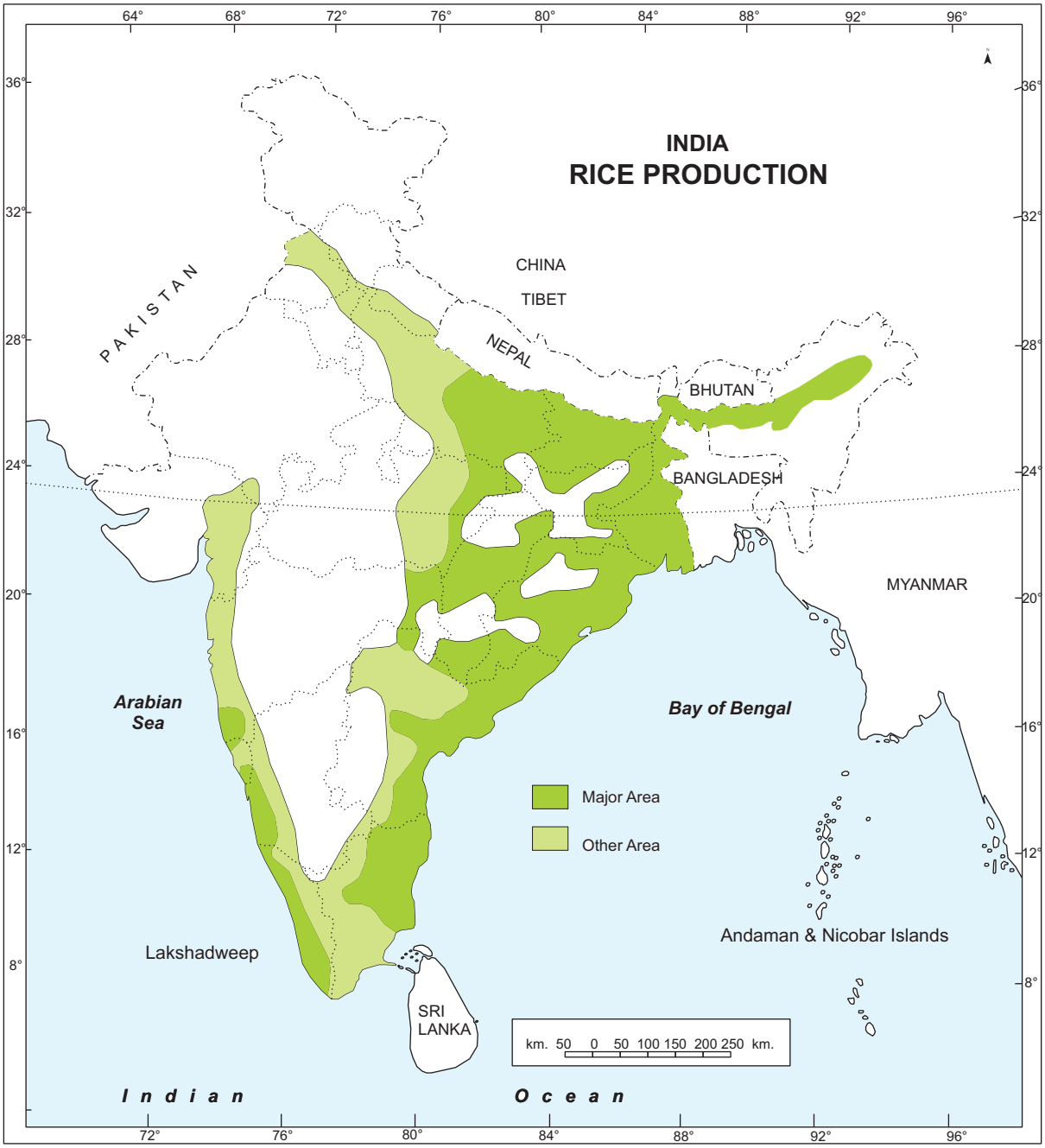


Figure 12.1: *India: Rice Producing Areas*

(d) **Labour:** Rice cultivation requires easily available cheap labour because most of the activities associated with it are labour orientated and are not very well suited for mechanization.

(e) **Distribution:** Rice is grown in almost all the states of India. The main rice producing states are Tamilnadu, West Bengal, Andhra Pradesh, Bihar, Jharkhand, Uttarakhand, Chhatisgarh, Punjab, Odisha, Uttar Pradesh, Karnataka, Assam and Maharashtra. It is also grown in Haryana, Madhya Pradesh, Kerala, Gujrat and Kashmir Valley (See figure 12.1).

(ii) **Wheat: W**heat is the second most important food crop of India next to rice. It is a **Rabi** or winter crop. It is sown in the beginning of winter and harvested in the beginning of summer. Normally (in north India) the sowing of wheat begins in the month of October-November and harvesting is done in the month of March-April. This is the staple food of millions of people particularly in the northern and north-western regions of India. Unlike rice, wheat is grown mostly as a rabi or winter crop.

Some of the **geographical conditions** are as follows:

(a) **Temperature:** It is primarily a crop of mid-latitude grassland. It requires cool climate. The ideal temperature is between 10°C to 15°C at the time of sowing and 21°C to 26°C at the time of ripening and harvesting.

(b) **Rainfall:** Wheat thrives well in areas receiving annual rainfall of about 75cm. Annual rainfall of about 100cm is the upper limit for wheat cultivation. As you know areas receiving more than 100cm of rainfall are suitable for rice cultivation. Like rice, wheat can also be grown by irrigation method in areas where rainfall is less than 75cm. But on the other hand, frost at the time of flowering and hailstorm at the time of ripening can cause heavy damage to the wheat crop.

(c) **Soil:** Although wheat can be grown in a variety of soils but well drained fertile loamy and clayey loamy soil is best suited for wheat cultivation. Plain areas are very well suited for wheat production.

(d) **Labour:** Wheat is highly mechanized and requires less labour.

(e) **Distribution:** The main regions of wheat production in India are U.P., Punjab, Haryana, Rajasthan, Madhya Pradesh, Gujrat,Maharashtra. U.P., Punjab and Haryana together produce more than 66% of the total wheat of the country (See figure 12.2).

(iii) **Millets**: Millets are short duration warm weather crops. These are coarse grain crops and are used for both food and fodder. These are kharif crop. These

are sown in May-August and harvested in October-November.Today millets are mostly consumed by poor people as their staple food. In India, lots of millet is grown and these are known by various local names. Some of these are *Jawar, Bajra, Ragi, Korra, Kodon, Kutki, Hraka, Bauti, Rajgira*. In India, *Jawar, Bajra and Ragi* are grown.on large areas But unfortunately area under these crops has drastically reduced over the years.

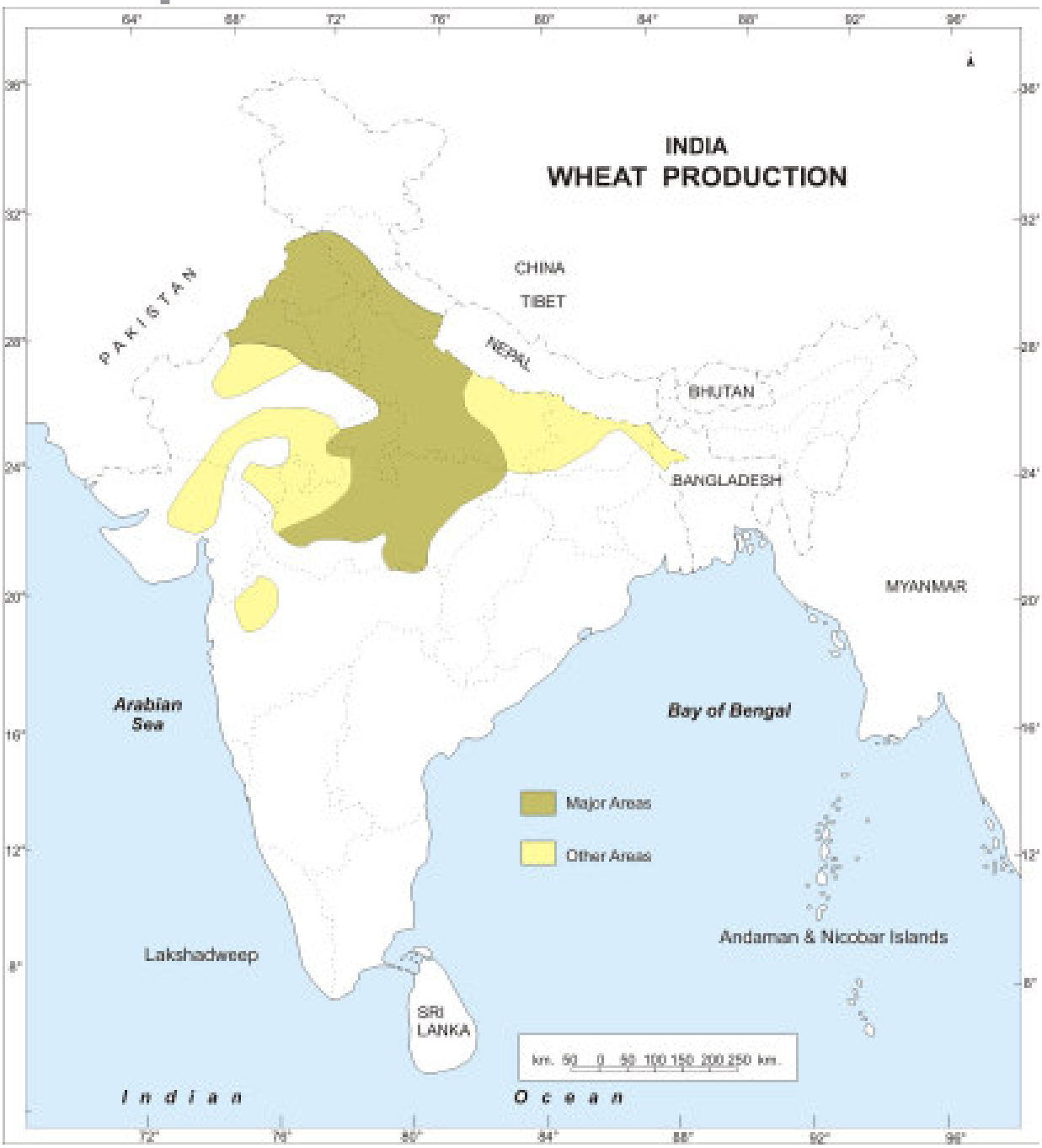


Figure 12.2: *India: Wheat Producing Areas*

Some of the **geographical conditions** for growing these crops are as follows:

(a) **Temperature:** These crops are grown where the temperature is high which ranges between 27°C to 32°C.

(b) **Rainfall:** As mentioned earlier that millets are 'dry land crops', therefore, rainfall ranging from 50 to 100cm is ideal for their cultivation.

(c) **Soil:** Millets are less sensitive to soil deficiencies. They can be grown in inferior alluvial or loamy soil.

(d) **Distribution:** *Jawar, Bajra,* is grown both in north and south India whereas *ragi* is generally concentrated in the southern India. *Jawar, Bajra,* is grown in Madhya Pradesh, Gujrat, Rajasthan, Maharastra, Karnataka, Tamil Nadu, Andhra Pradesh, Haryana and Punjab. R*agi* is generally concentrated in the southern India i.e. Tamilnadu, Karnataka and Andhra Pradesh.

(iv) **Pulses:** It includes a number of crops which are mostly leguminous and provide invaluable proteins to the vegetarian population of India. As they have fewer sources of proteins in comparision to those who consume meat and fish. They also serve as excellent forage and grain concentrates in the cattle feed. Apart from that these leguminous crops have the capacity to fix atmospheric nitrogen in the soil and are normally rotated with other crops to maintain and restore soil fertility. A large variety of pulses are found in India. These are gram, *tur or arhar* (Pigeon Pea or Red Gram), *urd* (black gram), *mung* (green gram), *masur* (lentil), *kulthi* (horse gram), *matar* (peas) etc. But among these above mentioned varieties only gram and *tur or arhar* are more important pulses.

Gram: It is the most important of all the pulses. It accounts for about 37% of the production and about 30% of the total area of pulses in India. It is a *rabi* crop which is sown between September and November and is harvested between February and April. It is either cultivated as a single crop or mixed with wheat, barley, linseed or mustard.

Some of the **geographical conditions** are as follows:

(a) **Temperature:** It is grown in a wide range of climatic condition. Mild cool and comparatively dry climate with 20°C-25°C temperature.

(b) **Rainfall:** 40-45 cm rainfall is favourable for gram cultivation.

(c) **Soil:** It grows well on loamy soils.

(d) **Distribution:** Although gram is cultivated in several parts of the country, however, 90% of the total production comes from five states. These states are Madhya Pradesh, Uttar Pradesh, Rajasthan, Haryana and Maharashtra.

Do you know

1. In India there was a strong tradition of eating various millets as staple food. But over the years majority of the population uses either rice or wheat as staple food.
2. As lifestyle related diseases become pandemic in nature, various millets are now prescribed as an essential food to control these diseases as they contain a lot of fibers.

ACTIVITY 12.2

1. Find out the areas/states where rice, wheat, and millets are staple foods in India. Mention the staple foods (rice, wheat, millets) in each of the following states of India

States	Staple food
Rajasthan	wheat, Bajara
Karnataka	
Your state	

2. On an outline map of India show the states (in two different shades) where rice and wheat are staple foods.

2. Commercial Crops

As mentioned in the beginning of the lesson, commercial crops are those crops which are grown for sale either in raw form or semi processed form. In this section we will learn more about selected cash crop i.e. sugarcane, cotton and jute; two beverages- tea and coffee; three oil seeds i.e. groundnut, mustard and rapeseed.

(i) Sugarcane: Can you think life without sugar in your everyday life? It is almost impossible to think of life without sugar. Do you know sugarcane belongs to bamboo family of plants and is indigenous to India? It is a *Kharif* crop. It is the main source of **sugar, gur and khandsari**. It also provides raw material for the manufacturing of alcohol. Bagasse, the crushed cane residue, has also multiple uses. It is used for manufacturing of paper. It is also an efficient substitute for petroleum products and a host of other chemical products. A part of it is also used as fodder.

Some of the **geographical conditions** for the growth of sugarcane are as follows:

(a) Temperature: It requires hot and humid climate with an average temperature of 21°C to 27°C.

(b) Rainfall: 75-150 cm rainfall is favourable for sugercane cultivation. Irrigation is required in those areas where rainfall is less than the prescribed limit.

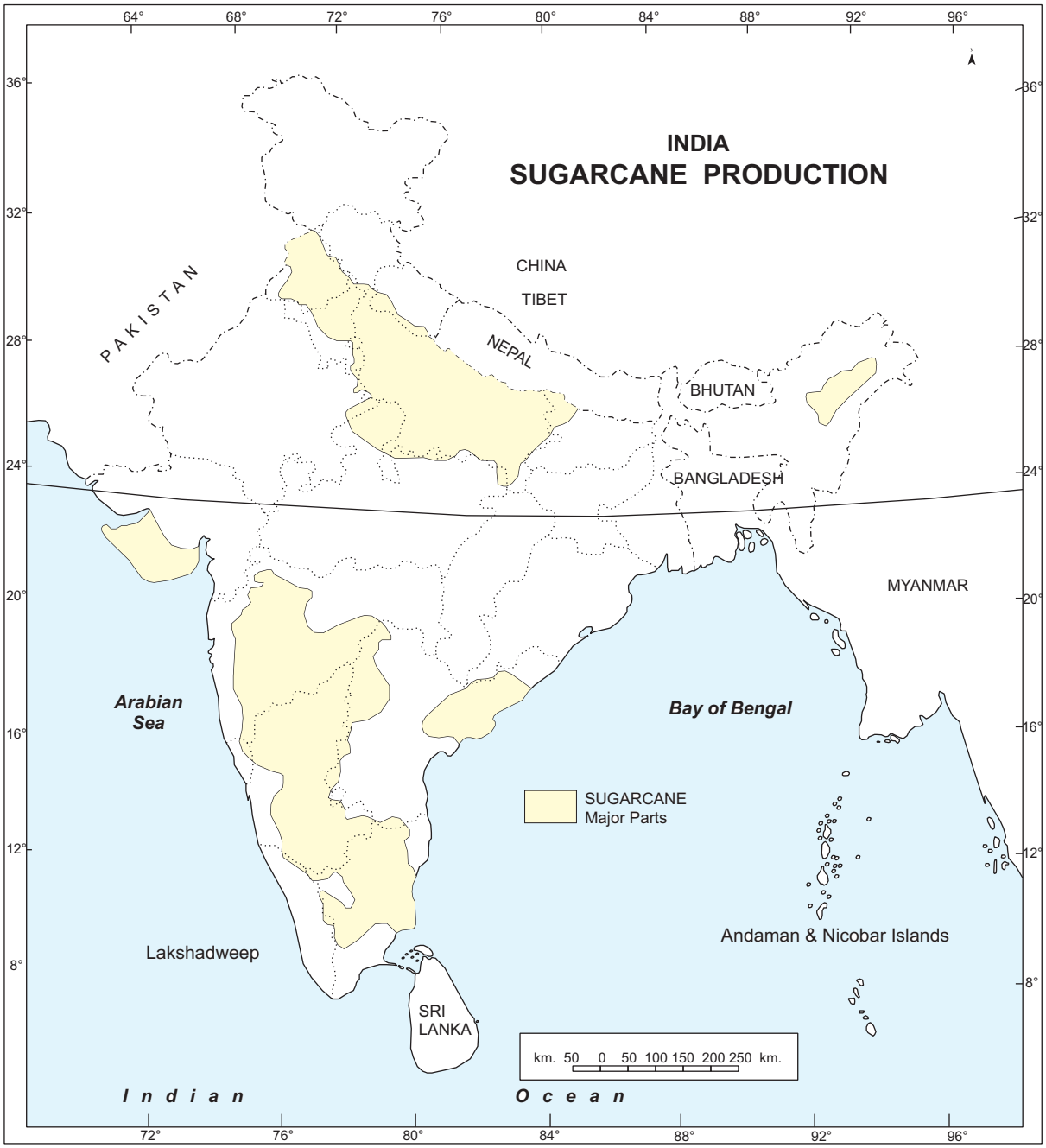


Figure 12.3: *India: Major Sugarcane Producing Areas*

(c) Soil: It can grow in a variety of soils. In fact sugarcane can tolerate any kind of soil that can retain moisture. But deep rich loamy soil is ideal for its growth. The soil should be rich in nitrogen, calcium and phosphorous but neither it should be too acidic nor alkaline. Flat, plain and level plateau is an advantage for sugarcane cultivation because it facilitates irrigation and transportation of cane to the sugar mills. Sugarcane cultivation requires heavy manures and fertilizers because it exhausts the fertility of soils quickly and extensively.

(d) Labour: It is a labour orientated cultivation and requires cheap labour. Ample human hands are required at every stage i.e. sowing, hoeing, weeding, irrigation, cutting and carrying sugarcanes to the factories

(e) Distribution: India has the largest area under sugarcane cultivation in the world and the second largest producer next to Brazil. As far as distribution of sugarcane cultivation in India is concerned, there are three distinct geographical regions in the country. These regions are:

(i) The Satluj-Ganga plain from Punjab to Bihar containing 51% of the total area and 60% of the country's total production.

(ii) The black soil belt from Maharashtra to Tamil Nadu along the eastern slopes of the western Gahats.

(iii) Coastal Andhra Pradesh and Krishna river valley.

(ii) Cotton: Cotton is the most important fibre crop not only of India but also of the entire world. It not only provides a raw material for cotton textile industry but also its seed is used in Vanaspati oil industry. The cotton seed is also used as part of fodder for milch cattle for better milk production. Cotton is basically a kharif crop and grown in tropical and sub-tropical areas.

Some of the **geographical conditions** are as follows:

(a) Temperature: Cotton is the crop of tropical and sub-tropical areas and requires uniformly high temperature varying between 21°C and 30°C.

(b) Rainfall: It grows mostly in the areas having at least 210 frost free days in a year.

It requires modest amount of rainfall of 50 to 100cm. However, cotton is successfully grown with the help of irrigation in the areas where rainfall is less than 50 cm.High amount of rainfall in the beginning and sunny and dry weather at the time of ripening are very useful for a good crop.

(c) Soil: Cotton cultivation is very closely related to Black soils of Deccan and Malwa plateau. However, it also grows well in alluvial soils of the Satluj-Ganga plain and red and laterite soils of the peninsular region.

(d) Labour: As picking of cotton has not been made mechanized till now, therefore a lot of cheap and efficient labour is required at the time of picking.

(e) Distribution: India has the largest area under cultivation and third largest producer of cotton next only to China and the USA. Within the country two third of total area and production is shared by four states. The main states for cotton production are Panjab, Maharashtra, Gujarat and Haryana.

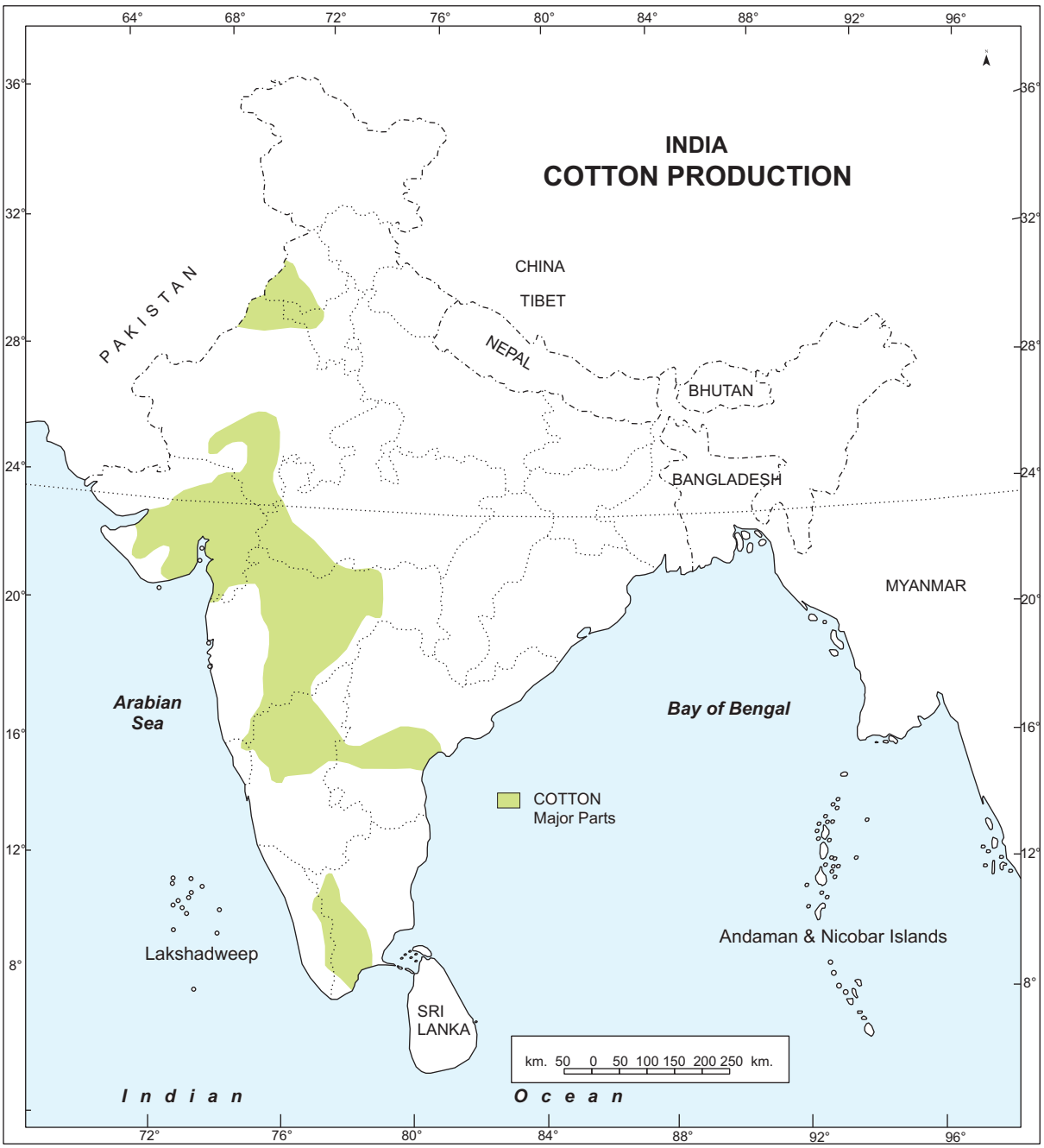


Figure 12.4: *India: Major Cotton Producing Areas*

(iii) **Oilseeds**: It is one of the important groups of commercial crops in India. In fact, India has the largest area and production of oilseeds in the world. Oil extracted from oilseeds not only forms an important item of our diet but also serves as raw material for the manufacturing of hydrogenated oils, paints, varnishes, soaps, lubricants etc. Oil-cake (the residue after the oil is extracted from the oilseeds) forms an important cattle feed and manure.

Groundnut: It is the most important oilseed of India. Groundnut is grown both as kharif and rabi crop but 90-95% of the total area is devoted to kharif crop.

Some of the **geographical conditions** are as follows:

(a) **Temperature:** It thrives best in the tropical climate and requires 20°C to 30°C temperature.

(b) **Rainfall:** 50-75 cm rainfall is favourable for groundnut cultivation. It is highly susceptible to frost, prolonged drought, continuous rain and stagnant water. Therefore dry winter is needed at the time of ripening.

(c) **Soil:** Well drained light sandy loams, red, yellow and black soils are well suited for its cultivation.

(d) **Distribution:** It is the most important oilseed of India and accounts for about half of the major oilseeds produced in the country. India is the largest producer of groundnut in the world and accounts for about one third of the world's to the production. Andhra Pradesh, Tamil Nadu and Gujarat are three main producer of groundnut in India and account for about 60% of the total production. Another 30% of the total production comes from Maharashtra, Karnataka and Odisha.

3. Plantation Crops

(i) **Tea**: India is famous for its tea gardens. You must have heard about tea gardens of Assam and Darjeeling in West Bengal. It is being said that tea plantation in India was started by the Britishers in 1923 when wild tea plants were discovered by them in the hilly and forest areas of Assam. Tea is made from tender sprouts of tea plants by drying them. At present, India is the leading tea producing country in the world. China and Sri Lanka are respectively second and third largest producers of tea.

Some of the **geographical conditions for the growth of tea** are as follows:

(a) **Temperature:** It requires hot and wet climate. The ideal temperature for the growth of tea bushes and leaf varies between 20°C to 30°C. If temperature either rises above 35°C or goes below 10°C, it would be harmful for the growth of tea bushes and leaves.

(b) Rainfall: As mentioned above tea requires a good amount of rainfall ranging between 150-300 cm and the annual rainfall should be well distributed throughout the year. Long dry spell is harmful for tea.

(c) Soil: Tea bush grows well in well drained, deep, friable loamy soil. However, virgin forest soils rich in humus and iron content are considered to be the best soils for the tea plantation. Tea is a shade loving plant and grows better when planted along with shady trees.

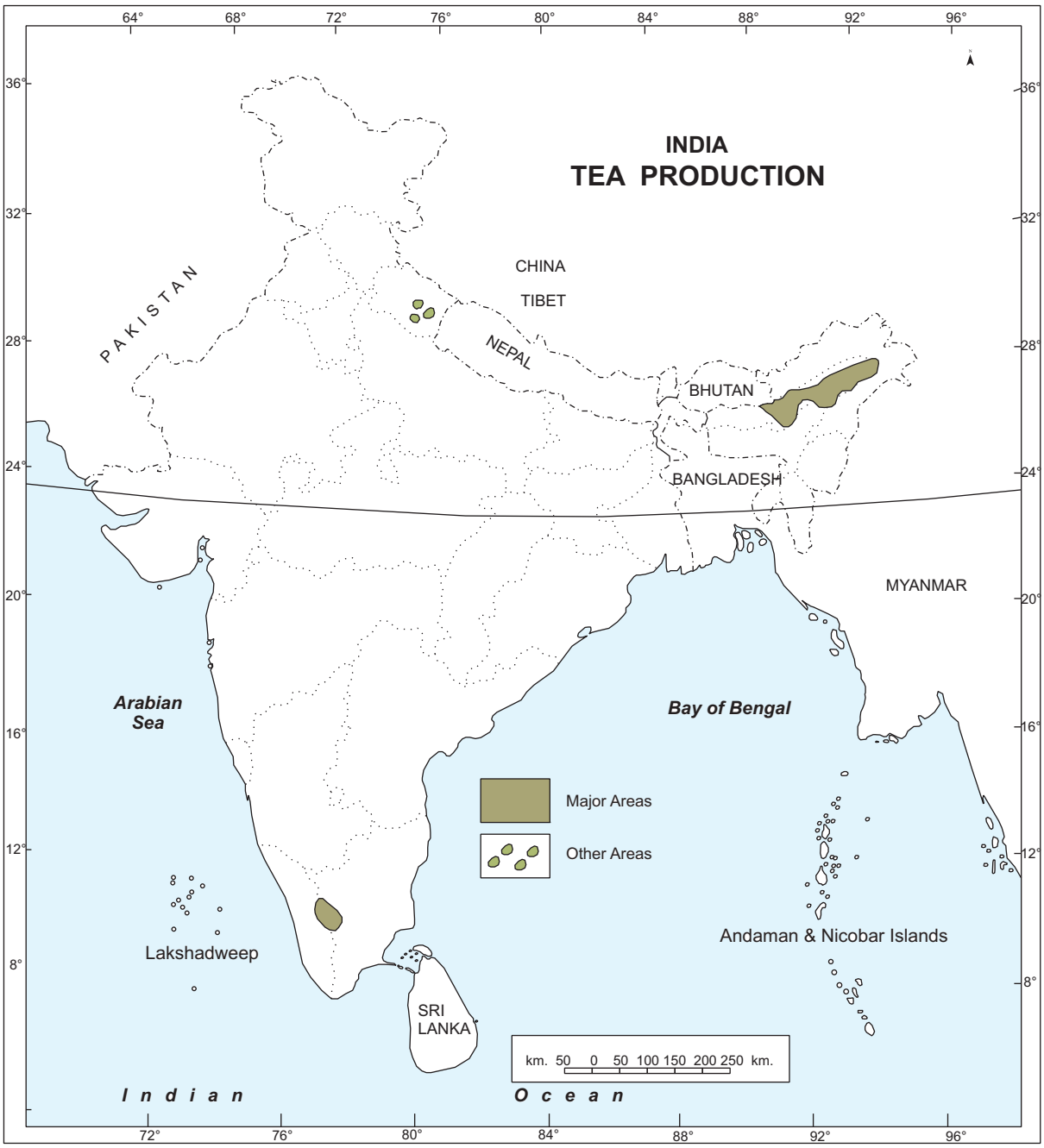


Figure 12.5: *India: Tea Producing Areas*

(d) Labour: Cheap and efficient labour is required for tea production

(e) Distribution: Assam is the leading producer that accounts for more than 50% of tea production of India. Tea producing areas of Assam are the hill slopes bordering the Brahmaputra and Surma valleys. West Bengal is the second largest producer of tea where tea is mostly grown in the districts of Darjeeling, Siliguri, Jalpaiguri and Cooch Bihar districts. Tamil Nadu is the third largest producer where tea growing areas are mostly restricted to Nilgiri hills.

(ii) Coffee: Do you know from where coffee was brought to India? It is the indigenous crop of Ethiopia (Abysinia Plateau). From Ethiopia, it was taken to Yemen in 11th Century. From Arabia, the seeds were brought by Baba Budan in 17th Century and were raised in Baba Budan hills of Karnataka. But it was British planters who took keen interest and large coffee estates were established in the hills of Western Ghats.

Some of the **geographical conditions for the growth of coffee** are as follows:

(a) Temperature : It requires hot and humid climate with temperature varying between 15°C and 28°C. It is generally grown under shady trees. Therefore, strong sun shine, high temperature above 30°C, frost and snowfall are harmful for coffee cultivation. Dry weather is necessary at the time of ripening of berries.

(b) Rainfall: Rainfall between 150 to 250 cm is favourable for coffee cultivation.

(c) Soil: Well drained, rich friable loamy soil containing good deal of humus and minerals like iron and calcium are ideal for coffee cultivation. The soil must be properly manured to retain and replenish fertility and to increase productivity.

(d) Labour: Like tea, coffee cultivation also requires plenty of cheap and skilled labour for various purposes like sowing, transplanting, pruning, plucking, dying, grading and packing of coffee.

(e) Distribution: Karnataka, Kerala and Tamil Nadu are the main states of coffee production in India.

INTEXT QUESTIONS 12.2

1. Explain any three geographical conditions required for the cultivation of cotton?
2. How will India cloth its billion + population if cotton crop fails for successive number of years?

12.4 MAJOR CHALLENGES FACED BY INDIAN AGRICULTURE

If we look at the challenges faced by Indian agriculture, we can broadly group them into two categories. One category belongs to the problems that have been long standing. Second category of problems is new and has been emerging from the prevailing agricultural practices, system, changing climate and economy. Let us discuss the major challenges in detail:

1. **Stagnation in Production of Major Crops:** Production of some of the major staple food crops like rice and wheat has been stagnating for quite some time. This is a situation which is worrying our agricultural scientists, planners and policy makers. If this trend continues, there would be a huge gap between the demand of ever growing population and the production. Nobody wants India to go back to a situation that was prevailing in our country prior to Green Revolution. Try to find out what was the situation during pre-Green Revolution period.
2. **High cost of Farm Inputs:** Over the years rates of farm inputs have increased manifold. Farm inputs include fertilizer, insecticide, pesticides, HYV seeds, farm labour cost etc. Such an increase puts low and medium land holding farmers at a disadvantage.
3. **Soil Exhaustion:** On one hand green revolution has played a positive role in reducing hunger from India. On the other hand it has also led to negative consequences. One of which is Soil exhaustion. Soil exhaustion means loss of nutrients in the soil from farming the same crop over and over again. This usually happens in the rain forest.
4. **Depletion of Fresh Ground Water:** The second major negative consequence of green revolution is depletion of fresh ground water. You would remember that areas where green revolution was successful, it was due to the use of chemical fertilizers and irrigation. Most of the irrigation in dry areas of Punjab, Haryana and Western Uttar Pradesh was carried out by excessive use of ground water. Today fresh ground water situation in these states is alarming. In the coming few years if this type of farming practice continues, these states are going to face water famine.
5. **Adverse impact of Global Climatic Change:** Among various challenges, global climatic change is the recent one. It has been predicted that its impact on agriculture would be immense. Since, 70% of Indian population is engaged in agricultural activities, you can imagine the consequences. It is predicted that due to climate change, temperature would increase from 2°C to 3°C, there would be increase in sea level, more intense cyclones, unpredictable rainfall etc These changes would adversely affect the production of rice and wheat. Specifically, rise in temperature in winter would affect production of wheat in north India.

Production of rice would be affected in coastal areas of India due to ingress of saline water and increase of frequency of cyclones.

6. **Impact of Globalisation** You can see the effect of globalisation on the farm sector in India. All developing countries have been affected by it. The most evident effect is the squeeze on farmer's income and the threat to the viability of cultivation in India. This is due to the rising input costs and falling output prices. This reflects the combination of reduced **subsidy** and protection to farmers. Trade **liberalization** exposes these farmers to competition from highly subsidized production in the developed world.

> **Globalisation** refers to the increasingly global relationships of culture, people and economic activity. **Subsidy:** A subsidy is money given by government to help support a business or person. **Liberalization:** liberty to establish any kind of economic activity at any time any where in the country without anticipating any kind of so called private or public restrictions.

7. **Providing Food Security:** Before the introduction of green revolution in India, we were not self sufficient in terms of our food grain production. Due to partition of India in 1947 the network of canal irrigation system, cotton belt and wheat bowl meant to West Pakistan which is now Pakistan. Similarly the jute belt and rice bowl was awarded to East Pakistan, which is now Bangladesh. With the introduction of green revolution, production of food grains increased substantially and India became self sufficient. However, during the last one decade the total production has become stagnant. On the other hand we have added another 16 to 18 million population over this period. Although India has become self sufficient in good it is yet to ensure food security which is dependent upon accessibility, affordability as well nutritional value of the food available. One of the biggest challenges facing India is Providing Food Security to its population.

8. **Farmers Suicide:** Every suicide has a multiple of causes. But when you have nearly 200,000 of them, it makes sense to seek broad common factors within that group. The suicides appear concentrated in regions of high commercialization of agriculture and very high peasant debt. Cash crop farmers seemed far more vulnerable to suicide than those growing food crops. Yet the basic underlying causes of the crisis remained untouched. Commercialization of the countryside along with massive decline in investment in agriculture was the beginning of the decline. Withdrawal of bank credit at a time of soaring input prices and the crash in farm incomes compounded the problems. Shifting of millions from food crop to cash crop cultivation had its own risks. Privatization of many resources has also compounded the problems.

The devastation lies in the big 5 States of Maharashtra, Andhra Pradesh, Karnataka, Madhya Pradesh and Chhattisgarh. These states accounted for two-thirds of all farm suicides during 2003-08.Some of the major factors responsible are indebtedness,

crop failure and deterioration in economic status. Decline in social position, exorbitant charges by local money lenders for the vulnerable farmers, chronic illness in the family, addiction etc. have made life of farmers difficult.

ACTIVITY 12.3

If you are assigned political leadership of the country, what measures would you adopt to address the challenges that are mentioned above? Which two changes would you address and how?

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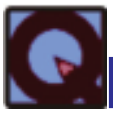


INTEXT QUESTIONS 12.3

1. How would climate change would affect agriculture in India? Explain any two situations.

.....

.....

.....

.....

.....

WHAT YOU HAVE LEARNT

- There are different types of farming practised in India. Some of these practices are subsistence and commercial farming, intensive and extensive farming, plantation farming and mixed farming.
- The major salient features of Indian agriculture are subsistence agriculture, highly dependent on monsoon and animals, variety of crops and predominance of food crops.
- Major crops in India can be broadly divided into four categories i.e. food crops, cash crops, plantation crops and fruits.

- Some of the major challenges faced by Indian agriculture are Stagnation in production, high cost of farm inputs, soil exhaustion, depletion of fresh ground water, climatic change, globalization and liberalization of economy, food security and farmer's suicide.

TERMINAL EXERCISES

1. Explain any four salient features of Indian agriculture.
2. Compare the geographical conditions required for the growth of rice and the growth of wheat cultivation.
3. Identify and write any four similar geographical conditions required for both tea and coffee.
4. Analyse any four major challenges confronted by Indian Agriculture.
5. Explain the concept of food security. How is it different from self sufficiency in food.
6. On the outline map of India locate the production areas of:
   (i) Two labour intensive crops
   (ii) Two crops that are grown in varied terrains

ANSWERS TO INTEXT QUESTIONS

12.1

1. The basic difference between these two types of farming is the amount of production from per unit of land. USA, Canada, former USSR are the major countries where extensive farming is practiced whereas Japan is the leading example of intensive farming.
2. As per the learners experience.

12.2

1. (i) Uniformly high temperature varying between 21°C and 30°C (ii) It grows mostly in the areas having at least 210 frost free days in a year; (iii) It requires modest amount of rainfall of 50 to 100cm. However, cotton is successfully grown by the help of irrigation in the areas where rainfall is less than 50 cm (iv) high amount of rainfall in the beginning and sunny and dry weather at the time of ripening are very useful for a good crop; (v) cotton cultivation is very closely related to Black soils. However, it also

grows well in alluvial soils of the Satluj-Ganga plain and red and laterite soils of the peninsular region; (vi) as picking of cotton has not been made mechanized till now, therefore a lot of cheap and efficient labour is required at the time of picking (Any three)

2. As per the learners' experience.

12.3

1. Due to climatic change, temperature would increase by 2 to 3 degree Celsius, increase in sea level, more intense cyclone, unpredictable rainfall etc These changes would adversely affect the production of rice and wheat. Specifically rise in temperature in winter would affect production of wheat in north India. Production of rice would be affected in coastal areas of India due to ingress of saline water and increase of frequency of cyclone.

Notes

13

TRANSPORT AND COMMUNICATION

Rakesh and his wife lived in a small village. One evening there was heavy rain and thunder storm. His wife had severe stomachache. The village nurse advised him to take her to the nearest hospital. Since there was no communication facility available, it was not possible for Rakesh to contact any doctor, hospital or ambulance. Rakesh requested his friend to take them to the nearest hospital. Unfortunately their tractor couldn't go beyond a few hundred metres as the road was broken and submerged in rain water. What should Rakesh do? What would have been the solution to the problem?This incident highlights the importance of transport and communication in our life. In this lesson, we plan to bring before you the various modes of transport and communication and their importance for the development of a nation.

OBJECTIVES

After completing this lesson, you will be able to:

- establish that modes of transport and communication help in connecting people and facilitate the socio-economic growth of a region;
- classify roads on different parameters and appreciate the role and importance of road transport in our daily life and national development;
- examine the factors affecting the distribution and density of railway network in India and recognise the technical advancement that has taken place in this sphere;
- explain the importance of various means of water transport;
- recognize the growing importance of air transport and its ever growing economic significance; and
- realise the role of communication in connecting people and reducing distance

13.1 TRANSPORT AND COMMUNICATION – LIFELINES OF A COUNTRY

Transport and means of communication are integral part of our life today. Can we imagine our life without them? Just imagine if one day you come to know that all the modern means of transport and communication have been stopped due to unavailability of fuel. Also imagine the problems you are going to face!

ACTIVITY 13.1

List your problems:

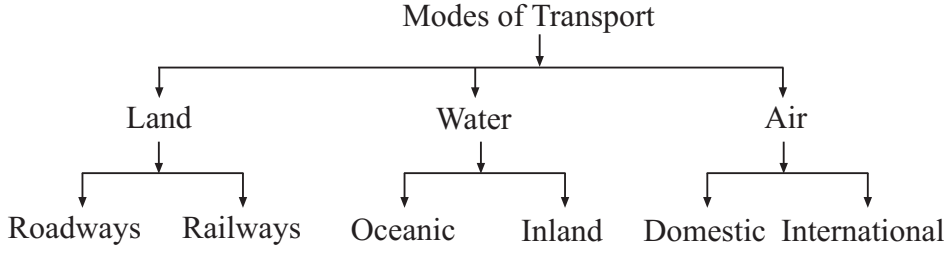
- .....
- .....
- .....
- .....
- .....

13.1.1 The Role of Transport and Communication

Transport facilitates trade and commerce by carrying goods from the areas of production to that of consumption. Goods from the areas that have surplus are shifted to those areas which are deficient in those items. Movement of people from one place to another place in search of job, education and emergency through transport facility. Communication keeps us informed about the world's events and trends. It brings in positive changes in the life of the people and thereby enhancing their economic conditions.

13.2 THE MODES OF TRANSPORT

The modes of transport on which the countries depend for connecting people, growth and development are as under:



13.2.1 Land Transport can be broadly divided into two types:

1. Roadways
2. Railways

1. Roadways

Look at the pictures in Fig. 13.1. Can you imagine the changes in the manner we have moved from ancient to modern time from these pictures? Suppose, you have to go to your friend's house just 500 metres away from your house, or a visitor or a relative living 200 km away from your house. A villager has to catch a bus to come from a village to a city. Of course, the roads will be used. Now, you must

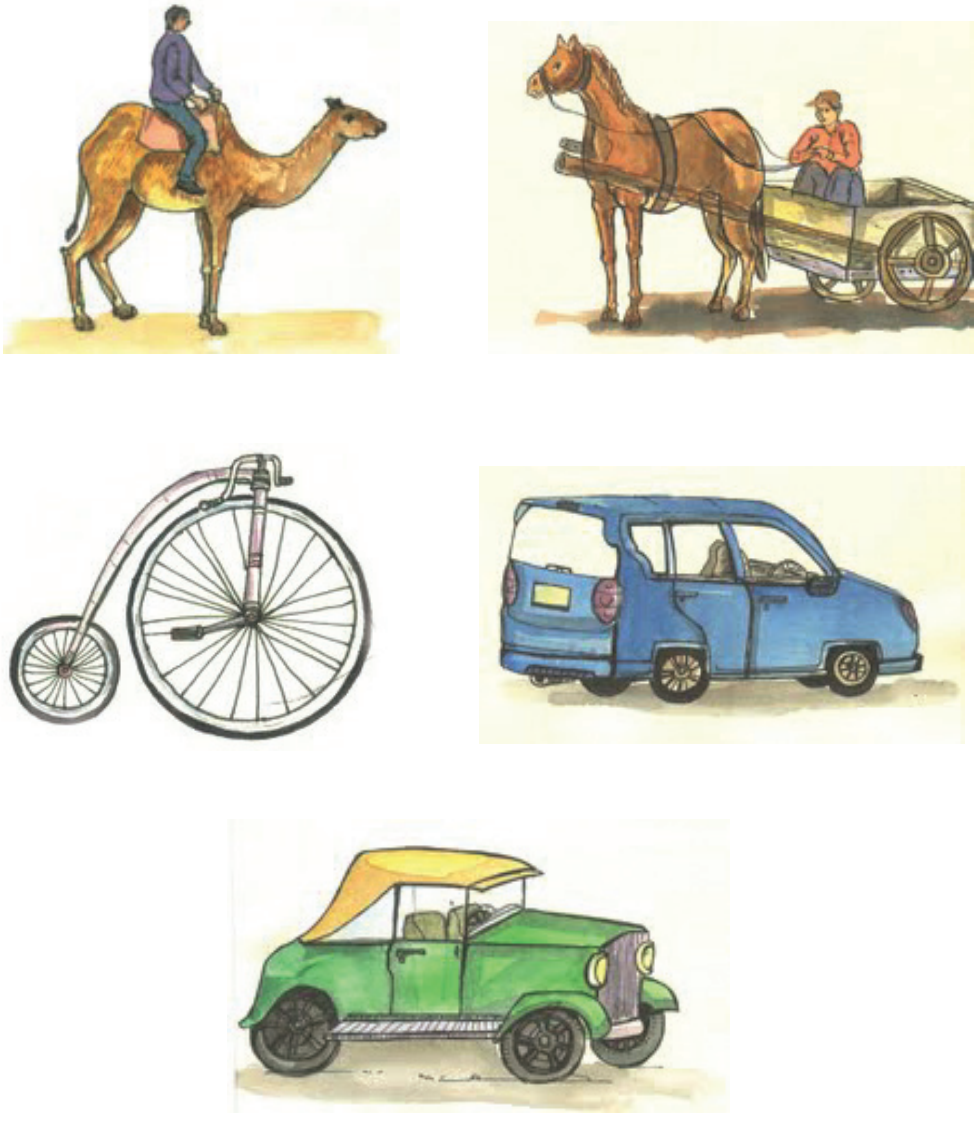


Figure 13.1 *Modes of Transport*

have understood that roads are most commonly used means of transport. Roads play an important role in connecting people and also in ensuring socio-economic growth of a country as under:

- Roads provide door to door service by means of a rickshaw, car, bicycle, bus, scooter or a truck.
- The construction, repair and maintenance cost is less than other means of transport.
- It is the cheapest and the most convenient mode of transportation for a few people and relatively smaller amount of goods over shorter distances.
- It is through roads that we reach railway stations, airports and seaports.
- Perishable goods like milk, fruits and vegetables are quickly carried from nearby villages to the cities or metropolis or to other destinations.
- Roads connect rural areas to the urban areas and can be constructed in all types of terrains like hills, deserts, mountain and plateaus.

Classification of Roads

Do you find same kind of roads everywhere? Obviously not, some roads may be *kuchcha*, and others *pakka*, then narrow while others broad. Roads are classified on the basis of:

(i) Materials used for construction.

(ii) Constructing and maintaining authority.

(i) Material used for construction

Roads can be classified on the basis of materials used for construction as metalled and un-metalled roads. Metalled roads are usually made by bricks, concrete, cement and charcoal. Un-metalled roads are made of sand, mud and straw.

ACTIVITY 13.2

Identify the materials used for the construction of the roads.

Metalled Roads (Pucca Roads)	Un-metalled Roads (Kuchha Roads)

(ii) Constructing and maintaining authority

Have you ever wondered as to who constructed these roads and where did they get the money from? They are constructed by using public money paid as taxes by people. Various government authorities are responsible for balanced development of roads and better management.

- The development of ***village roads*** are undertaken by the scheme known as **Pradhan Mantri Gram Sadak Yojna** launched by the Central government.

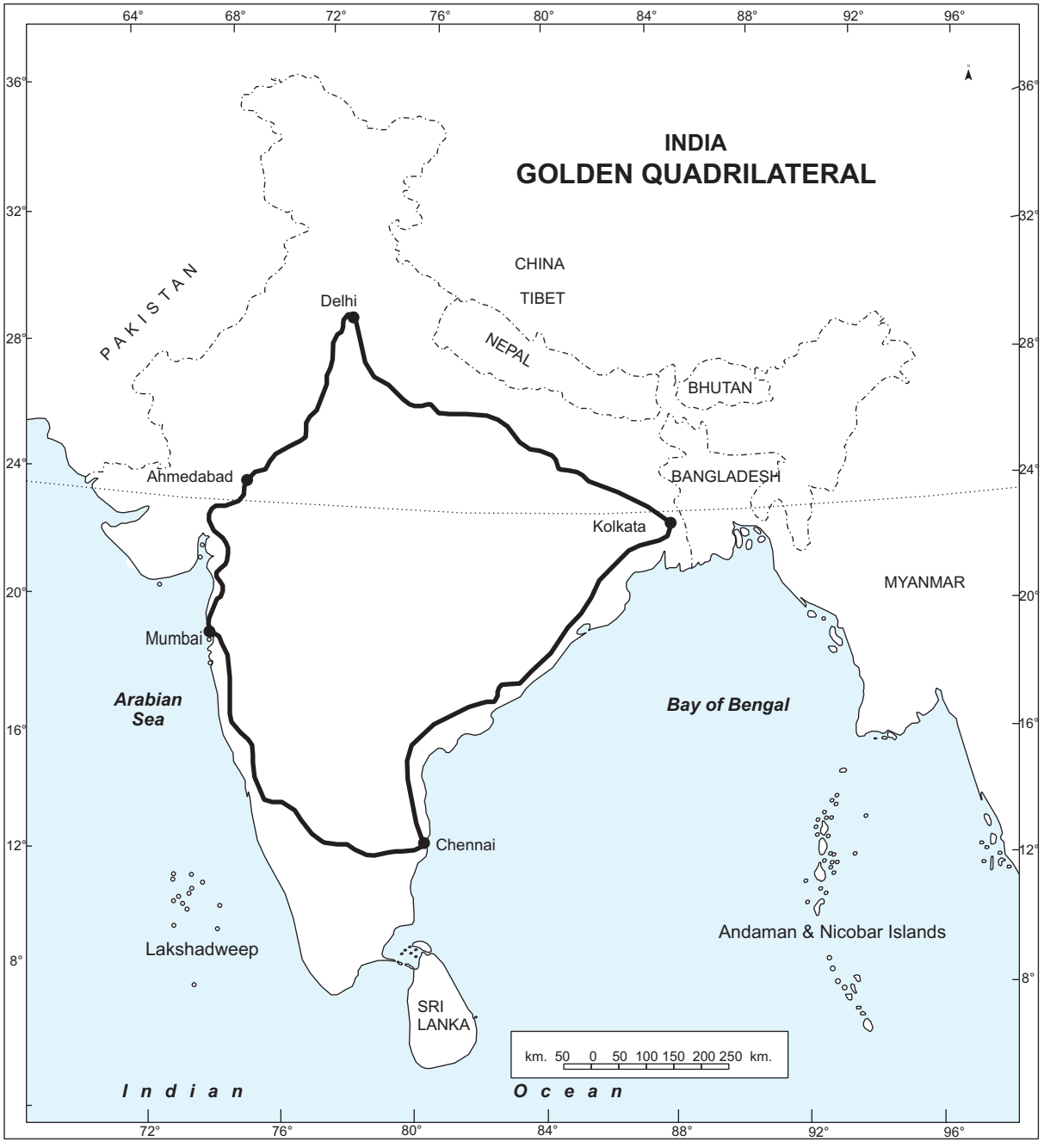


Figure 13.2 *India: Goldern Quadrilateral*

These provide links from village to village and village to main road in the rural areas. About 80% of the total road length in India is categorize as rural roads.

- **Zila Parisad** has been made responsible for constructing roads that connect district headquarters with other cities and towns of the district. These ***District Roads*** account for 14% of the total road length in India.
- **State Public Works Department (SPWD)** constructs and maintains roads that link state highways, state capitals with district headquarters. They constitute 4% of the total road length in the country.

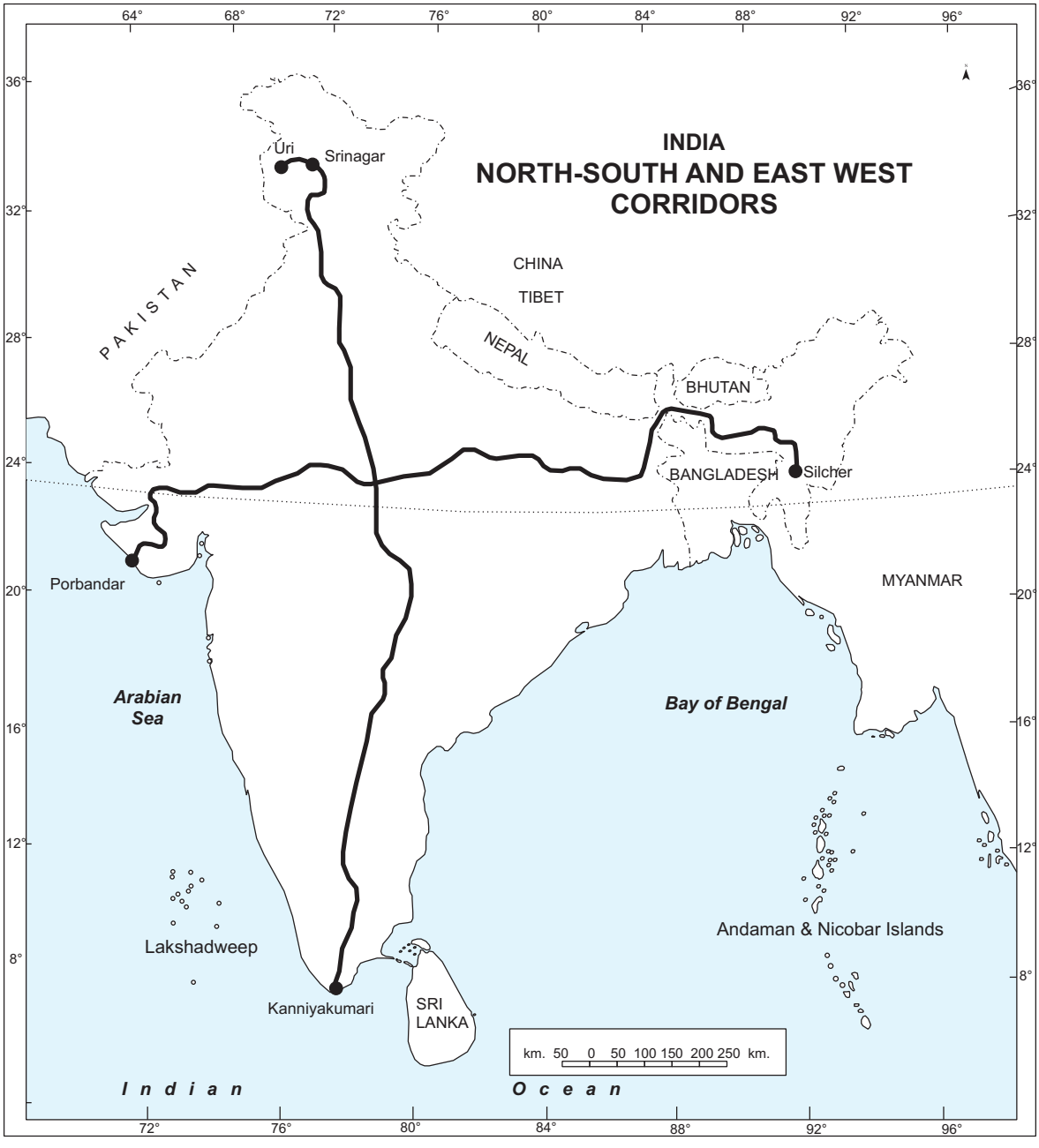


Figure 13.3 *North-South and East-West corridors*

- **National Highway Authority of India** constructs and maintains the ***National Highways [NH]***, important roads linking different parts of the country and connecting state capitals to the main cities of India. They constitute only 2% of the total road length but carry 40% of the road traffic. The government has launched a major road development project linking north, south, east and west India.This will reduce time and fuel. Then it will also help to maintain fast flow of traffic between mega cities of India. It is implemented by **National Highway Authority of India**. The major **super highways** are:

  (a) **Golden Quadrilateral** connects Delhi, Mumbai, Chennai and Kolkata which forms a geometrical figure of Quadrangle.

  (b) **North-South Corridor** links Srinagar to Kanyakumari.

  (c) **East-West Corridor** connecting Silchar in the east to Porbandar in the west.

- ***Border Roads*** are constructed along the bordering areas of the country for easy accessibility of goods and other requirements of defence personnels during the time of war and emergency and for the benefit of people living in those areas. They are constructed and maintained by **Border Road Organization (BRO)**.

Do you know

The oldest and the longest road in India was built across Gangetic plain from the north-west to the east on orders of Pashtun emperor, Sher Shah Suri in 16th century which was renamed as **Grand Trunk Road.** It is presently divided into NH-1 (Amritsar to Delhi)and NH-2(Delhi to Kolkata).Today India has about 330 lakh kms of road network whereas in 1947 it was only 4 lakh kms.

ACTIVITY 13.3

Look at the maps (Fig. 13.2 and 13.3) and find out which super highway is nearest to your home and which organization maintains it.

2. Railways

"This has become an easy way to place their demands and there is no strict punishment" said Anu's father while reading the newspaper. Anu asked, "what had happened". Father replied, "Nothing new, a group of protestors have blocked the

railway tracks. They stopped the trains and have burnt two bogies on Agra Delhi route". Anu asked her father "why he was upset". Father said, "Don't you know that millions of rupees, efforts of thousands of people and many years are spent in building railway tracks and manufacturing railway coaches. This is for our convenience and quick movement of passengers and freights. Such an act causes inconvenience to the passengers, loss of millions of rupees, and affects business."Anu has realized the importance of railways as stated below:

- This is the cheapest transport by which thousands of people can travel together from one corner of the country to another for the purpose of education, business, siteseeing, pilgrimage or visiting friends or relatives.
- People of all income groups can travel by train as it has different types of coaches like General, Sleeper and AC chair car.
- One can have comfortable night journey as it has berths and washrooms in sleeper coaches.
- It carries country's largest amount of bulky goods like coal, cement, food grains, fertilizer, petroleum, automobiles etc. from mines to industries and from industries to the areas of consumption.

That is why we should all help in maintaining this important resource of country. Railways facilitate the movement of both freight and passengers and contribute to the growth of our economy.

Do you know

Indian Railways started in 1853 from Bombay to Thane covering a distance of 34 km.

At present, Indian Railway network is the largest in Asia and the fourth largest in the world with the length of more than 64000 kms.

It is the largest government undertaking employing 1.6 million people and a separate budget is presented for it.

It has been divided into 16 zones for better administration and management of work.

When Anu and her father were talking about the importance of railways, one of her friends Jiya came to her house. She was studying in Delhi University but her native state was Sikkim. Jiya understood the logic, but question in her mind was why Sikikim

never be well connected with the other parts of the country. She stood for a while and said, "Uncle, why are there few railway lines in my state whereas other states have good network of railways?" He explained the factors which are responsible for the development of railways:

- The construction of railways is very difficult and costly in mountainous region whereas it can be easily done in areas of flat land. Therefore, India has dense railway network in the Gangetic plain where as desert, hills, marshy regions, flood prone areas, dense forest, areas with rapids and rivers have not been developed much.
- The states of Uttar Pradesh, Bihar, West Bengal, Punjab and Haryana, are well connected by railways because these states are located in the plains. He also told that these areas are food bowl of India and most of the crops grown here are taken to other parts of the country through railways.
- Areas where mining and industries are more developed tend to have better facilities of railways for easy transportation of goods. Areas with less industrial development cannot compensate the cost of construction of railways, therefore have less railway network.
- Regions which are densely populated and have more movements are definitely well connected with railways.
- Urban areas or large cities attract more people for jobs, business, education, trade, banking have high density railway network for quick movement of people.

Anu's father smiled and said "No Jiya, the government is aware of the importance of connecting different part of the country specially in remote areas. This is being done on priority now". Jiya understood that any one can be connected anywhere in the world on the internet.

Technical advancement provided by Indian Railways

There is a direct rail link available from the north to the south of the country (i.e. from Jammu to Kanya Kumari) covering a distance of 3751 km in 71 hours.Facilities to travel in 1^{st} A.C., 2^{nd} A.C., 3^{rd} A.C., A.C. Chair Car, 2^{nd} Class sleeper and General class are available to cater to the needs of the people of different economic strata.Only diesel and electric locomotives are used on broad gauge providing pollution free journey.The passengers can avail the facility of booking electronic-tickets easily from home.The trucks loaded with goods are delivered directly to the consumers or factories in special rail wagons.

ACTIVITY 13.4

Search the headquarters of the major railway zones in the grid given below.

P	*O*	*R*	*I*	*T*	*S*	*M*
U	*P*	*N*	*K*	*J*	*O*	*U*
K	*L*	*M*	*T*	*R*	*P*	*M*
Q	*U*	*W*	*A*	*I*	*T*	*B*
K	*O*	*L*	*K*	*A*	*T*	*A*
J	*A*	*I*	*P*	*I*	*N*	*I*
Z	*V*	*D*	*U*	*X*	*Y*	*R*
C	*H*	*E*	*N*	*N*	*A*	*I*
T	*K*	*L*	*J*	*Q*	*R*	*J*
I	*T*	*H*	*Q*	*X*	*Z*	*U*
N	*P*	*I*	*T*	*O*	*J*	*K*

INTEXT QUESTIONS 13.1

1. Complete the following statements;

   (a) East-West corridor links ..... and ..... as .....

   (b) Super Highway connecting four metro-cities is known as ..... as it forms .....

2. (a) Explain briefly the main factor affecting density of railways. Identify the following two groups of states where there is high and low density of railways and give reasons for your answer.

   (b) Identify two advantages and two disadvantages in each roadways and railways transport.

3. "A few states of India lack a good railway network". Justify the statement in 30 words.

ACTIVITY 13.5

Show the railway reservation form given below to your family. Try to fill it up discussing the meaning and the importance of the columns given below:

(a) Medical Practitioner

(b) Senior Citizen

(c) Choice of berth

(d) Meals available in some trains

RAILWAY RESERVATION / CANCELLATION REQUISITION FORM

If you are a Medical Practitioner Please tick ( ) in Box Dr. ☐ (You could be of help in an emergency)

If you want Sr. Citizen concession, please write Yes/No in box ☐ (if yes, please carry a proof of age during the journey to avoid inconvenience of penal charging under extant Railway Rules)

Do you want to be upgraded without any extra charge? Write ☐ Yes/No in the box. (If this option is not exercised, full fare paying passengers may be upgraded automatically)

Train No & Name:	Date of Journey:
Class:	No.of Berth / Seat:
Station From:	Station To:
Boarding At:	Reservation Upto:

S.No.	Name in Block Letters (not more than 15 chars)	Sex (M/F)	Age	Concession / Travel Authority No.	Choice if any
					Lower / Upper Berth
					Veg / Non-veg Meal for Rajdhani / Shatabdi Express only

CHILDREN BELOW 5 YEARS (FOR WHOM TICKET IS NOT TO BE ISSUED)

S.No.	Name in Block Letters	Sex	Age

ONWARD / RETURN JOURNEY DETAILS

Train No & Name _____ Date _____
Class _____ Station From _____ To _____
Name of Applicant _____
Full Address _____

Signature of the Applicant

FOR OFFICE USE ONLY

S.No. of Requisition _____ PNR No. _____
Berth/Seat No. _____ Amount Collected _____

Signature of Reservation Clerk

Note: 1. Maximum permissible passengers are 6 per requisition.
2. One person can give one requisition form at a time.
3. Please check your ticket and balance amount before leaving the window.
4. Forms not properly filled or in illegible forms shall not be entertained.
5. Choice is subject to availability.

13.2.2 Water Transport

Have you ever wondered why people in ancient times settled down near the rivers? How was trading possible between far off lands? Yes, it was through rivers and seas. From olden days till now waterways had been an important means of transportation. It is because:

Figure 13.4 *Mode of Water Transport*

- It is the cheapest means as compared to other means of transport because it involves no expenditure on construction other than maintenance.
- It is very useful for transporting heavy and bulky goods. A ship can carry lakhs of tonnes of goods at a time.
- It is a better mode of transportation for petroleum and its products as it involves cross-continental transfers. India lacks in petroleum deposit and most of it is imported from Middle East countries.
- It is fuel efficient and environment friendly means of transportation.

Water ways have been classified into two types – Do you know them? Find out why are they called Inland waterways and Ocean routes?

1. **Inland Waterways:** India has inland navigable waterways measuring 14,500 km which include canals, rivers, backwaters and narrow bays etc. But only 3,700 km of river length is suitable for mechanized boats in river Ganga and Brahmaputra in the north and Godavari, Krishna and Kaveri in the south. A good network of inland waterways is able to reduce the traffic on the highways. It also helps transportation of goods.

   Inland Waterways Authority of India was constituted in 1986 and looks after the development, maintenance and management of inland water ways in the country. The following three waterways have already been declared as National Waterways,

   NW 1 – River Ganga from Allahabad, Uttar Pradesh to Haldia, West Bengal (1620 km)

   NW 2 – River Brahmaputra from Sadiya to Dhubri in Assam (891 km)

   NW 3 – Kollam to Kotapuram stretch of canal in Kerala (205 km)

2. **Oceanic Waterways:** If you look at the map of India, you will find that India is surrounded on three sides by the Arabian Sea, the Bay of Bengal and the Indian Ocean with a coastline of 7516 km India had only 49 ships in 1946 with a capacity of 1,27,083 tonnes. After independence, the Government has taken various measures resulting in procurement of 616 ships in 2004 with a gross tonnage of 700,000 tonnes of carrying capacity.

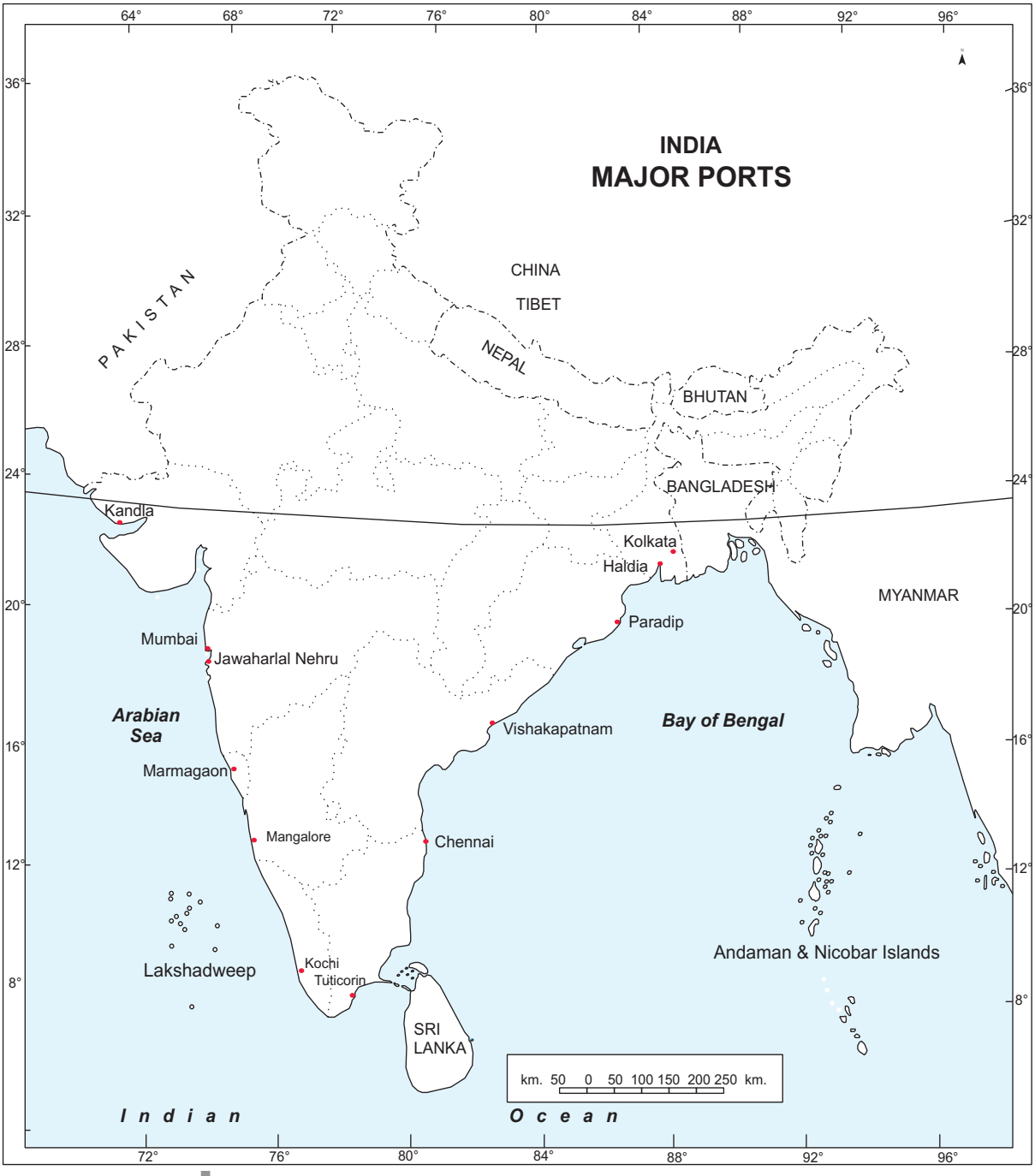


Figure 13.5 *Major Ports of India*

The two categories of Indian Sea Waterways are:

(a) Coastal shipping: Transporting passengers and cargo between the ports located along the coast of the country is done by coastal waterways. Ships of about 100 navigation companies are engaged in coastal waterways handling about 7 lakh tonnes of cargo through 12 main ports and 189 small and medium class ports.

(b) International shipping: Most of the shipping capacity of India is used in international trade. Through the ports of the east coast to Myanmar, Malaysia, Indonesia, Australia, China, Japan and from the west coast ports to the U.S.A., Europe and Asia, are used for export and import.

INTEXT QUESTIONS 13.2

1. (a) Complete the given table with the help of the map given below.

Port	State	Coast
Mumbai	Maharashtra	Western

(b) Point out the areas where there are no ports. Give one reason for the same.

13.2.3 Air Transport

Do you wish to fly like a bird? By airways, you can reach at the destination quickly and without encounter any cring traffic. Our modern day airplane was designed by the Wright Brothers in 1903. Air transport in India began in 1911. Today it is one of the important means of transportation like roadways and railways. India has facilities of both domestic as well as international airways. Let us discuss its importance in the modern age.

Figure 13.6 *Mode of Airways*

- Air transport is considering that world is becoming a global village. It is the fastest means of transport and one can reach the destination in a few hours covering the distance of hundreds of kilometers.
- It is free from surface hindrances such as inaccessible mountains, dense forests, marshy lands or flooded areas.
- It is most important due to its utility in national defence.
- It also connect countries of different continents making earth a global village.
- It is suitable for transporting fruits, vegetables or high value goods like costly drugs and sophisticated machines in desired time frame.
- It is very useful at the time of natural or any other calamities for saving people or supplying goods of their basic requirements immediately.

The only drawback is the high cost of travelling or transportation. That is why, it is still out of reach for the common man. In the last few years, the use of air transport has recorded a rapid increase.

Air transport services in India can be classified into the following categories:

13.2.4 Domestic and International Services

Domestic and International services are provided by government and private provider. **Pawanhans Helicopter Ltd.** (government undertaking) – This Company provides air transport to the Oil and Natural gas Corporation, Indian Oil and in the North-Eastern part of the country.

INTEXT QUESTIONS 13.3

1. Which states has more than one international airport?
2. Mention two states which do not have international airport?
3. Which is the closest or nearest Domestic and International airport from your house?

13.3 COMMUNICATION AND ITS IMPORTANCE

Your sister's marriage has been fixed and you want all your relatives and friends to be present at the wedding. How would you like to inform them? Suddenly, your grandfather suffered from a heart attack and your father is in his office. How will you inform him immediately? How did you come to know about tsunnami in Japan or about the incident where millions of people were protesting against the President

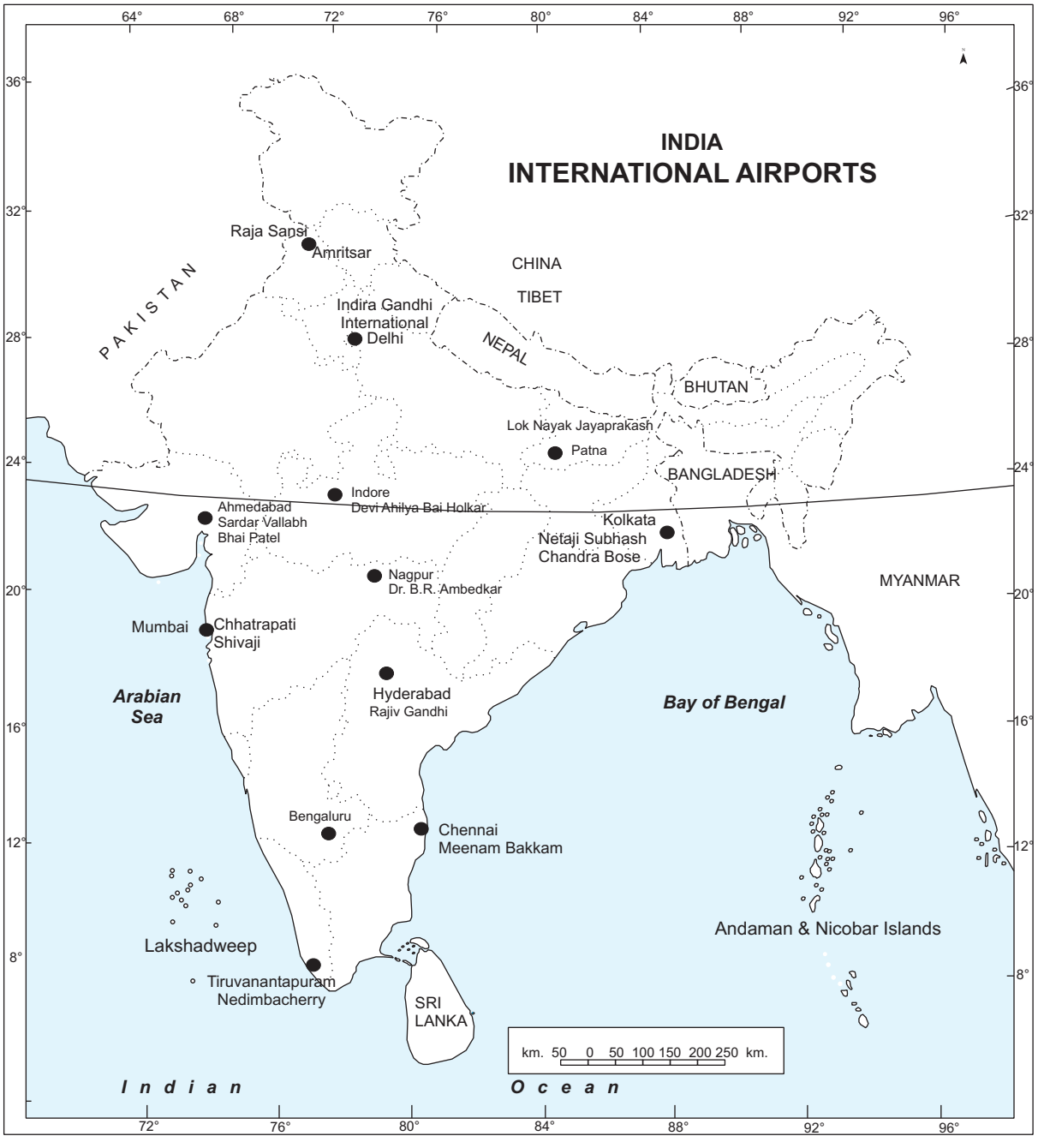


Figure 13.7 *Major International Airports of India*

in Egypt? Your response to the above situations must have classified the importance of communication in everyday life, its need and various means of carrying it out. Thus, communication is a system of carrying messages to exchange thoughts, ideas and information and also to share your sorrows and pleasures with your family members or friends.

Now you must have understood that the means of communication change suiting the purpose of communication. There are various means of communication. People communicate with each other by writing letters, sending telegrams, radio, T.V., computer technology, newspapers, magazines and pamphlets; messages can be sent by telegram, facsimile machine (FAX) and E-mail (Electronic mail) for business trade and other services. E-mail has emerged as the fastest means of communication and is almost free.

It is also important to know that the choice of a particular means of communication depends on purposes.

Now, let us classify different means of communication into two groups:

1. Means of Personal Communication
2. Means of Mass Communication

1. Means of Personal Communication: We classify means of personal communication into two parts:

(i) Postal Service

(ii) Telephone Service

(i) Postal Service: Postal service is a very old means of communication. Though letter writing is not that popular any longer, it is still important even today. Indian Postal Network is the largest in the world. In 2001, India had 1,55,000 post offices providing different services like – letters, money orders, parcels, postal saving schemes, etc.

(ii) Telephone Service: It has emerged as one of the most important and widely used means of communication in today's world. It is quick and affordable, serving our need seamlessly.

2. Means of Mass Communication: The means by which information can be communicated to a very large number of people are called Media or Mass Communication, such as radio, television, newspaper, cinema, books, magazines, traditional folk modes and satellite communication.

(i) **Radio:** Radio transmission in India started in 1927 from Mumbai and Kolkata to entertain, educate and apparise the people of the country with important information. Today the program of All India Radio (AIR) are available to 90% parts of the country to 98.8% of our people.

(ii) **Television:** The national television transmission service of India started in 1959 is one of the biggest ground transmission organizations of the world. Today, 87% of population can watch it. Television program telecast by National, Regional and local Doordarshan and a large number of private channels are available for education, information and recreation.

(iii) **Computer (Information Technology):** Today, computer has become the basis of communication and economic development as it is used everywhere from homes, offices to shops, hospitals, railways, airports, banks, educational institutions, etc.

13.3.1 Newer communication Technology

In recent years, there is revolution of new technology that has helped people in much better way such as:

(a) **Internet:** It provides access to several kinds of information.It connects all types of computers across the world to obtain information at the click of a button.

(b) **Video Conferencing:** People sitting at far off places can talk and express their views with the help of telecommunication and computer.

(c) **E-Commerce:** Facility available for sale and purchase of goods through internet and fax.

(d) **Internet Telephony:** It is a software programme which makes a computer to work like telephone. This facility has reduced the call rates drastically.

(e) **E-Mail:** It is a method of sending letters or information through internet to anyone in the world in the blink of an eye.

(f) **Tele-Medicine:** Using this technology, doctors can advise his patients sitting at a distance of thousands of kilometers from them.

Thus, scientific advancement and technology has revolutionized the system of communication and brought people very close to each other, to be in touch all the time and making the world a global village.

ACTIVITY 13.6

Take a pack of old playing cards. Cut pictures of various modes of communication from old newspapers or magazines. Stick one picture on each card. On the back side write one question about it. Now you have your own set of Communication Cards. Play it with your friends and family.

Hints: Which communication aid can deliver one message at the same time throughout the country? (Ans. T.V.).

INTEXT QUESTIONS 13.4

1. Categorize the following into personal communication, Mass Communication and others;

   Electronic monitor, utility van, tractor, telegram, metro rail, mobile, postcard, fax, news bulletin, radio, ambulance, facebook, twitter and magazine, bulk SMS.

2. Give one word for each of the following statement:

   (a) A system of carrying messages to exchange thoughts, ideas and information.

   (b) The service through which letters, parcels and money-orders are sent.

   (c) A system of writing letters through internet.

   (d) The authority responsible for transmission of programs through radio in India.

   (e) The most common and popular means of personal communication in India at present.

WHAT YOU HAVE LEARNT

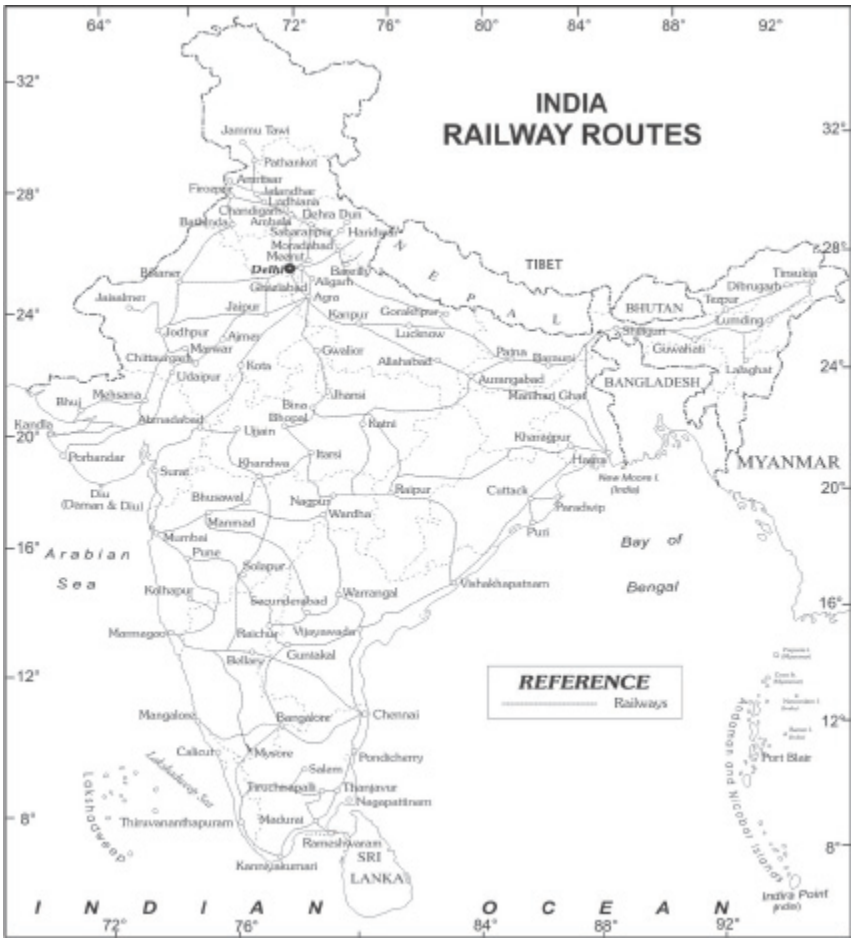
- Need and importance of means of transport and communication
- Types of roads constructed in India

- Role of railways in the development of a country
- Types of waterways and their importance in a country's trade
- Need of airways and its importance in a country like India
- Modern means of communication and their relevance in our lives

TERMINAL EXERCISES

1. Why are the means of transport and communication regarded as the lifelines of a country and its economy?
2. State three merits and three demerits of roadways?
3. What is the importance of water ways for India?
4. Study the map of Major Ports and answer the following questions:
   (a) Count and tell how many ports are there on the eastern coast.
   (b) List the states that have two ports.
   (c) Name the state in which Paradeep port is located.
   (d) Name the port located in Goa.
   (e) Name the southernmost port of India.
5. What are the benefits of airways over other means of transport?
6. State the importance of communication in your day-to-day activities?
7. Differentiate between personal communication and mass communication.
8. List five problems that you faced during your last journey by train. Suggest at least one remedy for each of the problems you faced.
9. On the outline map of India, identify the states of high, moderate and low rail density and name them. Why do they have such density?

   (**Hints:** Difficult terrain, climatic conditions, economy, etc)



India: Railway Zones

Project:

Interview at least five people in your locality who have been staying there for the last ten years, and ask them what changes have occurred over a period of time due to construction of new roads/railways.

OR

In your area, find the authority responsible for the construction of roads. You may need to go to that office to find the details of it.

ANSWERS TO INTEXT QUESTIONS

13.1

1. (a) Silchar, Porbander, they are located in the eastern and western edge of the country

(b) Golden quadrilateral, a geometrical quadrilateral, of various types of relief features across the country

2. (a) These regions have a high railway density due to the following reasons,

Punjab and Haryana – due to agricultural productions

Maharashtra and Gujarat – due to industrialization

Jharkhand and Chhattisgarh – due to mineral deposits

(b) Both are important means of transport of the masses.

Both are essential for the development of a region.

Railways are generally used for long distances.

Roadways are generally preferred over shorter distances.

Railways can carry very large volumes.

Roadways can carry lesser volume.

Railways involve high construction and maintenance cost.

Roadways involve lesser cost in construction and maintenance.

3. Because of high mountains and rugged topology. For example, Sikkim and Arunachal Pradesh.

13.2

1. (a) Table

Port	State	Coast
Kandla	Gujarat	Western
Mumbai	Maharashtra	Western
Jawaharlal Nehru	Maharashtra	Western
Marmagao	Goa	Western
New Mangalore	Karnataka	Western
Kochi	Kerala	Western
Tuticorin	Tamil Nadu	Eastern
Chennai	Tamil Nadu	Eastern
Vishakapatnam	Andhra Pradesh	Eastern
Paradip	Orissa	Eastern
Haldia	West Bengal	Eastern
Kolkata	West Bengal	Eastern

(b) Rajasthan, Haryana, Punjab, Bihar etc. donot have any port as those states are far away from the ocean.

13.3

1. Maharashtra
2. Haryana and Rajasthan
3. As per the learners' experience

13.4

1. Means of transport: Utility van, tractor, metro rail, ambulance, trolley, bicycle.
   Means of communication: Telegram, mobile, postcard, fax, facebook, twitter.
2. (a) Communication
   (b) Postal service
   (c) Email
   (d) All India Radio (AIR)
   (e) Mobile Phones

Notes

14

POPULATION: OUR GREATEST RESOURCE

All of us hear many people saying that the population of India is a great problem. You also may be feeling the same. You may be aware that the population of India is more than a billion and it is still growing. It may overtake the population of China within the next couple of decades, eventually making India the most populous nation of the world. It is in this way the population is quite often seen as a liability, a major hindrance to development and quality of life of the people. But is it true? Let's think and understand. Has population not been an asset, a resource for the country? Today, India is considered as a leading nation in the world in terms of human power. One of the major contributory factors for this global standing has been the young, educated and productive people of our country. They are contributing to the development of not only our country, but many of the foreign countries also. In this context, population is an asset for the economy, the greatest resource of the country rather than a liability. In this lesson, you shall know how population of our country can be viewed as the greatest resource.

OBJECTIVES

After studying this lesson you will be able to:

- analyze population not in terms of simple numbers and a problem, but as the greatest resource of the country;
- explain factors that make population a human resource;
- identify areas of high, moderate and low density of population and locate the same on the outline map of India;
- analyze the factors affecting the distribution and density of population;
- examine the implications of the population change and population composition, rural-urban composition, age composition, sex composition and literacy;

- appreciate needs of adolescents as a critical population group and the growing potential human resource;
- recognize the need for empowerment of women in India; and
- evaluate population policies adopted by the Government of India, especially in the context of human resource development.

14.1 POPULATION AS A RESOURCE

Generally, we understand that population means a collection of people. Let us go through the meanings of population stated in the box below. This term has been defined differently in different contexts. You may find that the meaning of population stated in a science or biology textbook is different from how it has been used in a social science, geography, economics or sociology textbooks. You will learn later on that in statistics this term has yet another meaning. Will you like to find out what it is? You may do it by consulting books on Statistics. However, in the present lesson we will be using population to mean the collection of people living in a given geographic area or territory. This is how it is used in the census. The collection of people is seen and understood primarily in terms of number. But population is also considered as a resource, a human resource.

What does population mean?

- Total number of people inhabiting a specified area or territory (e.g. population of a village, city, state, country, world).
- Total number of people of a particular group, race, class or category (e.g. population of Scheduled Castes, Scheduled Tribes, or religious groups like Hindus, Muslims, Christians, Sikhs)
- In biology, collection of inter-breeding organisms of a particular species (e.g. population of tigers, deer, etc.)

What is resource? It is something that can be used and reused. Let us look around the room. We find things like furniture, books, notebooks, pen, cups and others. We consider them as our resources and use and reuse them in our daily life.

Now, let us try to trace their origin. These are made out of the resources which we get from nature. The furniture is made from timber that we obtain from the forest. Books and notebooks are made from the wood pulp which comes from the forest. The pen is made up of plastic which is the by-product of petroleum. The cup is made of clay found in the soil. These and many more things which are part of our daily life are extracted, processed or manufactured from the natural resources. It is the people who with their physical and mental efforts convert the natural resources into various goods of utility.

Do you know

The Government of India created a Ministry of Human Resource Development in 1985, in place of its earlier Ministry of Education and Culture. Some of the States also have done so. This suggests that the idea of people being a human resource has gained acceptance.

If resources are things that are used and reused, how can population be considered a resource? We all know that the grains which are cultivated in the fields, the minerals that are mined and the goods which are manufactured in factories are all produced by people. People of the country produce and develop various facilities and services to make their lives comfortable. The facilities, whether these are means of transport and communication, schools, colleges, hospitals, electricity producing units, infrastructure for irrigation and others, play a significant role in the development of a country.

For producing and developing all such facilities and converting them into useful resources, human beings play the role of the best resource. Without human beings, other resources cannot be developed and utilized properly. Therefore, the number as well as the quality of people, collectively, is the real and ultimate resource of a country.

In view of the above, the sheer number of people, which is determined by census conducted at periodic intervals, may be a liability, but the qualitative population becomes the human capital of a country. For converting the number into capital, the country has to invest a lot in the form of improving the health and nutritional status of the people, their education and specialized training and their overall quality of life. The investments for improving the quality of the people made by the state as well as the society matter a lot. It is essential that every individual develops to the fullest capability and is engaged in the development process of the country. It is therefore important to understand that people as human resource are both an object of development and also a participant in development. As we discussed earlier the number of people may not be called resource, but there are certain factors which convert these numbers into a useful resource.

Do you know

Human capital: Over the years, the terms used to describe staff and employees in businesses have changed. We have moved from 'personnel' to 'human resources' to 'human capital'. Human capital represents attributes of a person that are productive in the economic context. It refers to the stock of productive skills and technical knowledge embodied in labour.

Census: The procedure of systematically acquiring and recording information about the members of a given population. The term is used mostly in connection with 'national population and door to door censuses' to be taken every 10 years. The Government of India, with the assistance of States, has been conducting census to collect data about various demographic and socio-economic aspects of our population.

Factors making population a Human Resource

What are the factors that influence the role of population as the human resource? You may infer from the above discussion that the education, health and nutritional status of the people, and their specialized training determine the quality of population as a human resource. But besides these, there are key socio-demographic factors that have significant impact on the role of population as a resource. These are: (i) Distribution of Population; (ii) Growth of Population; and (iii) Population Composition. We shall try to understand these three factors. Let us begin with Distribution of Population.

INTEXT QUESTIONS 14.1

1. What is meant by resource?
2. Enumerate qualities that are essential for making human beings a resource.

14.2 DISTRIBUTION OF POPULATION

You may be knowing that resources, whether natural or any other, are not evenlydistributed. For example, natural resources like forests or iron ore or coal are not found evenly in the world and also within our own country. The same is the case with human resources. They are not evenly spread everywhere in the world and their numbers keep on changing. The spread of population over an area, may be in a state or the entire country, is known as the distribution of population.

You will find it very interesting when you look at the following map of India (Figure 14.1). It shows how the population of India is spread across various States and Union Territories (UTs). This has been shown through dots. Each dot represents five lakh persons. As you see, in some States, the number of dots is less, even if the area is substantially large. It means that the population in these States is either widely spread or moderately spread. But in some other States, the dots are very close to one another, so close that those parts in the map look almost painted. In them, the spread of population is very dense. Let us prepare a list of sparsely populated, moderately populated and densely populated States and Union Territories (UTs) of India.

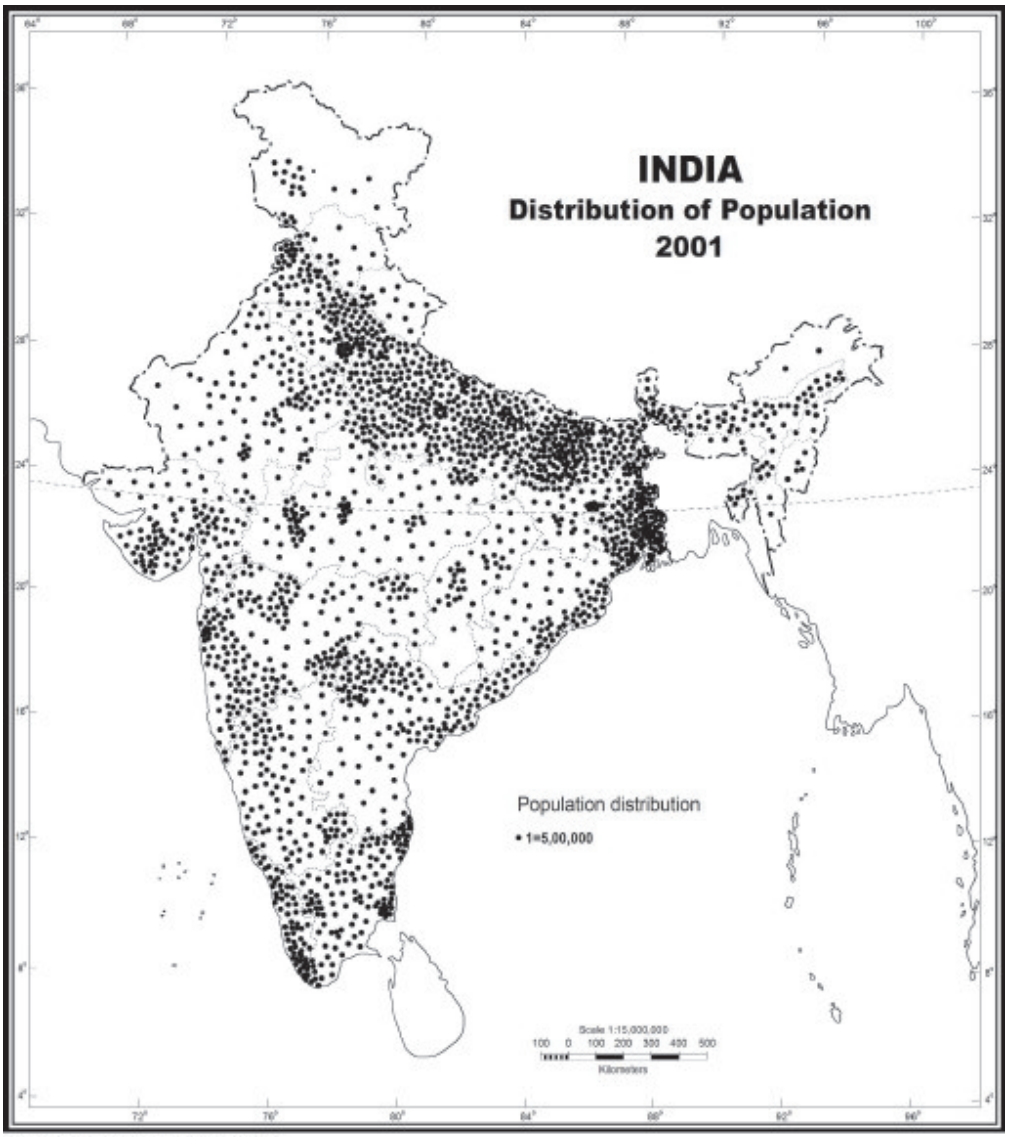


Figure 14.1: *Distribution of Population in India*

14.3 DENSITY OF POPULATION

Based on the above figure, a comparison of population distribution in any two States will be quite interesting. Let us look at the States of Maharashtra and West Bengal in the map (Figure 14.1). The patterns of the spread of population in them are different. From the simple look at the map, it appears that West Bengal has more population than Maharashtra. But it is not true. Maharashtra has more population than West Bengal, but Maharashtra is thinly populated because its land area is larger than that of West Bengal. Hence, we can not compare the population situation of two States in terms of only the number without considering their areas. That is why, the comparison of population of regions and countries is done through density of population.

Do you know

Density of Population: The density of population is the number of persons living per unit of an area. It is usually expressed as number of people per square kilometre (sq km). The formula for its computation is:

$$\text{Density of population} = \frac{\text{Number of people in a defined area unit}}{\text{Total area in square km of that particular area}}$$

For determining the density, the number of people living in a specific territory is divided by the total area of that territory. This provides an average number of persons living per sq km in the territory. For example, let us assume that the population of a district is 250,000 and its area is 1000 square km. The density of population of this district can be calculated as follows:

Density of Population = = 250 persons per sq km.

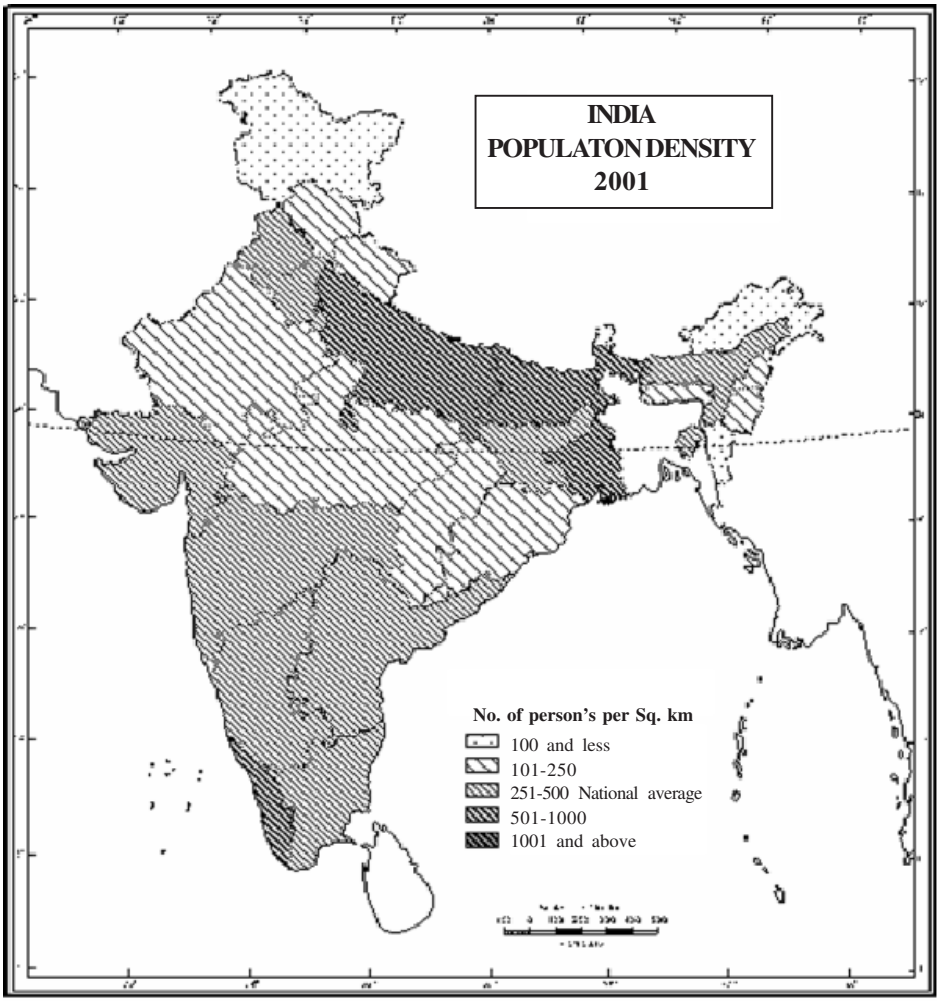


Figure 14.2: *Density of Population in India*

The map (Fig. 14.2) shows that the density of population in India is uneven. It varies from one state to another.

ACTIVITY 14.1

Look at the Figure 14.2. Identify and name the States having high (more than 500 persons per sq km), moderate (100-500 persons per sq km) and low (less than 100 persons per sq km) density.

States having high density

States having moderate density

States having low density

Can you state the reasons for such a variation in density among States?

Hints: Unfavorable/harsh climatic conditions, rugged terrain and poor soil fertility are mainly responsible for the low density. Rich soil, abundance of rainfall, developed irrigational facilities, moderate climate and urbanization support high density of population. The areas of average fertility, modest rainfall, less developed irrigational facilities and, to some extent, stony/sandy surface sustain moderate density of population.

It also keeps on changing. As you may find in figure 1.3 the density of population in India was as low as 77 persons per sq km in 1901. It has steadily increased from 90 persons per sq km in 1931 to 325 persons per sq km in 2001. You would be interested to know, which is the most densely populated State/ UTs of India. For that you may have to see the Census Reports. According to Census 2001, the NCT of Delhi has the highest density of population (9340 person per square km) followed by UT of Chandigarh (7900 persons per sq km). Arunachal Pradesh has the lowest density, 13 persons per sq km. Among the States, West Bengal has the highest density of population, i.e., 903 persons per sq km.

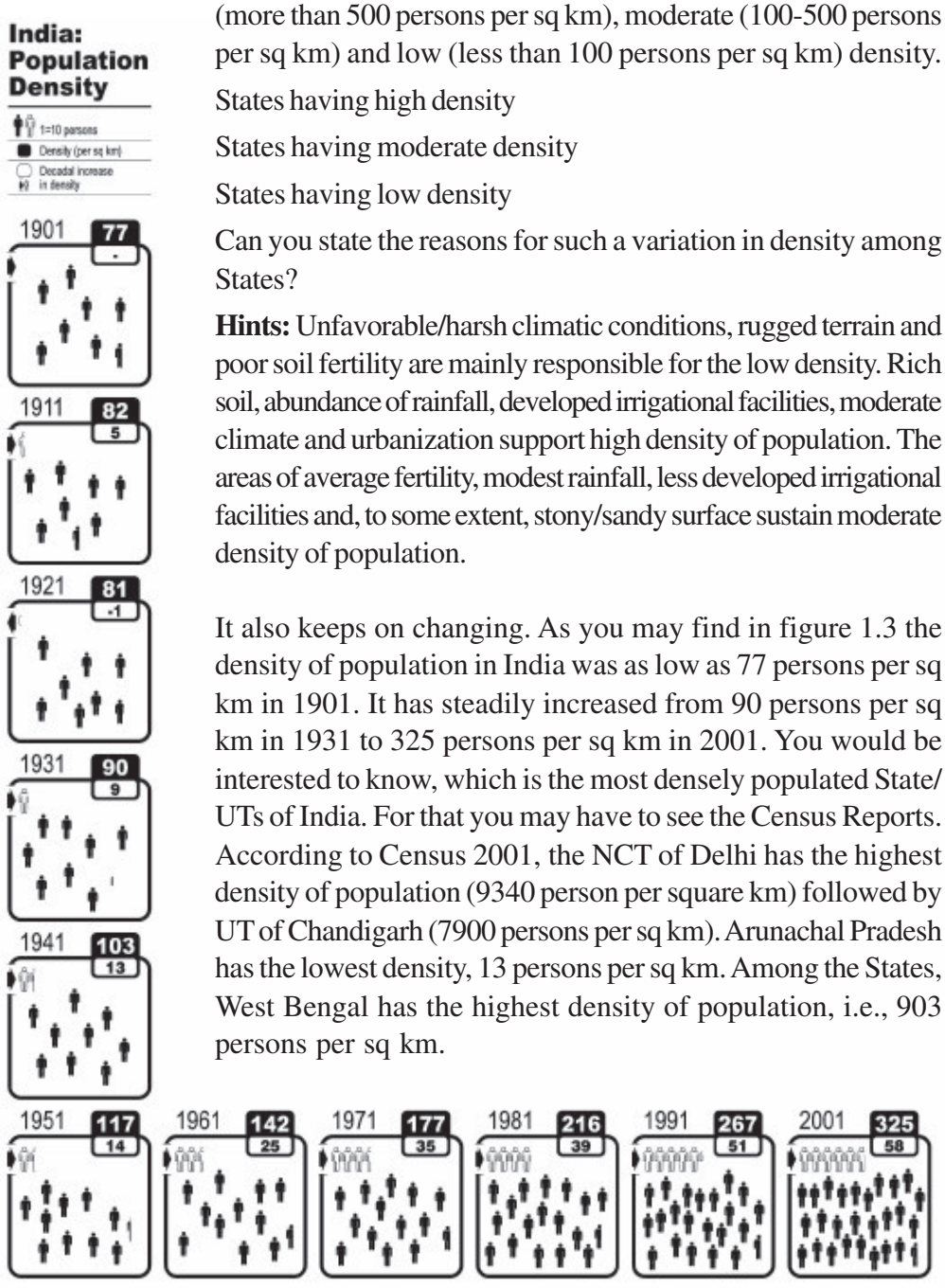


Figure 14.3: *Density of Population in Decades* (1901-2001)

Factors affecting distribution and density of population

Why is the distribution of population uneven? It is human nature that people like to live in the areas where resources are easily available. These resources may be fresh water, fertile soil, food and shelter, opportunities of work and others. The availability of these resources is influenced by geographical features which cause uneven distribution. And therefore, density and distribution of population are also uneven. We can divide the factors which affect distribution and density of population into two broad categories: Physical and Socio-economic.

A. Physical Factors

Three important physical factors influence the distribution and density of population, namely relief, climate and soil.

(i) **Relief:** you may have visited a mountainous area or a valley and also a plain area and observed that the mountains are less populated than the plains. Relief which represents the differences in elevation and slope between the higher and lower parts of the land surface of a given area, directly affects the accessibility of the area. The areas, which are easily accessible, are most likely to be inhabited by people. that is why, we find that the plains are densely populated and areas of rugged relief like mountains and plateaus are not. If you compare the density and distribution of population in northern plain and those in Himalayan areas, you can find the effects of relief.

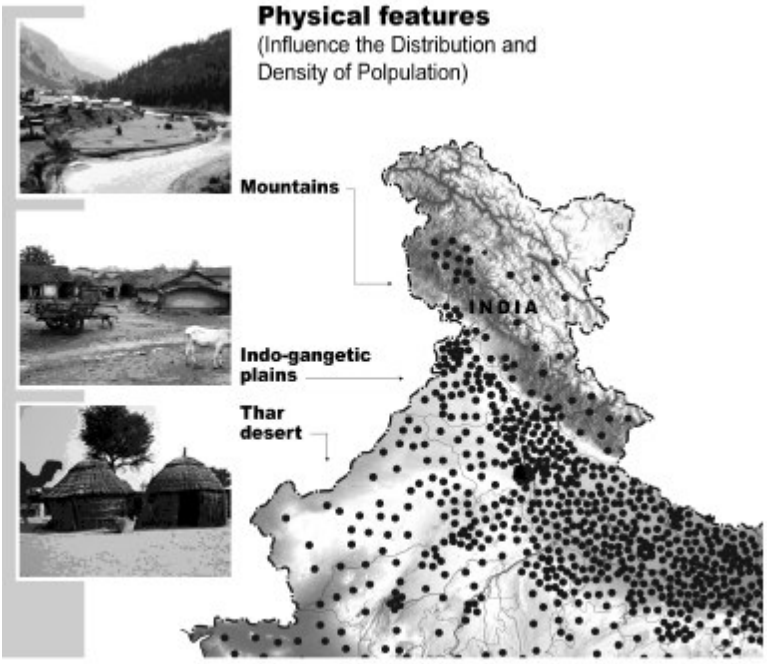


Figure 14.4 : *Factors affecting Distribution of Population*

Relief : Elevations of land; the variations in height of a land surface and its being shaped into hills and valleys.

(ii) **Climate:** Climatic condition is one of the most important factors which affects density and distribution of population. Favourable climate provides convenient living conditions for human beings. The higher density of population is found in the areas where the climate is favorable. But areas with harsh climate, i.e., areas that are too hot, too cold, too dry or too wet have lower density of population. In India, the area having dry climate such as Rajasthan and the areas with extreme cold climate such as the Valley in Jammu and Kashmir, or Himachal Pradesh and Uttarakhand have low density of population.

(iii) **Soil:** Human beings depend upon the quality of soil for agriculture. Areas of fertile soil can, therefore, support larger population. That is why, the regions of fertile soil such as the alluvial plains of North India and coastal plains have higher density of population. On the other hand, the areas with less fertile soils like parts of Madhya Pradesh, Rajasthan and Chhattisgarh have lower density of population.

B. Socio-economic Factors

The density and distribution of population also depend on the following socio-economic conditions of the area:

(i) **Industrialization and Urbanization:** As you always find, large number of people reside in the area having industries. They also prefer to live in the urban areas, towns and cities. The areas which are rich in mineral resources also attract large population. The mining areas in Jharkhand are very densely populated. This is so because these areas support several economic activities and offer lots of employment opportunities. Moreover, the education and health facilities are better in these areas. We are aware that all large cities of India like Delhi, Mumbai, Bangalore, Hyderabad, Chennai, Kolkata and many more have high density of population.

(ii) **Transport and Communication:** Some parts of the country have better transport and communication facilities and other public utility services than the other parts. Areas of northern plain are very well connected, whereas north eastern areas have comparatively poor connectivity. All such areas where the public facilities are well developed have a comparatively higher density of population. Sometimes we find that the places of cultural and religious significance are also densely populated.

All the above mentioned factors operate in combination. We can take the example of the high density population in the Ganga plain. It is caused by a combination of factors: level land, fertile soils, a favorable climate, industrialisation and urbanisation,

and comparatively well developed means of transport and communication. On the other hand, factors like rugged hilly terrain, unfavorable climate, poor means of transport and communication together cause low density of population in areas like those in Arunachal Pradesh.

ACTIVITY 14.2

Study the maps of physiographic divisions of India, the great northern mountains and the peninsular plateau of India in lesson 11. The smiling face of our Mother Land. Read these maps along with the data given in the figure numbers 14.1, 14.2 and 14.4 showing the distribution and density of population, respectively.

Co-relate and analyze the maps and identify the areas where physical conditions are favourable for people.

INTEXT QUESTIONS 14.2

1. Which one of the following States has the highest density of population according to 2001?

   A. West Bengal B. Kerala

   C. Tamil Nadu D. Uttar Pradesh

2. The population of a district is 3, 00,000 and its area is1000 square km. What would be the density of population?

   A. 150 persons/sq. km B. 200 persons/sq. km

   C. 250 persons/sq. km D. 300 persons/sq. km

3. Mention four important factors that are responsible for high density of population in big cities like Delhi, Mumbai, Kolkata and Chennai.

4. Why is density of population of Uttarakhand low? Give two reasons.

14.4 GROWTH OF POPULATION

The quality of population as a human resource in any country is greatly influenced by the pattern of population change. The change can be in terms of population growth or population negative growth. Although the population of the world is still growing, there are countries where it is declining. Both the situations of population change have their impact on the quality of human resources. If population grows at a faster rate, it results into an imbalance between population growth and resources of a country. This situation has an adverse impact on the quality of human resources.

The Indian population has been growing since long. From a population of 238 millions in the year 1901, it increased to 1028 millions in 2001and is still growing. This increase in population is more than four times within a span of a century. On the other hand there are countries in Western Europe where population is declining. Why it is so? Let us identify those factors which are responsible for population growth.

Factors of Growth of Population

Population of any country increases or decreases because of three main demographic factors: (a) birth rate, (b) death rate, and (c) migration. A number of socio-economic factors also influence birth rate and death rate which ultimately affect population change. However, you may find in figure 14.5 that in our country the main reason for rapid increase in population is high birth rate and low death rate. The migration as a factor has rather negligible influence on population growth at the national level. However, it has influence at local and regional level.

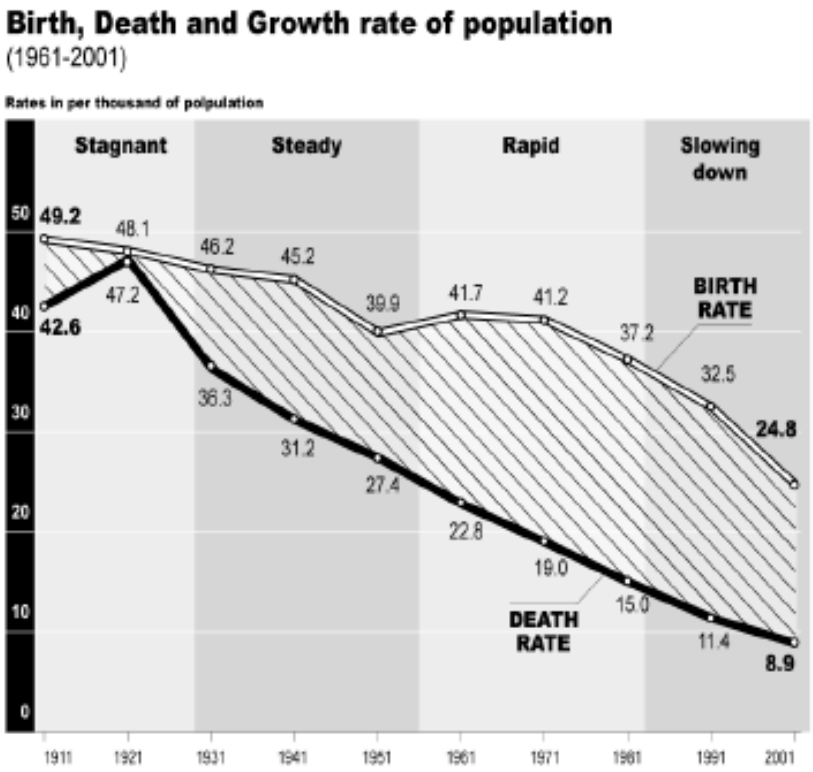


Figure 14.5 : *Growth of Population*

If you study figure 14.5 carefully, you will find that death rate has been declining since 1921. The birth rate also started declining during the same period. However, the decline in death rate has been faster than that of the birth rate. That is why, the gap between birth rate and death rate has been widening, leading to increase in population.

The population growth is also visible when you look at the decadal growth given in figure 14.6. The decadal growth rate have declined marginally between 1981 and 1991 and again between 1991-2001. It is a happy sign. But you may be surprised to know that in spite of decreasing growth rates, the absolute population has been increasing continuously over the successive years. Based on the outcome of birth rate and death rate, the entire period since 1901 to 2001 has been divided into four groups – stagnant, steady, rapid and slowing down stages of population growth.

Do you know

Birth Rate: The number of births per thousand of population in a given year under a particular territory is called Crude Birth Rate (popularly known as birth rate). Thus,

$$\text{Birth Rate} = \frac{\text{No. of live births in a year under an area}}{\text{Mid-year population of that area}} \times 1000$$

Suppose in a district, the total live births are 800 in a year and its mid-year population is 25000. So,

$$\text{Birth Rate} = \frac{800}{25{,}000} \times 1000 = 32 \text{ per thousand of population}$$

Death Rate: The number of deaths per thousand of population in a given year under a particular territory is called Crude Death Rate (popularly known as death rate). Thus,

$$\text{Death Rate} = \frac{\text{No. of deaths in a year under on area}}{\text{Mid-year population of that area}} \times 1000$$

Suppose in a district, the total deaths are 600 in a year and its mid-year population is 25000. So,

$$\text{Death Rate} = \frac{600}{25{,}000} \times 1000 = 24 \text{ per thousand of population}$$

Natural Growth Rate: Natural growth rate is the difference between birth rate and death rate. Therefore, natural growth rate = birth rate - death rate.

Suppose the birth rate of a particular year within an area is 32 and death rate is 24. Therefore, natural growth rate is 32 – 24 = 8 per thousand of population.

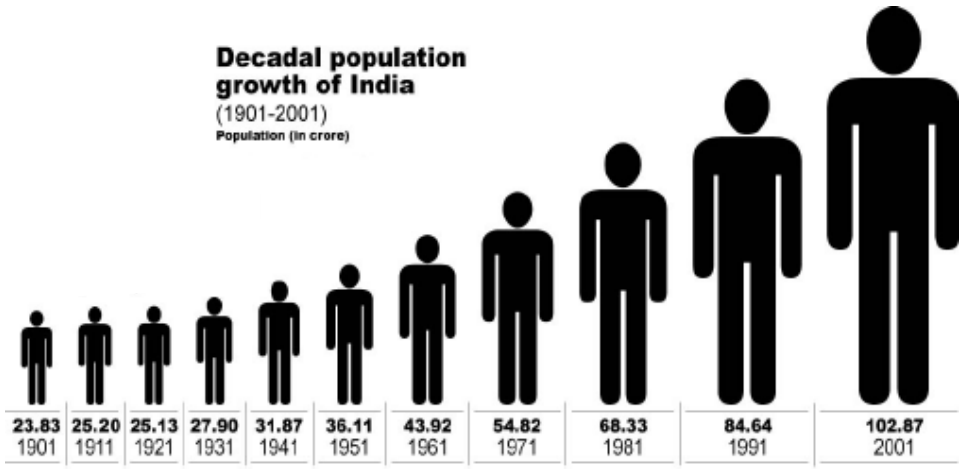


Figure 14.6 : *Decadal Population Growth of India* (1901-2001)

As we find right from the beginning of the 20th century, the population of India has been increasing in absolute numbers except during 1921 when there was a decline in absolute number. After 1921, there has been a continuous rising trend. That is why, the census year of 1921 is called the year of "The great divide" in the demographic history of India.

Let us try to understand the reasons for the fast rate of population growth in India. The most significant factors are illiteracy and low level of education, unsatisfactory health and nutritional status and poverty. There are some other crucial socio-cultural factors like preference for male child, early marriage, religious beliefs and low status of women.

INTEXT QUESTIONS 14.3

1. If in an area, birth rate is 45 per thousand and death rate is 25 per thousand, what would be the natural growth rate?

   A. 15 per thousand B. 18 per thousand

   C. 20 per thousand D. 25 per thousand

2. Which one of the following is the main reason for rapid increase in population of India?

   A. High birth rate and high death rate

   B. Low birth rate and low death rate

   C. High birth rate and low death rate

   D. Low birth rate and high death rate

3. Why is 1921 called the year of "The great demographic divide"?

14.5 POPULATION COMPOSITION

We have studied the distribution, density and growth of population so far. You would have been able to understand that the net effect of the difference between birth rate and death rate determines the pace and trend of population change. This net effect also demonstrates the composition of population which is an important factor influencing not only the pace of population growth but also the quality of population as a human resource. What is population composition? Population composition is the description of population defined by characteristics such as age, sex, rural-urban or literacy status. We shall, therefore, try to understand the following aspects of the population composition in India:

(i) Age composition,

(ii) Sex composition,

(iii) Rural-urban composition, and

(iv) Literacy

(i) Age Composition

The age composition of population has significant implications for the current and future development of a country. Population has been traditionally divided into three broad age groups: children (0-14 years), adults (15-60 years) and old (more than 60 years). Figure 14.7 shows age composition of Indian population in the above mentioned groups. If we compare the data from 1971, it is obvious that the child

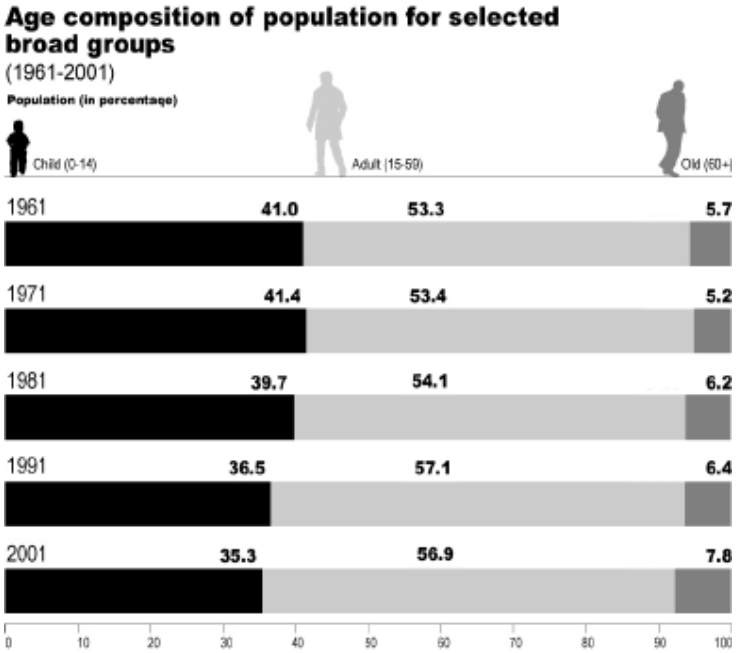


Figure 14.7 : Age Composition

population is declining and the population of adults has been increasing. However, population of the old is also increasing. In this way, the share of dependent population is increasing. Population of the old and children put together constitutes the dependent population. When the number of dependent population increases, the dependency ratio goes up. As a result, the country has to invest more on the growth and development of children and welfare of the old people; otherwise the same resources can be used for other productive purposes.

Do you know

Dependency Ratio

$$\text{Dependency Ratio} = \frac{\text{Dependent population (0-14 yrs. plus more than 60 yrs. old)}}{\text{Working population (15-59 years)}} \times 100$$

Suppose in a district, dependent population (0-14 years plus more than 60 years) is 7000 and working population (15-59 years) is 18000. Thus,

$$\text{Dependency Ratio} = \frac{7000}{18{,}000} \times 100 = 38.89$$

That means out of every 100 persons, 39 are dependent and 61 are working persons.

Think and Ponder

Your grandparents, being in the age-group of 60 years and above, belong to the dependent population group. Do you think they are a burden? Are they not contributing towards the welfare of the family and society? If 'yes', how are they contributing? If 'no' why are they not contributing?

Adolescents as a Distinct Population Group

The latest approach to understand the age composition emphasises the need to treat adolescents as a distinct population group. Traditionally, we have been dividing population in three phases: childhood, adulthood and old age. But as we observe, there are many individuals who are neither children nor adults. If you yourself are in that phase of life, you must have experienced your parents or other adults telling you, "Why are you doing this? You are no longer a child". On another occasion the same adults would be telling, "How can you do this? You are not an adult". In fact, the phase of life between childhood and adulthood, say between 10 years and 19 or a few more years, is known as adolescence and the persons in this age group are identified as adolescents. You may go through the text in the Box to understand meaning of adolescent better.

Do you know

What does Adolescent Mean?

United Nations **definitions are based on number of years as follows:**

- Adolescents: 10-19 years olds
- Youth: 15-24 years olds
- Young People: 10-24 years olds

But adolescents as a population group may not be seen only in association with the precise number of years, as its periodicity varies from person to person. Adolescents belong to "a developmental period which extends from the end of childhood to the beginning of adulthood".

Adolescence is defined as the period of physical, psychological and social maturation from childhood to adulthood, the period extending from puberty to the attainment of full reproductive maturity.

As shown in Table 1.1, adolescents as a distinct population group constitute almost 22.0 per cent of total population of India. This was their share in 2001. Their number is still growing and currently (in 2009) their percentage share has increased. The National Population Policy 2000 identifies them as an "under-served population group", because their needs have not been specifically addressed so far. The Policy describes various strategies to address different needs of adolescents. These are: (i) provide accurate information about physical, physiological, psychological and social changes and developments that take place during adolescence; (ii) develop the needed life skills to empower them to avoid risky situations and to attain sound physical, mental and social health; (iii) provide food supplements and nutritional

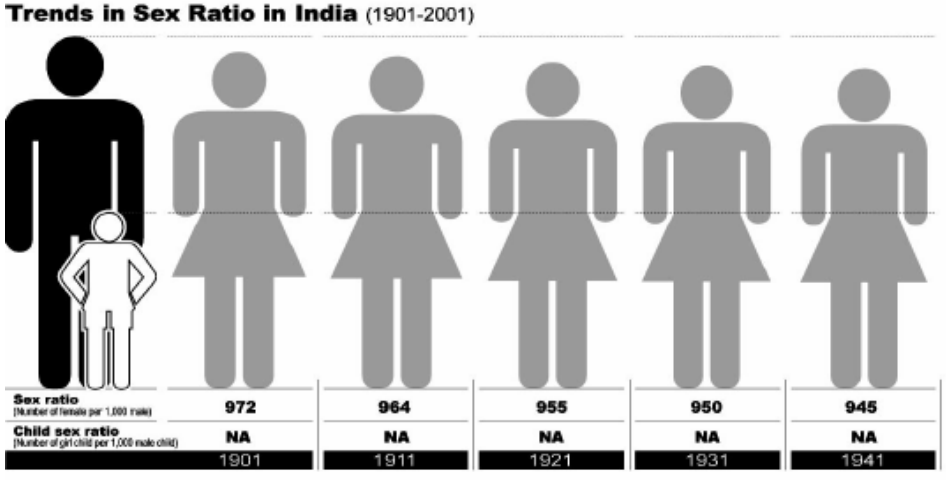


Figure 14.8(a) : *Trends in Sex Ratio in India*

services; and (iv) make available the needed health and counselling services available to them.

Table1.1 : Adolescents (10-19 Years) by Sex (in thousands) in India, 1991 and 2001

Census Year	Total No.of Adolescents	% of Total Population	Male	% of Total Male	Female	% of Total Female
1991	181,419	21.4	95,969	21.9	85,450	21.0
2001	225,061	21.9	119,571	22.4	105,490	21.2

ACTIVITY 14.3

Look into the data given in Table 1.1 and search answers for the following:

1. Why is the number of adolescent girls less than adolescent boys, though biologically the number of girls should have been more?
2. What is the trend in terms of percentage of male and female adolescents during 1991 and 2001?
3. Why are the adolescents considered as under-served population group?
4. Can you prepare a list of the needs of adolescents that must be addressed by the society?

(ii) Sex Composition

Sex composition is a very significant indicator of the quality of population of a country as a human resource. In fact, primarily it is understood on the basis of sex ratio. Sex ratio is defined as the number of females per 1000 males. It is an important

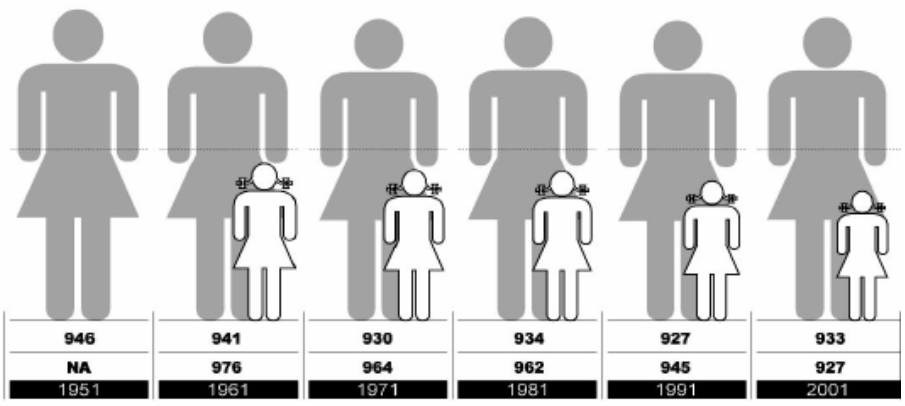


Figure 14.8 (b) : *Trends in Sex Ratio in India*

social indicator to measure the extent of prevailing equity between males and females at a given point of time. Sex ratio should be favourable. But in our country, sex ratio has always remained unfavorable to females, and the matter of concern is that it has been declining. In the year 1901, there were 972 females per 1000 males. In 2001, it has come down to 933 only. This trend is shown in figure 14.8 (a) and (b).

Do you know

Sex Ratio is calculated as follows:

$$\text{Sex Ratio} = \frac{\text{Total number of females in a particular area}}{\text{Total numbers of the male in same area}} \times 1000$$

Suppose in a district, the total number of females is 12000 and total number of males is 13000. Thus,

$$\text{Sex Ratio} = \frac{12{,}000}{13{,}000} \times 1000 = 923 \text{ females per thousand male}$$

Let us think why sex ratio is unfavorable in our country? It is primarily because of the prevailing discrimination against the females in our society. The favourable sex ratio is available only in one State and one Union Territory. It is 1058 in the State of Kerala and 1001in the Union Territory of Pondichery, now known as Puducherry.

Child Sex Ratio

The trend of decline in child sex ratio in the country is a matter of great concern. The sex ratio in 0-6 year population (child population) is continuously decreasing. Whereas the 1991 and 2001 Census Reports showed some improvement in overall sex ratio, the sex ratio of 0-6 year population has decreased sharply. Out of 28 States and 7 Union Territories, only in four States, namely Kerala, Mizoram, Sikkim, Tripura and Union Territory of Lakshadweep the child sex ratio is in tune with the overall sex ratio. The worst affected States are Haryana, Himachal Pradesh, Gujarat, Punjab, and Uttarakhand, and the Union Territory of Chandigarh and National Capital Region of Delhi. This decline in child sex ratio suggests the prevalence of the practices of female foeticide and female infanticide in these States. These practices are against the norms of a civil society.

(iii) Rural-urban Composition

India has been a land of farmers and a country of villages. At the beginning of the twentieth century nine out of ten persons used to live in villages. More than three-

fourths of our population still lives in rural areas. The urban area in India is defined as one, in which three-fourth of the population depends directly or indirectly on non-agricultural pursuits, with a minimum of 5000 population and the density being not less than 400 persons per sq. km and should have muciplaity town area or Municipal Corporation.

It seems, (see figure 14.9) we are moving rather fast towards urbanization along with its consequences such as shortage of housing, water, electricity, and encroachment on environment.

Rural and Urban population
(1951-2001)

Year	Population (million)		% of population	
	Rural	Urban	Rural	Urban
1951	299	62	82.7	17.3
1961	360	79	82.0	18.0
1971	439	109	80.1	19.9
1981	524	159	76.77	23.3
1991	629	218	74.3	25.7
2001	742	285	72.2	27.8

Figure 14.9: Rural - Urban Change

(iv) Literacy

Literacy is an indicator of development of any society. As defined in the Census Report, 'a person aged seven and above, who can both read and write with understanding in any language is treated as literate'. Literacy rate in our country was 18.33 percent in 1951. It has increased to 65.37 percent in 2001. Among various States of our country, Kerala has the highest literacy (90.86 percent) followed by Mizoram (88.49 percent) and Lakshdweep (87.52 percent). But the literacy rate, in general, is lower among females as compared to males (figure 14.10)

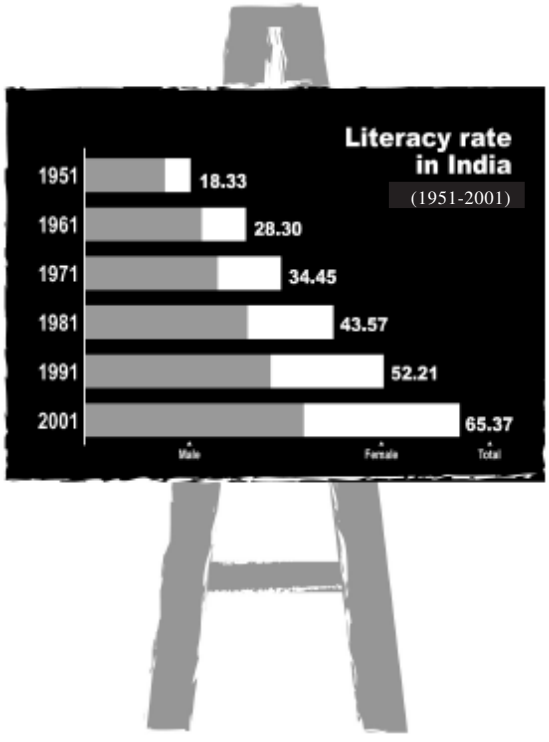


Figure 14.10: Literacy

ACTIVITY 14.4

Collect the following information from your vicinity for about 10-15 households:

1. Name of the person interviewed .....
2. Age ..... Years .....
3. Academic Qualification .....
4. Number of persons earning in the family .....
5. Total no. of members M ..... F .....
6. Members of family in the age groups
   (a) Up to 14 years .....
   (b) 15 years to 60 years .....
   (c) More than 60 years .....
7. Based on the data collected above, compute and analyze :
   (a) Sex-ratio
   (b) Dependency ratio .....
      (i) Below 14 years ..... and its percentage .....
      (ii) More than 60 years ..... and its percentage .....

We have been thus able to understand that the population of any country cannot become its greatest resource only by virtue of its number. The country has to invest to improve the quality of demographic characteristics and convert the number into a resource. For converting the number into human resource, India like many other countries of the world has been adopting and implementing policies and programmes. In the next section, therefore, we shall try to understand policies of Government of India in respect of population and empowerment of women.

INTEXT QUESTIONS 14.4

1. According to 2001 census, the sex ratio of India is:
   A. 920 B. 927
   C. 933 D. 943
2. The percentage of urban population, according to 2001 census is:
   A. 27.8 B. 26.7
   C. 25.7 D. 24.0
3. What would be the result if the dependency ratio is more?
4. State any two reasons responsible for unfavourable sex ratio in India.

14.6 POPULATION POLICIES IN INDIA

Do you know that discussions on population growth and the need to adopt a population policy had begun in India even before Independence? A Sub-Committee on population was set up by the National Planning Committee appointed in 1938 by the Interim Government. This Committee, in its resolution in 1940 said, "in the interest of social economy, family happiness and national planning, family planning and a limitation of children are essential".

In 1952, India was the first country in the world to launch a national population programme emphasizing family planning. The aim of the programme was to reduce birth rates "to stabilize the population at a level consistent with the requirement of national economy". Since then India has been reformulating its population policy from time to time, the details of which you can get from relevant books or when you study in higher classes. At present we shall try to understand the latest population policy which was adopted by Government of India in 2000.

National Population Policy (NPP) 2000

The National Population Policy 2000 has made a qualitative departure in its approach to population issues. It does not directly lay emphasis on population control. It states that the objective of economic and social development is to improve the quality of lives that people lead, to enhance their well-being, and to provide the opportunities and choices to become productive assets (resources) in the society. Stabilizing population is an essential requirement for promoting sustainable development. The **immediate objective** of the NPP 2000 is to address the unmet needs for contraception, health care infrastructure, and health personnel, and to provide integrated service delivery for basic reproductive and child health care. **The medium-term objective** is to bring the total fertility rate (TFR) to replacement levels by 2010 through vigorous implementation of inter-sectoral operational strategies. The **long-term objective** is to achieve a stable population by 2045 with sustainable economic growth, social development, and environmental protection.

Do you know

Total Fertility Rate at Replacement Level: It is the total fertility rate at which newborn girls would have an average of exactly one daughter over their lifetimes. In more familiar terms, every woman has as many babies as needed to replace her. It results into zero population growth.

Stable Population: A population where fertility and mortality are constant over a period of time. This type of population will show an unvarying age distribution and will grow at a constant rate. Where fertility and mortality are equal, the stable population is stationary.

Women Empowerment in India

The empowerment of women is very crucial for improving the quality of population as a human resource. Women, in India, although making up almost 50% of the total population, have been looked down upon and subjected to discrimination. By simple logic, this has deprived the nation of the contribution of half of its population as human resources. This is quite opposite of what is seen and observed in the developed world. The role of women in our country has been limited to looking after their families, also being mute spectators to all kinds of discrimination, ill treatments and crimes against them.

If you go through the Indian Constitution, you will find that in its Articles14, 15, 16, 19, 39, 42, 51e provisions have been made to ensure justice and equality to all. Many laws have been passed like Special Marriage Act 1954, Medical Termination of Pregnancy Act 1971 and Child Marriage Restraint Act (Amendment) 1978. Yet the status of women continues to be a matter of great concern.

Some steps have been taken and it is hoped that there will be qualitative change in the status of women. The empowerment of women received a major boost when the 73rd and 74th Constitutional Amendments providing 33 percent reservation of seats for Women in Panchayati Raj institutions and Urban Local Bodies were passed by the Parliament. Another Constitution Amendment Bill has been introduced, which aims at providing 33 percent reservation for women in the House of the People and State Legislative Assemblies. A National Commission for Women came into existence in 1992, through an Act passed in 1990. Wide ranging functions have been assigned to the Commission to look into and investigate into any ill treatment brought to their notice against women and to safeguard their interest.

The ultimate objective is to facilitate the advancement, development and empowerment of women and to eliminate all forms of discrimination. These steps will also ensure their active participation in all spheres of life and activities. You can read, learn and understand about the need of women empowerment and its efforts made more in detail in the lesson 'Socio –Economic Development and Empowerment of Disadvantaged Groups'.

INTEXT QUESTIONS 14.5

1. Suppose a particular district has an area of 200 square Km. The same district records the total number of persons as 17400, 26200, 36200, 47200, 59800, 75200 according to 1951, 1961, 1971, 1981, 1991 and 2001 census, respectively.
   A. Calculate the density of population for all six censuses.
   B. Find out the decadal change in density.
   C. Can you find any trend from your calculation of population density?

WHAT YOU HAVE LEARNT

- Population is the total number of people living in a country at a given time. The data regarding various socio-economic and demographic aspects of our population is collected by the Government of India at the beginning of each decade and it is called census.
- The total population of India according to the 2001 census is 1028.7 millions which is more than four times to that of 1901 (238.3 millions). The difference between the birth rate and death rate is called natural growth rate.
- Density of population is defined as the number of persons per square kilometer. Its distribution in India is highly uneven. NCT of Delhi has the highest density of 9294 persons/sq. km. and Arunachal Pradesh has the lowest 14 persons/sq. km.
- Sex ratio is defined as the number of females per 1000 male in the total population. Sex ratio is unfavorable in India. It is 933 according to the census of 2001. The sex ratio can be improved by empowering women.
- Population of India is divided mainly into three age-group; (i) children (0-14 years), (ii) adults (15-60 years) and (iii) old (60+years). Children and old form the dependent population and their percentage in the total population is about 43.
- For an awakened society, literacy is an important indicator. As per the census 'a person aged seven and above should be able to read and write with understanding'. Literacy rate in our country has improved a lot. It was only 18.33 in 1951 which has gone up to 65.37% in 2001. Kerala has the highest literacy rate 90.86 percent.
- The main objective of the National Population Policy is to improve the quality of life of the people by reducing birth and death rates, family welfare, stabilizing population, economic growth, social development and environmental protection. By making appropriate investment in improving the quality of life, our large population can be transformed into a productive resource of our country.

TERMINAL EXERCISES

1. Define sex-ratio. Why is the sex-ratio in India unfavorable?
2. Define population growth rate and explain how it is arrived at.
3. What inferences can we draw from the age composition data of India?
4. How can we turn our huge population into a resource?

5 Define the following terms

(i) Density of population

(ii) Birth rate, Death rate and Growth rate.

(iii) Literacy

6 Explain the National Population Policy?

7 What is meant by women empowerment? How does women empowerment empower the whole society/community?

ANSWER TO INTEXT QUESTIONS

14.1

1. Something that can be used or reused by us.
2. Education, health and nutrition, specialized training.

14.2

1. A. West Bengal
2. D. 300 persons/square km
3. Industrialization; (ii) Urbanization; (iii) Employment opportunities; (iv) Means of transport and communication.
4. (i) Rugged topography
   (ii) Harsh climatic condition

14.3

1. C. 20 per thousand
2. C. High birth rate and low death rate
3. The year 1921 shows decline in population but after that it has been increasing continuously.

14.4

1. C. 933
2. A. 27.8
3. Government has to invest more for the welfare of dependent population and hence less available fund for greater developmental works in country.
4. (i) Discrimination against females.
   (ii) Female foeticide and infanticide.

14.5

1.

Year	A Density	B Decade change in density	C
1951	87	—	Continuously increasing trend in the density of population
1961	131	44	
1971	181	50	
1981	236	55	
1991	299	63	
2001	376	77	