

Unit III
Chapter 3



12099CH05

LAND RESOURCES AND AGRICULTURE



You must have observed that the land around you is put to different uses. Some land is occupied by rivers, some may have trees and on some parts roads and buildings have been built. Different types of lands are suited to different uses. Human beings thus, use land as a resource for production as well as residence and recreation. Thus, the building of your school, roads on which you travel, parks in which you play, fields in which crops are grown and the pastures where animals graze represent different uses to which land is put.

Land Use Categories

Land-use records are maintained by land revenue department. The land use categories add up to *reporting area*, which is somewhat different from the *geographical area*. The Survey of India is responsible for measuring *geographical area* of administrative units in India. Have you ever used a map prepared by Survey of India? The difference between the two concepts are that while the former changes somewhat depending on the estimates of the land revenue records, the latter does not change and stays fixed as per Survey of India measurements. You may be familiar with land use categories as they are also included in your Social Science textbook of Class X.

The land-use categories as maintained in the Land Revenue Records are as follows :

- (i) **Forests** : It is important to note that area under actual forest cover is different from area classified as forest. The latter is the area which the Government has identified and demarcated for forest growth. The land revenue records are consistent with the latter definition. *Thus, there may be an increase in this category without any increase in the actual forest cover.*
- (ii) **Barren and Wastelands** : The land which may be classified as a wasteland such as barren hilly terrains, desert lands, ravines, etc. normally cannot be brought under cultivation with the available technology.

- (iii) **Land put to Non-agricultural Uses:** Land under settlements (rural and urban), infrastructure (roads, canals, etc.), industries, shops, etc., are included in this category. An expansion in the secondary and tertiary activities would lead to an increase in this category of land-use.
- (iv) **Area under Permanent Pastures and Grazing Lands :** Most of this type land is owned by the village 'Panchayat' or the Government. Only a small proportion of this land is privately owned. The land owned by the village panchayat comes under 'Common Property Resources'.
- (v) **Area under Miscellaneous Tree Crops and Groves (Not included in Net sown Area) :** The land under orchards and fruit trees are included in this category. Much of this land is privately owned.
- (vi) **Culturable Wasteland :** Any land which is left fallow (uncultivated) for more than five years is included in this category. It can be brought under cultivation after improving it through reclamation practices.
- (vii) **Current Fallow:** This is the land which is left without cultivation for one or less than one agricultural year. Fallowing is a cultural practice adopted for giving the land rest. The land recoups the lost fertility through natural processes.
- (viii) **Fallow other than Current Fallow :** This is also a cultivable land which is left uncultivated for more than a year but less than five years. If the land is left uncultivated for more than five years, it would be categorised as culturable wasteland.
- (ix) **Net Area Sown:** The physical extent of land on which crops are sown and harvested is known as net sown area.

Land-use Changes in India

Land-use in a region, to a large extent, is influenced by the nature of economic activities carried out in that region. However, while economic activities change over time, land, like many other natural resources, is fixed in terms of its area. At this stage, one needs to appreciate three types of changes that an economy undergoes, which affect land-use.

- (i) The **size of the economy** (measured in terms of value for all the goods and services produced in the economy) grows over time as a result of increasing population, change in income levels, available technology and associated factors. As a result, the pressure on land will increase with time and marginal lands would come under use.
- (ii) Secondly, **the composition of the economy** would undergo a change over time. In other words, the secondary and the tertiary sectors usually grow much faster than the primary sector, specifically the agricultural sector. This type of change is common in developing countries, like India. This process would result in a gradual shift of land from agricultural uses to non-agricultural uses. You would observe that such changes are sharp around large urban areas. The agricultural land is being used for building purposes.
- (iii) Thirdly, though the contribution of the agricultural activities reduces over time, the pressure on land for agricultural activities does not decline. The reasons for continued pressure on agricultural land are:
 - (a) In developing countries, the share of population dependent on agriculture usually declines much more slowly compared to the decline in the sector's share in GDP.
 - (b) The number of people that the agricultural sector has to feed is increasing day by day.



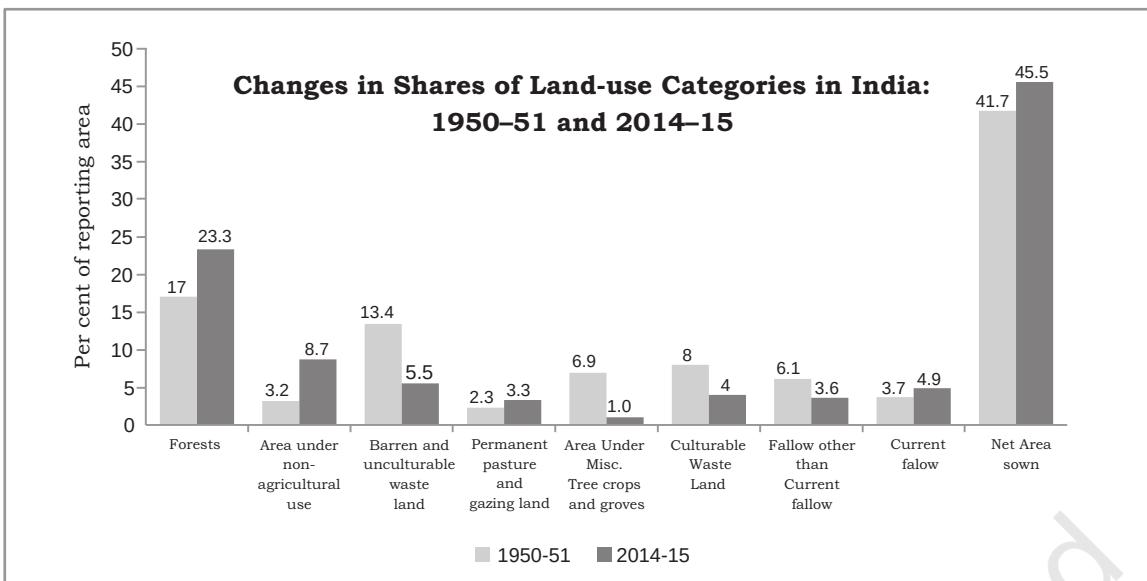


Fig. 3.1

Activity

Compare the changes of land-use between 1950–57 and 2014–15.

India has undergone major changes within the economy over the past four or five decades, and this has influenced the land-use changes in the country. These changes between 1950–51 and 2014–15 have been shown in Fig. 3.1. There are two points that you need to remember before you derive some meaning from this figure. Firstly, the percentages shown in the figure have been derived with respect to the reporting area. Secondly, since even the reporting area has been relatively constant over the years, a decline in one category usually leads to an increase in some other category.

Four categories have undergone increases, while four have registered declines. Share of area under forest, area under non-agricultural uses, current fallow lands and net area sown have shown an increase. The following observations can be made about these increases:

- The *rate of increase* is the highest in case of area under non-agricultural uses. This is due to the changing structure of Indian economy, which is increasingly depending on the contribution from

industrial and services sectors and expansion of related infrastructural facilities. Also, an expansion of area under both urban and rural settlements has added to the increase. Thus, the area under non-agricultural uses is increasing at the expense of wastelands and agricultural land.

- The increase in the share under forest, as explained before, can be accounted for by increase in the demarcated area under forest rather than an actual increase in the forest cover in the country.
- The increase in the current fallow cannot be explained from information pertaining to only two points. The trend of current fallow fluctuates a great deal over years, depending on the variability of rainfall and cropping cycles.
- The increase in net area sown is a recent phenomenon due to use of culturable waste land for agricultural purpose. Before which it was registering a slow decrease. There are indications that most of the decline had occurred due to the increases in area under non-agricultural use. (Note : the expansion of building activity on agricultural land in your village and city).



The four categories that have registered a decline are barren and wasteland, culturable wasteland, area under pastures and tree crops and fallow lands.

The following explanations can be given for the declining trends:

- (i) As the pressure on land increased, both from the agricultural and non-agricultural sectors, the wastelands and culturable wastelands have witnessed decline over time.
- (ii) The decline in land under pastures and grazing lands can be explained by pressure from agricultural land. Illegal encroachment due to expansion of cultivation on common pasture lands is largely responsible for this decline.

Activity

What is the difference between actual increase and rate of increase? Work out the actual increase and rate of increases for all the land use categories between 1950–51 and 2014–15 from the data given in the Appendix (vi). Explain the results.

Note for Teacher

For calculating actual increase, the difference of the land-use categories should be worked out over the two periods.

For deriving the rate of increase, simple growth rate i.e. (difference of values between the two time points i.e. value of terminal year minus base year / base year or 1960-61 value) should be used, e.g.

$$\frac{\text{Net sown Area in 2014-15} - \text{Net sown Area in 1950-51}}{\text{Net sown Area in 1950-51}} \times 100$$

Common Property Resources

Land, according to its ownership can broadly be classified under two broad heads – private land and common property resources (CPRs). While the former is owned by an individual or a group of individuals, the latter is owned by the state meant for the use of the community. CPRs provide fodder for the livestock and fuel for the households along with other minor forest products like fruits, nuts, fibre, medicinal plants, etc. In rural areas, such land is of

particular relevance for the livelihood of the landless and marginal farmers and other weaker sections since many of them depend on income from their livestock due to the fact that they have limited access to land. CPRs also are important for women as most of the fodder and fuel collection is done by them in rural areas. They have to devote long hours in collecting fuel and fodder from a degraded area of CPR.

CPRs can be defined as community's natural resource, where every member has the right of access and usage with specified obligations, without anybody having property rights over them. Community forests, pasture lands, village water bodies and other public spaces where a group larger than a household or family unit exercises rights of use and carries responsibility of management are examples of CPRs.

Agricultural Land Use in India

Land resource is more crucial to the livelihood of the people depending on agriculture:

- (i) Agriculture is a purely land based activity unlike secondary and tertiary activities. In other words, contribution of land in agricultural output is more compared to its contribution in the outputs in the other sectors. Thus, lack of access to land is directly correlated with incidence of poverty in rural areas.
- (ii) Quality of land has a direct bearing on the productivity of agriculture, which is not true for other activities.
- (iii) In rural areas, aside from its value as a productive factor, land ownership has a social value and serves as a security for credit, natural hazards or life contingencies, and also adds to the social status.

An estimation of the total stock of agricultural land resources (i.e. total cultivable land) can be arrived at by adding up net sown area, all fallow lands and culturable wasteland. It may be observed from Table 3.1 that over the years, there has been a marginal decline in the available total stock of cultivable land as a percentage to total reporting area. There has been a greater decline of cultivated land, in spite of a corresponding decline of cultivable wasteland.

Table 3.1 : Composition of Total Cultivable Land

Agricultural Land-use Categories	As a percentage of Reporting Area		As a percentage of total cultivable land	
	1950-51	2014-15	1950-51	2014-15
Culturable Waste land	8.0	4.0	13.4	6.8
Fallow other than Current Fallow	6.1	3.6	10.2	6.2
Current Fallow	3.7	4.9	6.2	8.4
Net Area Sown	41.7	45.5	70.0	78.4
Total Cultivable Land	59.5	58.0	100.00	100.00

It is clear from the above discussion that the scope for bringing in additional land under net sown area in India is limited. There is, thus, an urgent need to evolve and adopt land-saving technologies. Such technologies can be classified under two heads – those which raise the yield of any particular crop per unit area of land and those which increase the total output per unit area of land from all crops grown over one agricultural year by increasing land-use intensity. The advantage of the latter kind of technology is that along with increasing output from limited land, it also increases the demand for labour significantly. For a land scarce but labour abundant country like India, a high cropping intensity is desirable not only for fuller utilisation of land resource, but also for reducing unemployment in the rural economy.

The **cropping intensity (CI)** is calculated as follows :

$$\text{Cropping Intensity in percentage} = \frac{\text{GCA}}{\text{NSA}} \times 100$$

Cropping Seasons in India

There are three distinct crop seasons in the northern and interior parts of country, namely **kharif**, **rabi** and **zaid**. The **kharif** season largely coincides with Southwest Monsoon under which the cultivation of tropical crops, such as rice, cotton, jute, jowar, bajra and tur is possible. The **rabi** season begins with the onset of winter in October-November and ends in March-April. The low temperature conditions during this

season facilitate the cultivation of temperate and subtropical crops such as wheat, gram and mustard. **Zaid** is a short duration summer cropping season beginning after harvesting of rabi crops. The cultivation of watermelons, cucumbers, vegetables and fodder crops during this season is done on irrigated lands. However, this type of distinction in the cropping season does not exist in southern parts of the country. Here, the temperature is high enough to grow tropical crops during any period in the year provided the soil moisture is available. Therefore, in this region same crops can be grown thrice in an agricultural year provided there is sufficient soil moisture.

Types of Farming

On the basis of main source of moisture for crops, the farming can be classified as **irrigated** and **rainfed (barani)**. There is difference in the nature of irrigated farming, as well as based on the objective of irrigation, i.e., protective or productive. The objective of protective irrigation is to protect the crops from adverse effects of soil

Table 3.2 : Cropping Seasons in India

Cropping Season	Major Crops Cultivated	
	Northern States	Southern States
Kharif June-September	Rice, Cotton, Bajra, Maize, Jowar, Tur	Rice, Maize, Ragi, Jowar, Groundnut
Rabi October – March	Wheat, Gram, Rapeseeds and Mustard, Barley	Rice, Maize, Ragi, Groundnut, Jowar
Zaid April-June	Vegetables, Fruits, Fodder	Rice, Vegetables, Fodder



moisture deficiency which often means that irrigation acts as a supplementary source of water over and above the rainfall. The strategy of this kind of irrigation is to provide soil moisture to maximum possible area. Productive irrigation is meant to provide sufficient soil moisture in the cropping season to achieve high productivity. In such irrigation the water input per unit area of cultivated land is higher than protective irrigation. *Rainfed farming* is further classified on the basis of adequacy of soil moisture during cropping season into *dryland* and *wetland* farming. In India, the ***dryland farming*** is largely confined to the regions having annual rainfall less than 75 cm. These regions grow hardy and drought resistant crops such as *ragi*, *bajra*, *moong*, gram and *guar* (fodder crops) and practise various measures of soil moisture conservation and rain water harvesting. In ***wetland farming***, the rainfall is in excess of soil moisture requirement of plants during rainy season. Such regions may face flood and soil erosion hazards. These areas grow various water intensive crops such as rice, jute and sugarcane and practise aquaculture in the fresh water bodies.

Foodgrains

The importance of foodgrains in Indian agricultural economy may be gauged from the fact these crops occupy about two-third of total cropped area in the country. Foodgrains are dominant crops in all parts of the country whether they have subsistence or commercial agricultural economy. On the basis of the structure of grain the foodgrains are classified as cereals and pulses.

Cereals

The cereals occupy about 54 per cent of total cropped area in India. The country produces about 11 per cent cereals of the world and ranks third in production after China and U.S.A. India produces a variety of cereals, which are classified as fine grains (rice, wheat) and coarse grains (jowar, bajra, maize, ragi), etc. Account of important cereals has been given in the following paragraphs :

Rice

Rice is a staple food for the overwhelming majority of population in India. Though, it is considered to be a crop of tropical humid areas, it has about 3,000 varieties which are grown in different agro-climatic regions. These are successfully grown from sea level to about 2,000 m altitude and from humid areas in eastern India to dry but irrigated areas of Punjab, Haryana, western U.P. and northern Rajasthan. In southern states and West Bengal the climatic conditions allow the cultivation of two or three crops of rice in an agricultural year. In West Bengal farmers grow three crops of rice called ‘aus’, ‘aman’ and ‘boro’. But in Himalayas and northwestern parts of the country, it is grown as a *kharif* crop during southwest Monsoon season.

India contributes 22.07 per cent of rice production in the world and ranked second after China in 2018. About one-fourth of the total cropped area in the country is under rice cultivation. West Bengal, Uttar Pradesh, and Punjab are the leading rice producing states in the country. The yield level of rice is high in Punjab, Tamil Nadu, Haryana, Andhra Pradesh, Telangana, West Bengal and Kerala. In the first four of these states almost the entire land under rice cultivation is irrigated. Punjab and Haryana are not traditional rice growing areas. Rice



Fig. 3.2 : Rice transplantation in southern parts of India

cultivation in the irrigated areas of Punjab and Haryana was introduced in 1970s following the Green Revolution. Genetically improved varieties of seed, relatively high usage of fertilizers and pesticides and lower levels of susceptibility of the crop to pests due to dry climatic conditions



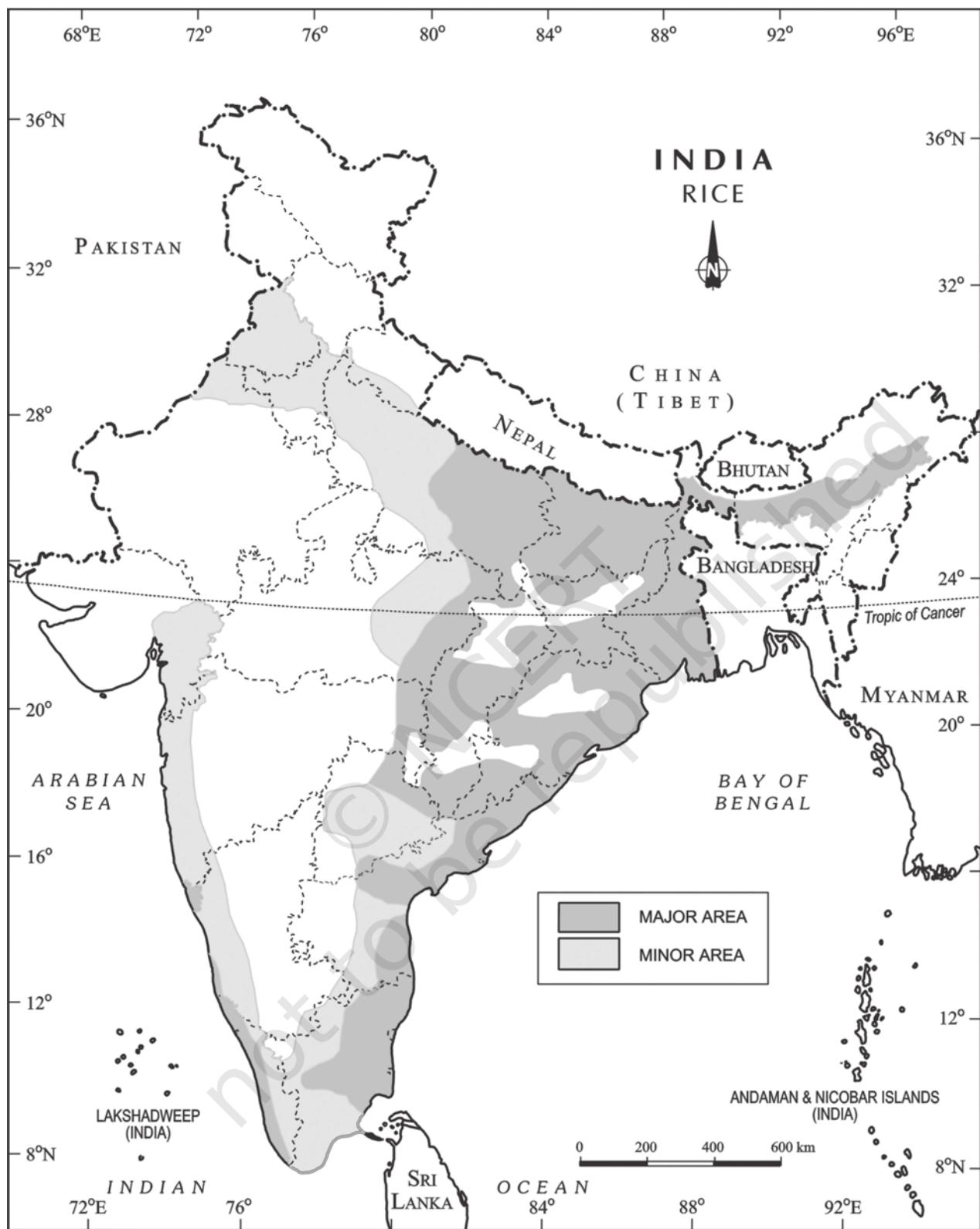


Fig. 3.3 : India - Distribution of Rice

are responsible for higher yield of rice in this region. The yield of this crop is very low in rainfed areas of Madhya Pradesh, Chhattisgarh and Odisha.

Wheat

Wheat is the second most important cereal crop in India after rice. India produces about 12.8 per cent of total wheat production of world (2017). It is primarily a crop of temperate zone. Hence, its cultivation in India is done during winter i.e. *rabi* season. About 85 per cent of total area under this crop is concentrated in north and central regions of the country i.e. Indo-Gangetic Plain, Malwa Plateau and Himalayas up to 2,700 m altitude. Being a *rabi* crop, it is mostly grown under irrigated conditions. But it is a rainfed crop in Himalayan highlands and parts of Malwa plateau in Madhya Pradesh.

About 14 per cent of the total cropped area in the country is under wheat cultivation. Uttar Pradesh, Madhya Pradesh, Punjab, Haryana and Rajasthan are leading wheat producing states. The yield level of wheat is very high (above 4,000 k.g. per ha) in Punjab and Haryana whereas, Uttar Pradesh, Rajasthan and Bihar have moderate yields. The states like Madhya Pradesh, Himachal Pradesh and Jammu and Kashmir growing wheat under rainfed conditions have low yield.

Jowar

The coarse cereals together occupy about 16.50 per cent of total cropped area in the country. Among these, *jowar* or *sorghum* alone accounts for about 5.3 per cent of total cropped area. It is main food crop in semi-arid areas of central and southern India. Maharashtra alone produces more than half of the total *jowar* production of the country. Other leading producer states of *jowar* are Karnataka, Madhya Pradesh, Andhra Pradesh and Telangana. It is sown in both *kharif* and *rabi* seasons in southern states. But it is a *kharif* crop in northern India where it is mostly grown as a fodder crop. South of Vindhya-Chal it is a rainfed crop and its yield level is very low in this region.

Bajra

Bajra is sown in hot and dry climatic conditions in northwestern and western parts of the country. It is a hardy crop which resists frequent dry spells and drought in this region. It is cultivated alone as well as part of mixed cropping. This coarse cereal occupies about 5.2 per cent of total cropped area in the country. Leading producers of *bajra* are the states of Maharashtra, Gujarat, Uttar Pradesh, Rajasthan and Haryana. Being a rainfed crop, the yield level of this crop is low in Rajasthan and fluctuates a lot from year to year. Yield of this crop has increased during recent years in Haryana and Gujarat due to introduction of drought resistant varieties and expansion of irrigation under it.

Maize

Maize is a food as well as fodder crop grown under semi-arid climatic conditions and over inferior soils. This crop occupies only about 3.6 per cent of total cropped area. Maize cultivation is not concentrated in any specific region. It is sown all over India except Punjab and eastern and north-eastern regions. The leading producers of maize are the states of Karnataka, Madhya Pradesh, Bihar, Andhra Pradesh, Telangana, Rajasthan and Uttar Pradesh. Yield level of maize is higher than other coarse cereals. It is high in southern states and declines towards central parts.

Pulses

Pulses are a very important ingredient of vegetarian food as these are rich sources of proteins. These are legume crops which increase the natural fertility of soils through nitrogen fixation. India is a leading producer of pulses in the world. The cultivation of pulses in the country is largely concentrated in the drylands of Deccan and central plateaus and northwestern parts of the country. Pulses occupy about 11 per cent of the total cropped area in the country. Being the rainfed crops of drylands, the yields of pulses are low and fluctuate from year to year. Gram and *tur* are the main pulses cultivated in India.



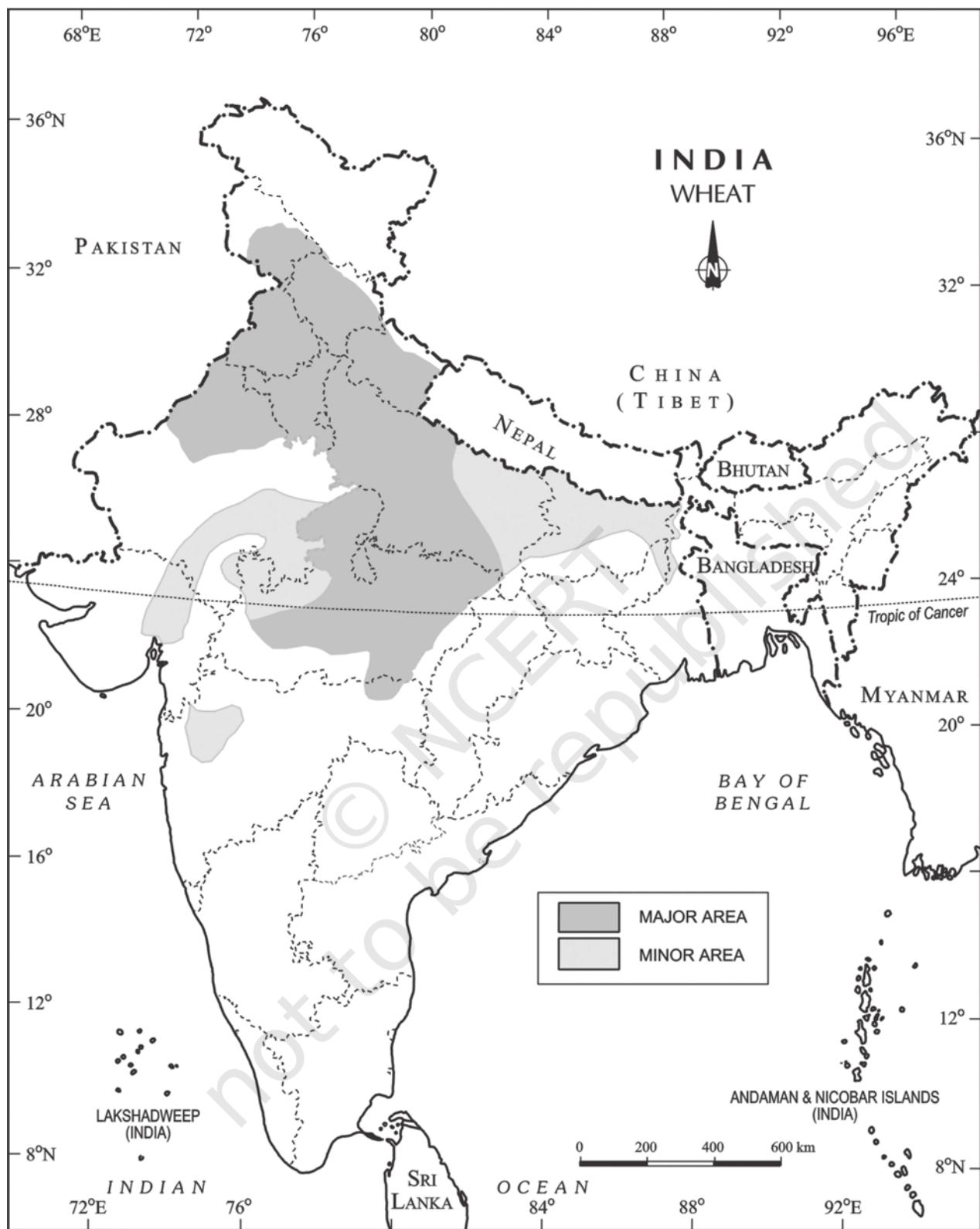


Fig. 3.4 : India - Distribution of Wheat

Gram

Gram is cultivated in subtropical areas. It is mostly a rainfed crop cultivated during rabi season in central, western and northwestern parts of the country. Just one or two light showers or irrigations are required to grow this crop successfully. It has been displaced from the cropping pattern by wheat in Haryana, Punjab and northern Rajasthan following the green revolution. At present, gram covers only about 2.8 per cent of the total cropped area in the country. Madhya Pradesh, Uttar Pradesh, Maharashtra, Andhra Pradesh, Telangana and Rajasthan are the main producers of this pulse crop. The yield of this crop continues to be low and fluctuates from year to year even in irrigated areas.

Tur (Arhar)

Tur is the second important pulse crop in the country. It is also known as *red gram* or *pigeon pea*. It is cultivated over marginal lands and under rainfed conditions in the dry areas of central and southern states of the country. This crop occupies only about 2 per cent of total cropped area of India. Maharashtra alone contributes about one-third of the total production of tur. Other leading producer states are Uttar Pradesh, Karnataka, Gujarat and Madhya Pradesh. Per hectare output of this crop is very low and its performance is inconsistent.

Activity

Differentiate between different foodgrains. Mix grains of various kinds and separate cereals from pulses. Also, separate fine from coarse cereals.

Oilseeds

The oilseeds are produced for extracting edible oils. Drylands of Malwa plateau, Marathwada, Gujarat, Rajasthan, Telangana, Rayalseema region of Andhra Pradesh and Karnataka plateau are oilseeds growing regions of India. These crops together occupy about 14 per cent of total cropped area in the country. Groundnut, rapeseed and mustard, soyabean and sunflower are the main oilseed crops grown in India.

Groundnut

India produces about 18.8 per cent of the total groundnut production in the world (2018). It is largely a rainfed *kharif* crop of drylands. But in southern India, it is cultivated during rabi season as well. It covers about 3.6 per cent of total cropped area in the country. Gujarat, Rajasthan, Tamil Nadu, Telangana, Andhra Pradesh, Karnataka and Maharashtra are the leading producers. Yield of groundnut is comparatively high in Tamil Nadu where it is partly irrigated. But its yield is low in Telangana, Andhra Pradesh and Karnataka.

Rapeseed and Mustard

Rapeseed and mustard comprise several oilseeds as *rai*, *sarson*, *toria* and *taramira*. These are subtropical crops cultivated during rabi season in north-western and central parts of India. These are frost sensitive crops and their yields fluctuate from year to year. But with the expansion of irrigation and improvement in seed technology, their yields have improved and stabilised to some extent. About two-third of the cultivated area under these crops is irrigated. These oilseeds together occupy only about 2.5 per cent of total cropped area in the country. Rajasthan contributes about one-third production while other leading producers are Haryana and Madhya Pradesh. Yields of these crops are comparatively high in Haryana and Rajasthan.

Other Oilseeds

Soyabean and sunflower are other important oilseeds grown in India. Soyabean is mostly grown in Madhya Pradesh and Maharashtra.

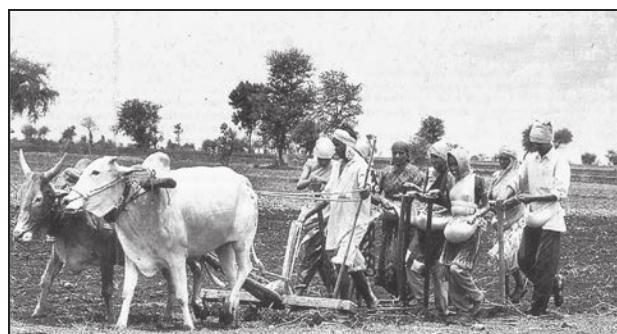


Fig. 3.5 : Farmers sowing soyabean seeds in Amravati, Maharashtra

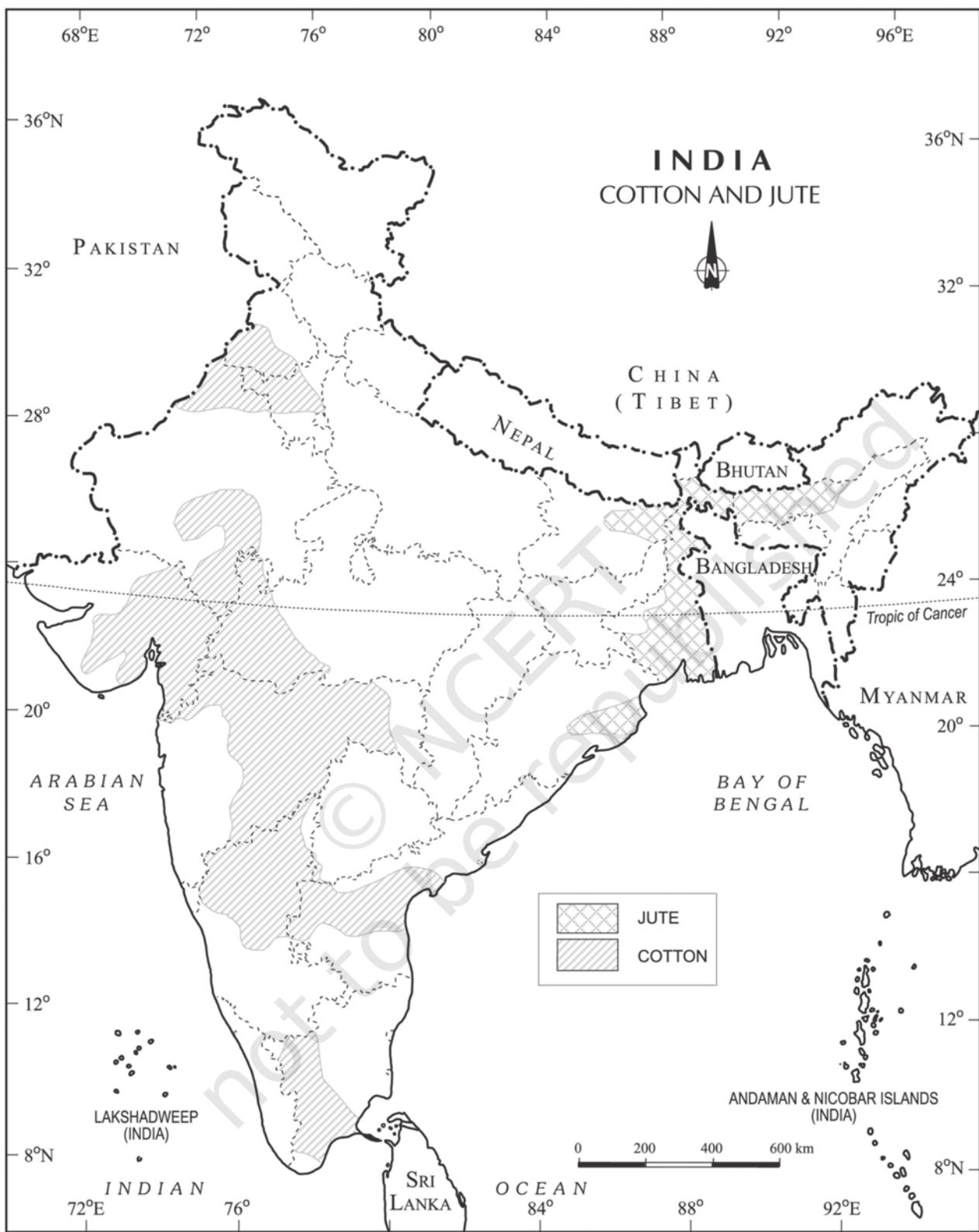


Fig. 3.6 : India – Distribution of Cotton and Jute

These two states together produce about 90 per cent of total output of soyabean in the country. Sunflower cultivation is concentrated in Karnataka, Andhra Pradesh, Telangana and adjoining areas of Maharashtra. It is a minor crop in northern parts of the country where its yield is high due to irrigation.

Fibre Crops

These crops provide us fibre for preparing cloth, bags, sacks and a number of other items. Cotton and jute are two main fibre crops grown in India.

Cotton

Cotton is a tropical crop grown in *kharif* season in semi-arid areas of the country. India lost a large proportion of cotton growing area to Pakistan during partition. However, its acreage has increased considerably during the last 50 years. India grows both short staple (Indian) cotton as well as long staple (American) cotton called '*narma*' in north-western parts of the country. Cotton requires clear sky during flowering stage.



Fig. 3.7 : Cotton Cultivation

India ranks second in the world in the production of cotton after China. Cotton occupies about 4.7 per cent of total cropped area in the country. There are three cotton growing areas, i.e. parts of Punjab, Haryana and northern Rajasthan in north-west, Gujarat and Maharashtra in the west and plateaus of Andhra Pradesh, Karnataka and Tamil Nadu in south. Leading producers of this crop are

Gujarat, Maharashtra and Telangana. Per hectare output of cotton is high under irrigated conditions in north-western region of the country. Its yield is very low in Maharashtra where it is grown under rainfed conditions.

Jute

Jute is used for making coarse cloth, bags, sacks and decorative items. It is a cash crop in West Bengal and adjoining eastern parts of the country. India lost large jute growing areas to East Pakistan (Bangladesh) during partition. At present, India produces about three-fifth of jute production of the world. West Bengal accounts for about three-fourth of the production in the country. Bihar and Assam are other jute growing areas. Being concentrated only in a few states, this crop accounts for only about 0.5 per cent of total cropped area in the country.

Other Crops

Sugarcane, tea and coffee are other important crops grown in India.

Sugarcane

Sugarcane is a crop of tropical areas. Under rainfed conditions, it is cultivated in sub-humid and humid climates. But it is largely an irrigated crop in India. In Indo-Gangetic plain, its cultivation is largely concentrated in Uttar Pradesh. Sugarcane growing area in western India is spread over Maharashtra and Gujarat.



Fig. 3.8 : Sugarcane Cultivation



Fig. 3.9 : India – Distribution of Sugarcane

In southern India, it is cultivated in irrigated tracts of Karnataka, Tamil Nadu, Telangana and Andhra Pradesh.

India was the second largest producer of sugarcane after Brazil in 2018. It accounts for about 19.7 per cent of the world production of sugarcane. But it occupies only 2.4 per cent of total cropped area in the country. Uttar Pradesh produces about two-fifth of sugarcane of the country. Maharashtra, Karnataka, Tamil Nadu, and Andhra Pradesh are other leading producers of this crop where yield level of sugarcane is high. Its yield is low in northern India.

Tea

Tea is a plantation crop used as beverage. Black tea leaves are fermented whereas green tea leaves are unfermented. Tea leaves have rich content of caffeine and tannin. It is an indigenous crop of hills in northern China. It is grown over undulating topography of hilly areas and well-drained soils in humid and sub-humid tropics and sub-tropics. In India, tea plantation started in 1840s in Brahmaputra valley of Assam which still is a major tea growing area in the country. Later on, its plantation was introduced in the sub-Himalayan region of West Bengal (Darjeeling, Jalpaiguri and Cooch Behar districts). Tea is also cultivated on the lower slopes of Nilgiri and



Fig. 3.10 : Tea Farming

Cardamom hills in Western Ghats. India is a leading producer of tea and accounts for about 21.22 per cent of total production in the world 2018. India's share in the international market of tea has declined substantially. It ranks second among tea exporting countries in the

world after China (2018). Assam accounts for about 53.2 per cent of the total cropped area and contributes more than half of total production of tea in the country. West Bengal and Tamil Nadu are the other leading producers of tea.

Coffee

Coffee is a tropical plantation crop. Its seeds are roasted, ground and are used for preparing a beverage. There are three varieties of coffee i.e. *arabica*, *robusta* and *liberica*. India mostly grows superior quality coffee, *arabica*, which is in great demand in International market. But India produces only about 3.17 per cent coffee of the world and *ranks eighth* after Brazil, Vietnam, Indonesia, Colombia, Honduras, Ethiopia and Peru in 2018. Coffee is cultivated in the highlands of Western Ghats in Karnataka, Kerala and Tamil Nadu. Karnataka alone accounts for more than two-third of total production of coffee in the country.

Agricultural Development in India

Indian agricultural economy was largely subsistence in nature before Independence. It had dismal performance in the first half of twentieth century. This period witnessed severe droughts and famines. During partition about one-third of the irrigated land in undivided India went to Pakistan. This reduced the proportion of irrigated area in Independent India. After Independence, the immediate goal of the Government was to increase foodgrains production by (i) switching over from cash crops to food crops; (ii) intensification of cropping over already cultivated land; and (iii) increasing cultivated area by bringing cultivable and fallow land under plough. Initially, this strategy helped in increasing foodgrains production. But agricultural production stagnated during late -1950s. To overcome this problem, Intensive Agricultural District Programme (IADP) and Intensive Agricultural Area Programme (IAAP) were launched. But two consecutive droughts during mid-1960s resulted in food crisis in the country. Consequently, foodgrains were imported from other countries.

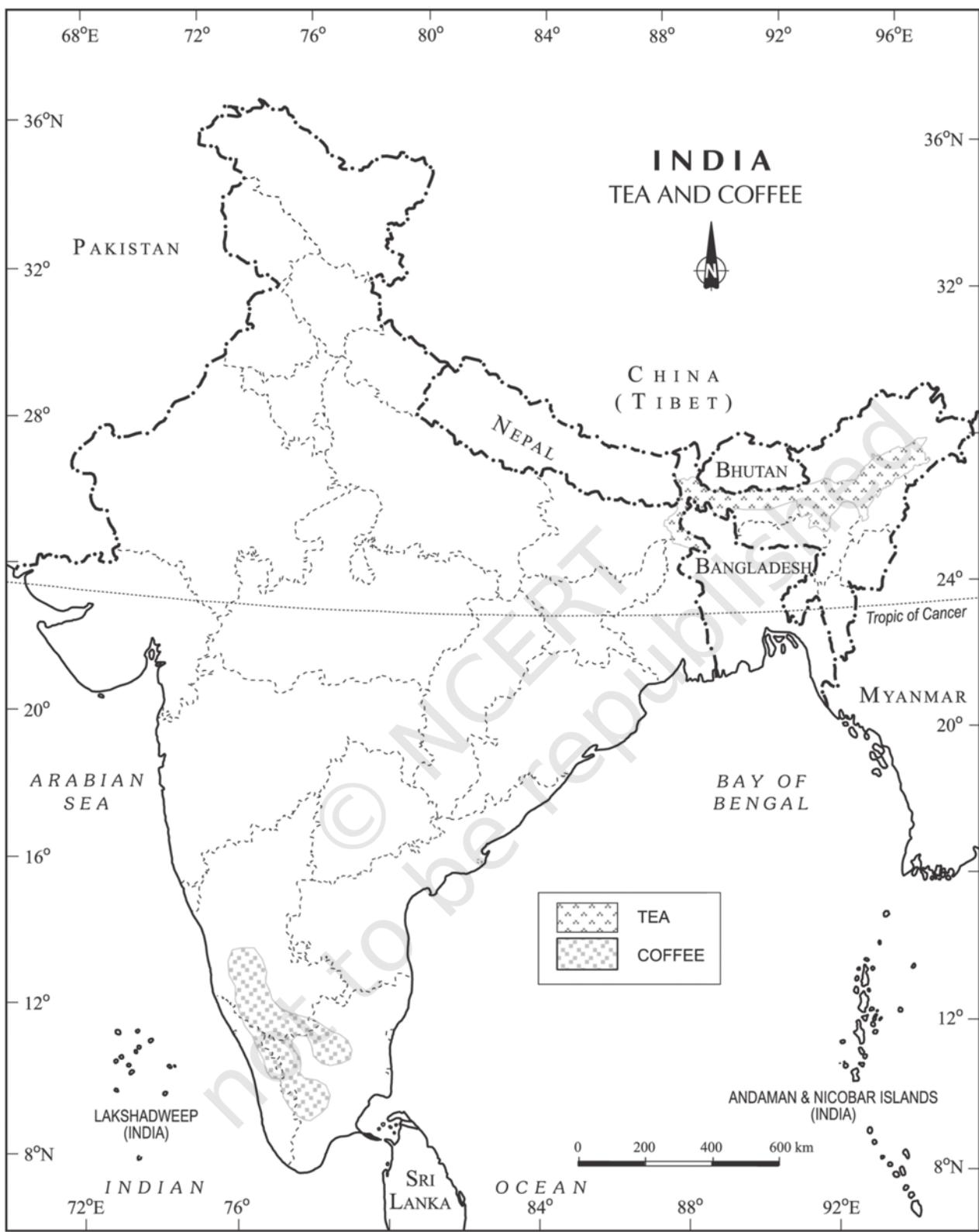


Fig. 3.11 : India - Distribution of Tea and Coffee

New seed varieties of wheat (Mexico) and rice (Philippines) known as high yielding varieties (HYVs) were available for cultivation by mid-1960s. India took advantage of this and introduced package technology comprising HYVs, along with chemical fertilisers in irrigated areas of Punjab, Haryana, Western Uttar Pradesh, Andhra Pradesh and Gujarat. Assured supply of soil moisture through irrigation was a basic pre-requisite for the success of this new agricultural technology. This strategy of agricultural development paid dividends instantly and increased the foodgrains production at very fast rate. This spurt of agricultural growth came to be known as '**Green Revolution**'. This also gave fillip to the development of a large number of agro-inputs, agro-processing industries and small-scale industries. This strategy of agricultural development made the country self-reliant in foodgrain production. But Green Revolution was initially confined to irrigated areas only. This led to regional disparities in agricultural development in the country till 1970s, after which the technology spread to the Eastern and Central parts of the country.

The Planning Commission of India focused its attention on the problems of agriculture in rainfed areas in 1980s. It initiated agro-climatic planning in 1988 to induce regionally balanced agricultural development in the country. It also emphasised on the need for diversification of agriculture and harnessing of resources for the development of dairy farming, poultry, horticulture, livestock rearing and aquaculture.

Initiation of the policy of liberalisation and free market economy in 1990s influenced the course of development of Indian agriculture.

National Mission for Sustainable Agriculture (NMSA)

National Mission for Sustainable Agriculture is to make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated/composite farming systems and to conserve natural resources through appropriate soil and moisture conservation measures. The Government has been promoting organic farming in the country through the scheme such as Paramparagat Krishi Vikas Yojana (PKVY) and Rashtriya Vikas Yojana (RKVY).

Growth of Agricultural Output and Technology

There has been a significant increase in agricultural output and improvement in technology during the last 50 years.

- Production and yield of many crops such as rice and wheat has increased at an impressive rate. Among the other crops, the production of sugarcane, oilseeds and cotton has also increased appreciably.
- Expansion of irrigation has played a crucial role in enhancing agricultural output in the country. It provided basis for introduction of modern agricultural technology, such as high yielding varieties of seeds, chemical fertilisers, pesticides and farm machinery. The net irrigated area in the country has also increased.
- Modern agricultural technology has diffused very fast in various areas of the country. Consumption of chemical fertilizers has increased by 15 times since mid-sixties. Since the high yielding varieties are highly susceptible to pests and diseases, the use of pesticides has increased significantly since 1960s.

Farmer's Portal of India

The Farmer's Portal is a platform for farmers to seek any information related to agriculture. Detailed information on farmers' insurance, agriculture storage, crops, extension activities, seeds, pesticides, farm machineries, etc. is provided. Details of fertilizers, market prices, package and practices, programmes, welfare schemes are also given. Block level details related to soil fertility, storage, insurance, training, etc. are available in an interactive map. Users can also download farm friendly handbook, scheme guidelines, etc.

(Source: <https://www.india.gov.in/farmers-portal-india-department-agriculture-and-cooperation>)

Problems of Indian Agriculture

The nature of problems faced by Indian agriculture varies according to agro-ecological and historical experiences of its different regions. Hence, most of the agricultural problems in the country are region specific. Yet, there are some problems which are common and range from physical constraints to institutional hindrances. A detailed discussion on these problems follows:



Fig. 3.12 : Roto Till Drill—A modern agricultural equipment

Dependence on Erratic Monsoon

Irrigation covers only about 33 per cent of the cultivated area in India. The crop production in rest of the cultivated land directly depends on rain. Poor performance of south-west monsoon also adversely affects the supply of canal water for irrigation. On the other hand, the rainfall in Rajasthan and other drought-prone areas is too meagre and highly unreliable. Even the areas receiving high annual rainfall experience considerable fluctuations. This makes them vulnerable to both droughts and floods. Drought is a common phenomenon in the low rainfall areas, which may also experience occasional floods. The flash floods in drylands of Maharashtra, Gujarat and Rajasthan in 2006 and 2017 are examples of this phenomenon. Droughts and floods continue to be the twin menace in Indian agriculture.

Low productivity

The yield of the crops in the country is low in comparison to the international level. Per hectare output of most of the crops such as rice, wheat, cotton and oilseeds in India is much lower than that of the U.S.A., Russia and Japan. Because of the very high pressure on the land resources, the labour productivity in Indian agriculture is also very low in comparison to international level. The vast rainfed areas of the country, particularly drylands which mostly grow coarse cereals, pulses and oilseeds have low yields.

Why is agricultural productivity low in dry regions?

Constraints of Financial Resources and Indebtedness

The inputs of modern agriculture are very expensive. This resource intensive approach has become unmanageable for marginal and small farmers as they have very meagre or no saving to invest in agriculture. To tide over these difficulties, most of such farmers have resorted to availing credit from various institutions and moneylenders. Crop failures and low returns from agriculture have forced them to fall in the trap of indebtedness.

What are the implications of severe indebtedness? Do you feel that the recent incidents of farmers' suicides in different states of the country are the result of indebtedness?

Lack of Land Reforms

Indian peasantry had been exploited for a long time as there had been unequal distribution of land. Among the three revenue systems operational during British period, i.e., Mahalwari, Ryotwari and Zamindari, the last one was most exploitative for the peasants. After Independence, land reforms were accorded priority, but these reforms were not implemented effectively due to lack of strong political will. Most of the state governments avoided taking politically tough decisions which went against strong political lobbies of landlords. Lack of implementation of land reforms has resulted in continuation of inequitable distribution of cultivable land which is detrimental to agricultural development.

Small Farm Size and Fragmentation of Landholdings

There are a large number of marginal and small farmers in the country. The average size of land holding is shrinking under increasing



DUE TO RISING PRICES, FARMERS MAY GROW SUGARCANE IN MORE AREAS

Oilseeds may lose acreage war to sugarcane, pulses

Ram Sogal

SRINAGAR

Indian farmers are likely to increase the acreages of sugarcane and pulses at the cost of oilseeds (soyabean, rapeseed/mustard) in the current kharif season to meet the growing demand for food commodities vis-a-vis the modest increase in the prices of edible oil. Similarly, in winter, some areas reserved for rape and mustard seeds may be used for chana and wheat. The diversion might be to the extent of 1.5 million tonnes of oilseed, believes BV Mehta, executive director of Soybean Extractors' Association of India.

While this could impact production in oil year '06-'07, Mr Mehta is quick to add that any shortfall could be met by the 3.4 million tonnes of oilseed stocks currently held by Nafed. "The price rise in edible oils as of June '06 has been around 5-7% year-on-year compared with a 25% year-on-year rise in other commodities like sugar, wheat and pulses," Mr Mehta said. "The modulus and rising prices of other commodities like pulses and oilseeds will be a silver lining though in the carry-forward stock held by Nafed."

In western UP, sugarcane is life

AVIJIT GHOSH / TNN

NASIPUR (UP): It's early morning. A bunch of agricultural lorries and tractors laden with sugarcane are racing along the traffic-laden NH 58. A little ahead, a team of bullock carts in similar conditions have formed a pyramidal queue before a sugar mill. In this dusty kashish, it will be hours before the last is delivered.

Outside, Raj Kumar Tyagi of Nasipur village sits by his tractor. His village sits by a massive dust hanging thick in the air. "We are used to waiting," he says. "That's what a crop like sugarcane that almost a year to mature can do."

The wait, from contracts, has been won. "This year, the sugar quantity is good," says Tyagi. "Can-

• 3.5% of oilseed areas may be used for chana or wheat in winter.

• Edible oil prices rose by 5-7% as of June, while sugar, pulses rose by 25%

• Total domestic demand for edible oils is expected to be about 12m tonnes in '06

• India's dependence on imports will be around 4-5% of its consumption requirement



of 4m tonnes. The country's dependence on imports will continue to be around 40% of its consumption requirement, according to Mr Mehta.

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Degradation of Cultivable Land

One of the serious problems that arises out of faulty strategy of irrigation and agricultural development is degradation of land resources. This is serious because it may lead to depletion of soil fertility. The situation is particularly alarming in irrigated areas. A large tract of agricultural land has lost its fertility due to alkalinisation and salinisation of soils and waterlogging. Excessive use of chemicals such as insecticides and pesticides has led to their concentration in toxic amounts in the soil profile. Leguminous crops have been displaced from the cropping pattern in the irrigated areas.

and duration of fallow has substantially reduced owing to multiple cropping. This has obliterated the process of natural fertilization such as nitrogen fixation. Rainfed areas in humid and semi-arid tropics also experience degradation of several types like soil erosion by water and wind erosion which are often induced by human activities.



Activity

Prepare a list of agricultural problems in your own region. How similar or different are these problems compared to the problems mentioned in this chapter?



EXERCISES



- 2.** Answer the following questions in about 30 words.
- (i) Differentiate between barren and wasteland and culturable wasteland.
 - (ii) How would you distinguish between net sown area and gross cropped area?
 - (iii) Why is the strategy of increasing cropping intensity important in a country like India?
 - (iv) How do you measure total cultivable land?
 - (v) What is the difference between dryland and wetland farming?
- 3.** Answer the following questions in about 150 words.
- (i) What are the different types of environmental problems of land resources in India?
 - (ii) What are the important strategies for agricultural development followed in the post-independence period in India?
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Unit III
Chapter 4



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WATER RESOURCES



Do you think that what exists today will continue to be so, or the future is going to be different in some respects? It can be said with some certainty that the societies will witness demographic transition, geographical shift of population, technological advancement, degradation of environment and water scarcity. Water scarcity is possibly to pose the greatest challenge on account of its increased demand coupled with shrinking supplies due to over utilisation and pollution. Water is a cyclic resource with abundant supplies on the globe. Approximately, 71 per cent of the earth's surface is covered with it but freshwater constitutes only about 3 per cent of the total water. In fact, a very small proportion of freshwater is effectively available for human use. The availability of freshwater varies over space and time. The tensions and disputes on sharing and control of this scarce resource are becoming contested issues among communities, regions, and states. The assessment, efficient use and conservation of water, therefore, become necessary to ensure development. In this chapter, we shall discuss water resources in India, its geographical distribution, sectoral utilisation, and methods of its conservation and management.

Water Resources of India

India accounts for about 2.45 per cent of the world's surface area, 4 per cent of the world's water resources and about 16 per cent of the world's population. The total water available from precipitation in the country in a year is about 4,000 cubic km. The availability from surface water and replenishable groundwater is 1,869 cubic km. Out of this, only 60 per cent can be put to beneficial uses. Thus, the total utilisable water resource in the country is only 1,122 cubic km.

Surface Water Resources

There are four major sources of surface water. These are rivers, lakes, ponds and tanks. In the country, there are about 10,360 rivers and their tributaries longer than 1.6 km each. The mean annual flow in all the river basins

in India is estimated to be 1,869 cubic km. However, due to topographical, hydrological and other constraints, only about 690 cubic km (32 per cent) of the available surface water can be utilised. Water flow in a river depends on size of its catchment area or river basin and rainfall within its catchment area. You have studied in your Class XI textbook "*India : Physical Environment*" that precipitation in India has very high spatial variation, and it is mainly concentrated in Monsoon season. You also have studied in the textbook that some of the rivers in the country like the Ganga, the Brahmaputra, and the Indus have huge catchment areas. Given that precipitation is relatively high in the catchment areas of the Ganga, the Brahmaputra and the Barak rivers, these rivers, although account for only about one-third of the total area in the country, have 60 per cent of the total surface water resources. Much of the annual water flow in south Indian rivers like the Godavari, the Krishna, and the Kaveri has been harnessed, but it is yet to be done in the Brahmaputra and the Ganga basins.

Groundwater Resources

The total replenishable groundwater resources in the country are about 432 cubic km. The level of groundwater utilisation is relatively high in the river basins lying in north-western region and parts of south India.

The groundwater utilisation is very high in the states of Punjab, Haryana, Rajasthan, and Tamil Nadu. However, there are States like Chhattisgarh, Odisha, Kerala, etc., which utilise only a small proportion of their groundwater potentials. States like Gujarat, Uttar Pradesh, Bihar, Tripura and Maharashtra are utilising their groundwater resources at a moderate rate. If the present trend continues, the demands for water would need the supplies. And such situation, will be detrimental to development, and can cause social upheaval and disruptions.

Lagoons and Backwaters

India has a vast coastline and the coast is very indented in some states. Due to this, a number

of lagoons and lakes have formed. The States like Kerala, Odisha and West Bengal have vast surface water resources in these lagoons and lakes. Although, water is generally brackish in these water bodies, it is used for fishing and irrigating certain varieties of paddy crops, coconut, etc.

Water Demand and Utilisation

India has traditionally been an agrarian economy, and about two-third of its population have been dependent on agriculture. Hence, development of irrigation to increase agricultural production has been assigned a very high priority in the Five Year Plans, and multipurpose river valleys projects, like the Bhakra-Nangal, Hirakud, Damodar Valley, Nagarjuna Sagar, Indira Gandhi Canal Project, etc., have been taken up. In fact, India's water demand at present is dominated by irrigational needs.

Agriculture accounts for most of the surface and groundwater utilisation, it accounts for 89 per cent of the surface water and 92 per cent of the groundwater utilisation. While the share of industrial sector is limited to 2 per cent of the surface water utilisation and 5 per cent of the ground-water, the share of domestic sector is higher (9 per cent) in surface water utilisation as compared to groundwater. The share of agricultural sector in total water utilisation is much higher than other sectors. However, in future, with development, the shares of industrial and domestic sectors in the country are likely to increase.

Demand of Water for Irrigation

In agriculture, water is mainly used for irrigation. Irrigation is needed because of spatio-temporal variability in rainfall in the country. The large tracts of the country are deficient in rainfall and are drought prone. North-western India and Deccan plateau constitute such areas. Winter and summer seasons are more or less dry in most part of the country. Hence, it is difficult to practise agriculture without assured





Fig. 4.1 : India - River Basins

irrigation during dry seasons. Even in the areas of ample rainfall like West Bengal and Bihar, breaks in monsoon or its failure creates dry spells detrimental for agriculture. Water need of certain crops also makes irrigation necessary. For instance, water requirement of rice, sugarcane, jute, etc. is very high which can be met only through irrigation.

Provision of irrigation makes multiple cropping possible. It has also been found that irrigated lands have higher agricultural productivity than unirrigated land. Further, the high yielding varieties of crops need regular moisture supply, which is made possible only by a developed irrigation systems. In fact, this is why that green revolution strategy of agriculture development in the country has largely been successful in Punjab, Haryana and western Uttar Pradesh.

In Punjab, Haryana and western Uttar Pradesh, more than 85 per cent of their net sown area is under irrigation. Wheat and rice are grown mainly with the help of irrigation in these states. Of the total net irrigated area 76.1 per cent in Punjab and 51.3 per cent in Haryana are irrigated through wells and tubewells. This shows that these states utilise large proportion of their groundwater potential which has resulted in groundwater depletion in these states.

The over-use of groundwater resources has led to decline in groundwater table in these states. In fact, over withdrawals in some states, like Rajasthan and Maharashtra, has increased fluoride concentration in groundwater, and this practice has led to increase in concentration of arsenic in parts of West Bengal and Bihar.

Activity

Intensive irrigation in Punjab, Haryana and western Uttar Pradesh is increasing salinity in the soil and depletion of groundwater irrigation. Discuss its likely impacts on agriculture.

Emerging Water Problems

The per capita availability of water is dwindling day-by-day due to increase in population. The available water resources are also getting polluted with industrial, agricultural and domestic effluents, and this, in turn, is further limiting the availability of usable water resources.

Deterioration of Water Quality

Water quality refers to purity of water, or water without unwanted foreign substances. Water gets polluted by foreign matters, such as micro-organisms, chemicals, industrial and other wastes. Such matters deteriorate the quality of water and render it unfit for human use. When toxic substances enter lakes, streams, rivers, ocean and other water bodies, they get dissolved or lie suspended in water. This results in pollution of water, whereby quality of water deteriorates affecting aquatic systems. Sometimes, these pollutants also seep down and pollute groundwater. The Ganga and the Yamuna are the two highly polluted rivers in the country.

Activity

Find out which are the major towns/cities located on the bank of the Ganga and its tributaries and major industries they have.

Water Conservation and Management

Since there is a declining availability of freshwater and increasing demand, the need has arisen to conserve and effectively manage this precious life giving resource for sustainable development. Given that water availability from sea/ocean, due to high cost of desalination, is considered negligible, India has to take quick steps and make effective policies and laws, and adopt effective measures for its conservation. Besides developing water-saving technologies and methods, attempts are also to be made to prevent the pollution. There is need to



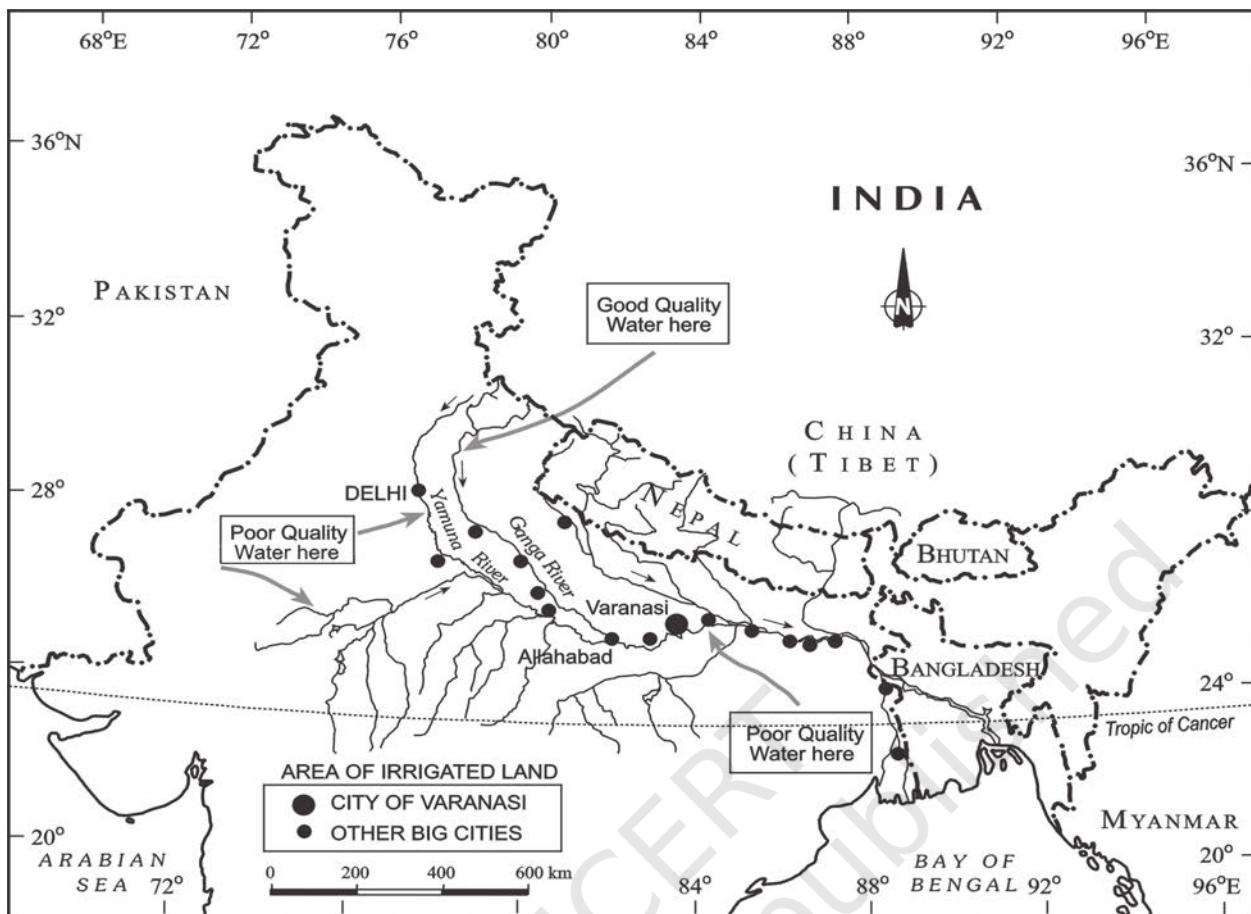


Fig. 4.2 : The Ganga and its Tributaries and Towns Located on them

encourage watershed development, rainwater harvesting, water recycling and reuse, and conjunctive use of water for sustaining water supply in long run.

Prevention of Water Pollution

Available water resources are degrading rapidly. The major rivers of the country generally retain better water quality in less densely populated upper stretches in hilly areas. In plains, river water is used intensively for irrigation, drinking, domestic and industrial purposes. The drains carrying agricultural (fertilizers and insecticides), domestic (solid and liquid wastes), and industrial effluents join the rivers. The concentration of pollutants in rivers,

especially remains very high during the summer season when flow of water is low.

The Central Pollution Control Board (CPCB) in collaboration with State Pollution Control Boards has been monitoring water quality of national aquatic resources at 507 stations. The data obtained from these stations show that organic and bacterial contamination continues to be the main source of pollution in rivers. The Yamuna river is the most polluted river in the country between Delhi and Etawah. Other severely polluted rivers are: the Sabarmati at Ahmedabad, the Gomti at Lucknow, the Kali, the Adyar, the Cooum (entire stretches), the Vaigai at Madurai and the Musi of Hyderabad and the Ganga at Kanpur and Varanasi. Groundwater pollution has occurred due to high

concentrations of heavy/toxic metals, fluoride and nitrates at different parts of the country.

The legislative provisions such as the Water (Prevention and Control of Pollution) Act 1974, and Environment Protection Act 1986 have not been implemented effectively. The result is that in 1997, 251 polluting industries were located along the rivers and lakes. The Water Cess Act, 1977, meant to reduce pollution has also made marginal impacts. There is a strong need to generate public awareness about importance of water and impacts of water pollution. The public awareness and action can be very effective in reducing the pollutants from agricultural activities, domestic and industrial discharges.

Recycle and Reuse of Water

Another way through which we can improve fresh water availability is by recycle and reuse. Use of water of lesser quality such as reclaimed wastewater would be an attractive option for industries for cooling and fire fighting to reduce their water cost. Similarly, in urban areas water after bathing and washing utensils can be used for gardening. Water used for washing vehicle can also be used for gardening. This would conserve better quality of water for drinking purposes. Currently, recycling of water is practised on a limited scale. However, there is enormous scope for replenishing water through recycling.

Rivers of conflict...but also of peace Rich countries poor in supply of water: WWF

Water has been known for centuries to be a major cause of tension and conflict—within countries, as well as among nations. Yet while its propensity to strain relations frequently makes headlines, the other side of the coin—water as an agent of cooperation—rarely gets sufficient attention.

With more than the 260 water basins in the world transcending national borders, it is hardly surprising that the situation is widely seen as being fodder for hostility.

Nevertheless, research has shown much more historical evidence of water as a catalyst for cooperation rather than a trigger of conflict. There are more than

than 500 conflicts over water in the past century, but it's also an agent of cooperation



ALL WELL? There are more than 3,800 declarations or conventions on water, including 285 treaties

3,800 unilateral, bilateral or multilateral declarations or conventions on water 285 are treaties, with 61 referring to over 200 international river basins.

Geneva: Rich countries have to make drastic changes to policies if they are to avoid the water crisis that is facing poorer nations, environmentalists like India and Pakistan, Israel and Jordan. Another example is that of the Northern Aral Sea, shared by Kazakhstan and Uzbekistan. It is being successfully restored after its surface had shrunk to less than half of its original size, losing the battle to a result of massive diversion of water under the Soviet Union, which has governments talked to leaders of the surrounding environment, implement their pledges.

In a survey of the situation across the globe, the UN has

been very difficult."

In Europe, the report said, countries around the Atlantic are suffering from recurring droughts, while in the Mediterranean region water resources were being depleted by the boom in tourism and irrigated agriculture.

In America, already the driest continent, salinity has become a major threat to a large proportion of key farming areas, while in the US wide areas were using substantially more water than could be replenished.

Even in Japan with its high rainfall, contamination of water supplies had become a serious issue.

Climate change? Barmer grapples with floods

Prakash Bhandari | TNN

AND THEY SAY IT'S A DESERT



In the Times of University : A woman carries her child to safety in the flooded Kudla village of Rajasthan's Barmer district



place in Barmer, 500 people in the region died of filarial malaria. The state government's health department is yet to wake up to the situation.

Ironically, this is the same region where the much-touted Indira Gandhi canal brings water across the desert, but it brings its own share of woes. The waters that were to bloom the desert, have also led to a change in eco-system of the desert. Large parts of it have turned marshy and in some places, soil salinity has changed, leading to problems of waterlogging and exports.

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नियंत्रण के लिये वह काम दर्शन ही रहा। लैंडव

SURVIVAL INSTINCT



Water Woes : A father carries his son to safety as he wades through floodwater, after a three-day spell of heavy rain in Dhangala village, near Siliguri

Discuss the issues highlighted in the news items.

Activity

Observe the quantity of water used at your home in various activities and enlist the ways in which the water can be reused and recycled in various activities.

Class teachers should organise a discussion on recycle and reuse of water.

Watershed Management

Watershed management basically refers to efficient management and conservation of surface and groundwater resources. It involves prevention of runoff and storage and recharge of groundwater through various methods like percolation tanks, recharge wells, etc. However, in broad sense watershed management includes conservation, regeneration and judicious use of all resources – natural (like land, water, plants and animals) and human within a watershed. Watershed management aims at bringing about balance between natural resources on the one hand and society on the other. The success of watershed development largely depends upon community participation.

The Central and State Governments have initiated many watershed development and management programmes in the country. Some of these are being implemented by non-governmental organisations also. **Haryali** is a watershed development project sponsored by the Central Government which aims at enabling the rural population to conserve water for drinking, irrigation, fisheries and afforestation. The Project is being executed by Gram Panchayats with people's participation.

Neeru-Meetu (Water and You) programme (in Andhra Pradesh) and **Arvary Pani Sansad** (in Alwar, Rajasthan) have taken up constructions of various water-harvesting structures such as percolation tanks, dug out ponds (*Johad*), check dams, etc., through people's participation. Tamil Nadu has made water harvesting structures in the houses

compulsory. No building can be constructed without making structures for water harvesting.

Watershed development projects in some areas have been successful in rejuvenating environment and economy. However, there are only a few success stories. In majority of cases, the programme is still in its nascent stage. There is a need to generate awareness regarding benefits of watershed development and management among people in the country, and through this integrated water resource management approach water availability can be ensured on sustainable basis.

Rainwater Harvesting

Rainwater harvesting is a method to capture and store rainwater for various uses. It is also used to recharge groundwater aquifers. It is a low cost and eco-friendly technique for preserving every drop of water by guiding the rain water to borewell, pits and wells. Rainwater harvesting increases water availability, checks the declining groundwater table, improves the quality of groundwater through dilution of contaminants, like fluoride and nitrates, prevents soil erosion, and flooding and arrests salt water intrusion in coastal areas if used to recharge aquifers.

Rainwater harvesting has been practised through various methods by different communities in the country for a long time. Traditional rainwater harvesting in rural areas is done by using surface storage bodies, like lakes, ponds, irrigation tanks, etc. In Rajasthan, rainwater harvesting structures locally known as *Kund* or *Tanka* (a covered underground tank) are constructed near or in the house or village to store harvested rainwater (see Fig. 4.3 to understand various ways of rainwater harvesting).

There is a wide scope to use rainwater harvesting technique to conserve precious water resource. It can be done by harvesting rainwater on rooftops and open spaces. Harvesting rainwater also decreases the



Watershed Development in Ralegan Siddhi, Ahmadnagar, Maharashtra: A Case Study

Ralegan Siddhi is a small village in the district of Ahmadnagar, Maharashtra. It has become an example for watershed development throughout the country.

In 1975, this village was caught in a web of poverty and illicit liquor trade. The transformation took place when a retired army personnel, settled down in the village and took up the task of watershed development. He convinced villagers about the importance of family planning and voluntary labour; preventing open grazing, felling trees, and liquor prohibition.

Voluntary labour was necessary to ensure minimum dependence on the government for financial aids. "It socialised the costs of the projects." explained the activist. Even those who were working outside the village contributed to the development by committing a month's salary every year.

Work began with the percolation tank constructed in the village. In 1975, the tank could not hold water. The embankment wall leaked. People voluntarily repaired the embankment. The seven wells below it swelled with water in summer for the first time in the living memory of the people. The people reposed their faith in him and his visions.

A youth group called Tarun Mandal was formed. The group worked to ban the dowry system, caste discrimination and untouchability. Liquor distilling units were removed and prohibition imposed. Open grazing was completely banned with a new emphasis on stall-feeding. The cultivation of water-intensive crops like sugarcane was banned. Crops such as pulses, oilseeds and certain cash crops with low water requirements were encouraged.

All elections to local bodies began to be held on the basis of consensus. "It made the community leaders complete representatives of the people." A system of Nyay Panchayats (informal courts) were also set up. Since then, no case has been referred to the police.

A Rs.22 lakh school building was constructed using only the resources of the village. No donations were taken. Money, if needed, was borrowed and paid back. The villagers took pride in this self-reliance. A new system of sharing labour grew out of this infusion of pride and voluntary spirit. People volunteered to help each other in agricultural operation. Landless labourers also gained employment. Today the village plans to buy land for them in adjoining villages.



Ralegan Siddhi before mitigation approach



Ralegan Siddhi after mitigation approach

Landless labourers also gained employment. Today the village plans to buy land for them in adjoining villages.

At present, water is adequate; agriculture is flourishing, though the use of fertilisers and pesticides is very high. The prosperity also brings the question of ability of the present generation to carry on the work after the leader of the movement who declared that, "The process of Ralegan's evolution to an ideal village will not stop. With changing times, people tend to evolve new ways. In future, Ralegan might present a different model to the country."

What a mitigation approach can do? A success story.



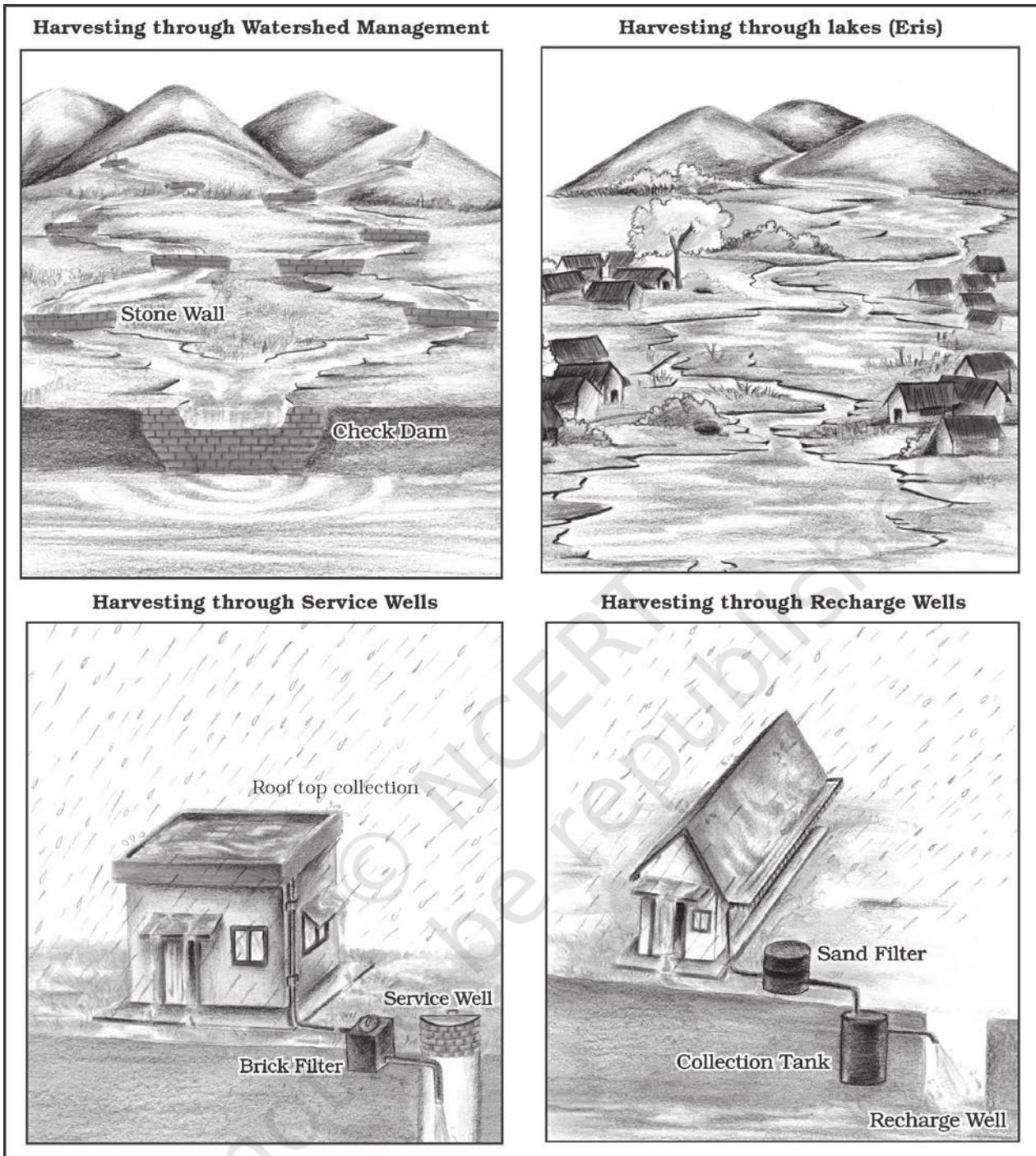


Fig. 4.3 : Various Methods of Rainwater Harvesting

community dependence on groundwater for domestic use. Besides bridging the demand-supply gap, it can also save energy to pump groundwater as recharge leads to rise in groundwater table. These days rainwater

harvesting is being taken up on massive scale in many states in the country. Urban areas can specially benefit from rainwater harvesting as water demand has already outstripped supply in most of the cities and towns.

Apart from the above mentioned factors, the issue desalination of water particularly in coastal areas and brackish water in arid and semi-arid areas, transfer of water from water surplus areas to water deficit areas through inter-linking of

rivers can be important remedies for solving water problem in India (read more about inter linking of rivers). However, the most important issue from the point of view of individual users, household and communities is pricing of water.

Highlights of India's National Water Policy, 2002

The National Water Policy 2002 stipulates water allocation priorities broadly in the following order: drinking water; irrigation, hydro-power, navigation, industrial and other uses. The policy stipulates progressive new approaches to water management. Key features include:

- Irrigation and multi-purpose projects should invariably include drinking water component, wherever there is no alternative source of drinking water.
- Providing drinking water to all human beings and animals should be the first priority.
- Measures should be taken to limit and regulate the exploitation of groundwater.
- Both surface and groundwater should be regularly monitored for quality. A phased programme should be undertaken for improving water quality.
- The efficiency of utilisation in all the diverse uses of water should be improved.
- Awareness of water as a scarce resource should be fostered.
- Conservation consciousness should be promoted through education, regulation, incentives and disincentives.

Source : Government of India (2002), 'India's Reform Initiatives in Water Sector', Ministry for Rural Development, New Delhi

Activity

Collect information about National Water Policy, 2012, and Ganga Rejuvenation from the website (www.wrmin.nic.in) and discuss in the classroom.

Jal Kranti Abhiyan (2015-16)

Water is a recyclable resource but its availability is limited and the gap between supply and demand will be widening over time. Climate change at the global scale will be creating water stress conditions in many regions of the world. India has a unique situation of high population growth and rapid economic development with high water demand. The *Jal Kranti Abhiyan* launched by the Government of India in 2015–16 with an aim to ensure water security through per capita availability of water in the country. People in different regions of India had practised the traditional knowledge of water conservation and management to ensure water availability.

The *Jal Kranti Abhiyan* aims at involving local bodies, NGOs and citizens, at large, in creating awareness regarding its objectives. The following activities have been proposed under the *Jal Kranti Abhiyan*:

1. Selection of one water stressed village in each 672 districts of the country to create a 'Jal Gram'.
2. Identification of model command area of about 1000 hectares in different parts of the country, for example, UP, Haryana (North), Karnataka, Telangana, Tamil Nadu (South), Rajasthan, Gujarat (West), Odisha (East), Meghalaya (North-East).
3. Abatement of pollution:
 - Water conservation and artificial recharge.
 - Reducing groundwater pollution.
 - Construction of Arsenic-free wells in selected areas of the country.
4. Creating mass awareness through social media, radio, TV, print media, poster and essay writing competitions in schools.

Jal Kranti Abhiyan is designed to provide livelihood and food security through water security.



EXERCISES

- 1.** Choose the right answers of the following from the given options.
 - (i) Which one of the following types describes water as a resource?

(a) Abiotic resource	(c) Biotic Resource
(b) Non-renewable Resources	(d) Non-cyclic Resource
 - (ii) Which one of the following south Indian states has the highest groundwater utilisation (in per cent) of its total ground water potential?

(a) Tamil Nadu	(c) Andhra Pradesh
(b) Karnataka	(d) Kerala
 - (iii) The highest proportion of the total water used in the country is in which one of the following sectors?

(a) Irrigation	(c) Domestic use
(b) Industries	(d) None of the above
- 2.** Answer the following questions in about 30 words.
 - (i) It is said that the water resources in India have been depleting very fast. Discuss the factors responsible for depletion of water resources?
 - (ii) What factors are responsible for the highest groundwater development in the states of Punjab, Haryana, and Tamil Nadu?

- (iii) Why the share of agricultural sector in total water used in the country is expected to decline?
 - (iv) What can be possible impacts of consumption of contaminated/unclean water on the people?
- 3.** Answer the following questions in about 150 words.
- (i) Discuss the availability of water resources in the country and factors that determine its spatial distribution?
 - (ii) The depleting water resources may lead to social conflicts and disputes. Elaborate it with suitable examples?
 - (iii) What is watershed management? Do you think it can play an important role in sustainable development?
-
-
-



Unit III
Chapter 5



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MINERAL AND ENERGY RESOURCES



India is endowed with a rich variety of mineral resources due to its varied geological structure. Bulk of the valuable minerals are products of pre-palaeozoic age (Refer: Chapter 2 of Class XI, Textbook: “*Fundamentals of Physical Geography*” and are mainly associated with metamorphic and igneous rocks of the peninsular India. The vast alluvial plain tract of north India is devoid of minerals of economic use. The mineral resources provide the country with the necessary base for industrial development. In this chapter, we shall discuss the availability of various types of mineral and energy resources in the country.

A mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties.

Types of Mineral Resources

On the basis of chemical and physical properties, minerals may be grouped under two main categories of metallics and non-metallics which may further be classified as follows :

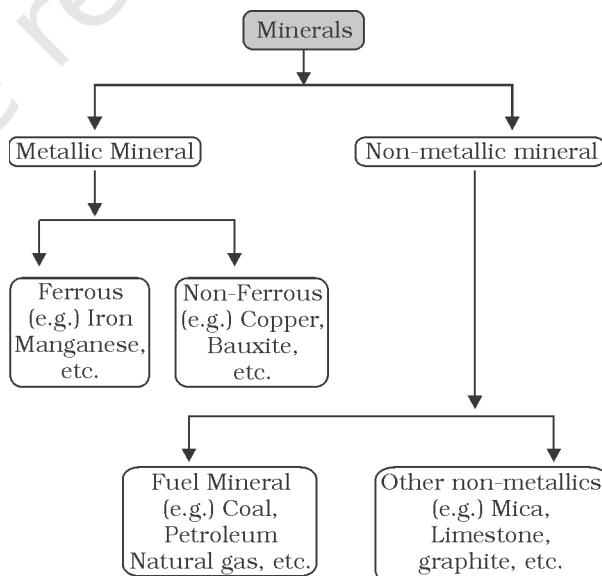


Fig. 5.1 : Classification of Minerals

As, it is clear from the Fig. 5.1 metallic minerals are the sources of metals. Iron ore, copper, gold produce metal and are included in this category. Metallic minerals are further divided into ferrous and non-ferrous metallic minerals. Ferrous, as you know, refers to iron. All those minerals which have iron content are ferrous such as iron ore itself and those which do not have iron content are non-ferrous such as copper, bauxite, etc.

Non-metallic minerals are either organic in origin such as fossil fuels also known as mineral fuels which are derived from the buried animal and plant life such as coal and petroleum. Other type of non-metallic minerals are inorganic in origin such as mica, limestone and graphite, etc.

Minerals have certain characteristics. These are unevenly distributed over space. There is inverse relationship in quality and quantity of minerals i.e. good quality minerals are less in quantity as compared to low quality minerals. The third main characteristic is that all minerals are exhaustible over time. These take long to develop geologically and they cannot be replenished immediately at the time of need. Thus, they have to be conserved and not misused as they do not have the second crop.

Distribution of Minerals in India

Most of the metallic minerals in India occur in the peninsular plateau region in the old crystalline rocks. Over 97 per cent of coal reserves occur in the valleys of Damodar, Sone, Mahanadi and Godavari. Petroleum reserves are located in the sedimentary basins of Assam, Gujarat and Mumbai High i.e. off-shore region in the Arabian Sea. New reserves have been located in the Krishna-Godavari and Kaveri basins. Most of the major mineral resources occur to the east of a line linking Mangaluru and Kanpur.

Minerals are generally concentrated in three broad belts in India. There may be some sporadic occurrences here and there in isolated pockets. These belts are :

The North-Eastern Plateau Region

This belt covers Chhotanagpur (Jharkhand), Odisha Plateau, West Bengal and parts of Chhattisgarh. Have you ever thought about the reason of major iron and steel industry being located in this region? It has variety of minerals viz. iron ore coal, manganese, bauxite, mica.

Find out the specific region where these minerals are being extracted.

The South-Western Plateau Region

This belt extends over Karnataka, Goa and contiguous Tamil Nadu uplands and Kerala. This belt is rich in ferrous metals and bauxite. It also contains high grade iron ore, manganese and limestone. This belt lacks in coal deposits except Neyveli lignite.

This belt does not have as diversified mineral deposits as the north-eastern belt. Kerala has deposits of monazite and thorium, bauxite clay. Goa has iron ore deposits.

The North-Western Region

This belt extends along Aravali in Rajasthan and part of Gujarat and minerals are associated with Dharwar system of rocks. Copper, zinc have been major minerals. Rajasthan is rich in building stones i.e. sandstone, granite, marble. Gypsum and Fuller's earth deposits are also extensive. Dolomite and limestone provide raw materials for cement industry. Gujarat is known for its petroleum deposits. You may be knowing that Gujarat and Rajasthan both have rich sources of salt.

Why and where Dandi March was organised by Mahatma Gandhi?

The Himalayan belt is another mineral belt where copper, lead, zinc, cobalt and tungsten are known to occur. They occur on both the eastern and western parts. Assam valley has



mineral oil deposits. Besides oil resources are also found in off-shore-areas near Mumbai Coast (Mumbai High).

In the following pages you will find the spatial pattern of some of the important minerals.

Ferrous Mineral

Ferrous minerals such as iron ore, manganese, chromite, etc., provide a strong base for the development of metallurgical industries. Our country is well-placed in respect of ferrous minerals both in reserves and production.

Iron Ore

India is endowed with fairly abundant resources of iron ore. It has the largest reserve of iron ore in Asia. The two main types of ore found in our country are *haematite* and *magnetite*. It has great demand in international market due to its superior quality. The iron ore mines occur in close proximity to the coal fields in the north-eastern plateau region of the country which adds to their advantage.

About 95 per cent of total reserves of iron ore is located in the States of Odisha, Jharkhand, Chhattisgarh, Karnataka, Goa, Telangana, Andhra Pradesh and Tamil Nadu. In Odisha, iron ore occurs in a series of hill ranges in Sundergarh, Mayurbhanj and Jharkhand. The important mines are Gurumahisani, Sulaipet, Badampahar (Mayurbhaj), Kiruburu (Kendujhar) and Bonai (Sundergarh). Similar hill ranges, Jharkhand has some of the oldest iron ore mines and most of the iron and steel plants are located around them. Most of the important mines such as Noamundi and Gua are located in Poorbi and Pashchimi Singhbhum districts. This belt further extends to Durg, Dantewara and Bailadila. Dalli, and Rajhara in Durg are the important mines of iron ore in the country. In Karnataka, iron ore deposits occur in Sandur-Hospet area of Ballari district, Baba Budan hills and Kudremukh in Chikkamagaluru district and

Iron ore mining gets a boost

The iron ore mining industry in India is attracting several new players, both large and small.

Any industrialized nation requires vast quantities of iron ore, which is the basic raw material from which iron and steel are made. India is no exception, and its dependence on imports for iron ore has necessitated huge reserves of iron and steel. Iron ore is produced in approximately 45 countries, and world resources are estimated to exceed 100 billion tonnes. Iron ore contains more than 230 billion tons of iron. While Brazil and China are world leaders in iron ore production and consumption, India ranks sixth in terms of iron ore deposits. Interestingly however, India's per capita mineral consumption is one of the lowest in the world.



The Indian ferrous industry can be divided into two miners and processors. Oresellers are engaged in mining activities to extract the ore, largely for the use of producers. Key players include National Mineral Development Corporation (NMDC), Kirurnmangan Ore Co (KIOCL), Boral Mining & Industries Ltd, and Sesa Goa (Sesa). Other players like the Reliance brother PVG group, which has tied up with the Kathputli-based Ghoshal Group to form Star PVG exports are also making a mark. Iron ore mines are mostly located in Jharkhand, Orissa, West Bengal, Chhattisgarh and Karnataka. Recently however, some foreign manufacturing companies have invested in steel and coal mines abroad, such as in Australia.

Producers are classified into main or integrated producers, i.e., oil and gas based, account for 6% of all crude steel production in joint integrated steel products of India Ltd (SAIL), Reliance (RIL), and TCS.



The best known private sector companies in the country are SAIL and TISCO. They have their own captive mines. The other secondary producers include re-rollers and smelters, all of whom use either sponge or concentrated ingots, and account for the remaining 88% of India's steel production. Steel stone producers produce sponge iron and pig iron to be used by the steel producers. India is the largest producer of coal based sponge iron in the world, and accounts for 15% of the global output. Lildi Steel & Power Ltd. is the largest producer of coal based sponge iron in India - it is also the largest in the world - with a capacity of 660,000 TPA. KIOCL, Sesa Goa and Ultra Ispat are the major producers of pig iron. Integrated steel producers, such as SAIL, also produce a significant amount of pig iron.

While iron ore is a major component of the steel manufacturing process, scrap is often used to supplement it, though it is relatively less expensive. Scrap is available in large quantities in the world, and is used as a substitute for iron ore in steel production. The use of scrap in steel production is increasing rapidly, especially in developed countries like the US and Japan.

Can you find out its reason?

Iron ore consumption than crude steel. However, imports of iron ore are not a direct indicator of a change in iron ore consumption in any country that produces iron ore.

The Government of India has taken several steps to promote the growth of the mineral sector under the overall framework of the National Mineral Policy, 1999. The amended Mineral Policy (1999) and the Mines and Minerals (Development and Regulation) Act (MMDR Act) is aimed at attracting private investment and foreign direct investment (FDI) into the sector. It is estimated that the production of iron ore during the term plan period (2012-13 to 2016-17) will increase by 60% compared with the Plan period. The Government also regulates the amount of iron ore to be extracted to counter pollution. Modern excavation and mining techniques have been developed which help minimize damage to the environment.

Export of high-grade iron ore has been so far controlled through the Mines and Minerals Trading Committee (the MMTC), and additional restrictions were imposed by the Government to ensure that indigenous demand was met before any surplus could be exported. However, a shift in this policy is expected.

With the number of end user industries in India growing at a significant rate, the production of steel based products is very prospective, drawing a long term future for the mineral resources of India.

parts of Shivamogga, Chitradurg and Tumakuru districts. The districts of Chandrapur, Bhandara and Ratnagiri in Maharashtra, Karimnagar and Warangal district of Telangana, Kurnool, Cuddapah and Anantapur districts of Andhra Pradesh, Salem and Nilgiris districts of Tamil Nadu are other iron mining regions. Goa has also emerged as an important producer of iron ore.

Manganese

Manganese is an important raw material for smelting of iron ore and also used for manufacturing ferro alloys. Manganese deposits are found in almost all geological formations, however, it is mainly associated with Dharwar system.

Odisha is the leading producer of Manganese. Major mines in Odisha are located in the central part of the iron ore belt of India, particularly in Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi and Bolangir.



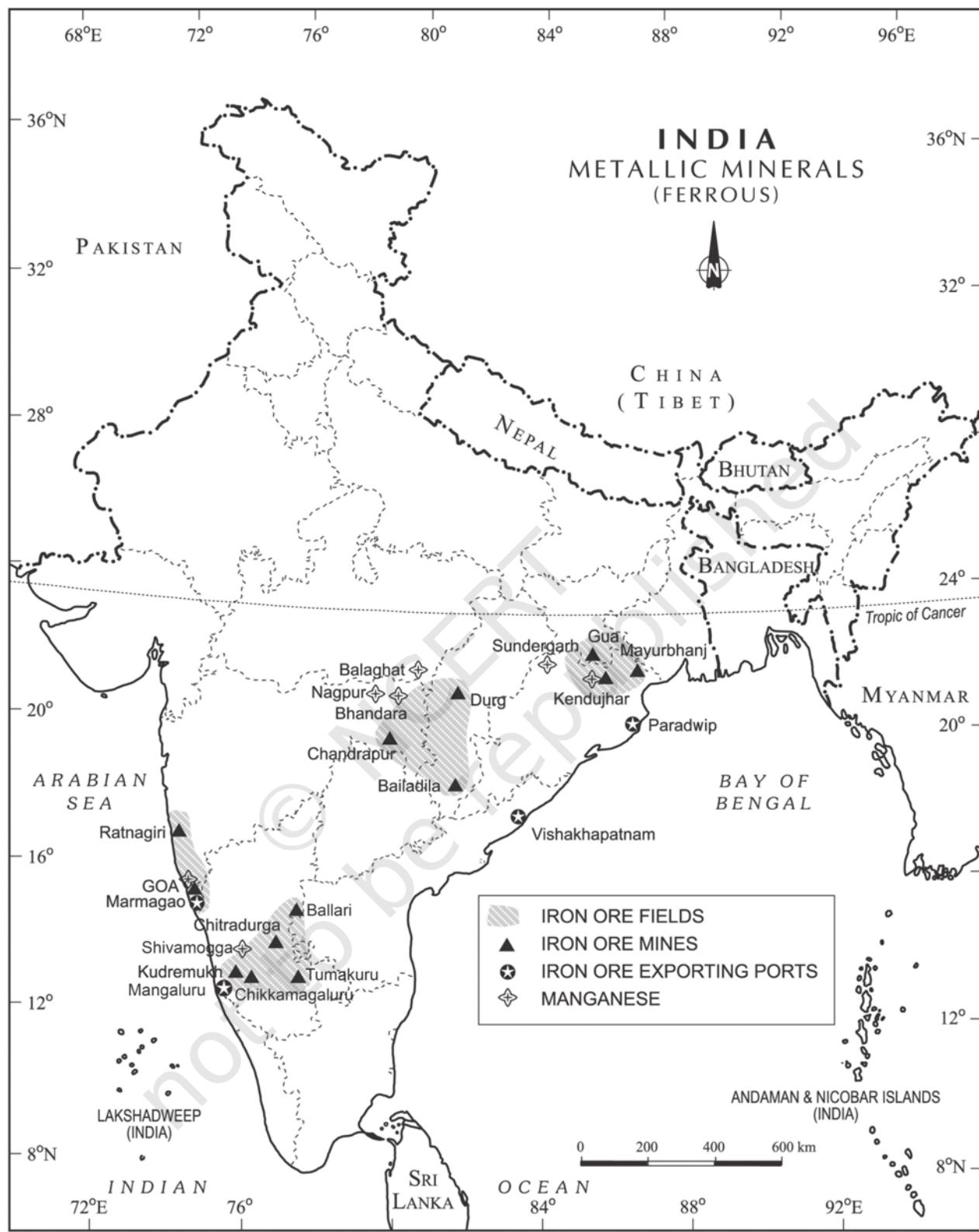


Fig. 5.2 : India - Metallic Minerals (Ferrous)

Karnataka is another major producer and here the mines are located in Dharwar, Ballari, Belagavi, North Canara, Chikmagaluru, Shivamogga, Chitradurg and Tumakuru. Maharashtra is also an important producer of manganese, which is mined in Nagpur, Bhandara and Ratnagiri districts. The disadvantage to these mines is that they are located far from steel plants. The manganese belt of Madhya Pradesh extends in a belt in Balaghat-Chhindwara-Nimar-Mandla and Jhabua districts.

Telangana, Goa, and Jharkhand are other minor producers of manganese.

Non-Ferrous Minerals

India is poorly endowed with non-ferrous metallic minerals except bauxite.

Bauxite

Bauxite is the ore, which is used in manufacturing of aluminium. Bauxite is found mainly in tertiary deposits and is associated with laterite rocks occurring extensively either on the plateau or hill ranges of peninsular India and also in the coastal tracts of the country.

Odisha happens to be the largest producer of Bauxite. Kalahandi and Sambalpur are the leading producers. The other two areas which have been increasing their production are Bolangir and Koraput. The patlands of Lohardaga in Jharkhand have rich deposits. Gujarat, Chhattisgarh, Madhya Pradesh and Maharashtra are other major producers. Bhavanagar, and Jamnagar in Gujarat have the major deposits. Chhattisgarh has bauxite deposits in Amarkantak plateau while Katni-Jabalpur area and Balaghat in M.P. have important deposits of bauxite. Kolaba, Thane, Ratnagiri, Satara, Pune and Kolhapur in Maharashtra are important producers. Tamil Nadu, Karnataka and Goa are minor producers of bauxite.

Copper

Copper is an indispensable metal in the electrical industry for making wires, electric motors, transformers and generators. It is

alloyable, malleable and ductile. It is also mixed with gold to provide strength to jewellery.

The Copper deposits mainly occur in Singhbhum district in Jharkhand, Balaghat district in Madhya Pradesh and Jhunjhunu and Alwar districts in Rajasthan.

Minor producers of Copper are Agnigundala in Guntur District (Andhra Pradesh), Chitradurg and Hassan districts (Karnataka) and South Arcot district (Tamil Nadu).

Non-metallic Minerals

Among the non-metallic minerals produced in India, mica is the important one. The other minerals extracted for local consumption are limestone, dolomite and phosphate.

Mica

Mica is mainly used in the electrical and electronic industries. It can be split into very thin sheets which are tough and flexible. Mica in India is produced in Jharkhand, Andhra Pradesh, Telanganga and Rajasthan followed by Tamil Nadu, West Bengal and Madhya Pradesh. In Jharkhand, high quality mica is obtained in a belt extending over a distance of about 150 km, in length and about 22 km, in width in lower Hazaribagh plateau. In Andhra Pradesh, Nellore district produces the best quality mica. In Rajasthan, mica belt extends for about 320 kms from Jaipur to Bhilwara and around Udaipur. Mica deposits also occur in Mysuru and Hasan districts of Karnataka, Coimbatore, Tiruchirapalli, Madurai and Kanniyanumkari in Tamil Nadu, Alleppey in Kerala, Ratnagiri in Maharashtra, Purulia and Bankura in West Bengal.

Energy Resources

Mineral fuels are essential for generation of power, required by agriculture, industry, transport and other sectors of the economy. Mineral fuels like coal, petroleum and natural gas (known as fossil fuels), nuclear energy minerals, are the conventional sources of energy. These conventional sources are exhaustible resources.





Coal

Coal is one of the important minerals which is mainly used in the generation of thermal power and smelting of iron ore. Coal occurs in rock sequences mainly of two geological ages, namely Gondwana and tertiary deposits.

About 80 per cent of the coal deposits in India is of bituminous type and is of non-coking grade. The most important Gondwana coal fields of India are located in Damodar Valley. They lie in Jharkhand-Bengal coal belt and the important coal fields in this region are Raniganj, Jharia, Bokaro, Giridih, Karanpura.

Jharia is the largest coal field followed by Raniganj. The other river valleys associated with coal are Godavari, Mahanadi and Sone. The most important coal mining centres are Singrauli in Madhya Pradesh (part of Singrauli coal field lies in Uttar Pradesh), Korba in Chhattisgarh, Talcher and Rampur in Odisha, Chanda-Wardha, Kamptee and Bander in Maharashtra and Singareni in Telangana and Pandur in Andhra Pradesh.

Tertiary coals occur in Assam, Arunachal Pradesh, Meghalaya and Nagaland. It is extracted from Darangiri, Cherrapunji, Mewlong and Langrin (Meghalaya); Makum, Jaipur and Nazira in upper Assam, Namchik – Namphuk (Arunachal Pradesh) and Kalakot (Jammu and Kashmir).

Besides, the brown coal or lignite occur in the coastal areas of Tamil Nadu, Puducherry, Gujarat and Jammu and Kashmir.

Petroleum

Crude petroleum consists of hydrocarbons of liquid and gaseous states varying in chemical composition, colour and specific gravity. It is an essential source of energy for all internal combustion engines in automobiles, railways and aircraft. Its numerous by-products are

processed in petrochemical industries, such as fertiliser, synthetic rubber, synthetic fibre, medicines, vaseline, lubricants, wax, soap and cosmetics.

DO YOU KNOW ?

Petroleum is referred to as liquid gold because of its scarcity and diversified uses.

Crude petroleum occurs in sedimentary rocks of the tertiary period. Oil exploration and production was systematically taken up after the Oil and Natural Gas Commission was set up in 1956. Till then, Digboi in Assam was the only oil producing region but the scenario changed after 1956. In recent years, new oil deposits have been found at the extreme western and eastern parts of the country. In Assam, Digboi, Naharkatiya and Moran are important oil producing areas. The major oilfields of Gujarat are Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba and Lunej. Mumbai High which lies 160 km off Mumbai was discovered in 1973 and production commenced in 1976. Oil and natural gas have been found in exploratory wells in Krishna-Godavari and Kaveri basin on the east coast.

Oil extracted from the wells is crude oil and contains many impurities. It cannot be used directly. It needs to be refined. There are two types of refineries in India: (a) field-based and (b) market-based. Digboi is an example of field-based and Barauni is an example of market-based refinery.

Natural Gas

Natural Gas is found with petroleum deposits and is released when crude oil is brought to





Fig. 5.4 : India – Conventional Energy Resources

Activity: Collect information about cross country natural gas pipelines laid by GAIL (India) under ‘One Nation One Grid’.

the surface. It can be used as a domestic and industrial fuel. It is used as fuel in power sector to generate electricity, for heating purpose in industries, as raw material in chemical, petrochemical and fertiliser industries. With the expansion of gas infrastructure and local city gas distribution (COD) networks, natural gas is also emerging as a preferred transport fuel (CNG) and cooking fuel (PNG) at homes. India's major gas reserves are found in the Mumbai High and allied fields along the west coast which are supplemented by finds in the Cambay basin. Along the East Coast, new reserves of natural gas have been discovered in the Krishna-Godavari basin.

Non-Conventional Energy Sources

Fossil fuel sources, such as coal, petroleum, natural gas and nuclear energy use exhaustible raw materials. Sustainable energy resources are only the renewable energy sources like solar, wind, hydro-geothermal and biomass. These energy sources are more equitably distributed and environment-friendly. The non-conventional energy sources will provide more sustained, eco-friendly cheaper energy after the initial cost is taken care of.

Nuclear Energy Resources

Nuclear energy has emerged as a viable source in recent times. Important minerals used for the generation of nuclear energy are uranium and thorium. Uranium deposits occur in the Dharwar rocks. Geographically, uranium ores are known to occur in several locations along the Singhbhum Copper belt. It is also found in Udaipur, Alwar and Jhunjhunu districts of Rajasthan, Durg district of Chhattisgarh, Bhandara district of Maharashtra and Kullu district of Himachal

Pradesh. Thorium is mainly obtained from monazite and ilmenite in the beach sands along the coast of Kerala and Tamil Nadu. World's richest monazite deposits occur in Palakkad and Kollam districts of Kerala, near Vishakhapatnam in Andhra Pradesh and Mahanadi river delta in Odisha.

Atomic Energy Commission was established in 1948, progress could be made only after the establishment of the Atomic Energy Institute at Trombay in 1954 which was renamed as the Bhabha Atomic Research Centre in 1967. The important nuclear power projects are Tarapur (Maharashtra), Rawatbhata near Kota (Rajasthan), Kalpakkam (Tamil Nadu), Narora (Uttar Pradesh), Kaiga (Karnataka) and Kakrapara (Gujarat).

Solar Energy

Sun rays tapped in photovoltaic cells can be converted into energy, known as solar energy. The two effective processes considered to be very effective to tap solar energy are photovoltaics and solar thermal technology. Solar thermal technology has some relative advantages over all other non-renewable energy sources. It is cost competitive, environment friendly and easy to construct. Solar energy is 7 per cent more effective than coal or oil based plants and 10 per cent more effective than nuclear plants. It is generally used more in appliances like heaters, crop dryers, cookers, etc. The western part of India has greater potential for the development of solar energy in Gujarat and Rajasthan.

Wind Energy

Wind energy is absolutely pollution free, inexhaustible source of energy. The mechanism of energy conversion from blowing wind is simple. The kinetic energy of wind, through turbines is converted into electrical energy. The





Fig. 5.5 : India - Oil Refineries

GEOGRAPHY'S CREATING HISTORY

RIL Seeks GI Status For Jamnagar Petrogoods, KG Basin Gas

G Ganapathy Subramanian &
Soma Banerjee
NEW DELHI

WHAT Darjeeling is to tea, is Jamnagar to diesel? Well, Reliance Industries certainly thinks so. The company has filed an application with the Geographical Indications (GI) Registry under the commerce and industries ministry for GI status to diesel produced from its Jamnagar gas tapped from dem...



Powerful idea: Floating windmills

The ocean and the wind may both come to our aid. In an effort to generate more power. Windpower is seen as nature's answer to man's growing need for power. But the columns of windmills are thought of as eyesores that spoil the beauty of a picturesque place. However, windmills that would float hundreds of miles out at sea could one day help satisfy our energy needs without being eyesores from land, say scientists, reports lscience.com.

Offshore wind turbines are not new, but they typically stand on towers that have to be driven deep into the ocean floor. This arrangement only works in water depths of about 50 feet or less - close enough to shore that they are still visible. Researchers at the Massachusetts Institute of Technology and the National Renewable Energy Laboratory (NREL) have designed a wind turbine that can be attached to a floating platform. Long steel cables would tether the floating platform to a connecting system on an



POWER OF FUTURE: Wind turbines in Drontheim, the Netherlands
chior. The setup is called a "tension leg platform," or TLP, and would be cheaper than fixed towers.

distinct status" of Jamnagar diesel and K-Gas in its filing, the ministry is not

applications could vitiate the very concept of GIs. While the legal and technical

अपारंपरिक स्रोतों से 2000 मे.वा. बिजली पैदा होगी

एस पी सेनी
नई दिल्ली

Floating windmills

"You don't pay anything to be buoyant," said Paul Stavroulakis, an MTT professor of mechanical engineering and naval architecture who was involved in the design. The floating platforms to sway side to side but not bob up and down. Computer simulations the platforms would shift by only about three to six feet and that the bottom of the turbines blades would revolve well above the peak of even the highest wave. Dampers similar to those used to steady skyscrapers during high winds and earthquakes could be used to further reduce sideways motion, the researchers say.

Like the offshore windmills currently in use, the TLP's would use underslung cables to shuttle the electricity to land.

The researchers estimate their floating-mounted turbines could work in water depths ranging from about 100 to 650 feet. This means that in the northeast US, they could be placed about 30 to 100 miles out at sea. Because winds are stronger farther offshore, the floating windmill

उत्पादन को बढ़ा कर 10वीं पंचवर्षीय योजना के अंत तक 11,000 मेगावाट कर दिया जाएगा जो वर्ष 2002-07 के लिए निश्चित उत्पादन से 67 प्रतिशत है। यह जानकारी दुष्पालय को यहाँ अपारंपरिक ऊर्जा स्रोत मंज़ालय में सचिव वी सुधारणायन ने एक विशेष भैट में दी। इसके अलावा मंज़ालय द्वारा अपारंपरिक ऊर्जा स्रोत से उत्पादन के लिए तैयार कर 10वीं पंचवर्षीय योजना में वर्ष 2032 के अंत तक देश में कुल दुष्पालय स्रोतों में अपारंपरिक ऊर्जा स्रोतों से उत्पादित बिजली का हिस्सा 20 से लेकर 30 तक तक होगा। अपारंपरिक ऊर्जा स्रोतों से उत्पादन को बढ़ावा दिया जाना चाहिए ताकि देश के अच्छे परिणाम देने में आप हैं। उत्पादन कहा कि यह और भी अच्छी बात है कि यहाँ ऊर्जा के दिलचस्पी बढ़ती जा रही है और इसके फिल्म मंज़ालय के प्रयासों से अधिक ऊर्जा गोंगों की दिलचस्पी बढ़ती जा रही है और

जिन ऊर्जावाटों में विजिती उत्पादन में वृद्धि

How are the developed countries of the world utilising non-conventional energy resources? Discuss.

permanent wind systems such as the trade winds, westerlies and seasonal wind like monsoon have been used as source of energy. Besides these, local winds, land and sea breezes can also be used to produce electricity.

India, already has started generating wind energy. In Rajasthan, Gujarat, Maharashtra and Karnataka, favourable conditions for wind energy exist.

Tidal and Wave Energy

Ocean currents are the store-house of infinite energy. Since the beginning of seventeenth and eighteenth century, persistent efforts were made to create a more efficient energy system from the ceaseless tidal waves and ocean current.

Large tidal waves are known to occur along the west coast of India. Hence, India has great potential for the development of tidal

energy along the coasts but so far these have not yet been utilised.

Geothermal Energy

When the magma from the interior of earth, comes out on the surface, tremendous heat is released. This heat energy can successfully be tapped and converted to electrical energy. Apart from this, the hot water that gushes out through the geyser wells is also used in the generation of thermal energy. It is popularly known as Geothermal energy. This energy is now considered to be one of the key energy sources which can be developed as an alternate source. The hot springs and geysers are being used since medieval period. In India, a geothermal energy plant has been commissioned at Manikaran in Himachal Pradesh.



The first successful (1890) attempt to tap the underground heat was made in the city of Boise, Idaho (U.S.A.), where a hot water pipe network was built to give heat to the surrounding buildings. This plant is still working.

Bio-energy

Bio-energy refers to energy derived from biological products which includes agricultural residues, municipal, industrial and other wastes. Bio-energy is a potential source of energy conversion. It can be converted into electrical energy, heat energy or gas for cooking. It will also process the waste and garbage and produce energy. This will improve economic life of rural areas in developing countries, reduce environmental pollution, enhance self-reliance and reduce pressure on fuel wood. One such project converting municipal waste into energy is Okhla in Delhi.

Conservation of Mineral Resources

The challenge of sustainable development requires integration of quest for economic development with environmental concerns. Traditional methods of resource use result into generating enormous quantity of waste as well as create other environmental problems. Hence, for sustainable development calls for the protection of resources for the future generations. There is an urgent need to conserve the resources. The alternative energy sources like solar power, wind, wave, geothermal energy are inexhaustible resource. These should be developed to replace the exhaustible resources. In case of metallic minerals, use of scrap metals will enable recycling of metals. Use of scrap is specially significant in metals like copper, lead and zinc in which India's reserves are meagre. Use of substitutes for scarce metals may also reduce their consumption. Export of strategic and scarce minerals must be reduced, so that the existing reserve may be used for a longer period.



EXERCISES



Unit III
Chapter 6



12099CH09

PLANNING AND SUSTAINABLE DEVELOPMENT IN INDIAN CONTEXT



The word ‘planning’ is not new to you as it is a part of everyday usage. You must have used it with reference to preparation for your examination or visit to a hill station. It involves the process of thinking, formulation of a scheme or programme and implementation of a set of actions to achieve some goal. Though it is a very broad term, in this chapter, it has been used with reference to the process of economic development. It is, thus different from the traditional hit-and-miss methods by

On 1 January 2015, the NITI Aayog was formed. India adopted centralised planning after Independence, but subsequently, it graduated into decentralised multi-level planning. The responsibility of plan formulation was with the Planning Commission at the Centre, State and district levels. But on 1 January 2015, the Planning Commission was replaced by the NITI Aayog.

NITI Aayog has been set up with the objective of involving the states in economic policy making for India for providing strategic and technical advice to the Central and State governments.

which reforms and reconstruction are often undertaken. Generally, there are two approaches to planning, i.e., sectoral planning and regional planning. Sectoral planning means formulation and implementation of the sets of schemes or programmes aimed at development of various sectors of the economy, such as agriculture, irrigation, manufacturing, power, construction, transport, communication, social infrastructure and services.

There is no uniform economic development over space in any country. Some areas are more developed and some lag behind. This uneven pattern of development over space necessitates that the planners have a spatial perspective and draw the plans to reduce regional imbalance in development. This type of planning is termed as regional planning.

Target Area Planning

The planning process has to take special care of those areas which have remained economically backward. As you know, the economic development of a region depends upon its resource base. But sometimes resource-rich region also remain backward. Economic development requires technology, as well as, investment besides resources. With the planning experience of about one-and-a-half decades, it was realised that regional imbalances in economic development were getting accentuated. In order to arrest the accentuation of regional and social disparities, the Planning Commission introduced the '*target area*' and *target group* approaches to planning. Some of the examples of programmes directed towards the development of target areas are *Command Area Development Programme*, *Drought Prone Area Development Programme*, *Desert Development Programme*, *Hill Area Development Programme*. The *Small Farmers Development Agency (SFDA)* and *Marginal Farmers Development Agency (MFDA)* which are the examples of target group programme.

In the 8th Five Year Plan special area programmes were designed to develop infrastructure in hill areas, north-eastern states, tribal areas and backward areas.

Hill Area Development Programme

Hill Area Development Programmes were initiated during the Fifth Five Year Plan covering 15 districts comprising all the hilly districts of Uttar Pradesh (present Uttarakhand), Mikir Hill and North Cachar hills of Assam, Darjeeling district of West Bengal and Nilgiri district of Tamil Nadu. The National Committee on the Development of Backward Area in 1981 recommended that all the hill areas in the country having height above 600 m and not covered under tribal sub-plan be treated as backward hill areas.

The detailed plans for the development of hill areas were drawn keeping in view their topographical, ecological, social and economic conditions. These programmes aimed at harnessing the indigenous resources of the hill areas through development of horticulture,

plantation, agriculture, animal husbandry, poultry, forestry and small-scale and village industry.

Drought Prone Area Programme

This programme was initiated during the Fourth Five Year Plan with the objectives of providing employment to the people in drought-prone areas and creating productive assets. Initially, this programme laid emphasis on the construction of labour-intensive civil works. But later on, it emphasised on irrigation projects, land development programmes, afforestation, grassland development and creation of basic rural infrastructure, such as electricity, roads, market, credit and services.

The National Committee on Development of Backward Areas reviewed the performance of this programme. It has been observed that this programme is largely confined to the development of agriculture and allied sectors with major focus on restoration of ecological balance. Since growing population pressure is forcing the society to utilise the marginal lands for agriculture, and, thereby causing ecological degradation, there is a need to create alternative employment opportunities in the drought-prone areas. The other strategies of development of these areas include adoption of integrated watershed development approach at the micro-level. The restoration of ecological balance between water, soil, plants, and human and animal population should be a basic consideration in the strategy of development of drought-prone areas.

The Planning Commission of India (1967) identified 67 districts (entire or partly) of the country prone to drought. The *Irrigation Commission* (1972) introduced the criterion of 30 per cent irrigated area and demarcated the drought-prone areas. Broadly, the drought-prone area in India spread over semi-arid and arid tract of Rajasthan, Gujarat, Western Madhya Pradesh, Marathwada region of Maharashtra, Rayalseema and Telangana plateaus of Andhra Pradesh, Karnataka plateau and highlands and interior parts of Tamil Nadu. The drought-prone areas of Punjab, Haryana and north-Rajasthan are largely protected due to spread of irrigation in these regions.



Case Study – Integrated Tribal Development Project in Bharmaur* Region

Bharmaur tribal area comprises Bharmaur and Holi tehsils of Chamba district of Himachal Pradesh. It is a notified tribal area since 21 November 1975. Bharmaur is inhabited by ‘*Gaddi*’, a tribal community who have maintained a distinct identity in the Himalayan region as they practised transhumance and conversed through *Gaddiali* dialect.

Bharmaur tribal region has harsh climate conditions, low resource base and fragile environment. These factors have influenced the society and Economy of the region. According to the 2011 census, the total population of Bharmaur sub-division was 39,113 i.e., 21 persons per sq km. It is one of the most (economically and socially) backward areas of Himachal Pradesh. Historically, the *Gaddis* have experienced geographical and political isolation and socio-economic deprivation. The economy is largely based on agriculture and allied activities such as sheep and goat rearing.

The process of development of tribal area of Bharmaur started in 1970s when *Gaddis* were included among ‘*scheduled tribes*’. Under

This region lies between 32° 11' N and 32° 41' N latitudes and 76° 22' E and 76° 53'E longitudes. Spread over an area of about 1,818 sq km, the region mostly lies between 1,500 m to 3,700 m above the mean sea level. This region popularly known as the homeland of *Gaddis* is surrounded by lofty mountains on all sides. It has *Pir Panjal* in the north and *Dhauladhar* in the south. In the east, the extension of *Dhauladhar* converges with *Pir Panjal* near *Rohtang Pass*. The river *Ravi* and its tributaries—the *Budhil* and the *Tundahen*, drain this territory, and carve out deep gorges. These rivers divide the region into four physiographic divisions called *Holi*, *Khani*, *Kugti* and *Tundah* areas. Bharmaur experiences freezing weather conditions and snowfall in winter. Its mean monthly temperature in January remains 4°C and in July 26°C.

the Fifth Five Year Plan, the tribal sub-plan was introduced in 1974 and Bharmaur was designated as one of the five Integrated Tribal Development Projects (ITDP) in Himachal Pradesh. This area development plan was aimed at improving the quality of life of the *Gaddis*.

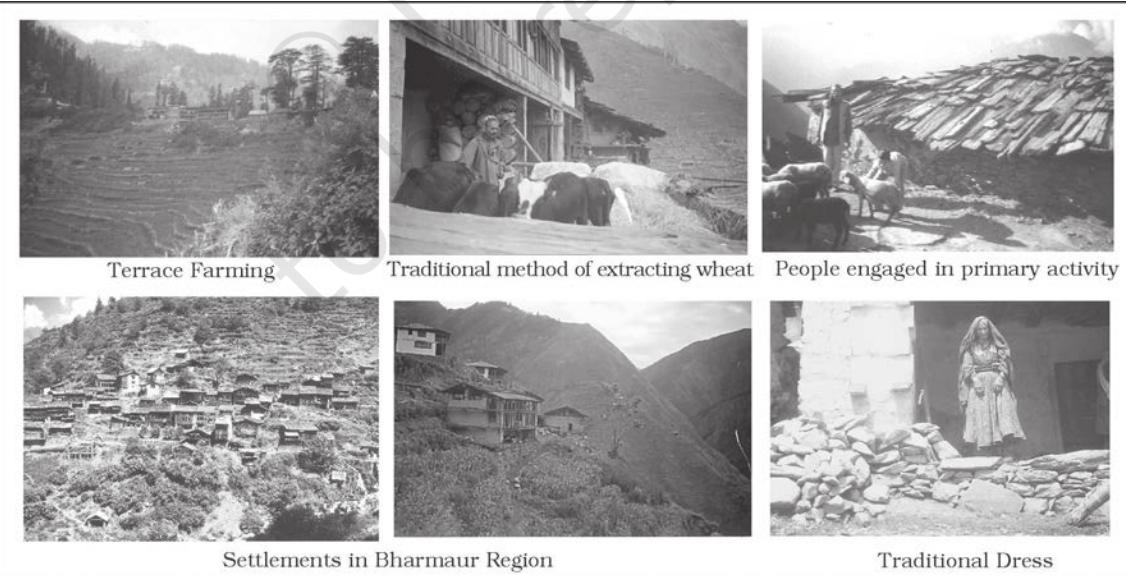


Fig. 6.1

* The name Bharmaur is derived from Sanskrit word Brahmaur. In this book Bharmaur has been used to retain the colloquial flavour.

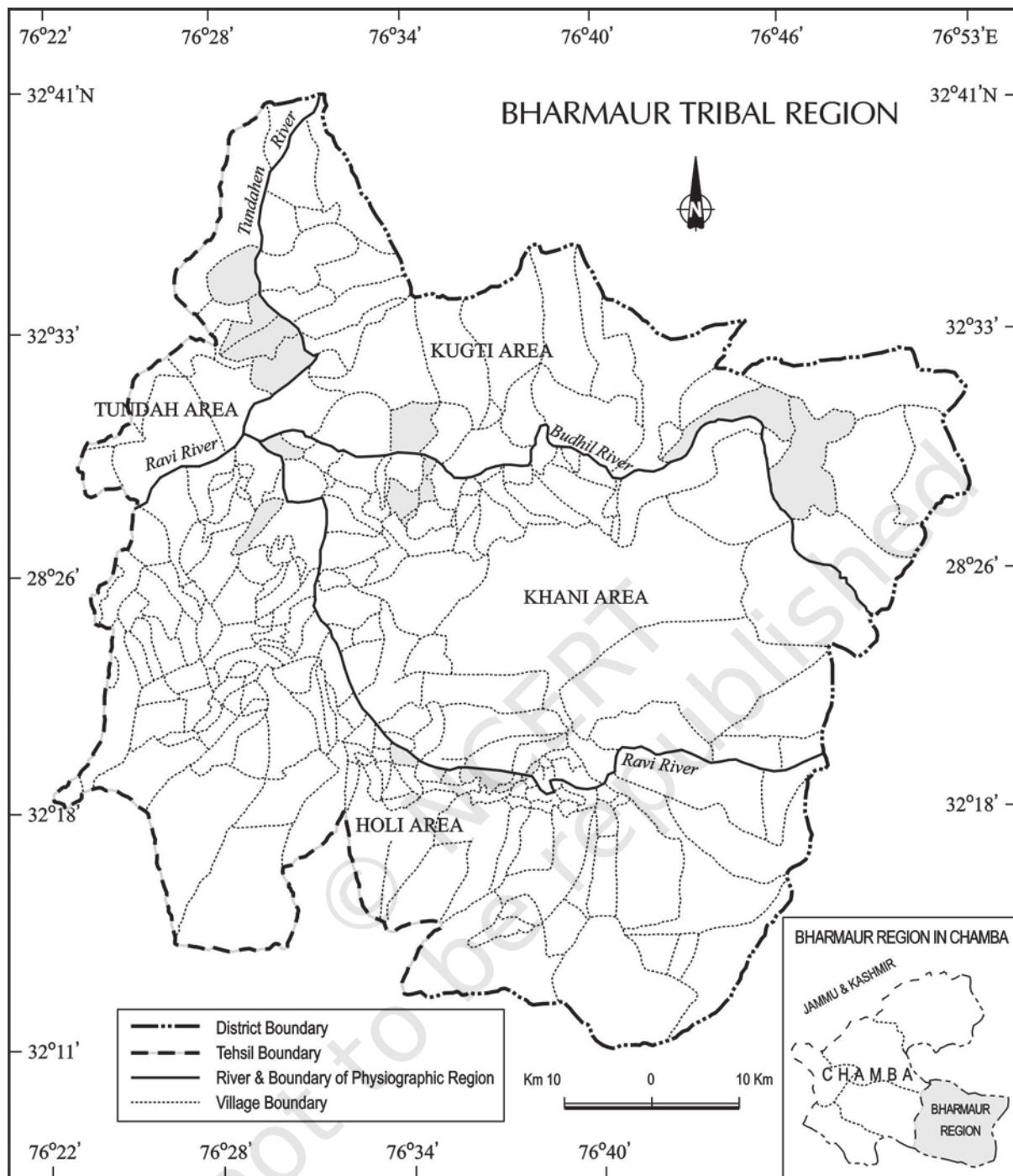


Fig. 6.2

and narrowing the gap in the level of development between Bharmaur and other areas of Himachal Pradesh. This plan laid the highest priority on development of transport and communications, agriculture and allied activities, and social and community services.

The most significant contribution of tribal sub-plan in Bharmaur region is the development of infrastructure in terms of schools, healthcare facilities, potable water, roads, communications and electricity. But the villages located along the river Ravi in Holi and Khani areas are the main

beneficiaries of infrastructural development. The remote villages in Tundah and Kugti areas still do not have sufficient infrastructure.

The social benefits derived from ITDP include tremendous increase in literacy rate, improvement in sex ratio and decline in child marriage. The female literacy rate in the region increased from 1.88 per cent in 1971 to 65 per cent in 2011. The difference between males and females in literacy level i.e. gender inequality, has also declined. Traditionally, the *Gaddis* had subsistence agricultural-cum-pastoral economy having emphasis on foodgrains and livestock production. But during the last three decades of twentieth century, the cultivation of pulses and other cash crops has increased in Bharmaur region. But the crop cultivation is still done with traditional technology. The declining importance of pastoralism in the economy of the region can be gauged from the fact that at present only about one-tenth of the total households practise transhumance. But the *Gaddis* are still very mobile as a sizeable section of them migrate to Kangra and surrounding areas during winter to earn their livings from wage labour.

Sustainable Development

The term development is generally used to describe the state of particular societies and the process of changes experienced by them. During a fairly large period of human history, the state of the societies has largely been determined by the interaction processes between human societies and their bio-physical environment. The processes of human-environment interaction depend upon the level of technology and institutions nurtured by a society. While the technology and institutions have helped in increasing the pace of human-environment interaction, the momentum thus, generated in return has accelerated technological progress and transformation and creation of institutions. Hence, development is a multi-dimensional concept and signifies the positive, irreversible transformation of the economy, society and environment.

The concept of development is dynamic and has evolved during the second half of twentieth

century. In the post World War II era, the concept of development was synonymous to economic growth which is measured in terms of temporal increase in gross national product (GNP) and per capita income/per capita consumption. But, even the countries having high economic growth, experienced speedy rise in poverty because of its unequal distribution. So, in 1970s, the phrases such as *redistribution with growth* and *growth and equity* were incorporated in the definition of development. While dealing with the questions related to redistribution and equity, it was realised that the concept of development cannot be restricted to the economic sphere alone. It also includes the issues such as improving the well-being and living standard of people, availing of the health, education and equality of opportunity and ensuring political and civil rights. By 1980s, development emerged as a concept encapsulating wide-spread improvement in social as well as material well-being of all in a society.

The notion of sustainable development emerged in the wake of general rise in the awareness of environmental issues in the late 1960s in Western World. It reflected the concern of people about undesirable effects of industrial development on the environment. The publication of '**The Population Bomb**' by Ehrlich in 1968 and '**The Limits to Growth**' by Meadows and others in 1972 further raised the level of fear among environmentalists in particular and people in general. This sets the scenario for the emergence of new models of development under a broad phrase '*sustainable development*'.

Concerned with the growing opinion of world community on the environmental issues, the United Nations established a *World Commission on Environment and Development* (WCED) headed by the Norwegian Prime Minister Gro Harlem Brundtland. The Commission gave its report (also known as *Brundtland Report*) entitled '*Our Common Future*' in 1987. The report defines sustainable development as a "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"

Sustainable development takes care of ecological, social and economic aspects of development during the present times and pleads



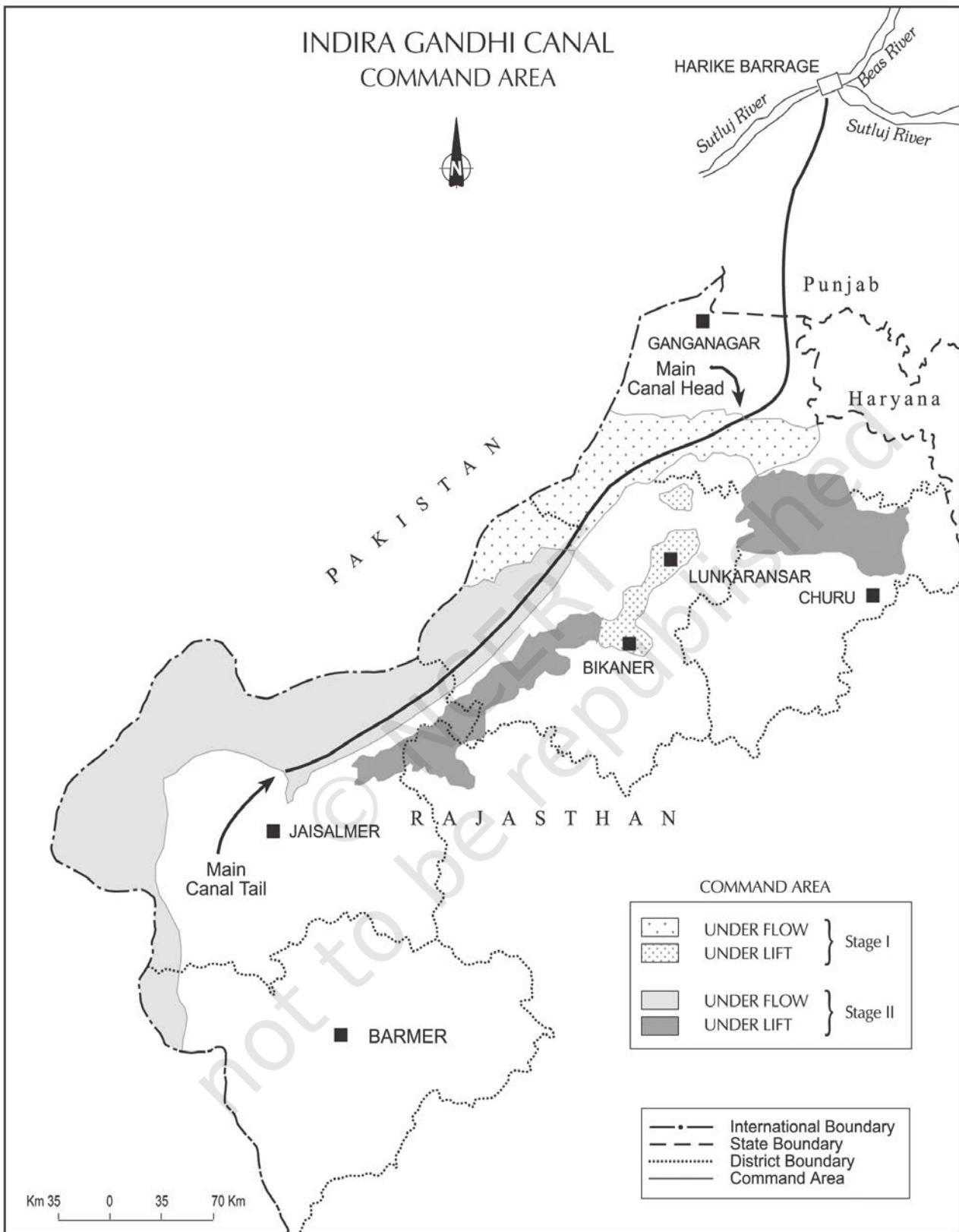


Fig. 6.3



Fig. 6.4: Indira Gandhi Canal

for conservation of resources to enable the future generations to use these resources. It takes into account the development of whole human kind which have common future.

Case Study

Indira Gandhi Canal (Nahar) Command Area

Indira Gandhi Canal, previously known as the Rajasthan Canal, is one of the largest canal systems in India. Conceived by Kanwar Sain in 1948, the canal project was launched on 31 March, 1958. The canal originates at Harike barrage in Punjab and runs parallel to Pakistan border at an average distance of 40 km in Thar Desert (Marusthal) of Rajasthan. The total planned length of the system is 9,060 km catering to the irrigation needs of a total culturable command area of 19.63 lakh hectares. Out of the total command area, about 70 per cent was envisaged to be irrigated by flow system and the rest by lift system. The construction work of the canal system has been carried out through two stages. The command area of Stage-I lies in Ganganagar, Hanumangarh and northern part of Bikaner districts. It has a gently undulating topography and its culturable command area is 5.53 lakh hectares. The command area of Stage-II is spread over Bikaner, Jaisalmer, Barmer, Jodhpur, Nagaur and Churu districts covering culturable command area of 14.10 lakh ha. It comprises desert land dotted with shifting sand dunes and temperature soaring to 50°C in summers. In the lift canal, the water is lifted up to make it to flow



Fig. 6.5 : Indira Gandhi Canal and its adjoining areas

against the slope of the land. All the lift canals of Indira Gandhi Canal system originate at the left bank of main canal while all the canals on the right bank of main canal are flow channels.

Irrigation in Stage-I command area of the canal was introduced in early 1960s, whereas, the command area of Stage-II began receiving irrigation in mid-1980s. The introduction of canal irrigation in this dry land has transformed its ecology, economy and society. It has influenced the environmental conditions of the region both positively as well as negatively. The availability of soil moisture for a longer period of time and various afforestation and pasture development programmes under CAD have resulted in greening the land. This has also helped in reducing wind erosion and siltation of canal systems. But the intensive irrigation and excessive use of water has led to the emergence of twin environmental problems of waterlogging and soil salinity.

Introduction of canal irrigation has brought about a perceptible transformation in the agricultural economy of the region. Soil moisture has been a limiting factor in successful growing of crops in this area. Spread of canal irrigation has led to increase in cultivated area and intensity of cropping. The traditional crops sown in the area, gram, bajra and jowar have been replaced by wheat, cotton, groundnut and rice. This is the result of intensive irrigation. This intensive irrigation, no doubt, initially has led to tremendous increase in agricultural and livestock productivity. This has also caused waterlogging



and soil salinity, and thus, in the long run, it hampers the sustainability of agriculture.

Measures for Promotion of Sustainable Development

The ecological sustainability of Indira Gandhi Canal Project has been questioned by various scholars. Their point of view has also largely been validated by the course of development this region has taken during the last four decades, which has resulted in degradation of physical environment. It is a hard fact that attaining sustainable development in the command area requires major thrust upon the measures to achieve ecological sustainability. Hence, five of the seven measures proposed to promote sustainable development in the command area are meant to restore ecological balance.

- (i) The first requirement is strict implementation of water management policy. The canal project envisages protective irrigation in Stage-I and extensive irrigation of crops and pasture development in Stage-II.
- (ii) In general, the cropping pattern shall not include water intensive crops. It shall be adhered to and people shall be encouraged to grow plantation crops such as citrus fruits.

- (iii) The CAD programmes such as lining of water courses, land development and levelling and *warabandi* system (equal distribution of canal water in the command area of outlet) shall be effectively implemented to reduce the conveyance loss of water.
- (iv) The areas affected by water logging and soil salinity shall be reclaimed.
- (v) The eco-development through afforestation, shelterbelt plantation and pasture development is necessary particularly in the fragile environment of Stage-II.
- (vi) The social sustainability in the region can be achieved only if the land allottees having poor economic background are provided adequate financial and institutional support for cultivation of land.
- (vii) The economic sustainability in the region cannot be attained only through development of agriculture and animal husbandry. The agricultural and allied activities have to develop alongwith other sectors of economy. This shall lead to diversification of economic base and establishment of functional linkages between basic villages, agro-service centres and market centres.





EXERCISES

- 1.** Choose the right answers of the following from the given options.
 - (i) Regional planning relates to :
 - (a) Development of various sectors of economy.
 - (b) Area specific approach of development.
 - (c) Area differences in transportation network.
 - (d) Development of rural areas.
 - (ii) ITDP refers to which one of the following?
 - (a) Integrated Tourism Development Programme
 - (b) Integrated Travel Development Programme
 - (c) Integrated Tribal Development Programme
 - (d) Integrated Transport Development Programme
 - (iii) Which one of the following is the most crucial factor for sustainable development in Indira Gandhi Canal Command Area?
 - (a) Agricultural development
 - (b) Eco-development
 - (c) Transport development
 - (d) Colonisation of land
- 2.** Answer the following questions in about 30 words.
 - (i) What are the social benefits of ITDP in the Bharmaur tribal region?
 - (ii) Define the concept of sustainable development.
 - (iii) What are the positive impacts of irrigation on Indira Gandhi Canal Command Area?
- 3.** Answer the following questions in about 150 words.
 - (i) Write short notes on drought-prone area programme. How does this programme help in the development of dryland agriculture in India?
 - (ii) Suggest the measures of promotion of sustainability in Indira Gandhi Canal Command Area.

Project

- (i) Find out the area development programmes being implemented in your region. Assess the impact of such programmes on the society and economy in your locality.
- (ii) Select your own area or identify an area facing severe environmental and socio-economic problems. Make an assessment of its resources and prepare their inventory. Suggest the measures for its sustainable development as it has been done in the case of Indira Gandhi Canal Command Area.



Unit IV

Chapter 7



12099CH10

TRANSPORT AND COMMUNICATION

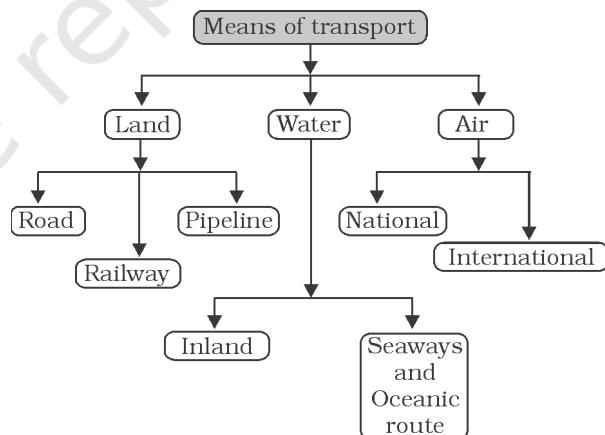


We use many items in our daily life. From toothpaste to our bed tea, milk, clothes, soaps, food items, etc., are required every day. All these can be purchased from the market. Have you ever thought as to how these items are brought from the site of production? All the production is meant for consumption. From the fields and factory, the produce is brought to the place from where consumers purchase it. It is the transportation of these items from the site of their production to the market which make them available to the consumer.

We not only use material things, like fruits, vegetables, books, clothes, etc., but also use ideas, views and messages in our daily life. Do you know we exchange our views, ideas and messages from one place to another or one individual to another while communicating with the help of various means?

The use of transport and communication depends upon our need to move things from place of their availability to the place of their use. Human beings use various methods to move goods, commodities, ideas from one place to another.

The following diagram shows the major means of transportation.



Land Transport

The pathways and unmetalled roads have been used for transportation in India since ancient times. With the economic and technological development, metalled roads and railways were developed to move large volume of goods and

people from one place to another. Ropeways, cableways and pipelines were devised to cater to the demands of transporting specific goods under special circumstances.

Road Transport

India has one of the second largest road networks in the world with a total length of about 62.16 lakh km (morth.nic.in, Annual Report 2020-21).

the princely states and British India. After Independence, twenty-year road plan (1961) was introduced to improve the conditions of roads in India. However, roads continue to concentrate in and around urban centres. Rural and remote areas had the least connectivity by road.

For the purpose of construction and maintenance, roads are classified as National Highways (NH), State Highways (SH), Major District Roads and Rural Roads.

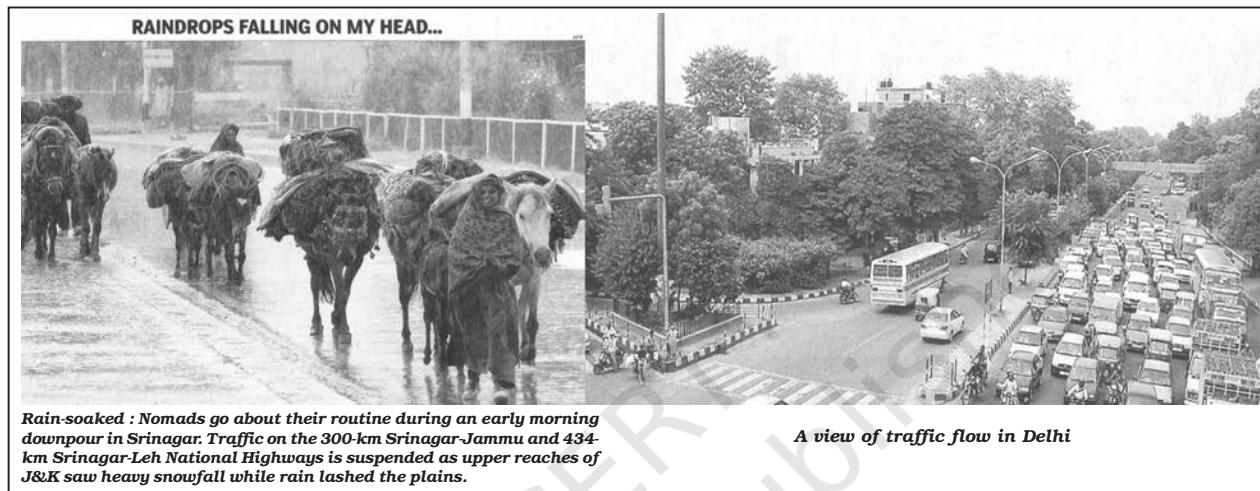


Fig. 7.1

About 85 per cent of passenger and 70 per cent of freight traffic are carried by roads every year. Road transport is relatively suitable for shorter distance travel.

DO YOU KNOW ?

Sher Shah Suri built the *Shahi* (Royal) road to strengthen and consolidate his empire from the Indus Valley to the Sonar Valley in Bengal. This road was renamed the Grand Trunk (GT) road during the British period, connecting Calcutta and Peshawar. At present, it extends from Amritsar to Kolkata.

Collect information about National Highway number (old and new) from the website morth.nic.in/national-highway-details.

Road transport in modern sense was very limited in India before World War-II. The first serious attempt was made in 1943 when 'Nagpur Plan' was drawn. This plan could not be implemented due to lack of coordination among

National Highways

The main roads which are constructed and maintained by the Central Government are known as the National Highways. These roads are meant for inter-state transport and movement of defence men and material in strategic areas. These also connect the state capitals, major cities, important ports, railway junctions, etc. The length of the National Highways has increased from 19,700 km in 1951 to 1,36,440 km in 2020. The National Highways constitute only about 2 per cent of the total road length but carry 40 per cent of the road traffic.

The National Highways Authority of India (NHAI) was operationalised in 1995. It is an autonomous body under the Ministry of Surface Transport. It is entrusted with the responsibility of development, maintenance and operation of National Highways. This is also the apex body to improve the quality of the roads designated as National Highways.

Table 7.1 : India Road Network 2020

Serial No.	Road Category	Length in Km
1.	National Highways	136440
2.	State Highways	176818
3.	Other Roads	5902539
	Total	6215797

Source: Ministry of Road Transport and Highways Annual Report 2020-21. For latest data see website morth.nic.in

National Highways Development Projects

NHAI has taken up some major projects in the country under different phases :

Golden Quadrilateral : It comprises construction of 5,846-km long 4/6 lane, high density traffic corridor, to connect India's four big metro cities of Delhi-Mumbai-Chennai-Kolkata. With the construction of Golden Quadrilateral, the time, distance and cost of movement among the mega cities of India will be considerably minimised.

North-South and East-West Corridors : North-South corridor aims at connecting Srinagar in Jammu and Kashmir with Kanyakumari in Tamil Nadu (including Kochchi-Salem Spur) with 4,076-km long road. The East-West Corridor has been planned to connect Silchar in Assam with the port town of Porbandar in Gujarat with 3,640-km of road length.

State Highways

These are constructed and maintained by state governments. They join the state capitals with district headquarters and other important towns. These roads are connected to the National Highways. These constitute 4 per cent of total road length in the country.

District Roads

These roads are the connecting link between District Headquarters and the other important nodes in the district. They account for 14 per cent of the total road length of the country.

Rural Roads

These roads are vital for providing links in the rural areas. About 80 per cent of the total road length in India are categorised as rural roads. There is regional variation in the density of rural road because these are influenced by the nature of the terrain.

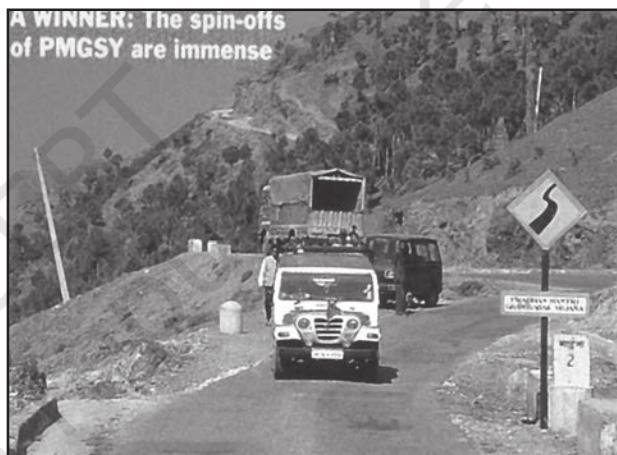


Fig. 7.2 : Road constructed under the Pradhan Mantri Gram Sadak Yojna

Why are the rural roads' density very low in hilly, plateau and forested areas? Why does the quality of rural roads deteriorate away from the urban centres?

Other Roads

Other roads include Border Roads and International Highways. The Border Road Organisation (BRO) was established in May 1960 for accelerating economic development and strengthening defence preparedness through rapid and coordinated improvement of strategically important roads along the



northern and north-eastern boundary of the country. It is a premier multifaceted construction agency. It has constructed roads in high altitude mountainous terrain joining Chandigarh with Manali (Himachal Pradesh) and Leh (Ladakh). This road runs at an average altitude of 4,270 metres above the mean sea level.

Apart from the construction and maintenance of roads in strategically sensitive areas, the BRO also undertakes snow clearance in high altitude areas. The international highways are meant to promote the harmonious relationship with the neighbouring countries by providing effective links with India. (Fig. 7.4 and 7.5)



Fig. 7.3 : Khardung La Pass in Jammu & Kashmir

DO YOU KNOW ?

The World's longest Highway tunnel — **Atal Tunnel** (9.02 Km) has been built by Border Road Organisation. This tunnel connects Manali to Lahaul-Spiti valley throughout the year. Earlier the valley was cut off for about 6 months each year owing to heavy snowfall. The Tunnel is built with ultra-modern specifications in the Pir Panjal range of Himalayas at an altitude of 3000 metres from the Mean Sea Level (MSL).

Source: <http://www.bro.gov.in/pagefimg.asp?imid=144>, And PIB Delhi 03 October 2020

Delhi-Lahore Bus



Fig. 7.4 : A Bus from Lahore to Delhi at Wagah Border



Fig. 7.5 : Aman Setu between Srinagar and Muzaffarabad

Activity

Why have Bengaluru and Hyderabad in the South and Delhi, Kanpur and Patna in north India have emerged as important nodes?

DO YOU KNOW ?

Bharatmala is a proposed umbrella scheme for:

- (i) Development of State roads along coastal border areas, including connectivity of non-major ports;
- (ii) Backward areas religious and tourist places connectivity programme;
- (iii) *Setubharatam Pariyojana*, which is for the construction of about 1500 major bridges and 200 rail over bridges rail under bridges; District Headquarters connectivity Scheme for the development of about 9000 km newly declared National Highways.

The programme is targeted for completion by 2022.

Source: *Economic Survey 2015-16 pp. 146.*

Rail Transport

Indian Railways network is one of the longest in the world. It facilitates the movement of both freight and passengers and contributes to the growth of the economy. Mahatma Gandhi said, the Indian railways "...brought people of diverse cultures together to contribute to India's freedom struggle".

Indian Railway was introduced in 1853, when a line was constructed from Bombay to Thane covering a distance of 34 km.

Indian Railways is the largest government undertaking in the country. The length of Indian Railways network was 67,956 km (Railway yearbook 2019-20). Its very large size puts a lot of pressure on a centralised railway management system. Thus, in India, the railway system has been divided into 16 zones.

**Table 7.2 : Indian Railways:
Railway Zones and Headquarters**

Railway Zone	Headquarters
Central	Mumbai CST
Eastern	Kolkata
East Central	Hajipur
East Coast	Bhubaneswar
Northern	New Delhi
North Central	Allahabad
North Eastern	Gorakhpur
North East Frontier	Maligaon (Guwahati)
North Western	Jaipur
Southern	Chennai
South Central	Secunderabad
South Eastern	Kolkata
South East Central	Bilaspur
South Western	Hubli
Western	Mumbai (Church Gate)
West Central	Jabalpur

DO YOU KNOW ?

On the basis of the width of track of the Indian Railways, three categories have been made:

Broad gauge: The distance between rails in broad gauge is 1.676 metre. The total length of broad gauge lines was 63950 km (2019-20).

Metre gauge: The distance between rails is one metre. Its total length was 2402 km (2019-20).

Narrow gauge: The distance between the rails in this case is 0.762 metre or 0.610 metre. The total length of narrow gauge was 1604 km (2019-20). It is generally confined to hilly areas.



Indian Railways has launched extensive programme to convert the metre and narrow gauges to broad gauge. Moreover, steam engines have been replaced by diesel and electric engines. This step has increased the speed, as well as, the haulage capacity.

The replacement of steam engines run by coal has also improved the environment of the stations.

Metro rail has revolutionised the urban transport system in India. Replacement of diesel buses by CNG-run vehicles along with the introduction of metro is a welcome step towards controlling the air pollution in urban centres.

Which cities of India have Metro Rail Facility? Collect information about it and discuss in the classroom.

Konkan Railway

One of the important achievements of the Indian Railways has been the construction of Konkan Railway in 1998. It is 760-km long rail route connecting Roha in Maharashtra to Mangalore in Karnataka. It is considered an engineering marvel. It crosses 146 rivers, streams, nearly 2000 bridges and 91 tunnels. Asia's largest tunnel which is nearly 6.5 km long, also lies on this route. The states of Maharashtra, Goa and Karnataka are partners in this undertaking.

Areas around towns, raw material producing areas and of plantations and other commercial crops, hill stations and cantonment towns were well-connected by railways from the British colonial era. These were mostly developed for the exploitation of resources. After the Independence of the country, railway routes have been extended to other areas too. The most significant development has been the development of Konkan Railway along the western coast providing a direct link between Mumbai and Mangaluru.

Railway continues to remain the main means of transport for the masses. Railway network is relatively less dense in the hill states, north eastern states, central parts of India and Rajasthan.

Water Transport

Waterways is an important mode of transport for both passenger and cargo traffic in India. It is the cheapest means of transport and is most suitable for carrying heavy and bulky material. It is a fuel-efficient and eco-friendly mode of transport. The water transport is of two types—(a) inland waterways, and (b) oceanic waterways.

Inland Waterways

It was the chief mode of transport before the advent of railways. It, however, faced tough competition from road and railway transport. Moreover, diversion of river water for irrigation purposes made them non-navigable in large



Fig. 7.6 : River navigation in the North-east

parts of their courses. India has 14,500 km of navigable waterways, contributing about 1% to the country's transportation. It comprises rivers, canals, backwaters, creeks, etc. At present, 5,685 km of major rivers are navigable by mechanised flat bottom vessels.

For the development, maintenance and regulation of national waterways in the country, the Inland Waterways Authority was set up in 1986. The following waterways have been declared as the National Waterways by the Government (Table 7.3).

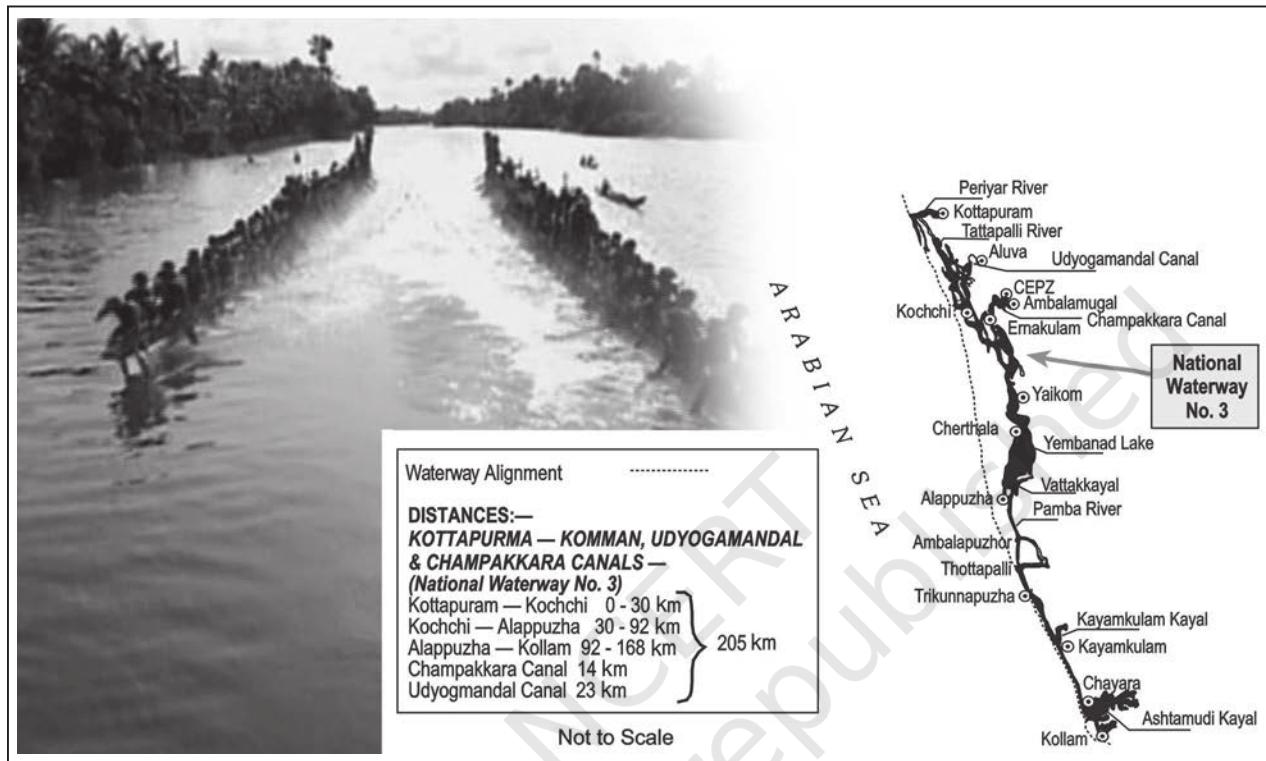


Fig. 7.7 : Natinal Waterway No.3

Table 7.3:1 National Waterways of India

Waterways	Stretch	Specification
NW 1	Allahabad-Haldia stretch (1,620 km)	It is one of the most important waterways in India, which is navigable by mechanical boats up to Patna and by ordinary boats up to Haridwar. It is divided into three parts for developmental purposes- (i) Haldia-Farakka (560 km), (ii) Farakka-Patna (460 km), (iii) Patna-Allahabad (600 km).
NW 2	Sadiya-Dhubri stretch (891 km)	Brahmaputra is navigable by steamers up to Dibrugarh (1,384 km) which is shared by India and Bangladesh
NW 3	Kottapuram-Kollam stretch (205 km)	It includes 168 km of west coast canal along with Champakkara canal (14 km) and Udyogmandal canal (23 km).
NW 4	Specified stretches of Godavari and Krishna rivers along with Kakinada Puducherry stretch of canals (1078 km)	
NW 5	Specified stretches of river Brahmani along with Matai river, delta channels of Mahanadi and Brahmani rivers and East Coast canals (588km).	

The Inland Waterways Authority has also identified 10 other inland waterways, which could be upgraded. The backwaters (Kadal) of Kerala has special significance in Inland Waterway. Apart from providing cheap means of transport, they are also attracting a large number of tourists in Kerala. The famous Nehru Trophy Boat Race (VALLAMKALI) is also held in the backwaters.

Oceanic Routes

India has a vast coastline of approximate 7,517 km, including islands. Twelve major and 185 minor ports provide infrastructural support to these routes. Oceanic routes play an important role in the transport sector of India's economy. Approximately 95 per cent of India's foreign trade by volume and 70 per cent by value moves through ocean routes. Apart from international trade, these are also used for the purpose of transportation between the islands and the rest of the country.

Air Transportation

Air transport is the fastest means of movement from one place to the other. It has reduced distances by minimising the travel time. It is essential for a vast country like India, where distances are large and the terrain and climatic conditions are diverse.

Air transport in India made a beginning in 1911 when airmail operation commenced over a little distance of 10 km between Allahabad and Naini. But its real development took place in post-Independent period. The Airport Authority of India is responsible for providing safe, efficient air traffic and aeronautical communication services in the Indian Air Space. The authority manages 125 airports.

Pawan Hans is the helicopter service operating in hilly areas and is widely used by tourists in north-eastern sector.

In addition, Pawan Hans Limited mainly provides helicopter services to petroleum sector and for tourism.

Oil and Gas Pipelines

Pipelines are the most convenient and efficient mode of transporting liquids and gases over long distances. Even solids can also be transported by pipelines after converting them into slurry. Oil India Limited (OIL) under the administrative set up of the Ministry of Petroleum and Natural Gas is engaged in the exploration, production and transportation of crude oil and natural gas. It was incorporated in 1959 as a company. Asia's first cross country pipeline covering a distance of 1,157 km was constructed by OIL from Naharkatiya oilfield in Assam to Barauni refinery in Bihar. It was further extended up to Kanpur in 1966. GAIL (India) Ltd. was set up in 1984 as a public sector undertaking to transport, process and market natural gas for its economic use. The first 1,700 km long Hazira-Vijaipur-Jagdishpur (HVJ) cross country gas pipeline, constructed by GAIL (India), linked Mumbai High and Bassein gas fields with various fertiliser, power and industrial complexes in western and northern India. This artery provided impetus to Indian gas market development. Overall, India's gas infrastructure has expanded over ten times from 1,700 km to 18,500 km of cross-country pipelines and is expected to soon reach over 34,000 km as Gas Grid by linking all the gas sources and consuming markets across the country including North Eastern States.

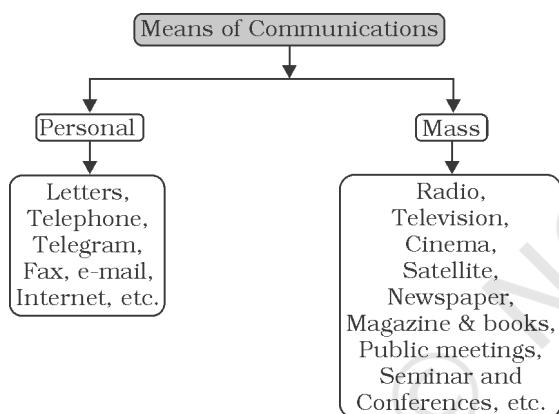
Communication Networks

Human beings have evolved different methods of communication over time. In earlier times, the messages were delivered by beating the drum or hollow tree trunks, giving indications



through smoke or fire or with the help of fast runners. Horses, camels, dogs, birds and other animals were also used to send messages. Initially, the means of communication were also the means of transportation. Invention of post-office, telegraph, printing press, telephone, satellite, etc has made the communication much faster and easier. Development in the field of science and technology has significantly contributed in bringing about revolution in the field of communication.

People use different modes of communication to convey the messages. On the basis of scale and quality, the mode of communication can be divided into following categories :



Personal Communication System

Among all the personal communication system internet is the most effective and advanced one. It is widely used in urban areas. It enables the user to establish direct contact through e-mail to get access to the world of knowledge and information. It is increasingly used for e-commerce and carrying out money transactions. The internet is like a huge central warehouse of data, with detailed information on various items. The network through internet and e-mail provides an efficient access to information at a comparatively low cost. It

enables us with the basic facilities of direct communication.

Mass Communication System

Radio

Radio broadcasting started in India in 1923 by the Radio Club of Bombay. Since then, it gained immense popularity and changed the socio-cultural life of people. Within no time, it made a place in every household of the country. Government took this opportunity and brought this popular mode of communication under its control in 1930 under the Indian Broadcasting System. It was changed to All India Radio in 1936 and to Akashwani in 1957.

All India Radio broadcasts a variety of programmes related to information, education and entertainment. Special news bulletins are also broadcast at specific occasions like session of parliament and state legislatures.

Television (T.V.)

Television broadcasting has emerged as the most effective audio-visual medium for disseminating information and educating masses. Initially, the T.V. services were limited only to the National Capital where it began in 1959. After 1972, several other centres became operational. In 1976, TV was delinked from All India Radio (AIR) and got a separate identity as Doordarshan (DD). After INSAT-IA (National Television-DD1) became operational, Common National Programmes (CNP) were started for the entire network and its services were extended to the backward and remote rural areas.

Satellite Communication

Satellites are mode of communication in themselves as well as they regulate the use of other means of communication. However, use of satellite in getting a continuous and synoptic view of larger area has made satellite communication very vital for the country due



to the economic and strategic reasons. Satellite images can be used for the weather forecast, monitoring of natural calamities, surveillance of border areas, etc.

On the basis of configuration and purposes, satellite system in India can be grouped into two: Indian National Satellite System (INSAT) and Indian Remote Sensing Satellite System (IRS). The INSAT, which was established in 1983, is a multi-purpose satellite system for telecommunication, meteorological observation and for various other data and programmes.

The IRS satellite system became operational with the launching of IRS-IA in March 1988 from Vaikanour in Russia. India has also developed her own Launching Vehicle PSLV (Polar Satellite Launch Vehicle). These satellites collect data in several spectral bands and transmit them to the ground stations for various uses. The National Remote Sensing Centre (NRSC) at Hyderabad provides facilities for acquisition of data and its processing. These are very useful in the management of natural resources.



EXERCISES

- 3.** Answer the following questions in about 150 words.
- (i) Which are the chief means of transportation in India? Discuss the factors affecting their development.
 - (ii) Give a detailed account of the development of railways in India and highlight their importance.
 - (iii) Describe the role of roads in the economic development of India.

Project

Find out the facilities that Indian Railways provide to the passengers.

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Unit IV

Chapter 8



12099CH11

INTERNATIONAL TRADE



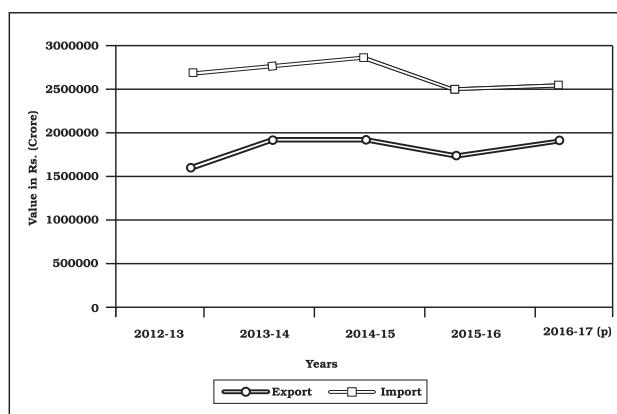
You have already studied about the various aspects of International trade in the book *Fundamentals of Human Geography*. International Trade is mutually beneficial as no country is self-sufficient. India's international trade has undergone a sea change in recent years in terms of volume, composition as well as direction. Although India's contribution in the world trade is as low as one per cent of the total volume, yet it plays a significant role in the world economy.

Let us examine the changing pattern of India's International trade. In 1950-51, India's external trade was worth Rs. 1,214 crore, which rose to Rs. 44,29,762 crore in 2016-17. Can you calculate the percentage growth in 2016-17 over 1950-51? There are numerous reasons for this sharp rise in overseas trade, such as the momentum picked up by the manufacturing sectors, the liberal policies of the government and the diversification of markets.

The nature of India's foreign trade has changed over the years (Table 8.1). Though there has been an increase in the total volume of import and export, the value of import continued to be higher than that of exports.

Changing Pattern of the Composition of India's Exports

Extent of gap between Exports and Imports in India's foreign trade During 2012-13 to 2016-17



Source : Economic Survey, 2016-17

Fig. 8.1

Table 8.1 India's Foreign Trade

Year	Exports	Imports	Value in Rs. Crores
			Trade Balance
2004-05	3,75,340	5,01,065	-1,25,725
2009-10	8,45,534	13,63,736	-5,18,202
2013-14	19,05,011	27,15,434	-8,10,423
2016-17	18,52,340	25,77,422	-7,25,082

Source : <http://commerce.nic.in/publications/annual-report-2010-11-and-Economic-Survey-2016-17>

Activity

Draw bar diagram to show the trends of exports of all items given in the table. Use pen/pencil of different colours.

Table 8.2 : Composition of India's Export, 2009-2017

(Percentage share in Exports)

Commodities	2009-10	2010-11	2015-16	2016-17
Agriculture and allied products	10.0	9.9	12.6	12.3
Ore and Minerals	4.9	4.0	1.6	1.9
Manufactured goods	67.4	68.0	72.9	73.6
Crude and petroleum products	16.2	16.8	11.9	11.7
Other commodities	1.5	1.2	1.1	0.5

Source : Economic Survey 2016-17

The composition of commodities in India's international trade has been undergoing a change over the years. The share of agriculture and allied products has declined, whereas, shares of petroleum and crude products and other commodities have increased. The shares of ore minerals and manufactured goods have largely remained constant over the years from 2009-10 to 2010-11 and 2015-16 to 2016-17.

The decline in traditional items is largely due to the tough international competition. Amongst the agricultural products, there is a decline in the export of traditional items, such as coffee, cashew, etc., though an increase has been registered in floricultural products, fresh fruits, marine products and sugar, etc.

Manufacturing sector alone accounted for 73.6 per cent of India's total value of export in 2016-17. Engineering goods have shown a significant growth in the export. China and other

East Asian countries are our major competitors. Gems and jewellery contributes a larger share of India's foreign trade.

Activity

Study Table 8.3 and select major commodities exported in 2016-17 and draw bar diagram.

Changing Patterns of the Composition of India's Import

India faced serious food shortage during 1950s and 1960s. The major item of import at that time was foodgrain, capital goods, machinery and equipment. The balance of payment was adverse as imports were more than export in spite of all the efforts of import substitution. After 1970s, foodgrain import was discontinued due to the success of Green revolution but the energy crisis of 1973 pushed the prices of petroleum, and import



Table 8.3 : Export of Some Principal Commodities
(in crore rupees)

Commodities	2016-17
Agriculture and allied products	228001
Ores and Minerals	35947
Manufactured goods	1363232
Mineral fuels and Lubricants	216280

Source : Economic Survey 2016-17.

budget was also pushed up. Foodgrain import was replaced by fertilisers and petroleum. Machine and equipment, special steel, edible oil and chemicals largely make the import basket. Examine the changing pattern of imports in Table 8.4 and try to comprehend the shifts.

Table 8.4 shows that there is a steep rise in the import of petroleum products. It is used not only as a fuel but also as an industrial raw material. It indicates the tempo of rising industrialisation and better standard of living. Sporadic price rise in the international market is another reason for the same. Import of capital goods maintained a steady increase due to rising demand in the export-oriented industrial and domestic sectors. Non-electrical machinery, transport

equipment, manufacturers of metals and machine tools were the main items of capital goods. Import of food and allied products declined with a fall in imports of edible oils. Other major items of India's import include pearls and semi-precious stones, gold and silver, metalliferous ores and metal scrap, non-ferrous metals, electronic goods, etc. The details of Indian imports of some principal commodities during 2016-17 have been given in Table 8.5.

Based on Table 8.5, few activities may be undertaken:

Arrange the items in ascending or descending order and write the names of the first five major items of India's import list of 2016-17.

Why does India import edible oil in spite of being an agriculturally rich country?

Select five most important and five least important items and represent them by bar diagram.

Can you identify some items of imports for which substitutes can be developed in India?

Table 8.4 : India Composition of Import 2009-17

(In percentage)

Commodity Group	2009-10	2010-11	2015-16	2016-17
Food and allied products	3.7	2.9	5.1	5.6
Fuel (Coal, POL)	33.2	31.3	25.4	26.7
Fertilisers	2.3	1.9	2.1	1.3
Paper board manufacturing and news print	0.5	0.6	0.8	0.9
Capital goods	15.0	13.1	13.0	13.6
Others	42.6	47.7	38.1	37.0

Source : Economic Survey 2016-17

Table 8.5 : Import of Some Principal Commodities
(in crore rupees)

Commodities	2016-17
Fertilisers and fertiliser manufacturing	33726
Edible oils	73048
Pulp and waste paper	6537
Non-ferrous metals	262961
Iron and steel	55278
Petroleum, oil and lubricants	582762
Pearls, precious and semi-precious stones	159464
Medicinal and Pharma products	33504
Chemical products	147350

Source : Economic Survey 2016-17

Direction of Trade

India has trade relations with most of the countries and major trading blocks of the world.

Region-wise and sub-region-wise trade during the period 2016-17 has been given in Table 8.6.

Table 8.6 Direction of India's Import trade
(in crore rupees)

Region	Imports	
	2010-11	2016-17
Europe	323857	403972
Africa	118612	193327
North America	100602	195332
Latin America	64576	115762
Asia and ASEAN	1029881	1544520

Source : Department of Commerce based on DCCI&S provisional data, Economic Survey 2011-12 and 2016-17.

India aims to double its share in the international trade within the next five years. It has already started adopting suitable measures such as import liberalisation, reduction in import duties, delicensing and change from process to product patents.

Activity

Draw a multiple bar diagram to represent the major trading partners.

Most of India's foreign trade is carried through sea and air routes. However, a small portion is also carried through land route to neighbouring countries like Nepal, Bhutan, Bangladesh and Pakistan.

Sea Ports as Gateways of International Trade

India is surrounded by sea from three sides and is bestowed with a long coastline. Water provides a smooth surface for very cheap transport provided there is no turbulence. India



Fig. 8.3 : Unloading of goods on port

has a long tradition of sea faring and developed many ports with place name suffixed with *pattan* meaning port. An interesting fact about ports in India is that its west coast has more ports than its east coast.

Can you find out the reasons for the variations in the location of ports along the two coasts?

Though ports have been in use since ancient times, the emergence of ports as gateways of international trade became important after the coming of the European traders and colonisation of the country by the British. This led to the variation in the size and quality of ports. There are some ports which have very vast area of influence and some have limited area of influence. At present, India has 12 major ports and 200 minor or intermediate ports. In case of the major ports, the central government decides the policy and plays regulatory functions. The minor ports are there whose policy and functions are regulated by state governments. The major ports handle larger share of the total traffic.

The British used the ports as suction points of the resources from their hinterlands. The extension of railways towards the interior facilitated the linking of the local markets to regional markets, regional markets to national markets and national markets to the international markets. This trend continued till 1947. It was expected that the country's Independence will reverse the process, but the partition of the country snatched away two very important ports, i.e., Karachi port went to Pakistan and Chittagong port to the erstwhile east-Pakistan and now Bangladesh. To compensate the losses, many new ports, like the Kandla in the west and the Diamond Harbour near Kolkata on river Hugli in the east were developed.

Despite this major setback, Indian ports continued to grow after the Independence. Today, Indian ports are handling large volumes of domestic, as well as, overseas trade. Most of the ports are equipped with modern infrastructure. Previously, the development and modernisation was the responsibility of the government agencies, but considering the increase in function and need to bring these ports at par with the international ports, private entrepreneurs

have been invited for the modernisation of ports in India.

The capacity of Indian ports increased from 20 million tonnes of cargo handling in 1951 to more than 837 million tonnes in 2016.

Some of the Indian ports along with their hinterlands are as follows :

Kandla Port situated at the head of Gulf of Kuchchh has been developed as a major port to cater to the needs of western and north western parts of the country and also to reduce the pressure at Mumbai port. The port is specially designed to receive large quantities of petroleum and petroleum products and fertiliser. The offshore terminal at Vadinar has been developed to reduce the pressure at Kandla port.

Demarcation of the boundary of the hinterland would be difficult as it is not fixed over space. In most of the cases, hinterland of one port may overlap with that of the other.

Mumbai is a natural harbour and the biggest port of the country. The port is situated closer to the general routes from the countries of Middle East, Mediterranean countries, North Africa, North America and Europe where the major share of country's overseas trade is carried out. The port is 20 km long and 6-10 km wide with 54 berths and has the country's largest oil terminal. M.P., Maharashtra, Gujarat, U.P. and parts of Rajasthan constitute the main hinterlands of Mumbai ports.

Jawaharlal Nehru Port at Nhava Sheva was developed as a satellite port to relieve the pressure at the Mumbai port. It is the largest container port in India.

Marmagao Port, situated at the entrance of the Zuari estuary, is a natural harbour in Goa. It gained significance after its remodelling in 1961 to handle iron-ore exports to Japan. Construction of Konkan railway has considerably extended the hinterland of this port. Karnataka, Goa, Southern Maharashtra constitute its hinterland.

New Mangalore Port is located in the state of Karnataka and caters to the needs of the export of iron-ore and iron-concentrates. It also handles fertilisers, petroleum products, edible





Fig. 8.4 : India - Major Ports and Sea Routes

oils, coffee, tea, wood pulp, yarn, granite stone, molasses, etc. Karnataka is the major hinterland for this port.

Kochchi Port, situated at the head of Vembanad Kayal, popularly known as the '*Queen of the Arabian Sea*', is also a natural harbour. This port has an advantageous location being close to the Suez-Colombo route. It caters to the needs of Kerala, southern-Karnataka and south western Tamil Nadu.

Kolkata Port is located on the Hugli river, 128 km inland from the Bay of Bengal. Like the Mumbai port, this port was also developed by the British. Kolkata had the initial advantage of being the capital of British India. The port has lost its significance considerably on account of the diversion of exports to the other ports such as Vishakhapatnam, Paradwip and its satellite port, Haldia.

Kolkata port is also confronted with the problem of silt accumulation in the Hugli river which provides a link to the sea. Its hinterland covers U.P., Bihar, Jharkhand, West Bengal, Sikkim and the north-eastern states. Apart from this, it also extends port facilities to our neighbouring land-locked countries such as Nepal and Bhutan.

Haldia Port is located 105 km downstream from Kolkata. It has been constructed to reduce the congestion at Kolkata port. It handles bulk cargo like iron ore, coal, petroleum, petroleum products and fertilisers, jute, jute products, cotton and cotton yarn, etc.

Paradwip Port is situated in the Mahanadi delta, about 100 km from Cuttack. It has the deepest harbour specially suited to handle very large vessels. It has been developed mainly to handle large-scale export of iron-ore. Odisha, Chhattisgarh and Jharkhand are the parts of its hinterland.

Visakhapatnam Port in Andhra Pradesh is a land-locked harbour, connected to the sea by a channel cut through solid rock and sand. An outer harbour has been developed for handling iron-ore, petroleum and general cargo.

Andhra Pradesh and Telangana are the main hinterland for this port.

Chennai Port is one of the oldest ports on the eastern coast. It is an artificial harbour built in 1859. It is not much suitable for large ships because of the shallow waters near the coast. Tamil Nadu and Puducherry are its hinterland.

Ennore, a newly developed port in Tamil Nadu, has been constructed 25 km north of Chennai to relieve the pressure at Chennai port.

Tuticorin Port was also developed to relieve the pressure of Chennai port. It deals with a variety of cargo, including coal, salt, food grains, edible oils, sugar, chemicals and petroleum products.

Airports

Air transport plays an important role in the international trade. It has the advantage of taking the least time for carriage and handling high value or perishable goods over long distances. It is very costly and unsuitable for carrying heavy and bulky commodities. This ultimately reduces the participation of this sector in the international trade as compared to the oceanic routes.

There were 25 major airports functioning in the country (Annual Report 2016-17). They are Ahmedabad, Bengaluru, Chennai, Delhi, Goa, Guwahati, Hyderabad, Kolkata, Mumbai, Thiruvananthapuram, Srinagar, Jaipur, Calicut, Nagpur, Coimbatore, Cochin, Lucknow, Pune, Chandigarh, Mangaluru, Vishakhapatnam, Indore, Patna, Bhubaneswar and Kannur.

You have already studied about the air transport in the previous chapter. You consult the chapter on transport to find out the main features of air transport in India.

Activity

Name the nearest domestic and international airports from your place. Identify the state with maximum number of domestic airports.

Identify four cities where maximum number of air routes converge and also give reasons for this.



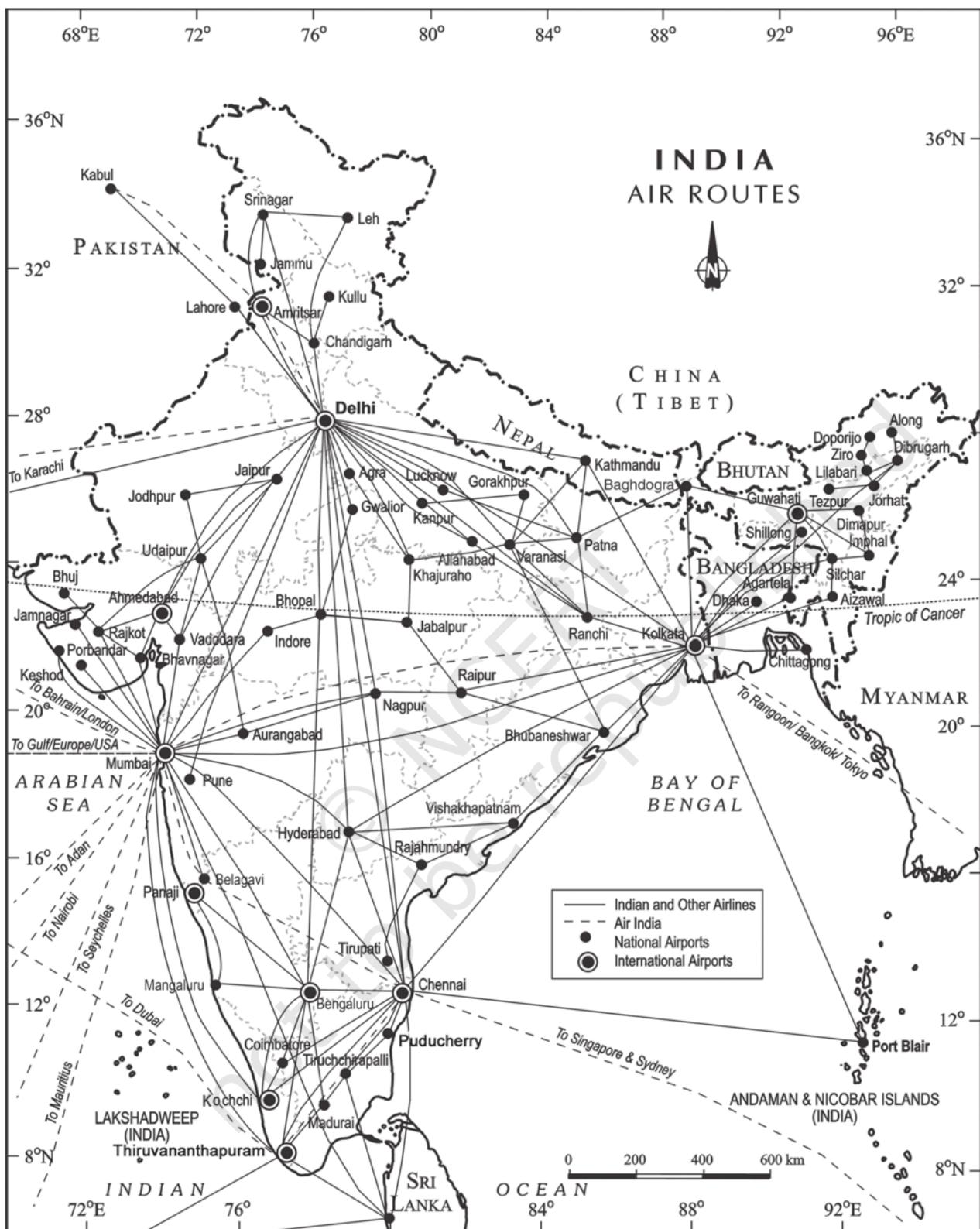


Fig. 8.5 : India – Air Routes



EXERCISES

- 1.** Choose the right answers of the following from the given options.
 - (i) Trade between two countries is termed as
 - (a) Internal trade
 - (c) International trade
 - (b) External trade
 - (d) Local trade
 - (ii) Which one of the following is a land locked harbour?
 - (a) Vishakhapatnam
 - (c) Ennor
 - (b) Mumbai
 - (d) Haldia
 - (iii) Most of India's foreign trade is carried through
 - (a) Land and sea
 - (c) Sea and air
 - (b) Land and air
 - (d) Sea
- 2.** Answer the following questions in about 30 words.
 - (i) Mention the characteristics of India's foreign trade.
 - (ii) Distinguish between port and harbour.
 - (iii) Explain the meaning of hinterland.
 - (iv) Name important items which India imports from different countries.
 - (v) Name the ports of India located on the east coast.
- 3.** Answer the following questions in about 150 words.
 - (i) Describe the composition of export and import trade of India.
 - (ii) Write a note on the changing nature of the international trade of India.



Unit V
Chapter 9



12099CH12

GEOGRAPHICAL PERSPECTIVE ON SELECTED ISSUES AND PROBLEMS



Environmental Pollution

Environmental pollution results from 'the release of substances and energy from waste products of human activities. There are many types of pollution. They are classified on the basis of medium through which pollutants are transported and diffused. Pollution can be classified into (i) air pollution, (ii) water pollution, (iii) land pollution and (iv) noise pollution.

Water Pollution

Indiscriminate use of water by increasing population and industrial expansion has led degradation of the quality of water considerably. Surface water available from rivers, canals, lakes, etc. is never pure. It contains small quantities of suspended particles, organic and inorganic substances. When concentration of these substances increases, the water becomes polluted, and hence becomes unfit for use. In such a situation, the self-purifying capacity of water is unable to purify the water.



Fig.9.1 : Cutting Through Effluent : Rowing through a pervasive layer of foam on the heavily polluted Yamuna on the outskirts of New Delhi

Though water pollutants are also created from natural sources (erosion, landslides, decay and decomposition of plants and animals, etc.) pollutants from human activities are the real causes of concern. Human beings pollute the water through industrial, agricultural and cultural activities. Among these activities, industry is the most significant contributor.

Table 9.1 : Types and Sources of Pollution

Pollution Types	Pollution Involved	Sources of Pollution
Air Pollution	Oxides of sulphur (SO_2 , SO_3), Oxides of nitrogen, carbon monoxide, hydro-carbon, ammonia, lead, aldehydes asbestos and beryllium.	Combustion of coal, petrol and diesel, industrial processes, solid waste disposal, sewage disposal, etc.
Water Pollution	Odour, dissolved and suspended solids, ammonia and urea, nitrate and nitrates, chloride, fluoride, carbonates, oil and grease, insecticide and pesticide residue, tannin, coliform MPM (bacterial count) sulphates and sulphides, heavy metals e.g. lead, arsenic, mercury, manganese, etc., radioactive substances.	Sewage disposal, urban run-off, toxic effluents from industries, run-off over cultivated lands and nuclear power plants.
Land Pollution	Human and animal excreta viruses and bacteria, garbage and vectors therein, pesticides and fertiliser-residue alkalinity, fluorides, radio-active substances.	Improper human activities, disposal of untreated industrial waste, use of pesticides and fertilisers.
Noise Pollution	High level of noise above tolerance level.	Aircrafts, automobiles, trains, industrial processing and advertising media.

Industries produce several undesirable products including industrial wastes, polluted waste water, poisonous gases, chemical residuals, numerous heavy metals, dust, smoke, etc. Most of the industrial wastes are disposed off in running water or lakes. Consequently, poisonous elements reach the reservoirs, rivers and other water bodies, which destroy the bio-system of these waters. Major water polluting industries are leather, pulp and paper, textiles and chemicals.

Various types of chemicals used in modern agriculture such as inorganic fertilisers, pesticides and herbicides are also pollution generating components. These chemicals are washed down to rivers, lakes and tanks. These chemicals also infiltrate the soil to reach the ground water. Fertiliser induces an increase in the nitrate content of surface waters. Cultural activities such as pilgrimage, religious fairs, tourism, etc. also cause water pollution. In India, almost all

Table 9.2 : Sources of Pollution in the Ganga and the Yamuna Rivers

River and State	Polluted Stretches	Nature of Pollution	Main Polluters
Ganga (Uttar Pradesh) Bihar and West Bengal	(a) Downstream of Kanpur (b) Downstream of Varanasi (c) Farrakka Barrage	1. Industrial pollution from towns like Kanpur 2. Domestic wastes from urban centres 3. Dumping of carcasses in the river	Cities of Kanpur, Allahabad, Varanasi, Patna and Kolkata release domestic waste into the river
Yamuna (Delhi) and (Uttar Pradesh)	(a) Delhi to confluence with Chambal (b) Mathura and Agra	1. Extraction of water by Haryana and Uttar Pradesh for irrigation 2. Agricultural run off resulting in high levels of micro-pollutants in the Yamuna 3. Domestic and industrial waste of Delhi flowing into the river	Delhi dumping its domestic waste

surface water sources are contaminated and unfit for human consumption.

Water pollution is a source of various water-borne diseases. The diseases commonly caused due to contaminated water are diarrhoea, intestinal worms, hepatitis, etc. The World Health Organization shows that about one-fourth of the communicable diseases in India are water-borne. Though river pollution is common to all rivers, yet pollution of river Ganga flowing through one of the most populous regions of India has caused great concerns among all. To improve the condition of the river, National Mission for Clean Ganga was initiated. The Namami Gange Programme has been launched for the same.

Air Pollution

Air pollution is taken as addition of contaminants, like dust, fumes, gas, fog, odour, smoke or vapour to the air in substantial proportion and duration that may be harmful to flora and fauna and to property. With increasing use of varieties of fuels as the source of energy, there is a marked increase in emission of toxic gases into the atmosphere resulting in the pollution of air. Combustion of fossil fuels, mining and industries are the main sources of air pollution. These processes release oxides of sulphur and nitrogen,

Namami Gange Programme

Ganga, as a river, has national importance but the river requires cleaning by effectively controlling the pollution for its water. The Union Government has launched the 'Namami Gange Programme' with the following objectives:

- developing sewerage treatment systems in towns,
- monitoring of industrial effluents,
- development of river front,
- afforestation along the bank of increase biodiversity,
- cleaning of the river surface,
- development of 'Ganga Grams' in Uttarakhand, UP, Bihar, Jharkhand and West Bengal, and
- creating public awareness to avoid adding pollutants in to the river even in the form of rituals.

hydrocarbons, carbon dioxide, carbon monoxide, lead and asbestos.

Air pollution causes various diseases related to respiratory, nervous and circulatory systems.



Greens list top 10 pollution sites

Ranipet In TN Features On The 'Blacklist' Along With N-Tainted Chernobyl

LIVING HELL

- Chernobyl, Ukraine
- Dzerzhinsk, Russia
- Haina, Dominican Republic
- Kabwe, Zambia
- La Oroya, Peru
- Linfen, China
- Maimuu-Suu, Kyrgyzstan
- Norilsk, Russia
- Ranipet, Tamil Nadu, India, (where leather tanning wastes contaminate groundwater with risk of being poisoned, developing cancers and lung in-



hexavalent chromium, made famous by Erin Brockovich, result in water that apparently stings like an insect bite)

● Rudnaya Pristan, Russia

sites to come up with its list. The sites were not ranked be-

just a horror story," Fuller said about an industrial city

Air pollution biggest killer in Southeast Asia, says WHO

A smoky haze that year, shrouded parts of Southeast Asia this month, forcing schools and businesses to close, is just one element of an air pollution problem that kills hundreds of thousands of people in the region annually, the World Health Organisation said.

Air pollution in major Southeast Asian and Chinese cities ranks among the

said Michal Krzyzanowski, an air quality specialist at the WHO's European Centre for Environment and Health in Bonn.

Drifting smoke from purposely set forest fires in Indonesia caused Malaysia to declare a state of emergency last week in two areas outside Kuala Lumpur. Parts of Thailand were also blanketed in the haze.

of respiratory problems reportedly died. The government could not confirm the smoky air was to blame.

Worldwide, air pollution contributes to some 7 million deaths each year. The emergency in Malaysia was lifted after two days. But meteorologists are predicting a new cloud will hover over parts of Malaysia and possibly Singapore.



DO YOU KNOW ?

Oceans 10 times noisier today than 40 years ago

A study by Scripps Institute of Oceanography has revealed that Ocean Noise has increased tenfold since the 1960s. Oceanologists Sean Wiggins, John Hildebrand from Scripps and Mark McDonald from WhaleAcoustics, Colorado, studied declassified US Navy documents and came to the conclusion that global shipping has contributed a lot to increased undersea noise pollution. They said with populations increasing around the globe in recent decades, the underwater world had also become a noisier place, adding that the effects of greater noise on marine life was still unknown. Findings revealed a tenfold increase in underwater ocean noise as compared with the 1960s. They said the noise levels in 2003-2004 were about 10 to 12 decibels higher than in 1964-1966. The reasons could be due to the vast increase in the global shipping trade, the number of ships plying the oceans and higher speed of vessels.



Fig. 9.2 : Noise monitoring at Panchpatmalai Bauxite Mine

associated with community activities. The level of steady noise is measured by sound level expressed in terms of decibels (dB).

Of all these sources, the biggest nuisance is the noise produced by traffic, because its intensity and nature depend upon factors, such as the type of aircraft, vehicle, train and the condition of road, as well as, that of vehicle (in case of automobiles). In sea traffic, the noise pollution is confined to the harbour due to loading and unloading activities being carried. Industries cause noise pollution but with varying intensity depending upon the type of industry.

Noise pollution is location specific and its intensity declines with increase in distance

from the source of pollution, i.e. industrial areas, arteries of transportation, airport, etc. Noise pollution is hazardous in many metropolitan and big cities in India.

Urban Waste Disposal

Urban areas are generally marked by overcrowding, congestion, inadequate facilities to support the fast growing population and consequent poor sanitary conditions and foul air. Environmental pollution by solid wastes has now got significance because of enormous growth in the quantity of wastes generated from various sources. Solid waste refers to a variety of old and used articles, for example stained small pieces of metals, broken glassware, plastic containers, polythene bags, ash, floppies, CDs, etc., dumped at different places. These discarded materials are also termed as refuse, garbage and rubbish, etc., and are disposed of from two sources : (i) household or domestic establishments, and (ii) industrial or commercial establishments. The household wastes are disposed off either on public lands or on private contractors' sites,

whereas the solid wastes of industrial units are collected and disposed off through public (municipal) facilities at low lying public grounds (landfill areas). The huge turn out of ashes and debris from industries, thermal power houses and building constructions or demolitions have posed problems of serious consequences. Solid wastes cause health hazard through creation of obnoxious smell, and harbouring of flies and rodents, which act as carriers of diseases like typhoid, diphtheria, diarrhoea, malaria and cholera, etc. These wastes cause frequent nuisance as and when these are carelessly handled, spread by wind and splitted through rain water.

Concentration of industrial units in and around urban centres gives rise to disposal of industrial wastes. The dumping of industrial waste into rivers leads to water pollution. River pollution from city-based industries and untreated sewage leads to serious health problems downstream.

Urban waste disposal is a serious problem in India. In metropolitan cities like Mumbai, Kolkata, Chennai, Bengaluru, etc., about 90 per cent of the solid waste is collected and disposed. But in most of other cities and towns



in the country, about 30 to 50 per cent of the waste generated are left uncollected which accumulate on streets, in open spaces between houses and in wastelands leading to serious

Case Study : A Role Model to Restore the Ecology and Safeguard Human Health in Daurala

Based on the universal law “Polluter pays”, effort to restore the ecology and safeguard the human health with people’s participation has taken place in Daurala near Meerut. These efforts are now bearing fruits after a span of three years when Meerut based NGO had developed a model for ecological restoration. The meeting of the Daurala Industries officials, NGOs, Government officials and other stakeholders at Meerut has brought out results. The powerful logics, authentic studies and the pressure of people have brought a new lease of life to the twelve thousand residents of this village. It was in the year 2003 that the pitiable condition of Dauralaites drew the attention of the civil society. The groundwater of this village was contaminated with heavy metals. The reason was that the untreated wastewater of Daurala industries was leaching to the groundwater table. The NGO conducted a door to door survey of the health status of the residents and came out with a report. The organisation, the village community and people’s representatives sat together to find out sustainable solutions to the health problem. The industrialists showed a keen interest towards checking the deteriorating ecology. The overhead water tank’s capacity in the village was enhanced and a 900m extra pipeline was laid to supply potable water to the community. The silted pond of the village was cleaned and recharged by desilting it. Large quantity of silt was removed paving way to large quantity of water so that it recharged the aquifers. Rainwater harvesting structures have been constructed at different places which has helped in diluting the contaminants of the groundwater after the monsoons. 1000 trees have also been planted which have improved the environment.



health hazards. These wastes should be treated as resource and utilised for generating energy and compost. Untreated wastes ferment slowly and release toxic biogas to the atmosphere, including methane.

Activity

What do we throw away? Why?

Where does our waste end up?

Why do ragpickers sort out rubbish dumps? Does it have some value?

Is our urban waste worth anything?



Fig. 9.3 : A view of urban waste in Mahim, Mumbai

Rural-Urban Migration

Population flow from rural to urban areas is caused by many factors, like high demand for

labour in urban areas, low job opportunities in rural areas and unbalanced pattern of development between urban and rural areas. In India, population in cities is rapidly increasing. Due to low opportunities in smaller and medium cities, the poor people generally bypass these small cities and directly come to the mega cities for their livelihood.

A case study given below to have better understanding of the subject. Read it carefully and try to comprehend the process of rural urban migration.

A Case Study

Ramesh has been working in contract as a welder on construction site in Talcher (coal region of Odisha) for the last two years. He moved with the contractor to various places like Surat, Mumbai, Gandhi Nagar, Bharuch, Jamnagar and so on. He remits Rs. 20,000 per year to his father in his native village. The remittances have been mainly used for daily consumption, healthcare, schooling of children, etc. Part of the money is also used in agriculture, purchasing of land and building of houses, etc. The standard of living of Ramesh's family improved significantly.

Fifteen years ago, the situation was not the same. The family was passing through very tough times. Three of his brothers and their families had to survive on three acres of land. The family was highly in debt. Ramesh had to discontinue his studies after ninth standard. He was further hard pressed when he got married.

DO YOU KNOW ?

At present, 47 per cent of the world's six billion population lives in cities and more will join them in near future. This proportion is estimated to go up to 50 per cent by 2008. That will put pressure on governments to make urban areas better places to live with optimum infrastructure facilities for desirable quality of life.

By 2050, an estimated two-thirds of the world's population will live in urban areas, imposing even more pressure on the space infrastructure and resources of cities, which are manifested in terms of sanitary, health, crime problems and urban poverty.

Urban population grows as a result of natural increase (when birth rate exceeds death rate), net in-migration (when people move in than out), and sometimes reclassification of urban areas to encompass formerly rural population settlements. In India, it is estimated that after 1961 around 60 per cent of the urban growth has been attributed and 29 per cent of them from rural areas to urban migration.

Simultaneously, he was also impressed by some successful out-migrants of his village who had been working in Ludhiana and supporting their families in village by sending money and some consumer goods. Thus, due to abject poverty in the family and perceived job promises at Ludhiana, he made a move to Punjab with his friend. He worked there in a woolen factory for six months at the rate of only Rs. 20 per day in 1988. Apart from the crisis of managing his personal expenditure from this meagre income, he was also facing difficulty in assimilation to the new culture and environment. Then he decided to change his place of work from Ludhiana to Surat under the guidance of his friend. He learnt the skills of welding in Surat and after that he has been moving to different places with the same contractor. Though the economic condition of Ramesh's family at village improved, he is bearing the pain of separation of his near and dear ones. He cannot shift them with him, as the job is temporary and transferable.

Comments

In developing countries, poor, semi-illiterate and the unskilled like Ramesh migrating from rural areas frequently end up performing menial jobs at low wages in informal sector in urban areas. Since wages are very low to support the family at the place of destination, the spouses are left behind in rural areas to look after children and elderly people. Thus, the rural-urban migration stream is dominated by the males.

Problems of Slums

The concept “Urban or Urban Centre” is defined in settlement geography to differentiate it from the “Rural” about which you have learnt in some previous chapters of this book. You have also learnt in the book entitled *“Fundamentals of Human Geography”* that this concept is defined differently in different countries.

Both urban and rural settlements are different in their functions, sometimes,

Dharavi—Asia's Largest Slum

“.... Buses merely skirt the periphery. Autorickshaws cannot go there, Dharavi is part of central Bombay where three wheelers are banned.

Only one main road traverses the slum, the miscalled ‘ninety-foot road’, which has been reduced to less than half of that for most of its length. Some of the side alleys and lanes are so narrow that not



even a bicycle can pass. The whole neighbourhood consists of temporary buildings, two or three storeyed high with rusty iron stairways to the upper part, where a single room is rented by a whole family, sometimes accommodating twelve or more people; it is a kind of tropical version of the industrial dwelling of Victorian London’s East End.

But Dharavi is a keeper of more sombre secrets than the revulsion it inspires in the rich; a revulsion, moreover, that is, in direct proportion to the role it serves in the creation of the wealth of Bombay. In this place of shadowless, treeless sunlight, uncollected garbage, stagnant pools of foul water, where the only non-human creatures are the shining black crows and long grey rats, some of the most beautiful, valuable and useful articles in India are made. From Dharavi come delicate ceramics and pottery, exquisite embroidery and zari work, sophisticated leather goods, high-fashion garments, finely-wrought metalwork, delicate jewellery settings, wood carvings and furniture that would find its way into the richest houses, both in India and abroad...

Dharavi was an arm of the sea, that was filled by waste, largely produced by the people who have come to live there: Scheduled Castes and poor Muslims. It comprises rambling buildings of corrugated metal, 20 metres high in places, used for the treatment of hides and tanning. There are pleasant parts, but rotting garbage is everywhere...”

(Seabrook, 1996, pp. 50, 51-52)

complementing each other. Apart from these, rural and urban areas have also emerged into two separate cultural, social, political, economic and technological divide.

India, which has a predominance of rural population (approximately 69 per cent of the total population in 2011) and where villages were considered the ideal republics by

Mahatma Gandhi, most of the rural areas are still poor performing primary activities. Here most of the villages exist as appendix to the core urban centre forming its hinterland.

This may give an impression that urban centres exist as undifferentiated homogeneous entities in opposition to the rural areas. On the contrary, urban centres in India are more differentiated in terms of the socio-economic, politico-cultural and other indicators of development than any other areas. At the top, there are farm houses and high income group localities characterised by well-developed urban infrastructures, like wide roads, streetlights, water and sanitation facilities, lawns, well-developed green belt, parks, playgrounds and provisions for individual security and right to privacy. At the other extreme of it are the *slums*, *jhuggi-jhopari* clusters and colonies of shanty structures. These are inhabited by those people who were forced to migrate from the rural areas to these urban centres in search of livelihood but could not afford proper housing due to high rent and high costs of land. They occupy environmentally incompatible and degraded areas.

Slums are residential areas of the least choice, dilapidated houses, poor hygienic conditions, poor ventilation, lack of basic amenities, like drinking water, light and toilet facilities, etc. Open defecation, unregulated drainage system and overcrowded narrow street patterns are serious health and socio-environmental hazards.

The *Swachh Bharat Mission* (SBM) is part of the urban renewal mission launched by the Government of India to improve the quality of life in urban slums.

Moreover, most of the slum population works in low-paid, high risk-prone, unorganised sectors of the urban economy. Consequently, they are the undernourished, prone to different types of diseases and illness

and can not afford to give proper education to their children. The poverty makes them vulnerable to drug abuse, alcoholism, crime, vandalism, escapism, apathy and ultimately social exclusion.

Why are the children of slum-dwellers deprived of school education?

Land Degradation

The pressure on agricultural land increases not only due to the limited availability but also by deterioration of quality of agricultural land. Soil erosion, waterlogging, salinisation and alkalinisation of land lead to land degradation. What happens if land is consistently used without managing its fertility? Land is degraded and productivity declines. Land degradation is generally understood either as a temporary or a permanent decline in productive capacity of the land.

Though all degraded land may not be wasteland, but unchecked process of degradation may lead to the conversion to wasteland.

There are two processes that induce land degradation. These are natural and created by human beings. National Remote Sensing Centre (NRSC) has classified wastelands by using remote sensing techniques and it is possible to categorise these wastelands according to the processes that have created them. There are a few types of wastelands such as gullied /ravinous land, desertic or coastal sands, barren rocky areas, steep sloping land, and glacial areas, which are primarily caused by *natural agents*. There are other types of degraded lands such as waterlogged and marshy areas, land affected by salinity and alkalinity and land with or without scrub, which have largely been caused by *natural as well as human factors*. There are some other types of wastelands such as degraded shifting cultivation area, degraded land under plantation crops, degraded forests, degraded pastures, and mining and industrial wastelands,



are caused by human action. Table 12.3 indicates that wastelands caused by man-made processes are more important than natural processes.

A Case Study

Jhabua district is located in the westernmost agro-climatic zone in Madhya Pradesh. It is, in fact, one of the five most backward districts of the country. It is characterised by high concentration of tribal population (mostly *Bhils*). The people suffer due to poverty which has been accentuated by the high rate of resource degradation, both forest and land. The watershed management programmes funded by both the ministries of "Rural Development" and "Agriculture", Government of India, have been successfully implemented in Jhabua district which has gone a long way in preventing land degradation and improving soil quality. Watershed Management Programmes acknowledge the linkage between land, water and vegetation and attempts to improve livelihoods of people through natural resource management and community participation. In the past five years, the programmes funded by the Ministry of Rural Development alone (*implemented by Rajiv Gandhi Mission for Watershed Management*) has treated 20 per cent of the total area under Jhabua district.



Fig. 9.4 : Trees planted on Common Property Resources in Jhabua

Source: *Evaluation Report, Rajiv Gandhi Mission for Watershed Management, Government of Madhya Pradesh, 2002*

The Petlawad block of Jhabua is located in the northernmost part of the district and represents an interesting and successful case of Government-NGO partnership and community participation in managing watershed programmes. The *Bhils* in Petlawad block, for example, (Sat Rundi hamlet of Karravat village) through their own efforts, have revitalised large parts of common property resources. Each household planted and maintained one tree on the common property. They also have planted fodder grass on the pasture land and adopted social-fencing of these lands for at least two years. Even after that, they say, there would be no open grazing on these lands, but stall feeding of cattle, and they are thus confident that the pastures they have developed would sustain their cattle in future.

An interesting aspect of this experience is that before the community embarked upon the process of management of the pasture, there was encroachment on this land by a villager from an adjoining village. The villagers called the tehsildar to ascertain the rights of the common land. The ensuing conflict was tackled by the villagers by offering to make the defaulter encroaching on the CPR a member of their user group and sharing the benefits of greening the common lands/pastures. (See the section on CPR in chapter 'Land Resources and Agriculture').

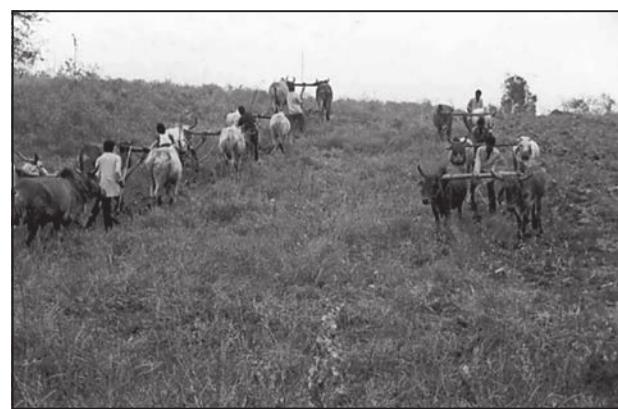


Fig. 9.5 : Community Participation for Land Leveling in Common Property Resources in Jhabua (ASA, 2004)



EXERCISES

- 1.** Choose the right answers of the following from the given options.

 - (i) Which one of the following river is highly polluted?
 - (a) Brahmaputra
 - (c) Yamuna
 - (b) Satluj
 - (d) Godavari
 - (ii) Which one of the following diseases is caused by water pollution?
 - (a) Conjunctivitis
 - (c) Respiratory infections
 - (b) Diarrhoea
 - (d) Bronchitis
 - (iii) Which one of the following is the cause of acid rain?
 - (a) Water pollution
 - (c) Noise pollution
 - (b) Land pollution
 - (d) Air pollution
 - (iv) Push and pull factors are responsible for—
 - (a) Migration
 - (c) Slums
 - (b) Land degradation
 - (d) Air pollution

2. Answer the following questions in about 30 words.

 - (i) What is the difference between pollution and pollutants?
 - (ii) Describe the major source of air pollution.
 - (iii) Mention major problems associated with urban waste disposal in India.
 - (iv) What are the effects of air pollution on human health.

3. Answer the following questions in about 150 words.

 - (i) Describe the nature of water pollution in India.
 - (ii) Describe the problem of slums in India.
 - (iii) Suggest measures for reduction of land degradation.



PRACTICAL WORK in Geography

PART II

TEXTBOOK FOR CLASS XII



राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

First Edition*February 2007 Magha 1928***Reprinted***February 2008 Magha 1929**January 2009 Magha 1930**January 2010 Magha 1931**December 2010 Pausa 1932**January 2014 Magha 1935**February 2015 Magha 1936**December 2015 Agrahayana 1937**February 2017 Magha 1938**December 2017 Pausa 1939**December 2018 Agrahayana 1940**August 2019 Shravana 1941**January 2021 Pausa 1942**December 2021 Agrahayana 1943***Revised Edition***August 2022 Sharvana 1944***PD 75T HK**

© National Council of Educational
Research and Training, 2007, 2022

₹ 75.00

Printed on 80 GSM paper with NCERT
watermark

Published at the Publication Division by the
Secretary, National Council of Educational
Research and Training, Sri Aurobindo Marg,
New Delhi 110 016 and printed at
Raj Printers, A-9, Sector B-2, Tronica City
Industrial Area, Loni, District Ghaziabad
201 102 (U.P.)

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Cover and Layout*Blue Fish***Cartography***Cartographic Design Agency*

Foreword

The National Curriculum Framework (NCF), 2005, recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy on Education (1986).

The success of this effort depends on the steps that school principals and teachers will take to encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognise that, given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults. Treating the prescribed textbook as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. Inculcating creativity and initiative is possible if we perceive and treat children as participants in learning, not as receivers of a fixed body of knowledge.

These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required number of teaching days are actually devoted to teaching. The methods used for teaching and evaluation will also determine how effective this textbook proves for making children's life at school a happy experience, rather than a source of stress or boredom. Syllabus designers have tried to address the problem of curricular burden by restructuring and reorienting knowledge at different stages with greater consideration for child psychology and the time available for teaching. The textbook attempts to enhance this endeavour by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience.

The National Council of Educational Research and Training (NCERT) appreciates the hard work done by the textbook development committee responsible for this book. We wish to thank the Chairperson of the advisory committee for textbooks in Social Sciences, at the higher secondary level, Professor Hari Vasudevan and the Chief Advisor for this book, Professor M.H. Qureshi for guiding the work of this committee. Several teachers contributed to the development of this textbook; we are grateful to their principals for making this possible. We are indebted to the institutions and organisations which have

generously permitted us to draw upon their resources, material and personnel. We are especially grateful to the members of the National Monitoring Committee, appointed by the Department of Secondary and Higher Education, Ministry of Human Resource Development under the Chairpersonship of Professor Mrinal Miri and Professor G.P. Deshpande, for their valuable time and contribution. As an organisation committed to systemic reform and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to undertake further revision and refinement.

New Delhi
20 November 2006

Director
National Council of Educational
Research and Training

Rationalisation of Content In The Textbooks

In view of the COVID-19 pandemic, it is imperative to reduce content load on students. The National Education Policy 2020, also emphasises reducing the content load and providing opportunities for experiential learning with creative mindset. In this background, the NCERT has undertaken the exercise to rationalise the textbooks across all classes. Learning Outcomes already developed by the NCERT across classes have been taken into consideration in this exercise.

Contents of the textbooks have been rationalised in view of the following:

- Overlapping with similar content included in other subject areas in the same class
- Similar content included in the lower or higher class in the same subject
- Difficulty level
- Content, which is easily accessible to students without much interventions from teachers and can be learned by children through self-learning or peer-learning
- Content, which is irrelevant in the present context

This present edition, is a reformatted version after carrying out the changes given above.

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Acknowledgements

The National Council of Educational Research and Training acknowledges the contributions of H. Ramachandran, *Professor and Head*, Delhi School of Economics, Delhi University; B. S. Butola, *Professor*, CSRD, JNU; Odilia Coutinho, *Reader*, R.P.D. College, Belgaum; Anup Saikia, *Reader*, Gauhati University, Guwahati; Abdul Shaban, *Asstt. Professor*, Tata Institute of Social Sciences, Mumbai and Rupa Das, *PGT*, DPS, R.K. Puram, New Delhi in the development of this textbook.

Special thanks are due to Savita Sinha, *Professor and Head*, Department of Education in Social Sciences and Humanities for her valuable support at every stage of preparation of this textbook.

The Council is thankful to the Survey of India for certification of maps given in the textbook. It also gratefully acknowledges the support of individuals and organisations as listed below for providing various photographs and illustrations used in this textbook:

S.M. Rashid, *Professor*, Jamia Millia Islamia, New Delhi for fig. 1.2, 1.3 and 1.4; M.H. Quasmi, *Lecturer*, IASE, Jamia Millia Islamia, New Delhi for fig. 3.9, 3.10, 3.11 and 3.12; and Shahab Fazal, *Reader*, Aligarh Muslim University, Aligarh for fig. 4.8, 4.9, 4.10, 4.12 and 4.13.

The Council also gratefully acknowledges the contribution of Anil Sharma and Ishwar Singh *DTP Operators*; Ajay Singh, *Copy Editor*, Aarati Baloni, *Proof Reader* and Dinesh Kumar, *Computer Incharge* who have helped in giving a final shape to this book. The contribution of the Publication Department, NCERT in bringing out this textbook is also duly acknowledged.

The following are applicable to all the maps of India used in this textbook

1. © Government of India, Copyright 2006
2. The responsibility for the correctness of internal details rests with the publisher.
3. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
4. The administrative headquarters of Chandigarh, Haryana and Punjab are at Chandigarh.
5. The interstate boundaries amongst Arunachal Pradesh, Assam and Meghalaya shown on this map are as interpreted from the "North-Eastern Areas (Reorganisation) Act.1971," but have yet to be verified.
6. The external boundaries and coastlines of India agree with the Record/Master Copy certified by Survey of India.
7. The state boundaries between Uttaranchal and Uttar Pradesh, Bihar and Jharkhand, Chhattisgarh and Madhya Pradesh have not been verified by the Governments concerned.
8. The spellings of names in this map, have been taken from various sources.

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THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a **[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the **[unity and integrity of the Nation];**

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)



1

Data – Its Source and Compilation

You must have seen and used various forms of data. For example, at the end of almost every news bulletin on Television, the temperatures recorded on that day in major cities are displayed. Similarly, the books on the Geography of India show data relating to the growth and distribution of population, and the production, distribution and trade of various crops, minerals and industrial products in tabular form. Have you ever thought what they mean? From where these data are obtained? How are they tabulated and processed to extract meaningful information from them ? In this chapter, we will deliberate on these aspects of the data and try to answer these many questions.

What is Data?

The data are defined as numbers that represent measurements from the real world. **Datum** is a single measurement. We often read the news like 20 centimetres of continuous rain in Barmer or 35 centimetres of rain at a stretch in Banswara in 24 hours or information such as New Delhi – Mumbai distance via Kota – Vadodara is 1385 kilometres and via Itarsi - Manmad is 1542 kilometres by train. This numerical information is called data. It may be easily realised that there are large volume of data available around the world today. However, at times, it becomes difficult to derive logical conclusions from these data if they are in raw form. Hence, it is important to ensure that the measured information is algorithmically derived and/or logically deduced and/or statistically calculated from multiple data. **Information** is defined as either a meaningful answer to a query or a meaningful stimulus that can cascade into further queries.

Need of Data

Maps are important tools in studying geography. Besides, the distribution and growth of phenomena are also explained through the data in tabular form. We know that an interrelationship exists between many phenomena over the surface of the earth. These interactions are influenced by many variables which can be

explained best in quantitative terms. Statistical analysis of those variables has become a necessity today. For example, to study cropping pattern of an area, it is necessary to have statistical information about the cropped area, crop yield and production, irrigated area, amount of rainfall and inputs like use of fertiliser, insecticides, pesticides, etc. Similarly, data related to the total population, density, number of migrants, occupation of people, their salaries, industries, means of transportation and communication is needed to study the growth of a city. Thus, data plays an important role in geographical analysis.

Presentation of the Data

You might have heard the story of a person who was travelling with his wife and a five-year old child. On his way, he had to cross a river. Firstly, he fathomed the depth of the river at four points as 0.6, 0.8, 0.9 and 1.5 metres. He calculated the average depth as 0.95 metres. His child's height was 1 metre. So, he led them to cross the river and his child drowned in the river. On the other bank, he sat pondering: "*Lekha Jokha Thahe, to Bachha Dooba Kahe?*" (Why did the child drown when average depth was within the reach of each one?). This is called statistical fallacy, which may deviate you from the real situation. So, it is important to collect the data to know the facts and figures, but equally important is the presentation of data. Today, the use of statistical methods in the analysis, presentation and in drawing conclusions plays a significant role in almost all disciplines, including geography, which use the data. It may, therefore, be inferred that the concentration of a phenomenon, e.g., population, forest or network of transportation or communication not only vary over space and time but may also be conveniently explained using the data. In other words, you may say that there is a shift from qualitative description to quantitative analysis in explaining the relationship among variables. Hence, analytical tools and techniques have become more important these days to make the study more logical and derive precise conclusion. Precise quantitative techniques are used right from the beginning of collecting and compiling data to its tabulation, organisation, ordering and analysis till the derivation of conclusions.

Sources of Data

The data are collected through the following ways. These are : 1. Primary Sources, and 2. Secondary Sources.

The data which are collected for the first time by an individual or the group of individuals, institution/organisations are called **Primary sources of the data**. On the other hand, data collected from any published or unpublished sources are called **Secondary sources**. Fig. 1.1 shows the different methods of data collection.

Sources of Primary Data

1. Personal Observations

It refers to the collection of information by an individual or group of individuals through direct observations in the field. Through a field survey, information about the relief features, drainage patterns, types of soil and natural vegetation, as well as, population structure, sex ratio, literacy, means of transport and communication, urban and rural settlements, etc., is collected. However, in

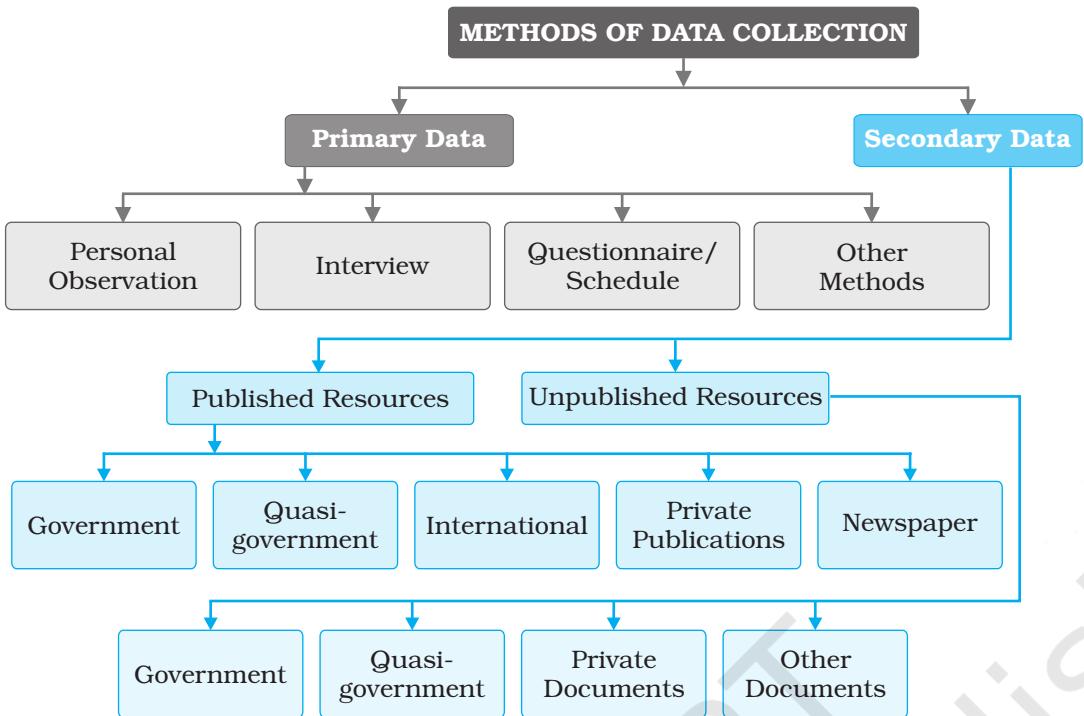


Fig. 1.1 : Methods of Data Collection

carrying out personal observations, the person(s) involved must have theoretical knowledge of the subject and scientific attitude for unbiased evaluation.

2. Interview

In this method, the researcher gets direct information from the respondent through dialogues and conversations. However, the interviewer must take the following precautions while conducting an interview with people of the area:

- (i) A precise list of items about which information is to be gathered from the persons interviewed be prepared.
- (ii) The person(s) involved in conducting the interview should be clear about the objective of the survey.
- (iii) The respondents should be taken into confidence before asking any sensitive question and he/she be assured that the secrecy will be maintained.
- (iv) A congenial atmosphere should be created so that the respondent may explain the facts without any hesitation.
- (v) The language of the questions should be simple and polite so that the respondents feel motivated and readily agree to give the information asked for.
- (vi) Avoid asking any such question that may hurt the self-respect or the religious feelings of the respondent.
- (vii) At the end of the interview, ask the respondent what additional information he/she may provide, other than what has already been provided by him/her.
- (viii) Pay your thanks and gratefulness for sparing his/her valuable time for you.