

## **POPULATION**

### *Distribution, Density, Growth and Composition*



The people are very important component of a country. India is the second most populous country after China in the world with its total population of 1,210 million (2011). India's population is larger than the total population of North America, South America and Australia put together. More often, it is argued that such a large population invariably puts pressure on its limited resources and is also responsible for many socio-economic problems in the country.

How do you perceive the idea of India? Is it simply a territory? Does this signify an amalgam of people? Is it a territory inhabited by people living under certain institutions of governance?

In this chapter, we will discuss the patterns of distribution, density, growth and composition of India's population.

#### **Sources of Population Data**

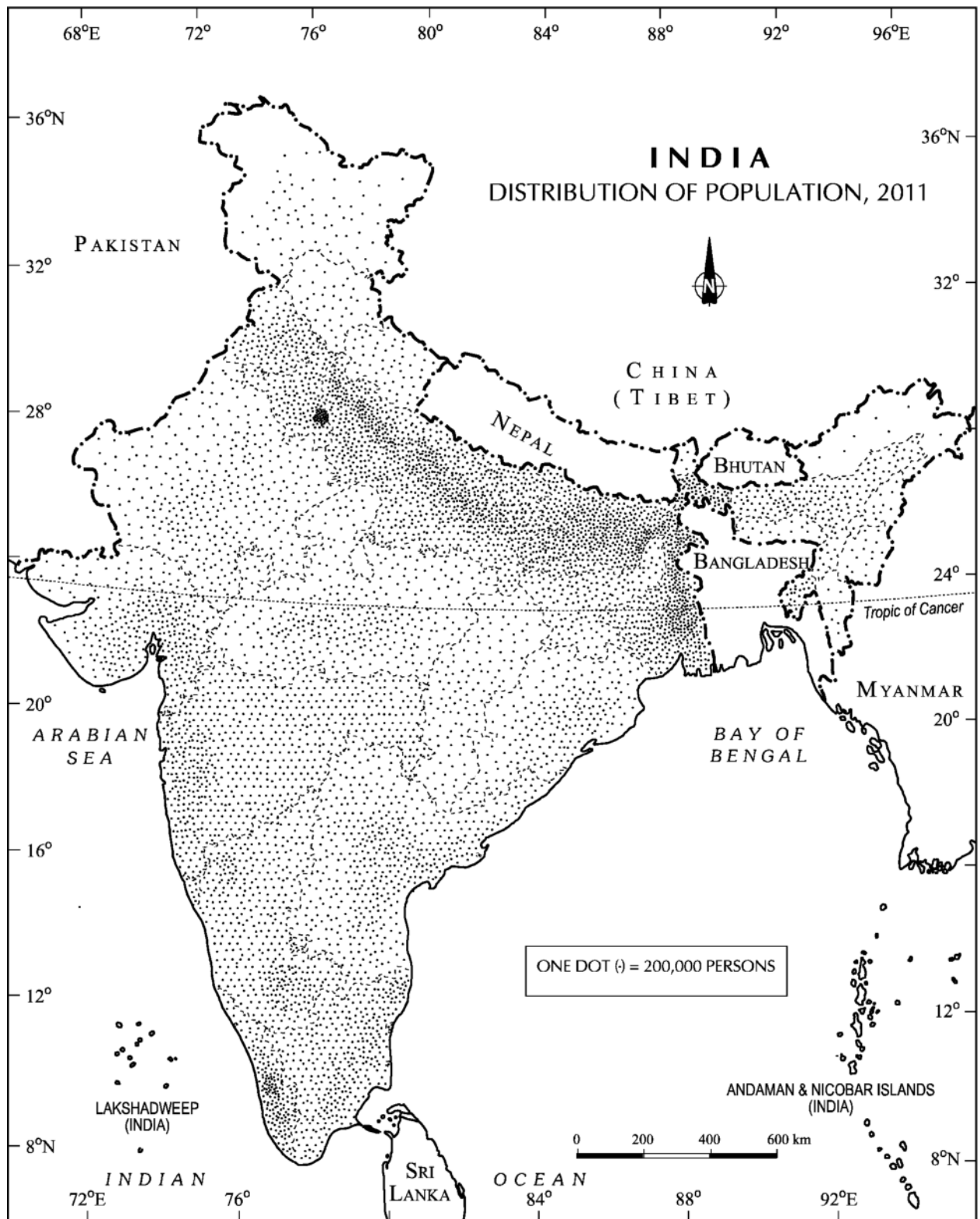
Population data are collected through Census operation held every 10 years in our country. The first population Census in India was conducted in 1872 but its first complete Census was conducted only in 1881.

#### **Distribution of Population**

Examine Fig. 1.1 and try to describe the patterns of spatial distribution of population shown on it. It is clear that India has a highly uneven pattern of population distribution. The percentage shares of population of the states and Union Territories in the country (Appendix) show that Uttar Pradesh has the highest population followed by Maharashtra, Bihar and West Bengal.

#### **Activity**

Looking at the data in Appendix i, arrange the Indian States and Union Territories according to their sizes and population and find out :



**Fig. 1.1 : India – Distribution of Population**



States/UTs of large size and large population

States/UTs of large size but small population

States/UTs of smaller size but larger population

Check from the table (Appendix-iA) that U.P., Maharashtra, Bihar, West Bengal, Andhra Pradesh along with Tamil Nadu, Madhya Pradesh, Rajasthan, Karnataka and Gujarat, together account for about 76 per cent of the total population of the country. On the other hand, share of population is very small in the states like Jammu & Kashmir (1.04%), Arunachal Pradesh (0.11%) and Uttarakhand (0.84%) inspite of these states having fairly large geographical area.

Such an uneven spatial distribution of population in India suggests a close relationship between population and physical, socio-economic and historical factors. As far as the physical factors are concerned, it is clear that climate along with terrain and availability of water largely determines the pattern of the population distribution. Consequently, we observe that the North Indian Plains, deltas and Coastal Plains have higher proportion of population than the interior districts of southern and central Indian States, Himalayas, some of the north eastern and the western states. However, development of irrigation (Rajasthan), availability of mineral and energy resources (Jharkhand) and development of transport network (Peninsular States) have resulted in moderate to high concentration of population in areas which were previously very thinly populated.

Among the socio-economic and historical factors of distribution of population, important ones are evolution of settled agriculture and agricultural development; pattern of human settlement; development of transport network, industrialisation and urbanisation. It is observed that the regions falling in the river plains and coastal areas of India have remained the regions of larger population concentration. Even though the uses of natural resources like land and water in these regions have shown the sign of degradation, the concentration of population remains high because of an early

history of human settlement and development of transport network. On the other hand, the urban regions of Delhi, Mumbai, Kolkata, Bengaluru, Pune, Ahmedabad, Chennai and Jaipur have high concentration of population due to industrial development and urbanisation drawing a large numbers of rural-urban migrants.

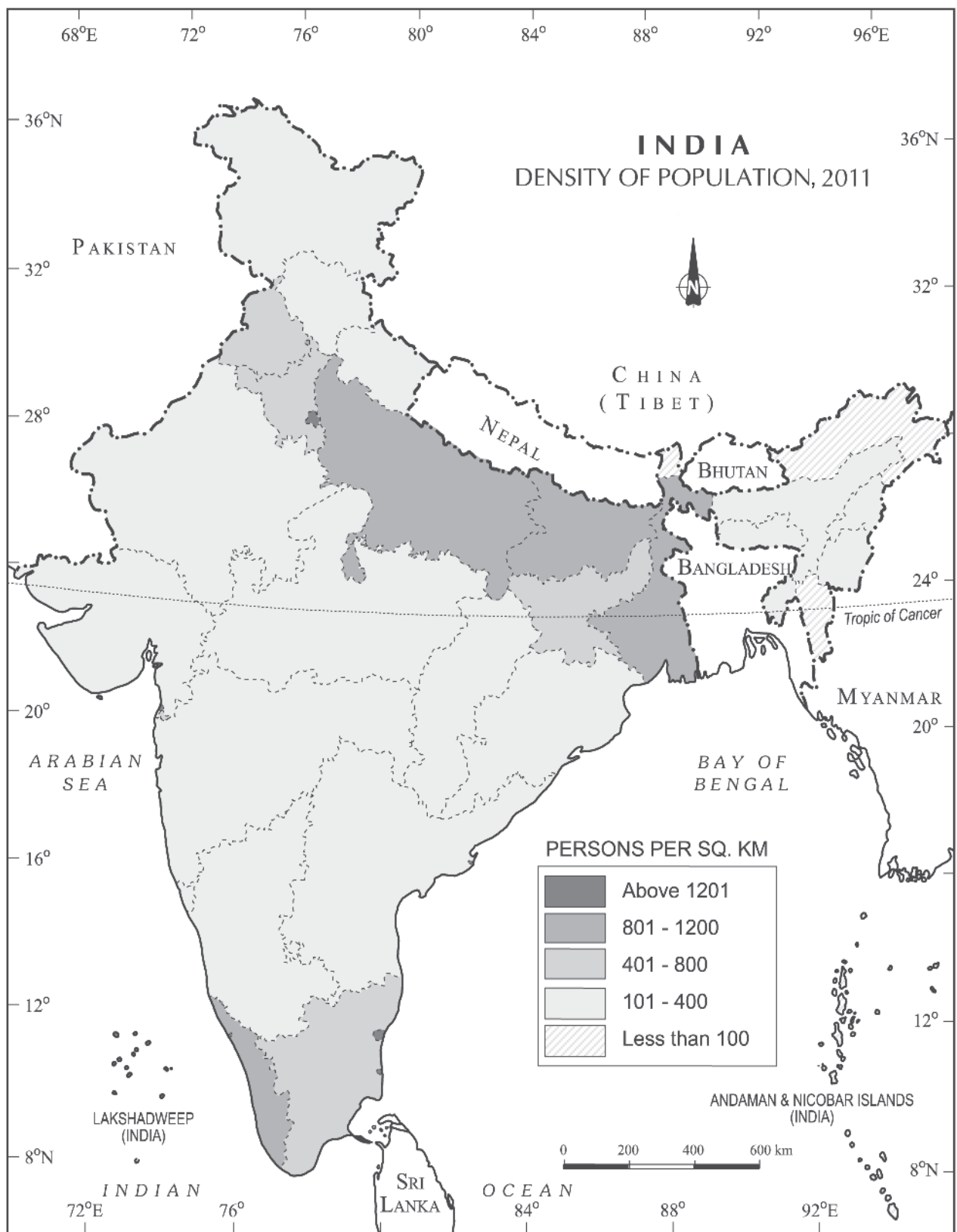
## Density of Population

Density of population, is expressed as number of persons per unit area. It helps in getting a better understanding of the spatial distribution of population in relation to land. The density of population in India (2011) is 382 persons per sq km. There has been a steady increase of more than 200 persons per sq km over the last 50 years as the density of population increased from 117 persons/ sq km in 1951 to 382 persons/sq km in 2011.

The data shown in Appendix (i) give an idea of spatial variation of population densities in the country which ranges from as low as 17 persons per sq km in Arunachal Pradesh to 11,297 persons in the National Capital Territory of Delhi. Among the northern Indian States, Bihar (1102), West Bengal (1029) and Uttar Pradesh (828) have higher densities, while Kerala (859) and Tamil Nadu (555) have higher densities among the peninsular Indian states. States like Assam, Gujarat, Andhra Pradesh, Haryana, Jharkhand, Odisha have moderate densities. The hill states of the Himalayan region and North eastern states of India (excluding Assam) have relatively low densities while the Union Territories (excluding Andaman and Nicobar islands) have very high densities of population (Appendix-i).

The density of population, as discussed in the earlier paragraph, is a crude measure of human and land relationship. To get a better insight into the human-land ratio in terms of pressure of population on total cultivable land, the *physiological* and the *agricultural* densities should be found out which are significant for a country like India having a large agricultural population.





**Fig. 1.2 : India - Density of Population**

Physiological density = total population / net cultivated area

Agricultural density = total agricultural population / net cultivable area

Agricultural population includes cultivators and agricultural labourers and their family members.

## Activity

With the help of data given in Appendix (ii), Calculate the Physiological and Agricultural densities of population of Indian States and Union Territories. Compare them with density of population and see how are these different?

## Growth of Population

Growth of population is the change in the number of people living in a particular area between two points of time. Its rate is expressed in percentage. Population growth has two components namely; natural and induced. While the natural growth is analysed by

assessing the crude birth and death rates, the induced components are explained by the volume of inward and outward movement of people in any given area. However, in the present chapter, we will only discuss the natural growth of India's population.

The decadal and annual growth rates of population in India are both very high and steadily increasing over time. The annual growth rate of India's population is 1.64 per cent (2011).

## Population Doubling Time

Population doubling time is the time taken by any population to double itself at its current annual growth rate.

The growth rate of population in India over the last one century has been caused by annual birth rate and death rate and rate of migration and thereby shows different trends. There are four distinct phases of growth identified within this period:

**Table 1.1 : Decadal Growth Rates in India, 1901-2011**

Census Years	Total Population	Growth Rate*	
		Absolute Number	% of Growth
1901	238396327	-----	-----
1911	252093390	(+) 13697063	(+) 5.75
1921	251321213	(-) 772117	(-) 0.31
1931	278977238	(+) 27656025	(+) 11.60
1941	318660580	(+) 39683342	(+) 14.22
1951	361088090	(+) 42420485	(+) 13.31
1961	439234771	(+) 77682873	(+) 21.51
1971	548159652	(+) 108924881	(+) 24.80
1981	683329097	(+) 135169445	(+) 24.66
1991	846302688	(+) 162973591	(+) 23.85
2001	1028610328	(+) 182307640	(+) 21.54
2011**	1210193422	(+) 181583094	(+) 17.64

\* Decadal growth rate:  $g = \frac{P_2 - P_1}{P_1} \times 100$

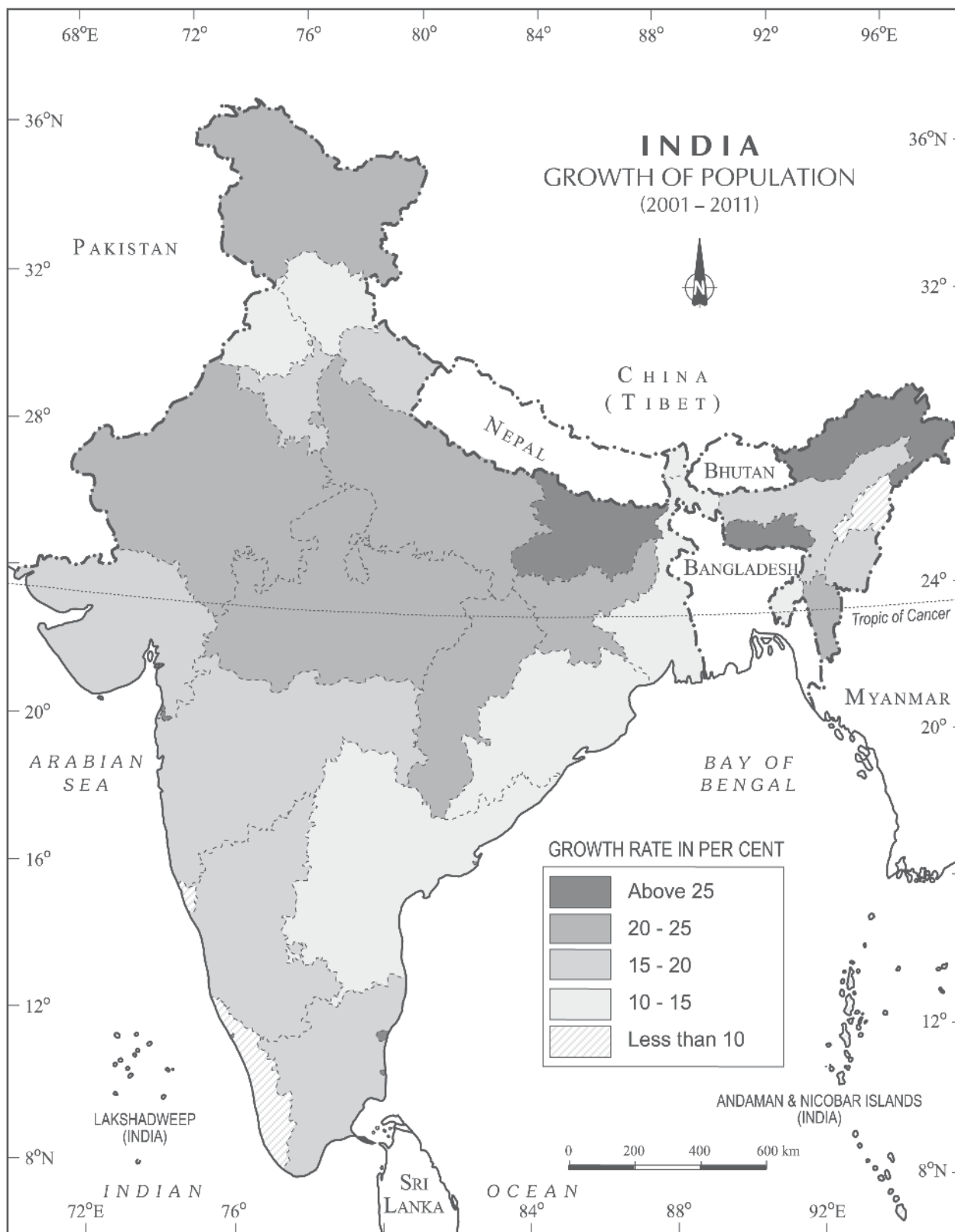
where  $P_1$  = population of the base year

$P_2$  = population of the present year

\*\* Source : Census of India, 2011 (Provisional)







**Fig. 1.3 : India – Growth of Population**

**Phase I :** The period from 1901-1921 is referred to as a period of stagnant or stationary phase of growth of India's population, since in this period growth rate was very low, even recording a negative growth rate during 1911-1921. Both the birth rate and death rate were high keeping the rate of increase low (Appendix-iii). Poor health and medical services, illiteracy of people at large and inefficient distribution system of food and other basic necessities were largely responsible for a high birth and death rates in this period.

**Phase II :** The decades 1921-1951 are referred to as the period of steady population growth. An overall improvement in health and sanitation throughout the country brought down the mortality rate. At the same time better transport and communication system improved distribution system. The crude birth rate remained high in this period leading to higher growth rate than the previous phase. This is impressive at the backdrop of Great Economic Depression, 1920s and World War II.

**Phase III :** The decades 1951-1981 are referred to as the period of population explosion in India, which was caused by a rapid fall in the mortality rate but a high fertility rate of population in the country. The average annual growth rate was as high as 2.2 per cent. It is in this period, after the Independence, that developmental activities were introduced through a centralised planning process and economy started showing up ensuring the improvement of living condition of people at large. Consequently, there was a high natural increase and higher growth rate. Besides, increased international migration bringing in

Tibetans, Bangladeshis, Nepalis and even people from Pakistan contributed to the high growth rate.

**Phase IV :** In the post 1981 till present, the growth rate of country's population though remained high, has started slowing down gradually (Table 1.1). A downward trend of crude birth rate is held responsible for such a population growth. This was, in turn, affected by an increase in the mean age at marriage, improved quality of life particularly education of females in the country.

The growth rate of population is, however, still high in the country, and it has been projected by World Development Report that population of India will touch 1,350 million by 2025.

The analysis done so far shows the average growth rate, but the country also has wide variation (Appendix-iv) in growth rates from one area to another which is discussed below.

### **Regional Variation in Population Growth**

The growth rate of population during 1991-2001 in Indian States and Union Territories shows very obvious pattern.

The States like Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Odisha, Puducherry, and Goa show a low rate of growth not exceeding 20 per cent over the decade. Kerala registered the lowest growth rate (9.4) not only in this group of states but also in the country as a whole.

A continuous belt of states from west to east in the north-west, north, and north central parts of the country has relatively high growth rate than the southern states. It is in this belt comprising Gujarat, Maharashtra, Rajasthan, Punjab, Haryana, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Sikkim, Assam, West Bengal, Bihar, Chhattisgarh, and Jharkhand, the growth rate on the average remained 20-25 per cent.

During 2001-2011, the growth rates of almost all States and Union Territories have registered a lower figure compared to the previous decade, namely, 1991-2001. The percentage decadal growth rates of the six most populous States, namely, Uttar Pradesh, Maharashtra, Bihar, West Bengal, Andhra



Pradesh and Madhya Pradesh have all fallen during 2001-2011 compared to 1991-2001, the fall being the lowest for Andhra Pradesh (3.5% percentage points) and highest for Maharashtra (6.7 percentage points). Tamil Nadu (3.9 percentage points) and Puducherry (7.1 percentage points) have registered some increase during 2001-2011 over the previous decade.

### Activity

With the help of data given in Appendix i and iA, compare the growth rate of population of different States/UTs between 1991-2001 and 2001-2011.

Take the population growth data of the districts/selected districts of your respective state for total male and female population and represent them with the help of Composite Bar Graph.

An important aspect of population growth in India is the growth of its adolescents. At present the share of adolescents i.e., up to the age group of 10-19 years is about 20.9 per cent (2011), among which male adolescents constitute 52.7 per cent and female adolescents constitute 47.3 per cent. The adolescent population, though, regarded as the youthful population having high potentials, but at the same time they are quite vulnerable if not guided and channelised properly. There are many challenges for the society as far as these adolescents are concerned, some of which are lower age at marriage, illiteracy – particularly female illiteracy, school dropouts, low intake of nutrients, high rate of maternal mortality of adolescent mothers, high rate of HIV and AIDS infections, physical and mental disability or retardedness, drug abuse and alcoholism, juvenile delinquency and commitment of crimes, etc.

In view of these, the Government of India has undertaken certain policies to impart proper education to the adolescent groups so that their talents are better channelised and properly utilised. The National Youth Policy is

one example which has been designed to look into the overall development of our large youth and adolescent population.

The National Youth Policy (NYP-2014) launched in February 2014 proposes a holistic 'vision' for the youth of India, which is "To empower the youth of the country to achieve their full potential, and through them enable India to find its rightful place in the community of nations". The NYP-2014 has defined 'youth' as persons in the age group of 15-29 years.

The Government of India also formulated the National Policy for Skill Development and Entrepreneurship in 2015 to provide an umbrella framework to all skilling activities being carried out within the country, and to align these to common standards and link skilling with demand centres.

It appears from the above discussion that the growth rate of population is widely variant over space and time in the country and also highlights various social problems related to the growth of population. However, in order to have a better insight into the growth pattern of population it is also necessary to look into the social composition of population.

## Population Composition

Population composition is a distinct field of study within population geography with a vast coverage of analysis of age and sex, place of residence, ethnic characteristics, tribes, language, religion, marital status, literacy and education, occupational characteristics, etc. In this section, the composition of Indian population with respect to their rural-urban characteristics, language, religion and pattern of occupation will be discussed.

### Rural – Urban Composition

Composition of population by their respective places of residence is an important indicator of social and economic characteristics. This becomes even more significant for a country where about 68.8 per cent of its total population lives in village (2011).





## Activity

Compare the data given in Appendix (iv) and iv A calculate the percentages of rural population of the states in India and represent them cartographically on a map of India.

Do you know that India has 640,867 villages according to the Census 2011 out of which 597,608 (93.2 per cent) are inhabited villages? However, the distribution of rural population is not uniform throughout the country. You might have noted that the states like Bihar and Sikkim have very high percentage of rural population. The states of Goa and Maharashtra have only little over half of their total population residing in villages.

The Union Territories, on the other hand, have smaller proportion of rural population, except Dadra and Nagar Haveli (53.38 per cent). The size of villages also varies considerably. It is less than 200 persons in the hill states of north-eastern India, Western Rajasthan and Rann of Kutch and as high as 17 thousand persons in the states of Kerala and in parts of Maharashtra. A thorough examination of the pattern of distribution of rural population of India reveals that both at intra-State and inter-State levels, the relative degree of urbanisation and extent of rural-urban migration regulate the concentration of rural population.

You have noted that contrary to rural population, the proportion of urban population (31.16 per cent) in India is quite low but it is showing a much faster rate of growth over the decades. The growth rate of urban population has accelerated due to enhanced economic development and improvement in health and hygienic conditions.

The distribution of urban population too, as in the case of total population, has a wide variation throughout the country (Appendix-iv).

## Activity

Compare the data of Appendix (iv) and iv A and identify the states/UTs with very high and very low proportion of urban population.

It is, however, noticed that in almost all the states and Union Territories, there has been a considerable increase of urban population. This

indicates both development of urban areas in terms of socio-economic conditions and an increased rate of rural-urban migration. The rural-urban migration is conspicuous in the case of urban areas along the main road links and railroads in the North Indian Plains, the industrial areas around Kolkata, Mumbai, Bengaluru – Mysuru, Madurai – Coimbatore, Ahmedabad – Surat, Delhi – Kanpur and Ludhiana – Jalandhar. In the agriculturally stagnant parts of the middle and lower Ganga Plains, Telengana, non-irrigated Western Rajasthan, remote hilly, tribal areas of north-east, along the flood prone areas of Peninsular India and along eastern part of Madhya Pradesh, the degree of urbanisation has remained low.

## **Linguistic Composition**

India is a land of linguistic diversity. According to Grierson (Linguistic Survey of India, 1903 – 1928), there were 179 languages and as many as 544 dialects in the country. In the context of modern India, there are about 22 scheduled languages and a number of non-scheduled languages.

## Activity

See how many languages appear on a Rs 10 note.

Among the scheduled languages, the speakers of Hindi have the highest percentage. The smallest language groups are Sanskrit, Bodo and Manipuri speakers (2011). However, it is noticed that the linguistic regions in the country do not have a sharp and distinct boundary, rather they gradually merge and overlap in their respective frontier zones.

## **Linguistic Classification**

The speakers of major Indian languages belong to four language families, which have their sub-families and branches or groups. This can be better understood from Table 1.2.

## **Religious Composition**

Religion is one of the most dominant forces affecting the cultural and political life of the majority of Indians. Since religion virtually permeates into almost all the aspects of people's family and community lives, it is important to study the religious composition in detail.



**Table 1.2 : Classification of Modern Indian Languages**

Family	Sub-Family	Branch/Group	Speech Areas
Austic (Nishada) 1.38%	Austro-Asiatic	Mon-Khmer	Meghalaya, Nicobar Islands
	Austro- Nesian	Munda	West Bengal, Bihar, Orissa, Assam, Madhya Pradesh, Maharashtra Outside India
Dravidian (Dravida) 20%		South-Dravidian	Tamil Nadu, Karnataka, Kerala
		Central Dravidian	Andhra Pradesh, M.P., Orissa, Maharashtra
		North Dravidian	Bihar, Orissa, West Bengal, Madhya Pradesh
Sino-Tibetan (Kirata) 0.85%	Tibeto - Myanmari	Tibeto-Himalayan	Jammu & Kashmir, Himachal Pradesh, Sikkim
	Siamese-Chinese	North Assam	Arunachal Pradesh
		Assam- Myanmari	Assam, Nagaland, Manipur, Mizoram, Tripura, Meghalaya
Indo - European (Aryan) 73%	Indo-Aryan	Iranian	Outside India
		Dardic	Jammu & Kashmir
		Indo-Aryan	Jammu & Kashmir, Punjab, Himachal Pradesh, U.P., Rajasthan, Haryana, M.P., Bihar, Orissa, West Bengal, Assam, Gujarat, Maharashtra, Goa.

Source : Ahmed, A. (1999) : *Social Geography*, Rawat Publication, New Delhi

### Activity

Look at Table 1.2 and prepare a pie diagram of linguistic composition of India showing the sectoral shares of each linguistic group.

Or

Prepare a qualitative symbol map of India showing the distribution of different linguistic groups in the country.

The spatial distribution of religious communities in the country (Appendix-v) shows that there are certain states and districts having large numerical strength of one religion, while the same may be very negligibly represented in other states.

Hindus are distributed as a major group in many states (ranging from 70 - 90 per cent and above) except the districts of states along Indo-Bangladesh border, Indo-Pak border, Jammu & Kashmir, Hill States of North-East and in scattered areas of Deccan Plateau and Ganga Plain.

**Table 1.3 : Religious Communities of India, 2011**

Religious Group	2011	
	Population (in million)	% of Total
Hindus	966.3	79.8
Muslims	172.2	14.2
Christians	27.8	2.3
Sikhs	20.8	1.7
Buddhists	8.4	0.7
Jains	4.5	0.4
Other Religions and Persuasions (ORP)	7.9	0.7
Religion Not Stated	2.9	0.2

Source : *Census of India, 2011*

Muslims, the largest religious minority, are concentrated in Jammu & Kashmir, certain districts of West Bengal and Kerala, many districts of Uttar Pradesh, in and around Delhi and in Lakshadweep. They form majority in Kashmir valley and Lakshadweep.



### Religion and Landscape

Formal expression of religions on landscape is manifested through sacred structures, use of cemeteries and assemblages of plants and animals, groves of trees for religious purposes. Sacred structures are widely distributed throughout the country. These may range from inconspicuous village shrines to large Hindu temples, monumental masjids or ornately designed cathedrals in large metropolitan cities. These temples, masjids, gurudwaras, monasteries and churches differ in size, form, space – use and density, while attributing a special dimension to the total landscape of the area.

The Christian population is distributed mostly in rural areas of the country. The main concentration is observed along the Western coast around Goa, Kerala and also in the hill states of Meghalaya, Mizoram, Nagaland, Chotanagpur area and Hills of Manipur.

Sikhs are mostly concentrated in relatively small area of the country, particularly in the states of Punjab, Haryana and Delhi.

Jains and Buddhists, the smallest religious groups in India have their concentration only in selected areas of the country. Jains have major concentration in the urban areas of Rajasthan, Gujarat and Maharashtra, while the Buddhists are concentrated mostly in Maharashtra. The other areas of Buddhist majority are Sikkim, Arunachal Pradesh, Ladakh in Jammu & Kashmir, Tripura, and Lahul and Spiti in Himachal Pradesh.

The other religions of India include Zoroastrians, tribal and other indigenous faiths and beliefs. These groups are concentrated in small pockets scattered throughout the country.

### Composition of Working Population

The population of India according to their economic status is divided into three groups, namely; main workers, marginal workers and non-workers.

It is observed that in India, the proportion of workers (both main and marginal) is only 39.8

### Standard Census Definition

Main Worker is a person who works for atleast 183 days ( or six months) in a year.

Marginal Worker is a person who works for less than 183 days ( or six months) in a year.

per cent (2011) leaving a vast majority of about 60 per cent as non-workers. This indicates an economic status in which there is a larger proportion of dependent population, further indicating possible existence of large number of unemployed or under employed people.

### What is work participation rate?

The proportion of working population, of the states and Union Territories show a moderate variation from about 39.6 per cent in Goa to about 49.9 per cent in Daman and Diu. The states with larger percentages of workers are Himachal Pradesh, Sikkim, Chhattisgarh, Andhra Pradesh, Karnataka, Arunachal Pradesh, Nagaland, Manipur and Meghalaya. Among the Union Territories, Dadra and Nagar Haveli and Daman and Diu have higher participation rate. It is understood that, in the context of a country like India, the work participation rate tends to be higher in the areas of lower levels of economic development since number of manual workers are needed to perform the subsistence or near subsistence economic activities.

The occupational composition (see box) of India's population (which actually means engagement of an individual in farming, manufacturing, trade, services or any kind of professional activities) show a large proportion of primary sector workers compared to secondary and tertiary sectors. About 54.6 per cent of total working population are cultivators and agricultural labourers, whereas only 3.8% of workers are engaged in household industries and 41.6 % are other workers including non-household industries, trade, commerce, construction and repair and other services. As far as the occupation of country's male and female population is concerned, male workers outnumber female workers in all the three sectors (Fig. 1.4 and Table 1.4).





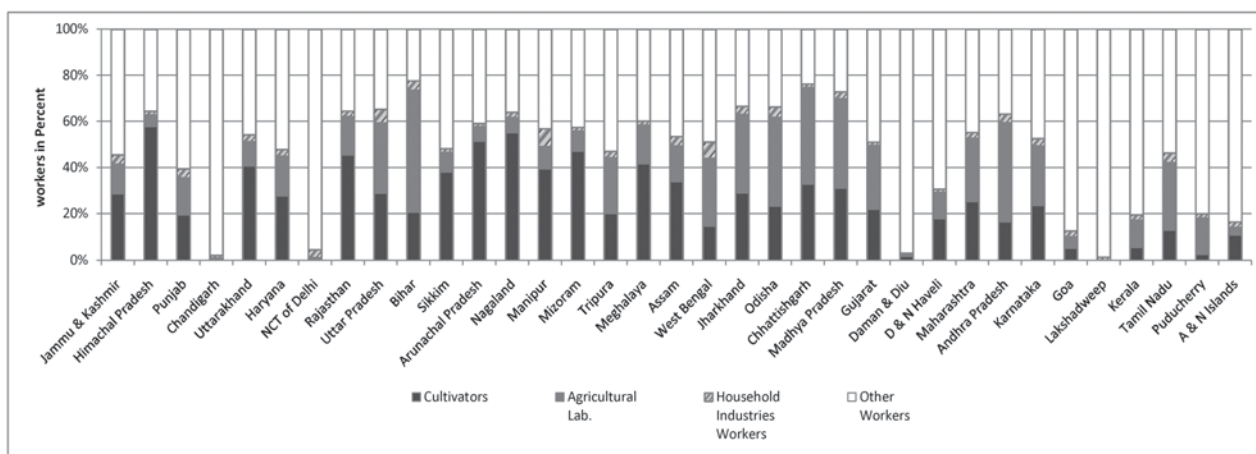


Fig. 1.4 : India – Occupational Structure, 2011

## Gender: India better than neighbours

TIMES INSIGHT GROUP

**New Delhi:** Women don't seem to be doing too badly in India, when we consider just South Asia. India's gender-related development index (GDI) rank is 96 out of 177 countries, one of the best in the region if we do not count Sri Lanka, way ahead at rank 68. But, as always, the ranking hides more than it reveals about gender equality.

While Sri Lanka soars ahead on most counts, when it comes to women's political participation, it is behind most countries in the region and so is India. Pakistan leads the way with 20.4%, highest percentage of women in Parliament. In Sri Lanka, the figure is 4.9% and in India 9.2%. Bangladesh too, is better off with 14.8% of seats in Parliament held by women.

If female life expectancy in

### WOMEN ON TOP

Country	GDI Rank	Women at ministerial level %
India	96	3.4
Bangladesh	102	8.3
Pakistan	105	5.6
Nepal	106	7.4
Sri Lanka	68	10.3
China	64	6.3

India is 65.3, Bangladesh is not too far behind at 64.2 years. Sri Lanka is way ahead with a female life expectancy of 71.3 and its adult female literacy rate is almost double the Indian figure of 47.8%. India's only comfort is that it has better literacy rates than Pakistan and Nepal. In gross school enrolment of women too, India's percentage is just 58, same as Bangladesh. On most counts, including the GDI ranking Chi-

na (rank 64) is far ahead of all the countries in South Asia.

The estimated earned income of women in India, \$1,471 per capita in purchasing power parity (PPP) terms, might be high in the region, but again Sri Lankan women earn almost twice as much and Chinese women three times the amount.

Yet again, Bangladesh is close behind India with its women earning \$1,170, while in Pakistan and Nepal, they earn less than \$1,000 per capita. Interestingly, when it comes to the proportion of females involved in economic activity, Sri Lanka and India are almost equally badly off - India's rate is 34% and Sri Lanka's is 35%. Here, Bangladesh does a lot better with 52.9% and Nepal with 49.7%. What is really revealing in terms of gender dispar-

ity is a comparison of the time spent by men and women on market-oriented activity as opposed to non-market activities, which would mean work that is not paid for. Women in India spend 35% of their time on market activity and the rest on non-market activity.

This figure in itself is not too shocking because there is a similar divide, and sometimes a sharper one, even in the developed countries, between time spent by women on market and non-market activities.

However, when we look at the corresponding figure for men in India, it shows that they spend only 9% of their time on non-market activities, much less than women.

**Identify some issues in which India is ahead of or lagging behind its neighbours.**

### Promoting Gender Sensitivity through 'Beti Bachao-Beti Padhao' Social Campaign

The division of the society into male, female and transgender is believed to be natural and biological. But, in reality, there are social constructs and roles assigned to individuals which are reinforced by social institutions. Consequently, these biological differences become the basis of social differentiations, discriminations and exclusions. The exclusion of over half of the population becomes a serious handicap to any developing and civilised society. It is a global challenge, which has been acknowledged by

the UNDP when it mentioned that, "If development is not engendered it is endangered" (HDR UNDP 1995). Discrimination, in general, and gender discrimination, in particular, is a crime against humanity.

All efforts need to be made to address the denial of opportunities of education, employment, political representation, low wages for similar types of work, disregard to their entitlement to live a dignified life, etc. A society, which fails to acknowledge and take effective measures to remove such discriminations, cannot be treated as a civilised one. The Government of India has duly acknowledged the adverse impacts of these discriminations and launched a nationwide campaign called 'Beti Bachao - Beti Padhao'.

### Occupational Categories

The 2011 Census has divided the working population of India into four major categories :

1. Cultivators
2. Agricultural Labourers
3. Household Industrial Workers
4. Other Workers.

The number of female workers is relatively high in primary sector, though in recent years there has been some improvement in work participation of women in secondary and tertiary sectors.

It is important to note that the proportion of workers in agricultural sector in India has shown a decline over the last few decades (58.2% in 2001 to 54.6% in 2011). Consequently, the participation rate in secondary and tertiary sector has registered an increase. This indicates a shift of dependence of workers from farm-based occupations to non-farm based ones, indicating a sectoral shift in the economy of the country.

The spatial variation of work participation rate in different sectors in the country (Appendix-v and vA) is very wide. For instance, the states like Himachal Pradesh and Nagaland have very large shares of cultivators. On the other hand states like Bihar, Andhra Pradesh, Chhattisgarh, Odisha, Jharkhand, West Bengal

and Madhya Pradesh have higher proportion of agricultural labourers. The highly urbanised areas like Delhi, Chandigarh and Puducherry have a very large proportion of workers being engaged in other services. This indicates not only availability of limited farming land, but also large scale urbanisation and industrialisation requiring more workers in non-farm sectors.

**Table 1.4 : Sectoral Composition of workforce in India, 2011**

Categories	Population			
	Persons	% to total Workers	Male	Female
Primary	26,30,22,473	54.6	16,54,47,075	9,75,75,398
Secondary	1,83,36,307	3.8	97,75,635	85,60,672
Tertiary	20,03,84,531	41.6	15,66,43,220	4,37,41,311

### Activity

Prepare composite bar graphs, one for India and the other for your respective states showing the proportion of male and female workers in agriculture, household industries and other sectors, and compare.



### EXERCISES

1. Choose the right answers of the followings from the given options.
  - (i) India's population as per 2011 census is :
 

(a) 1028 million	(c) 3287 million
(b) 3182 million	(d) 1210 million



- (ii) Which one of the following states has the highest density of population in India?  
(a) West Bengal (c) Uttar Pradesh  
(b) Kerala (d) Punjab
- (iii) Which one of the following states has the highest proportion of urban population in India according to 2011 Census?  
(a) Tamil Nadu (c) Kerala  
(b) Maharashtra (d) Goa
- (iv) Which one of the following is the largest linguistic group of India?  
(a) Sino – Tibetan (c) Austric  
(b) Indo – Aryan (d) Dravidian
- 2.** Answer the following questions in about 30 words.
- (i) Very hot and dry and very cold and wet regions of India have low density of population. In this light, explain the role of climate on the distribution of population.
- (ii) Which states have large rural population in India? Give one reason for such large rural population.
- (iii) Why do some states of India have higher rates of work participation than others?
- (iv) 'The agricultural sector has the largest share of Indian workers.' – Explain.
- 3.** Answer the following questions in about 150 words.
- (i) Discuss the spatial pattern of density of population in India.
- (ii) Give an account of the occupational structure of India's population.
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# MIGRATION

## *Types, Causes and Consequences*



Ram Babu, working as an engineer in Bhilai Steel Plant, Chhattisgarh, was born in a small village of district Bhojpur, Bihar. At an early age of twelve he moved to a nearby town Ara to complete his intermediate level studies. He went to Sindri, Jharkhand, for his engineering degree and he got a job at Bhilai, where he is living for the last 31 years. His parents were illiterate and the only source of their livelihood was meagre income from agriculture. They spent their whole life in that village.

Ram Babu has three children who got their education up to the intermediate level at Bhilai and then moved to different places for higher education. First one studied at Allahabad and Mumbai and is presently working in Delhi as a scientist. The second child got her higher education from different universities in India and is now working in USA. The third one after finishing her education settled at Surat after marriage.

This is not a story of only Ram Babu and his children but such movements are increasingly becoming universal trend. People have been moving from one village to another, from villages to towns, from smaller towns to bigger towns and from one country to another.

In your Book *Fundamentals of Human Geography* you have already learnt about the concept and definition of migration. Migration has been an integral part and a very important factor in redistributing population over time and space. India has witnessed the waves of migrants coming to the country from Central and West Asia and also from Southeast Asia. In fact, the history of India is a history of waves of migrants coming and settling one after another in different parts of the country. In the words of a renowned poet *Firaque Gorakhpuri*:

*SAR ZAMIN-E-HIND PAR AQWAM-E-ALAM KE  
FIRAQUE  
KAFLE BASTE GAYE, HINDOSTAN BANTA  
GAYA*

(The carvans of people from all parts of the world kept on coming and settling in India and led to the formation of India.)

Similarly, large numbers of people from India too have been migrating to places in search

of better opportunities specially to the countries of the Middle-East, Western Europe, America, Australia and East and South East Asia.

### Indian Diaspora

During colonial period (British period) millions of the indentured labourers were sent to Mauritius, Caribbean islands (Trinidad, Tobago and Guyana), Fiji and South Africa by British from Uttar Pradesh and Bihar; to Reunion Island, Guadeloupe, Martinique and Surinam by French and Dutch and by Portuguese from Goa, Daman and Diu to Angola, Mozambique to work as plantation workers. All such migrations were covered under the time-bound contract known as *Girmit Act* (Indian Emigration Act). However, the living conditions of these indentured labourers were not better than the slaves.

The second wave of migrants ventured out into the neighbouring countries in recent times as professionals, artisans, traders and factory workers, in search of economic opportunities to Thailand, Malaysia, Singapore, Indonesia, Brunei and African countries, etc. and the trend still continues. There was a steady outflow of India's semi-skilled and skilled labour in the wake of the oil boom in West Asia in the 1970s. There was also some outflow of entrepreneurs, storeowners, professionals, businessmen to Western Countries.

Third wave, of migrant was comprised professionals like doctors, engineers (1960s onwards), software engineers, management consultants, financial experts, media persons (1980s onwards), and others migrated to countries such as USA, Canada, UK, Australia, New Zealand and Germany, etc. These professional enjoy the distinction of being one of highly educated, the highest earning and prospering groups. After liberalisation, in the 90s education and knowledge-based Indian emigration has made Indian Diaspora one of the most powerful diasporas in the world.

In all these countries, Indian diaspora has been playing an important role in the development of the respective countries.

### Migration

You are familiar with Census in India. It contains information about migration in the country. Actually migration was recorded beginning from the first Census of India conducted in 1881. This data were recorded on the basis of place of birth. However, the first major modification was introduced in 1961 Census by bringing in two additional components viz; place of birth i.e. village or town and duration of residence (if born elsewhere). Further in 1971, additional information on place of last residence and duration of stay at the place of enumeration were incorporated. Information on reasons for migration were incorporated in 1981 Census and modified in consecutive Censuses.

In the Census the following questions are asked on migration :

- Is the person born in this village or town? If no, then further information is taken on rural/urban status of the place of birth, name of district and state and if outside India then name of the country of birth.
- Has the person come to this village or town from elsewhere? If yes, then further questions are asked about the status (rural/urban) of previous place of residence, name of district and state and if outside India then name of the country.

In addition, reasons for migration from the place of last residence and duration of residence in place of enumeration are also asked.

In the Census of India migration is enumerated on two bases : (i) place of birth, if the place of birth is different from the place of enumeration (known as life-time migrant); (ii) place of residence, if the place of last residence is different from the place of enumeration (known as migrant by place of last residence). Can you imagine the proportion of migrants in the population of India? As per 2001 census, out of 1,029 million people in the country, 307 million (30 per cent) were reported as migrants by place of birth. However, this figure was 315 million (31 per cent) in case of place of last residence.

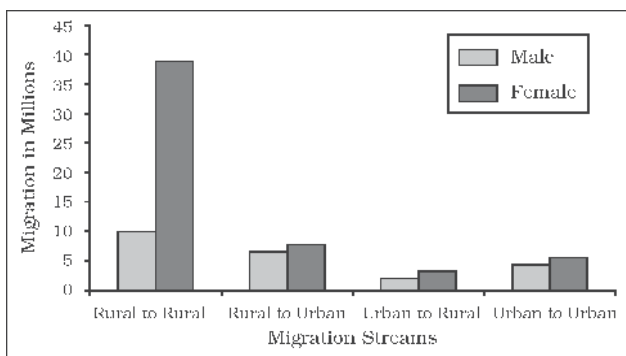


## Activity

Conduct a survey of five households in your neighbourhood to find out their migration status. If migrants, classify these on the basis of the two criteria mentioned in the text.

### Streams of Migration

A few facts pertaining to the internal migration (within the country) and international migration (out of the country and into the country from other countries) are presented here. Under the internal



**Fig. 2.1 a : Intra-state Migration by Place of Last Residence Indicating Migration Streams (Duration 0-9 years), India, 2001**

Source: Census of India, 2001

## Activity

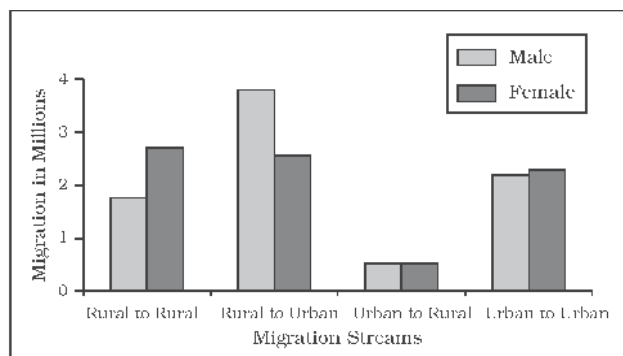
Examine Fig. 2.1 a and 2.1 b showing intra-state and inter-state migration in India according to the Census 2001 and find out:

- Why are the numbers of females migrating from rural to rural areas in both the diagrams higher?
- Why is the male migration higher from rural to urban?

migration, four streams are identified: (a) rural to rural (R-R); (b) rural to urban (R-U); (c) urban to urban (U-U); and (d) urban to rural (U-R). In India, during 2001, out of 315 million migrants, enumerated on the basis of the last residence, 98 million had changed their place of residence in the last ten years. Out of these, 81 million were intra-state migrants. The stream was dominated by female migrants. Most of these were migrants related to marriage.

The distribution of male and female migrants in different streams of intra-state and inter-state migration is presented in Fig. 2.1 a and 2.1 b. It is clearly evident that females predominate the streams of short distance rural to rural migration in both types of migration. Contrary to this, men predominate the rural to urban stream of inter-state migration due to economic reasons.

Apart from these streams of internal migration, India also experiences immigration from and emigration to the neighbouring countries. Table 2.1 presents the details of migrants from neighbouring countries. Indian



**Fig. 2.1 b : Inter-state Migration by Place of Last Residence Indicating Migration Streams (Duration 0-9 years), India, 2001**

Census 2001 has recorded that more than 5 million person have migrated to India from other countries. Out of these, 96 per cent came from the neighbouring countries: Bangladesh (3.0 million) followed by Pakistan (0.9 million) and Nepal (0.5 million). Included in this are 0.16 million refugees from Tibet, Sri Lanka, Bangladesh, Pakistan, Afghanistan, Iran, and Myanmar. As far as emigration from India is concerned it is estimated that there are around 20 million people of Indian Diaspora, spread across 110 countries.





## Activity

Represent the data given in Table 2.1 by pie diagrams assuming the migration from neighbouring countries (4,918,266 persons as 100 per cent).

### Spatial Variation in Migration

Some states like Maharashtra, Delhi, Gujarat and Haryana attract migrants from other states such as Uttar Pradesh, Bihar, etc. (see Appendix-vii for detail). Maharashtra occupied first place in the list with 2.3 million net in-migrants, followed by Delhi, Gujarat and Haryana. On the other hand, Uttar Pradesh (-2.6 million) and Bihar (-1.7 million) were the states, which had the largest number of net out-migrants from the state.

Among the urban agglomeration (UA), Greater Mumbai received the higher number of in migrants. Intra-states migration constituted the largest share in it. These differences are largely due to the size of the state in which these Urban Agglomeration are located.

**Table 2.1 : Immigrants by last residence from neighbouring countries by all duration in India, 2001**

Countries%	No of immigrants	% of total immigrants
<b>Total international migration</b>	<b>5,155,423</b>	<b>100</b>
<b>Migration from neighbouring countries</b>	<b>4,918,266</b>	<b>95.5</b>
Afghanistan	9,194	0.2
Bangladesh	3,084,826	59.8
Bhutan	8,337	0.2
China	23,721	0.5
Myanmar	49,086	1.0
Nepal	596,696	11.6
Pakistan	997,106	19.3
Sri Lanka	149,300	2.9

Source : Census of India, 2001

### 'Chalo Dilli' is mantra for migrants

Over 665 Come To City Every Day; Maximum From UP & Haryana, Not Bihar

DAILY MIGRATION IN CITIES	
Delhi	665
Mumbai	254
Bangalore	345
Ahmedabad	321

ANNUAL POPULATION GROWTH RATE	
Delhi	4.27%
Mumbai	2.65%
All India	2.79%

SOURCE: DELHI'S FIRST HUMAN DEVELOPMENT REPORT 2001

Some of the Sri Lankan refugees who arrived at Rameswaram on Wednesday.

Refugee rush increases at Rameswaram: As tension between government troops and the LTTE mounts in Sri Lanka, the influx of refugees in Rameswaram has increased. The number on Friday stood at 7,440, with a record 120 refugees arriving on Friday.

The refugees are from the given news items try to identify the political and economic causes of migration.

### Migrant outflow: India No. 4

In Terms Of Inflow, It Doesn't Even Make It To Top Ten

REMA NAGARAJAN

New Delhi: It comes as a surprise that the US is the country with the largest number of migrants. But, you may guess which country is the second largest in terms of migrants. Believe it or not, it is Afghanistan.

According to data from the United Nations Population Division, Afghanistan's average annual migration is about 4.3 lakh, more than the US's 3.8 lakh. On the list is another country you're unlikely to guess—Spain—whose inflow almost twice as that into Germany is next on the list.

The net migrant inflow to the country minus those who leave. On the other side of the coin, Mexico tops the list with the highest net outflow, followed by China and India. India is at a fall behind Pakistan at 1.2 lakh.

So why would people move into Afghanistan? The answer is, migration.

NET INWARD MIGRATION		NET OUTWARD MIGRATION	
USA	11.60	MEXICO	4.00
AFGHANISTAN	428	CHINA	3.90
SPAIN	405	PAKISTAN	3.62
GERMANY	220	INDIA	2.80
CANADA	210	IRAN	2.76
UAE	192	INDONESIA	2.00
UK	137	PHILIPPINES	1.80
ITALY	120	UKRAINE	1.40
AUSTRALIA	100	KAZAKHSTAN	1.20
RUSSIA	80	SUDAN	1.04

### Be humane to refugees from Sri Lanka: PUCL

Ongoing war a human rights violation: K.G. Kannabiran

Staff Reporter

COIMBATORE: The Tamil Nadu Government should deal with the refugees from Sri Lanka who are fleeing the war there with humane-ness, K.G. Kannabiran, national president of the People's Union of Civil Liberties (PUCL), told presspersons here on Wednesday.

Besides providing security, it was for the State Government to provide security to the refugees.

Call for permanent ceasefire in Sri Lanka for next five years

Government urged to re-introduce reservation in professional colleges for refugees' children

re-introduce the two per cent reservation in professional colleges for the children of refugees. According to them, reservation has been denied in the last three years.

The Tamil Nadu Government should withdraw all cases under the Prevention of Terrorism Act (including the case against 26 people arrested in Dharmapuri on charges of naxalism), Mr. Kannabiran said.



## Activity


Statewise in-migration and out-migration data are given in Appendix (vii). Calculate net migration for all the states of India.

### Causes of Migration


People, generally are emotionally attached to their place of birth. But millions of people leave their places of birth and residence. There could

be variety of reasons. These reasons can be put into two broad categories : (i) **push factor**, these cause people to leave their place of residence or origin; and (ii) **pull factors**, which attract the people from different places.


In India people migrate from rural to urban areas mainly due to poverty, high population pressure on the land, lack of basic infrastructural facilities like health care, education, etc. Apart from these factors, natural disasters such as, flood, drought, cyclonic storms, earthquake,




I am Aarif Khan. I live in village with my wife and four children. I work here in the field on daily base basis at the rate of Rs. 30 a day. Here there is no availability of work for all the 30 days. Further, I have also taken some land on lease for agriculture. I could give education to my children. My wife is sick and suffering with tuberculosis due to lack of health care facilities and shortage of money I am unable to get treatment of my wife. I am very puzzled with the prevailing situation.



I am Subbalakshmi, belong to fishermen community from coast of Tamil Nadu. The devastative tsunami has swept away all the family members except my two children. Everything is destroyed. Till then, I am living in a slum of Chennai. I work here as a domestic servant and my children go to school and also help me by picking rags during off time. However, I miss my place but I would not go back. I cannot forget the giant waves. I have to safeguard my children.



I am Mohan Singh working in a hosiery factory in Ludhiana. There I get Rs 2,000 a month after working 8 hours a day. I have an opportunity to earn extra by over time. Medical, educational, recreational facilities are also available here. However, the absence of family members and children causes anxiety. The job opportunities are many.



I am Manish Gawarkar, Science graduate from Bhandara. Here in Mumbai I am doing my Post graduation along with a part time job. However, the cost of living is high and people have no leisure time for others. I came to Mumbai as it was my dream. The city offers a lot of opportunities, high salary and chance of going abroad.

## Activity

The four stories describe different situations of migrants.

Enumerate the push and pull factors for Aarif?

What are the pull factors for Mohan Singh?

Study the story of Subbalakshmi and Manish Gawarkar. Compare their cases on the basis of types of migration, causes of migration and their living conditions.



tsunami, wars and local conflicts also give extra push to migrate. On the other hand, there are pull factors which attract people from rural areas to cities. The most important pull factor for majority of the rural migrants to urban areas is the better opportunities, availability of regular work and relatively higher wages. Better opportunities for education, better health facilities and sources of entertainment, etc. are also quite important pull factors.

Examine the reasons for migration for males and females separately in Fig. 2.2. On the basis of the figures, it can be seen that reason for migration of males and females are different. For example, work and employment have remained the main cause for male migration (38 per cent) while it is only three per cent for the females. Contrary to this, about 65 per cent of females move out from their parental houses following their marriage. This is the most important cause in the rural areas of India except in Meghalaya where reverse is the case.

**Why is the female marriage migration law in Meghalaya different?**

In comparison to these marriage migration of the male, is only 2 per cent in the country.

### Consequences of Migration

Migration is a response to the uneven distribution of opportunities over space. People tend to move from place of low opportunity and low safety to the place of higher opportunity and better safety. This, in turn, creates both benefits and problems for the areas, people migrate from and migrate to. Consequences can be observed in economic, social, cultural, political and demographic terms.

### Economic Consequences

A major benefit for the source region is the remittance sent by migrants. Remittances from the international migrants are one of the major sources of foreign exchange. In 2002, India received US\$ 11 billion as remittances from international migrants. Punjab, Kerala and Tamil Nadu receive very significant amount

from their international migrants. The amount of remittances sent by the internal migrants is very meagre as compared to international migrants, but it plays an important role in the growth of economy of the source area. Remittances are mainly used for food, repayment of debts, treatment, marriages, children's education, agricultural inputs, construction of houses, etc. For thousands of the poor villages of Bihar, Uttar Pradesh, Odisha, Andhra Pradesh, Himachal Pradesh, etc. remittance works as life blood for their economy. Migration from rural areas of Eastern Uttar Pradesh, Bihar, Madhya Pradesh and Odisha to the rural areas of Punjab, Haryana, Western Uttar Pradesh accounted for the success of their green revolution strategy for agricultural development. Besides this, unregulated migration to the metropolitan cities of India has caused overcrowding. Development of slums in industrially developed states such as Maharashtra, Gujarat, Karnataka, Tamil Nadu and Delhi is a negative consequence of unregulated migration within the country.

**Can you name some other positive and negative consequences of migration?**

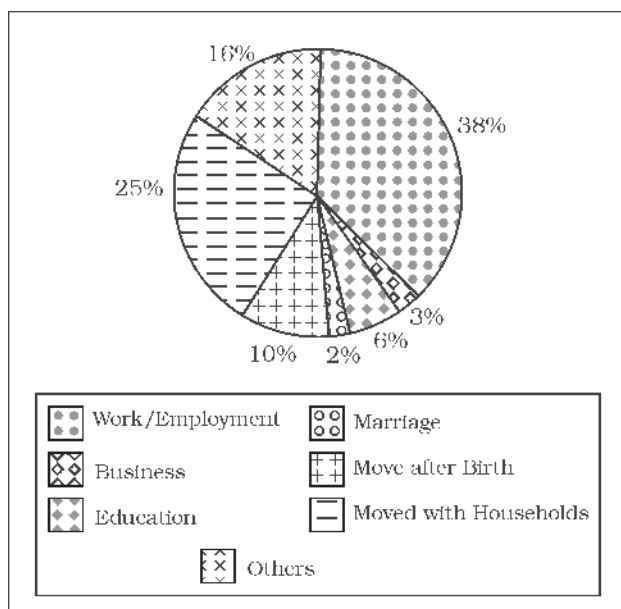
### Demographic Consequences

Migration leads to the redistribution of the population within a country. Rural urban migration is one of the important factors contributing to the population growth of cities. Age and skill selective out migration from the rural area have adverse effect on the rural demographic structure. However, high out migration from Uttarakhand, Rajasthan, Madhya Pradesh and Eastern Maharashtra have brought serious imbalances in age and sex composition in these states. Similar imbalances are also brought in the recipients states. What is the cause of imbalance in sex ratio in the place of origin and destination of the migrants?

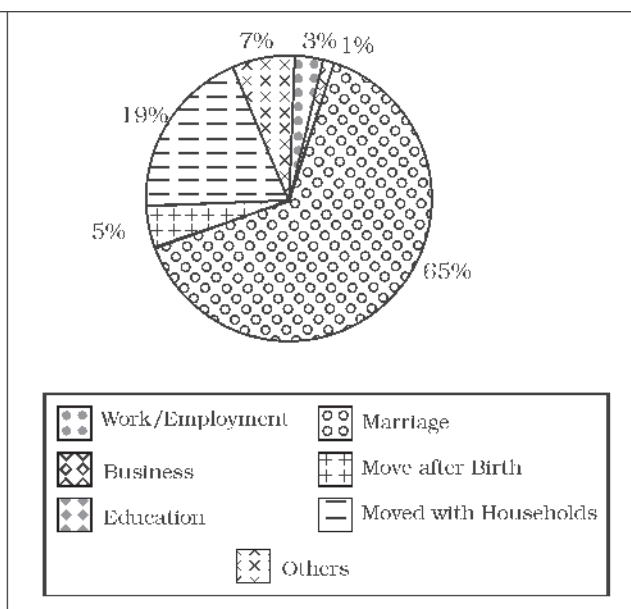
### Social Consequences

Migrants act as agents of social change. The new ideas related to new technologies, family





**Fig. 2.2 a : Reasons for Male Migration by Last Residence with Duration (0-9 years), India, 2001**



**Fig. 2.2 b : Reasons for Female Migration by last Residence with Duration (0-9 years), India, 2001**

planning, girl's education, etc. get diffused from urban to rural areas through them.

Migration leads to intermixing of people from diverse cultures. It has positive contribution such as evolution of composite culture and breaking through the narrow considerations and widens up the mental horizon of the people at large. But it also has serious negative consequences such as anonymity, which creates social vacuum and sense of dejection among individuals. Continued feeling of dejection may motivate people to fall in the trap of anti-social activities like crime and drug abuse.

### Environmental Consequences

Overcrowding of people due to rural-urban migration has put pressure on the existing social and physical infrastructure in the urban areas. This ultimately leads to unplanned growth of urban settlement and formation of slums shanty colonies.

Apart from this, due to over-exploitation of natural resources, cities are facing the acute problem of depletion of ground water, air

pollution, disposal of sewage and management of solid wastes.

### Others

Migration (even excluding the marriage migration) affects the status of women directly or indirectly. In the rural areas, male selective out migration leaving their wives behind puts extra physical as well mental pressure on the women. Migration of 'women' either for education or employment enhances their autonomy and role in the economy but also increases their vulnerability.

If remittances are the major benefits of migration from the point of view of the source region, the loss of human resources particularly highly skilled people is the most serious cost. The market for advanced skills has become truly a global market and the most dynamic industrial economies are admitting and recruiting significant proportions of the highly trained professionals from poor regions. Consequently, the existing underdevelopment in the source region gets reinforced.





## EXERCISES

1. Choose the right answers of the following from the given options.
  - (i) Which one of the following is the main reason for male migration in India?
    - (a) Education
    - (b) Business
    - (c) Work and employment
    - (d) Marriage
  - (ii) Which one of the following states receives maximum number of immigrants?
    - (a) Uttar Pradesh
    - (b) Delhi
    - (c) Maharashtra
    - (d) Bihar
  - (iii) Which one of the following streams is dominated by male migrants in India?
    - (a) Rural-rural
    - (b) Urban-rural
    - (c) Rural-urban
    - (d) Urban-Urban
  - (iv) Which one of the following urban agglomeration has the highest share of in migrant population?
    - (a) Mumbai UA
    - (b) Delhi UA
    - (c) Bengaluru UA
    - (d) Chennai UA
2. Answer the following questions in about 30 words.
  - (i) Differentiate between life-time migrant and migrant by last residence.
  - (ii) Identify the main reason for male/female selective migration.
  - (iii) What is the impact of rural-urban migration on the age and sex structure of the place of origin and destination?
3. Answer the following questions in about 150 words.
  - (i) Discuss the consequences of international migration in India.
  - (ii) What are the socio demographic consequences of migration?





# HUMAN DEVELOPMENT



Sixty years ago, Rekha was born in a family of small farmer in Uttarakhand. She helped her mother in household chores. While her brothers went to school, she did not receive any education. She was dependent on her in-laws after she was widowed immediately after marriage. She could not be economically independent and faced neglect. Her brother helped her to migrate to Delhi.

For the first time, she travelled by bus and train and was exposed to a large city like Delhi. After a while, the same city which attracted her with its buildings, roads, avenues and facilities and amenities disillusioned her.

With greater familiarity of the city, she could comprehend the paradoxes. The *jhuggi* and slum clusters, traffic jams, congestion, crimes, poverty, small children begging on traffic lights, people sleeping on footpaths, polluted water and air revealed another face of development. She used to think whether development and underdevelopment coexist? Whether development help some segments of population more than the other? Does development create haves and have nots? Let us examine these paradoxes and try to understand the phenomena.

Of all the paradoxes of our times mentioned in the story, development is the most significant one. Development of a few regions, individuals brought about in a short span of time leads to poverty and malnutrition for many along with large scale ecological degradation. Is development class biased?

Apparently, it is believed that “Development is freedom” which is often associated with modernisation, leisure, comfort and affluence. In the present context, computerisation, industrialisation, efficient transport and communication network, large education system, advanced and modern medical facilities, safety and security of individuals, etc. are considered as the symbols of development. Every individual, community and government measures its performance or levels of development in relation to the availability and access to some of these things. But, this may be partial and one-sided view of development. It is often called the western or euro-centric view of development. For a

postcolonial country like India, colonisation, marginalisation, social discrimination and regional disparity, etc. show the other face of development.

Thus, for India, development is a mixed bag of opportunities as well as neglect and deprivations. There are a few areas like the metropolitan centres and other developed enclaves that have all the modern facilities available to a small section of its population. At the other extreme of it, there are large rural areas and the slums in the urban areas that do not have basic amenities like potable water, education and health infrastructure available to majority of this population. The situation is more alarming if one looks at the distribution of the development opportunities among different sections of our society. It is a well-established fact that majority of the scheduled castes, scheduled tribes, landless agricultural labourers, poor farmers and slums dwellers, etc. are the most marginalised lot. A large segment of female population is the worst sufferers among all. It is also equally true that the relative as well as absolute conditions of the majority of these marginalised sections have worsened with the development happening over the years. Consequently, vast majority of people are compelled to live under abject poverty and sub-human conditions.

There is yet another inter-related aspect of development that has direct bearings on the deteriorating human conditions. It pertains to the environmental pollution leading to ecological crisis. Air, soil, water and noise pollutions have not only led to the 'tragedy of commons' but these have also threatened the

existence of our society. Consequently, the poor are being subjected to three inter-related processes of declining capabilities; i.e. (1) social capabilities – due to displacement and weakening social ties (social capital), (2) environmental capabilities – due to pollution and, (3) personal capabilities – due to increasing incidence of diseases and accidents. This, in turn, has adverse effects on their quality of life and human development.

Based on the above experiences, it can be said that the present development has not been able to address the issues of social injustice, regional imbalances and environmental degradation. On the contrary, it is being widely considered as the prime cause of the social distributive injustices, deterioration in the quality of life and human development, ecological crisis and social unrest. Does development create, reinforce and perpetuate these crises? Thus, it was thought to take up human development as a separate issue against the prevalent western views of development which considers development as the remedy to all the ills including human development, regional disparities and environmental crisis.

Concerted efforts were made to look at development critically at various times in the past. But, most systematic effort towards this was the publication of the First Human Development Report by United Nations Development Programme (UNDP) in 1990. Since then, this organisation has been bringing out World Human Development Report every year. This report does not only define human development, make amendments and changes its indicators but also ranks all the countries

### What is Human Development?

*"Human development is a process of enlarging the range of people's choices, increasing their opportunities for education, health care, income and empowerment and covering the full range of human choices from a sound physical environment to economic, social and political freedom."*

Thus, enlarging the range of people's choices is the most significant aspect of human development. People's choices may involve a host of other issues, but, living a long and healthy life, to be educated and have access to resources needed for a decent standard of living including political freedom, guaranteed human rights and personal self-respect, etc. are considered some of the non-negotiable aspects of the human development.



of the world based on the calculated scores. According to the Human Development Report 1993, “progressive democratisation and increasing empowerment of people are seen as the minimum conditions for human development”. Moreover, it also mentions that “development must be woven around people, not the people around development” as was the case previously.

You have already studied the concepts, indicators and approaches to human development and methods of calculating the index in your book, “*Fundamentals of Human Geography*.” In this chapter, let us try to understand the applicability of these concepts and indicators to India.

## Human Development in India

India with a population of over 1.20 billion is ranked 131 among 188 countries of the world in terms of the Human Development Index (HDI). With the composite HDI value of 0.624 India finds herself grouped with countries showing medium human development (UNDP 2016).

**Table 3.1 : Human Development Index Values of India and some other Countries**

Country	HDI value	Rank
Norway	0.949	1
Germany	0.926	4
USA	0.920	10
UK	0.909	16
Russian Fed.	0.804	49
Malaysia	0.789	59
Sri Lanka	0.766	73
Brazil	0.754	79
China	0.738	90
Egypt	0.691	111
Indonesia	0.689	113
South Africa	0.666	119
India	0.624	131
Bangladesh	0.579	139
Pakistan	0.550	147

Source: UNDP Human Development Report -2016, Economic survey 2016-17

Low scores in the HDI is a matter of serious concern but, some reservations have been expressed about the approach as well as indicators selected to calculate the index values and ranking of the states/countries. Lack of sensitivity to the historical factors like colonisation, imperialism and neo-imperialism, socio-cultural factors like human rights violation, social discrimination on the basis of race, religion, gender and caste, social problems like crimes, terrorism, and war and political factors like nature of the state, forms of the government (democracy or dictatorship) level of empowerment are some factors that are very crucial in determining the nature of human development. These aspects have special significance in case of India and many other developing countries.

Using the indicators selected by the UNDP, the Planning Commission of India also prepared the Human Development Report for India. It used states and the Union Territories as the units of analysis. Subsequently, each state government also started preparing the state level Human Development Reports, using districts as the units of analysis. Although, the final HDI by the Planning Commission of India has been calculated by taking the three indicators as discussed in the book entitled, “*Fundamentals of Human Geography*”, yet, this report also discussed other indicators like economic attainment, social empowerment, social distributive justice, accessibility, hygiene and various welfare measures undertaken by the state. Some of the important indicators have been discussed in the following pages.

### Indicators of Economic Attainments

Rich resource base and access to these resources by all, particularly the poor, down trodden and the marginalised is the key to productivity, well-being and human development. Gross National Product (GNP) and its per capita availability are taken as measures to assess the resource base/endowment of any country. Economic attainment and the well-being of individuals depend on economic growth, employment opportunities and access to assets. Over the years the per capita income and consumption



expenditure in India has increased. As a result there has been a consistent decline in the proportion of population living below the poverty line. The percentage of persons below the poverty line in 2011-12 has been estimated as 25.7% in rural areas, 13.7% in urban areas and 21.9% for the country as a whole.

The data of poverty for the states show that there are States like Chhattisgarh, Jharkhand, Manipur, Arunachal Pradesh, Assam, Bihar, Jharkhand, Madhya Pradesh, Manipur and Odisha, Dadra and Nagar Haveli which have recorded more than 30 per cent of their population living below the poverty line. Other states like Gujarat, Haryana, Jammu and Kashmir, Maharashtra, Meghalaya, Nagaland Rajasthan, Tamil Nadu, Tripura, Uttarakhand and West-Bengal have recorded between 10 to 20 per cent of their population below poverty line. Andhra Pradesh, Delhi, Goa, Himachal Pradesh, Kerala, Punjab, Sikkim, Puducherry, Andaman and Nicobar Islands, Daman and Diu, Lakshadweep have below 10 per cent of their population living below poverty line. "Poverty is a state of deprivation. In absolute terms it reflects the inability of an individual to satisfy certain basic needs for a sustained, healthy and reasonably productive living.

The Gross Domestic Product (GDP) of a country does not fully reflect the quality of life of a country. There are other factors like housing, access to public transport, air, quality and access to drinking water which also determine the standard of living. Jobless growth and rampant unemployment are some of the important reasons for higher incidences of poverty in India.

**Table 3.2 : Poverty in India, 2011-12**

State	% of Population below poverty line
Andhra Pradesh	9.20
Arunachal Pradesh	34.67
Assam	31.98
Bihar	33.74
Chhattisgarh	39.93
Delhi	9.91
Goa	5.09
Gujarat	16.63
Haryana	11.16
Himachal Pradesh	8.06
Jammu & Kashmir	10.35
Jharkhand	36.96
Karnataka	20.91
Kerala	7.05
Madhya Pradesh	31.65
Maharashtra	17.35
Manipur	36.89
Meghalaya	11.87
Mizoram	20.40
Nagaland	18.88
Odisha	32.59
Punjab	8.26
Rajasthan	14.71
Sikkim	8.19
Tamil Nadu	11.28
Tripura	14.05
Uttarakhand	11.26
Uttar Pradesh	29.43
West Bengal	19.98
Puducherry	9.69
Andaman & Nicobar Islands	1.00
Chandigarh	21.81
Dadra & Nagar Haveli	39.31
Daman & Diu	9.86
Lakshadweep	2.77
<b>All India</b>	<b>21.92</b>

Source: Press Note on Poverty Estimate, 2011-12, Government of India, Planning Commission, July 2013

### Activity

Which one of the states in India has the highest proportion of population below poverty line?

Arrange the states on the basis of their percentage of population below poverty line in ascending order.

Select 10 states which have the high proportion of population below poverty line and represent the data by bar diagram.



## Indicators of a Healthy Life

Life free from illness and ailment and living a reasonably long life span are indicative of a healthy life. Availability of pre and post natal healthcare facilities in order to reduce infant mortality and post delivery deaths among mothers, old age health care, adequate nutrition and safety of individual are some important measures of a healthy and reasonably long life.

### Swachh Bharat Mission (SBM)

The release of toxic and non-biodegradable wastes from industries and urban sewerages, and open defecation, etc, have created many health hazards. The Government of India has initiated many steps to address these problems and the *Swachh Bharat Mission* is one of these.

A healthy mind lives in a healthy body and for a healthy body, clean environment, particularly, clean air, water, noise-free ambience and hygienic surrounding are pre-requisites.

Municipal waste, industrial effluents and pollutants generated by transport, etc., are major sources of pollution in urban India. Open defecation in rural areas and in urban slums are a major source of pollution. The Government of India with its flagship programme *Swachh Bharat Mission* (SBM) aims at a pollution-free environment. Its objectives are :

- making India open defecation-free and achieving 100 per cent scientific management of municipal solid waste, construction of individual household latrines (IHHL), community toilet (CT) seats and public toilet (PT) seats;
- making provisions for the supply of clean energy fuel LPG to all households in rural India to reduce domestic pollution;
- providing potable drinking water to every household to control the spread of water-borne diseases; and
- promoting the use of non-convention energy resources, like wind and solar energy.

**Table 3.3 : India Literacy Rates, 2011**

State	Total literacy	Female literacy
<b>India</b>	<b>74.04%</b>	<b>65.46%</b>
Jammu and Kashmir	68.74	58.01
Himachal Pradesh	83.78	76.60
Punjab	76.68	71.34
Chandigarh	86.43	81.38
Uttarakhand	79.63	70.70
Haryana	76.64	66.77
NCT of Delhi	86.34	80.93
Rajasthan	67.06	52.66
Uttar Pradesh	69.72	59.26
Bihar	63.82	53.33
Sikkim	82.20	76.43
Arunachal Pradesh	66.95	59.57
Nagaland	80.11	76.69
Manipur	79.85	73.17
Mizoram	91.58	89.40
Tripura	87.75	83.15
Meghalaya	75.48	73.78
Assam	73.18	67.27
West Bengal	77.08	71.16
Jharkhand	67.63	56.21
Orissa	73.45	64.36
Chhattisgarh	71.04	60.59
Madhya Pradesh	70.63	60.02
Gujarat	79.31	70.73
Daman & Diu	87.07	79.59
Dadra and Nagar Haveli	77.65	65.93
Maharashtra	82.91	75.48
Andhra Pradesh	67.66	59.74
Karnataka	75.60	68.13
Goa	87.40	81.84
Lakshadweep Is.	92.28	88.25
Kerala	93.91	91.98
Tamil Nadu	80.33	73.86
Puduchhery	86.55	81.22
Andaman & Nicobar Is.	86.27	81.84

Source: Census of India – 2011 (Provisional)  
<http://www.censusindia.gov.in>



India has done reasonably well in some of the health indicators like decline in death rate from 25.1 per thousand in 1951 to 6.5 per thousand in 2015 and infant mortality from 148 per thousand to 37 during the same period. Similarly, it also succeeded in increasing life expectancy at birth from 37.1 years to 66.9 years for males and 36.2 to 70 years for females from 1951 to 2015. Though, these are great achievements, a lot needs to be done. Similarly, it has also done reasonably well in bringing down birth rate from 40.8 to 20.8 during the same years, but it still is much higher than many developed countries.

The situation is more alarming when seen in the context of gender specific and rural and urban health indicators. India has recorded declining female sex ratio. The findings of 2011 Census of India are very disturbing particularly in case of child sex ratio in the age group of 0-6 years. The other significant features of the report are, with the exception of Kerala, the child sex ratio has declined in all the states and it is the most alarming in the developed state of Haryana and Punjab where it is below 850 female children per thousand male children. What factors are responsible for it? Is it the social attitude or scientific methods of sex determination?

### Indicators of Social Empowerment

“Development is freedom”. Freedom from hunger, poverty, servitude, bondage, ignorance, illiteracy and any other forms of domination is the key to human development. Freedom in real sense of the term is possible only with the empowerment and participation of the people in the exercise of their capabilities and choices in the society. Access to knowledge about the society and environment are fundamental to freedom. Literacy is the beginning of access to such a world of knowledge and freedom.

### Activity

Represent the literacy rates for states having more than the national average by bar diagram after arranging the data in descending order.

Why is the total literacy rates in Kerala, Mizoram, Lakshadweep and Goa are higher than other states?

Can literacy reflect the status of Human Developments? Debate.

Table 3.3 showing the percentage of literates in India reveals some interesting features:

- Overall literacy in India is approximately 74.04 per cent (2011), while female literacy is 65.46 per cent.
- Total literacy as well as female literacy is higher than the national average in most of the states from south India.
- There are wide regional disparities in literacy rate across the states of India. There is a state like Bihar which has very low (63.82 per cent) literacy and there are states like Kerala and Mizoram which have literacy rates of 93.91 and 91.58 per cent respectively.

Apart from the spatial variations, percentage of literates in the rural areas and among the marginalised sections of our society such as females, scheduled castes, scheduled tribes, agricultural labourers, etc. is very low. It is worth mentioning here that though, there has been improvement in the percentage of literates among the marginalised section yet the gap between the richer and the marginalised sections of the population has increased over the years.

### Human Development Index in India

In the backdrop of the above-mentioned important indicators the Planning Commission calculated the human development index by taking states and union territories as the unit of analysis.

India has been placed among the countries showing medium human development. What is the rank of India among the 188 countries of the world? As indicated in Table 3.4 Kerala with the composite index value of 0.790 is placed at the top rank followed by Delhi, Himachal Pradesh, Goa and Punjab. As expected, states like Bihar, Odisha and Chhattisgarh are at the bottom among the 23 major states in India.



# One notch up, but India still has miles to go

## Has Growth Slowed Down Development?

## Better healthcare still out of bounds

TIMES INSIGHT GROUP

**New Delhi:** The Human Development Report (HDR) 2006, released by the United Nations Development Programme (UNDP) on Thursday provides the opponents of globalisation, particularly in India, with useful ammunition. What it shows is that in most countries including India, improvement in the human development index has slowed down in the period 1990 to 2004, compared to the pace in the previous 15 years.

In India's case for instance, the period from 1975 to 1990 saw the HDI score improve by close to 25%. In the next 14 years, that figure has come down to 18.6%. Given the fact that the latter period is more or less the post-reforms period in India, this is bound to be used as a strong argument by those opposed to the reforms. India is by no means an isolated example. The HDR gives index scores for 177 UN member countries. For as many as 79 of these, comparative figures are not available over the two periods we are looking at. This could be because some countries simply did not exist in 1975 — Slovenia, Bosnia or Turkmenistan for instance — or because they were not in the list of countries included in the report.

**HOW THEY FARE**

Share of govt health spending to total health expenditure

Investment in HDI (%)

Rank	Country	1975-90	1990-04
138	Nepal	42	24
134	Pakistan	27	16
93	Sri Lanka	15	7
126	India	25	19
81	China	19	22
137	Bangladesh	22	26

idly since 1990 than they did between 1975 and 1990.

It might seem that this is because countries that had already attained very high levels of human development by the mid-80s would have had little scope for improvement later. That, however, is not the case. In fact, Norway, which tops the latest HDI index, is among the few that have improved more in the later period. Other developed countries in this select list include the UK, Italy, Sweden, Luxembourg, Australia, Ireland, Denmark and New Zealand, all of which are ranked in the top 20. Switzerland's HDI score has improved exactly as much between 1990 and 2004 as it did in the 1975-90 period, while "Swiss have a bit better since it is a bit better in the 1975-90 period, but it is a bit better in the 1990-04 period."

lades are countries e rapid im- ore in re-

TIMES INSIGHT GROUP

**New Delhi:** India may be among the fastest growing economies in the world, but the UNDP's Human Development Report 2006 shows that this growth hasn't translated into better public healthcare for the citizen, at least not as yet.

For instance, there are only seven countries — of the 177 that the HDR looks at — with a lower share of public expenditure in total health expenditure. These seven — Guinea, Congo, Myanmar, Cambodia, Armenia, Tazikistan and Burundi — are not exactly those with whom India would like to be compared, but they are the only ones in which the government accounts for less than a quarter of total health expenditure. For India, the share

**MEDICAL MALADY**

Share of govt health spending to total health expenditure

HDI Rank Country

160	Guinea	16.7
167	Congo	17.5
130	Myanmar	17.9
129	Cambodia	19.3
80	Armenia	20.0
122	Tajikistan	20.5
169	Burundi	22.6
126	India	25.0
97	Georgia	25.0
99	Azerbaijan	25.0

of public expenditure in the total is exactly one-fourth or 25%. The low share of public health expenditure is not surprising, given the fact that only 13 countries spend a smaller proportion of the gross do-

mestic product (GDP) on the health sector than India's level of 1.2%. Apart from six of the seven mentioned above, these include Pakistan and Bangladesh in our neighbourhood as well as Azerbaijan, Georgia, Ivory Coast, Equatorial Guinea and Indonesia.

One result of this low level of government spending on healthcare is that people have to spend more from their pockets to keep themselves in good health. Thus, India's private spending on healthcare at 3.6% of GDP is higher than most. In fact, only 33 of the remaining 176 countries has a higher level on this count.

However, the high private expenditures are clearly unable to bridge the gap when it comes to things like immunisation, which are typically public pro-

grammes in most parts of the globe. Not surprisingly, India's immunisation rate for those who are one-year old against measles is worst in the world, with just 13 countries doing worse. A similar picture emerges if we look at the numbers for full immunisation of one-year olds against tuberculosis. Again, there are a mere 20 of the 176 others who have a lower rate.

What highlights all of this as a glaring failure of our governments is the fact that India's pool of roughly 6.5 lakh physicians is the third biggest in the world after China, which has about twice as many, and the US, which has only a few tens of thousands of doctors more than India, although for a population that's only about one-third the size of India's.

## 'Water distribution in India inequitable'

TIMES NEWS NETWORK

**New Delhi:** On the face of it, India looks like a country with plenty of water with the average use per person per day exceeding 140 litres. However, as the HDR 2006 points out, aggregate figures are often deceptive, because they conceal the disparity in the distribution of water over regions, groups of people, between rich and poor and between the rural and urban population.

Even in the UK, the average use of water per person per day is only 150 litres, not too far above the Indian level, and in neighbouring Bangladesh, the average use is only 100 litres.

### NOT ENOUGH LIFELINE

- In India, spending on military is 3% of GDP and on water and sanitation it is less than 0.5%.
- Diarrhoea kills 450,000 in India annually, more than in any other country.
- Research in India by Self Employed Women's Association (SEWA) has shown that reducing water collection to one hour a day would enable women to earn upto an additional \$100 (Rs 4,500 roughly) a year.
- In Delhi, Karachi and Kathmandu, fewer than 10% of households with piped water receive service 24 hours a day. Two or three hours of delivery is the norm.
- If the entire population of South Asia had access to basic low-cost water and sanitation technology, it would save the region \$34 billion available for average use per person per day. Yet, specific expenditure on water supply is only 0.5% of GDP.

distribution of water is and how dismal the situation is for many parts of the country.

20 litres of clean water per person per day.

Official data for Mumbai says the city enjoys a safe water coverage of more than 90%. But, as the HDR points out, a most half the city's population lives in slums and these residents do not even figure in municipal data.

Similarly, in Chennai, the average supply is 68 litres a day, but areas relying on tankers use as little as 8 litres.

The HDR also talks about the 'water lords' of Gujarat, land owners who have constructed deep wells depriving neighbouring villages of water, only to sell it back at a high price.

**Can you find out the causes of the above problems?**

**Table 3.4 : India – Human Development Index**

State	HDI Value 2007-08	Rank 2007-08
Kerala	0.790	1
Delhi	0.750	2
Himachal Pradesh	0.652	3
Goa	0.617	4
Punjab	0.605	5
NE (excluding Assam)	0.573	6
Maharashtra	0.572	7
Tamil Nadu	0.570	8
Haryana	0.552	9
Jammu and Kashmir	0.529	10
Gujarat	0.527	11
Karnataka	0.519	12
West Bengal	0.492	13
Uttarakhand	0.490	14
Andhra Pradesh	0.473	15
Assam	0.444	16
Rajasthan	0.434	17
Uttar Pradesh	0.380	18
Jharkhand	0.376	19
Madhya Pradesh	0.375	20
Bihar	0.367	21
Orissa	0.362	22
Chhattisgarh	0.358	23

Source: Planning Commission of India: India National Human Development Report, 2011

There are several socio-political, economic and historical reasons for such a state of affairs. Kerala is able to record the highest value in the HDI largely due to its impressive performance in achieving near hundred per cent literacy. In a different scenario the states like Bihar, Madhya Pradesh, Odisha, Assam and Uttar Pradesh have very low literacy. States showing higher total literacy rates have less gaps between the male and female literacy rates.

Apart from the educational attainment, the levels of economic development too play significant impacts on HDI. Economically developed states like Maharashtra, Tamil Nadu and Punjab and Haryana have higher value of HDI as compared to states like Chhattisgarh, Bihar, Madhya Pradesh, etc.

Regional distortions and social disparities which developed during the colonial period continue to play an important role in the Indian economy, polity and society. The Government of India has made concerted efforts to institutionalise the balanced development with its main focus on social distributive justice



through planned development. It has made significant achievements in most of the fields but, these are still below the desired level.

### **Population, Environment and Development**

Development in general and human development in particular is a complex concept used in social sciences. It is complex because for ages it was thought that development is a substantive concept and once it is achieved it will address all the socio-cultural and environmental ills of the society. Though, development has brought in significant improvement in the quality of life in more than one way but increasing regional disparities, social inequalities, discriminations, deprivations, displacement of people, abuse of human rights and undermining human values and environmental degradation have also increased.

Considering the gravity and sensitivity of the issues involved, the UNDP in its Human Development Report 1993, tried to amend some of the implicit biases and prejudices which were entrenched in the concept of development. People's participation and their security were the major issues in the Human Development Report of 1993. It also emphasised on progressive democratisation and increasing empowerment of people as minimum conditions for human development. The report recognised greater constructive role of 'Civil Societies' in bringing about peace and human development. The civil society should work for building up opinion for reduction in the military expenditure, demobilisation of armed forces, transition from defence to production of basic goods and services and particularly disarmament and reduction in the nuclear warheads by the developed countries. In a nuclearised world, peace and well-being are major global concerns.

At the other extreme of this approach lie the views expressed by the Neo-Malthusians, environmentalists and radical ecologists. They believe that for a happy and peaceful social life proper balance between population and resources is a necessary condition. According to these thinkers, the gap between the resources and population has widened after eighteenth century. There have been marginal expansion

in the resources of the world in the last three hundred years but there has been phenomenal growth in the human population. Development has only contributed in increasing the multiple uses of the limited resources of the world while there has been enormous increase in the demand for these resources. Therefore, the prime task before any development activity is to maintain parity between population and resources.

Scholar like Sir Robert Malthus was the first one to voice his concern about the growing scarcity of resources as compared to the human population. Apparently this argument looks logical and convincing, but a critical look will reveal certain intrinsic flaws such as resources are not a neutral category. It is not the availability of resources that is as important as their social distribution. Resources everywhere are unevenly distributed. Rich countries and people have access to large resource baskets while the poor find their resources shrinking. Moreover, unending pursuit for the control of more and more resources by the powerful and use of the same for exhibiting ones prowess is the prime cause of conflicts as well as the apparent contradictions between population-resource and development.

Indian culture and civilisation have been very sensitive to the issues of population, resource and development for a long time. It would not be incorrect to say that the ancient scriptures were essentially concerned about the balance and harmony among the elements of nature. Mahatma Gandhi in the recent times advocated the reinforcement of the harmony and balance between the two. He was quite apprehensive about the on-going development particularly the way industrialisation has institutionalised the loss of morality, spirituality, self-reliance, non-violence and mutual co-operation and environment. In his opinion, austerity for individual, trusteeship of social wealth and non-violence are the key to attain higher goals in the life of an individual as well as that of a nation. His views were also re-echoed in the Club of Rome Report "Limits to Growth" (1972), Schumacher's book "Small is Beautiful" (1974), Brundtland Commission's Report "Our Common Future" (1987) and finally in the "Agenda-21 Report of the Rio Conference" (1993).







## EXERCISES

1. Choose the right answers of the following from the given options.
  - (i) Which one of the following is India's rank in terms of Human Development Index among the countries of the world in 2011?
    - (a) 126
    - (b) 134
    - (c) 128
    - (d) 129
  - (ii) Which one of the following states of India has the highest rank in the Human Development Index?
    - (a) Tamil Nadu
    - (b) Punjab
    - (c) Kerala
    - (d) Haryana
  - (iii) Which one of the following states of India has the lowest female literacy?
    - (a) Jammu and Kashmir
    - (b) Arunachal Pradesh
    - (c) Jharkhand
    - (d) Bihar
  - (iv) Which one of the following states of India has the lowest female child sex ratio 0-6 years?
    - (a) Gujarat
    - (b) Haryana
    - (c) Punjab
    - (d) Himachal Pradesh
  - (v) Which one of the following Union Territories of India has the highest literacy rate?
    - (a) Lakshadweep
    - (b) Chandigarh
    - (c) Daman and Diu
    - (d) Andaman and Nicobar Islands
2. Answer the following questions in about 30 words.
  - (i) Define Human Development.
  - (ii) Give two reasons for low levels of Human Development in most of the Northern States of India.
  - (iii) Give two reasons for declining child sex ratio in India.
3. Answer the following questions in about 150 words.
  - (i) Discuss the spatial patterns of female literacy in India in 2011 and bring out the reasons responsible for it.
  - (ii) Which factors have caused spatial variations in the levels of Human Development among the states in India?



# HUMAN SETTLEMENTS



Human Settlement means cluster of dwellings of any type or size where human beings live. For this purpose, people may erect houses and other structures and command some area or territory as their economic support-base. Thus, the process of settlement inherently involves grouping of people and apportioning of territory as their resource base.

Settlements vary in size and type. They range from a hamlet to metropolitan cities. With size, the economic character and social structure of settlements changes and so do its ecology and technology. Settlements could be small and sparsely spaced; they may also be large and closely spaced. The sparsely located small settlements are called villages, specialising in agriculture or other primary activities. On the other hand, there are fewer but larger settlements which are termed as urban settlements specialising in secondary and tertiary activities. The basic differences between rural and urban settlements are as follows :

- The rural settlements derive their life support or basic economic needs from land based primary economic activities, whereas, urban settlements, depend on processing of raw materials and manufacturing of finished goods on the one hand and a variety of services on the other.
- Cities act as nodes of economic growth, provide goods and services not only to urban dwellers but also to the people of the rural settlements in their hinterlands in return for food and raw materials. This functional relationship between the urban and rural settlements takes place through transport and communication network.
- Rural and urban settlements differ in terms of social relationship, attitude and outlook. Rural people are less mobile and therefore, social relations among them are intimate. In urban areas, on the other hand, way of life is complex and fast, and social relations are formal.

## Types of Rural Settlement

Types of the settlement are determined by the extent of the built-up area and inter-house

distance. In India compact or clustered village of a few hundred houses is a rather universal feature, particularly in the northern plains. However, there are several areas, which have other forms of rural settlements. There are various factors and conditions responsible for having different types of rural settlements in India. These include: (i) physical features – nature of terrain, altitude, climate and availability of water (ii) cultural and ethnic factors – social structure, caste and religion (iii) security factors – defence against thefts and robberies. Rural settlements in India can broadly be put into four types:

- Clustered, agglomerated or nucleated,
- Semi-clustered or fragmented,
- Hamleted, and
- Dispersed or isolated.

### Clustered Settlements

The clustered rural settlement is a compact or closely built up area of houses. In this type of village the general living area is distinct and separated from the surrounding farms, barns and pastures. The closely built-up area and its



**Fig. 4.1 : Clustered Settlements in the North-eastern states**

intervening streets present some recognisable pattern or geometric shape, such as rectangular, radial, linear, etc. Such settlements are generally found in fertile alluvial plains and in the northeastern states. Sometimes, people live in compact village for security or defence reasons, such as in the Bundelkhand region of central India and in Nagaland. In Rajasthan, scarcity of water has necessitated compact settlement for maximum utilisation of available water resources.

### Semi-Clustered Settlements

Semi-clustered or fragmented settlements may result from tendency of clustering in a restricted area of dispersed settlement. More often such a pattern may also result from segregation or fragmentation of a large compact village. In this case, one or more sections of the village society choose or is forced to live a little away from the main cluster or village. In such cases, generally, the land-owning and dominant community occupies the central part of the main village, whereas people of lower strata of society and menial workers settle on the outer flanks of the village. Such settlements are widespread in the Gujarat plain and some parts of Rajasthan.



**Fig. 4.2 : Semi-clustered settlements**

### Hamleted Settlements

Sometimes settlement is fragmented into several units physically separated from each other bearing a common name. These units are locally called *panna*, *para*, *palli*, *nagla*, *dhani*, etc. in various parts of the country. This segmentation of a large village is often motivated by social and ethnic factors. Such villages are more frequently found in the middle and lower Ganga plain, Chhattisgarh and lower valleys of the Himalayas.

### Dispersed Settlements

Dispersed or isolated settlement pattern in India appears in the form of isolated huts or hamlets of few huts in remote jungles, or on small hills







**Fig. 4.3 : Dispersed settlements in Nagaland**

with farms or pasture on the slopes. Extreme dispersion of settlement is often caused by extremely fragmented nature of the terrain and land resource base of habitable areas. Many areas of Meghalaya, Uttarakhand, Himachal Pradesh and Kerala have this type of settlement.

## Urban Settlements

Unlike rural settlements, urban settlements are generally compact and larger in size. They are engaged in a variety of non-agricultural, economic and administrative functions. As mentioned earlier, cities are functionally linked to rural areas around them. Thus, exchange of goods and services is performed sometimes directly and sometimes through a series of market towns and cities. Thus, cities are connected directly as well as indirectly with the villages and also with each other. You can see the definition of towns in Chapter 10 of the book, *“Fundamentals of Human Geography.”*

### Evolution of Towns in India

Towns flourished since prehistoric times in India. Even at the time of Indus valley civilisation, towns like Harappa and Mohanjodaro were in existence. The following period has witnessed evolution of towns. It continued with periodic ups and downs until the arrival of Europeans in India in the eighteenth century. On the basis of their evolution in different periods, Indian towns may be classified as:

- Ancient towns, • Medieval towns, and
- Modern towns.

### Ancient Towns

There are number of towns in India having historical background spanning over 2000 years. Most of them developed as religious and cultural centres. Varanasi is one of the important towns among these. Prayag (Allahabad), Pataliputra (Patna), Madurai are some other examples of ancient towns in the country.

### Medieval Towns

About 100 of the existing towns have their roots in the medieval period. Most of them developed as headquarters of principalities and kingdoms. These are fort towns which came up on the ruins of ancient towns. Important among them are Delhi, Hyderabad, Jaipur, Lucknow, Agra and Nagpur.

### Modern Towns

The British and other Europeans have developed a number of towns in India. Starting their foothold on coastal locations, they first developed some trading ports such as Surat, Daman, Goa, Pondicherry, etc. The British later consolidated their hold around three principal nodes – Mumbai (Bombay), Chennai (Madras), and Kolkata (Calcutta) – and built them in the British style. Rapidly



**Fig. 4.4 : A view of the modern city**

extending their domination either directly or through control over the princely states, they established their administrative centres, hill-towns as summer resorts, and added new civil,





**Table 4.1 : India – Trends of Urbanisation 1901-2011**

Year	Number of Towns/UAs	Urban Population (in Thousands)	% of Total Population	Decennial Growth (%)
1901	1,827	25,851.9	10.84	—
1911	1,815	25,941.6	10.29	0.35
1921	1,949	28,086.2	11.18	8.27
1931	2,072	33,456.0	11.99	19.12
1941	2,250	44,153.3	13.86	31.97
1951	2,843	62,443.7	17.29	41.42
1961	2,365	78,936.6	17.97	26.41
1971	2,590	1,09,114	19.91	38.23
1981	3,378	1,59,463	23.34	46.14
1991	4,689	2,17,611	25.71	36.47
2001	5,161	2,85,355	27.78	31.13
2011*	6,171	3,77,000	31.16	31.08

\*Source: Census of India, 2011 <http://www.censusindia.gov.in> (Provisional)

administrative and military areas to them. Towns based on modern industries also evolved after 1850. Jamshedpur can be cited as an example.

After independence, a large number of towns have been developed as administrative headquarters, e.g., Chandigarh, Bhubaneswar, Gandhinagar, Dispur, etc., and industrial centres, such as Durgapur, Bhilai, Sindri, Barauni. Some old towns also developed as satellite towns around metropolitan cities, such as Ghaziabad, Rohtak, Gurugram around Delhi. With increasing investment in rural areas, a large number of medium and small towns have developed all over the country.

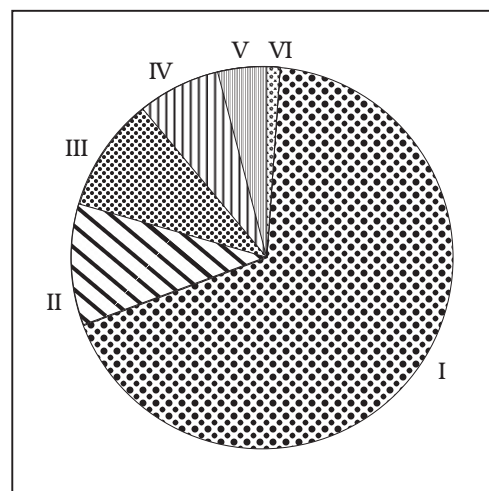
## Urbanisation in India

The level of urbanisation is measured in terms of percentage of urban population to total population. The level of urbanisation in India in 2011 was 31.16 per cent, which is quite low in comparison to developed countries. Total urban population has increased eleven-fold during the twentieth century. Enlargement of urban centres and emergence of new towns have played a significant role in the growth of urban population and urbanisation in the country. (Table 4.1). But the growth rate of urbanisation has slowed down during last two decades.

## Classification of Towns on the basis of Population Size

Census of India classifies urban centres into six classes as presented in Table 4.2. Urban centre with population of more than one lakh is called a city or class I town. Cities accommodating population size between one to five million are called metropolitan cities and more than five million are mega cities. Majority of metropolitan and mega cities are urban agglomerations. An urban agglomeration may consist of any one of the following three

**Fig. 4.6 : India : Distribution of urban population (%), according to size class of urban centre — 2011**



**Table 4.2 : India – Class-wise number of towns and cities and their population, 2011**

Class	Population Size	Number of Cities	Total Urban Population	% of Total Urban Population
I	1,00,000 and more	468	2,27,899	60.45
II	50,000 – 99,999	474	41,328	10.96
III	20,000 – 49,999	1,373	58,174	15.43
IV	10,000 – 19,999	1,683	31,866	8.45
V	5,000 – 9,999	1,749	15,883	4.21
VI	Less than 5,000	424	1,956	0.51

\*Source: Census of India – 2011 and India, 2017, Ministry of Information and Broadcasting, Government of India

combinations: (i) a town and its adjoining urban outgrowths, (ii) two or more contiguous towns with or without their outgrowths, and (iii) a city and one or more adjoining towns with their outgrowths together forming a contiguous spread. Examples of urban outgrowth are railway colonies, university campus, port area, military cantonment, etc., located within the revenue limits of a village or villages contiguous to the town or city.

It is evident from Table 4.2 that more than 60 per cent of urban population in India lives in Class I towns. Out of 468 cities, 53 cities/urban agglomerations are metropolitan cities. Six of them are mega cities with population over five million each. More than one-fifth (21.0%) of urban population lives in these mega cities.

Among them, Greater Mumbai is the largest agglomeration with 18.4 million people. Delhi, Kolkata, Chennai, Bengaluru and Hyderabad are other mega cities in the country.

### Functional Classification of Towns

Apart from their role as central or nodal places, many towns and cities perform specialised services. Some towns and cities specialise in certain functions and they are known for some specific activities, products or services. However, each town performs a number of functions. On the basis of dominant or specialised functions, Indian cities and towns can be broadly classified as follows:

#### Administrative towns and cities

Towns supporting administrative headquarters of higher order are administrative towns, such as Chandigarh, New Delhi, Bhopal, Shillong, Guwahati, Imphal, Srinagar, Gandhinagar, Jaipur, Chennai, etc.

#### Industrial towns

Industries constitute prime motive force of these cities, such as Mumbai, Salem, Coimbatore, Modinagar, Jamshedpur, Hugli, Bhilai, etc.

#### Transport Cities

They may be ports primarily engaged in export and import activities such as Kandla, Kochchi, Kozhikode, Vishakhapatnam, etc., or hubs of inland transport, such as Agra, Dhulia, Mughalsarai, Itarsi, Katni, etc.

#### Commercial towns

Towns and cities specialising in trade and commerce are kept in this class. Kolkata, Saharanpur, Satna, etc., are some examples.

#### Mining towns

These towns have developed in mineral rich areas such as Raniganj, Jharia, Digboi, Ankaleshwar, Singrauli, etc.

#### Garrison Cantonment towns

These towns emerged as garrison towns such as Ambala, Jalandhar, Mhow, Babina, Udhampur, etc.



**Table 4.3 India: Population of Million plus Cities/ Urban Agglomeration, 2011**

S.N.	Name of Urban Agglomeration	Population
1.	Srinagar UA	1,273,312
2.	Ludhiana (M Corpl)	1,613,878
3.	Amritsar UA	1,183,705
4.	Chandigarh UA	1,025,682
5.	Faridabad (M Corp.)	1,404,653
6.	Delhi UA	16,314,838
7.	Jaipur (M Corp.)	3,073,350
8.	Jodhpur UA	1,137,815
9.	Kota (M Corp.)	1,001,365
10.	Kanpur UA	2,920,067
11.	Lucknow UA	2,901,474
12.	Ghaziabad UA	2,358,525
13.	Agra UA	1,746,467
14.	Varanasi UA	1,435,113
15.	Meerut UA	1,424,908
16.	Allahabad UA	1,216,719
17.	Patna UA	2,046,652
18.	Kolkata UA	14,112,536
19.	Asansol UA	1,243,008
20.	Jamshedpur UA	1,337,131
21.	Dhanbad UA	1,195,298
22.	Ranchi UA	1,126,741
23.	Raipur UA	1,122,555
24.	Durg-Bhillainagar UA	1,064,007
25.	Indore UA	2,167,447
26.	Bhopal UA	1,883,381
27.	Jabalpur UA	1,267,564
28.	Gwalior UA	1,101,981
29.	Ahmedabad UA	6,352,254
30.	Surat UA	4,585,367
31.	Vadodara UA	1,817,191
32.	Rajkot UA	1,390,933
33.	Greater Mumbai UA	18,414,288
34.	Pune UA	5,049,968
35.	Nagpur UA	2,497,777
36.	Nashik UA	1,562,769
37.	Vasai Virar City (M Corp.)	1,221,233
38.	Aurangabad UA	1,189,376
39.	Hyderabad UA	7,749,334
40.	GVMC (MC)	1,730,320
41.	Vijayawada UA	1,491,202
42.	Bengaluru UA	8,499,399
43.	Kochi UA	2,117,990
44.	Kozhikode UA	2,030,519
45.	Thrissur UA	1,854,783
46.	Malappuram UA	1,698,645
47.	Thiruvananthapuram UA	1,687,406
48.	Kannur UA	1,642,892
49.	Kollam UA	1,110,005
50.	Chennai UA	8,696,010
51.	Coimbatore UA	2,151,466
52.	Madurai UA	1,462,420
53.	Tiruchirappalli UA	1,021,717

Source : Census of India- 2011, Provisional (Website <http://www.censusindia.gov.in>)



### Smart Cities Mission

The objective of the *Smart Cities Mission* is to promote cities that provide core infrastructure, a clean and sustainable environment and give a decent quality of life to its citizens. One of the features of Smart Cities is to apply smart solutions to infrastructure and services in order to make them better. For example, making areas less vulnerable to disasters, using fewer resources and providing cheaper services. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model, which will act like a lighthouse to other aspiring cities.

### Educational towns

Starting as centres of education, some of the towns have grown into major campus towns, such as Roorki, Varanasi, Aligarh, Pilani, Allahabad, etc.

### Religious and cultural towns

Varanasi, Mathura, Amritsar, Madurai, Puri, Ajmer, Pushkar, Tirupati, Kurukshetra, Haridwar, Ujjain came to prominence due to their religious/cultural significance.

### Tourist towns

Nainital, Mussoorie, Shimla, Pachmarhi, Jodhpur, Jaisalmer, Udagamandalam (Ooty), Mount Abu are some of the tourist destinations.

The cities are not static in their function. The functions change due to their dynamic nature.

Even specialised cities, as they grow into metropolises become multifunctional wherein industry, business, administration, transport, etc., become important. The functions get so intertwined that the city can not be categorised in a particular functional class.

List the urban agglomerations/cities state-wise and see the state-wise population under this category of cities.



## EXERCISES

1. Choose the right answers of the following from the given options.
  - (i) Which one of the following towns is NOT located on a river bank?
    - (a) Agra
    - (b) Bhopal
    - (c) Patna
    - (d) Kolkata
  - (ii) Which one of the following is NOT the part of the definition of a town as per the census of India?
    - (a) Population density of 400 persons per sq km.
    - (b) Presence of municipality, corporation, etc.
    - (c) More than 75% of the population engaged in primary sector.
    - (d) Population size of more than 5,000 persons.





- (iii) In which one of the following environments does one expect the presence of dispersed rural settlements?
- (a) Alluvial plains of Ganga
  - (b) Arid and semi-arid regions of Rajasthan
  - (c) Lower valleys of Himalayas
  - (d) Forests and hills in north-east
- (iv) Which one of the following group of cities have been arranged in the sequence of their ranks i.e. 1, 2, 3 and 4 in size?
- (a) Greater Mumbai, Bengaluru, Kolkata, Chennai
  - (b) Delhi, Greater Mumbai, Chennai, Kolkata
  - (c) Kolkata, Greater Mumbai, Chennai, Kolkata
  - (d) Greater Mumbai, Kolkata, Delhi, Chennai
- 2.** Answer the following questions in about 30 words.
- (i) What are garrison towns? What is their function?
  - (ii) How can one identify an urban agglomeration?
  - (iii) What are the main factors for the location of villages in desert regions?
  - (iv) What are metropolitan cities? How are they different from urban agglomerations?
- 3.** Answer the following questions in about 150 words.
- (i) Discuss the features of different types of rural settlements. What are the factors responsible for the settlement patterns in different physical environments?
  - (ii) Can one imagine the presence of only one-function town? Why do the cities become multi-functional?
- 



## 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.

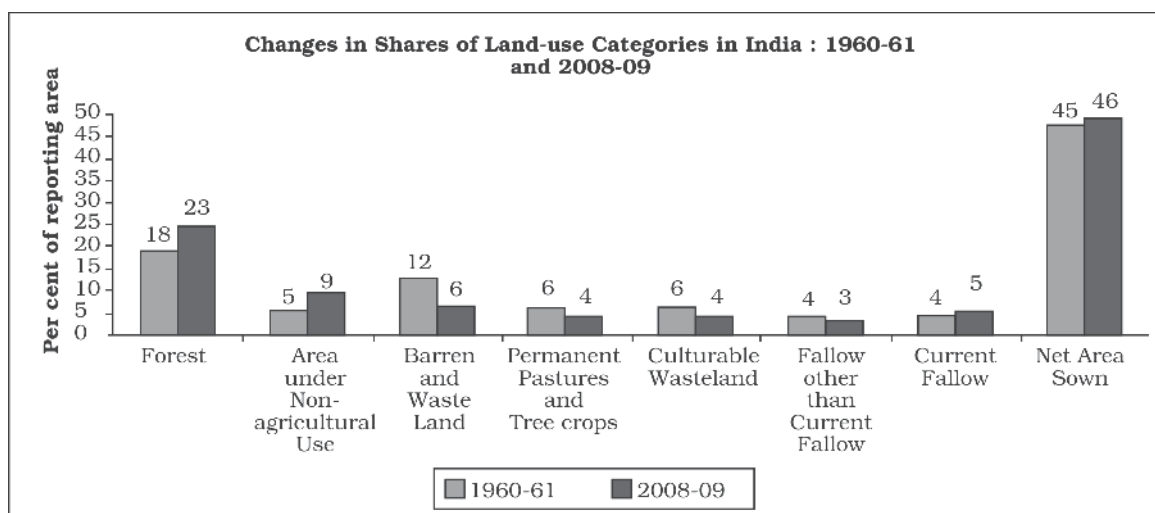
(ii) Secondly, **the composition of the economy** would undergo a change over time. In other words, the secondary and the tertiary sectors usually grow much faster than the primary sector, specifically the agricultural sector. This type of change is common in developing countries, like India. This process 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.





Note : Categories (iv) and (v) of Section I have been clubbed together in the graph.

**Fig. 5.1**

## Activity

Compare the change in shares of primary, secondary and tertiary sectors in GDP between 1960-61 and 1999-2000 with the changes of land-use between 1960-61 and 2008-09 using Appendix (vii) Tables 1 and 2.

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 1960-61 and 2008-09 have been shown in Fig. 5.1. 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:

- (i) 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.

- (ii) 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.
- (iii) 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.
- (iv) 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 1960-61 and 2008-09 from the data given in the Appendix (vii) (Table 1). 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.

$$\frac{\text{Net sown Area in 2008-09} - \text{Net sown Area in 1960-61}}{\text{Net sown Area in 1960-61}} \times 100$$

### 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 5.1 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 5.1 : Composition of Total Cultivable Land**

Agricultural Land-use Categories	As a percentage of Reporting Area		As percentage of total cultivated land	
	1960-61	2008-09	1960-61	2008-09
Culturable Waste land	6.23	4.17	10.61	7.14
Fallow other than Current Fallow	3.5	3.37	5.96	5.75
Current Fallow	3.73	4.76	6.35	8.13
Net Area Sown	45.26	46.24	77.08	78.98
<b>Total Cultivable Land</b>	<b>58.72</b>	<b>58.54</b>	<b>100.00</b>	<b>100.00</b>

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 5.2 : Cropping Seasons in India**

Cropping Season	Major Crops Cultivated	
	Northern States	Southern States
<b>Kharif</b> June-September	Rice, Cotton, Bajra, Maize, Jowar, Tur	Rice, Maize, Ragi, Jowar, Groundnut
<b>Rabi</b> October – March	Wheat, Gram, Rapeseeds and Mustard, Barley	Rice, Maize, Ragi, Groundnut, Jowar
<b>Zaid</b> 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.

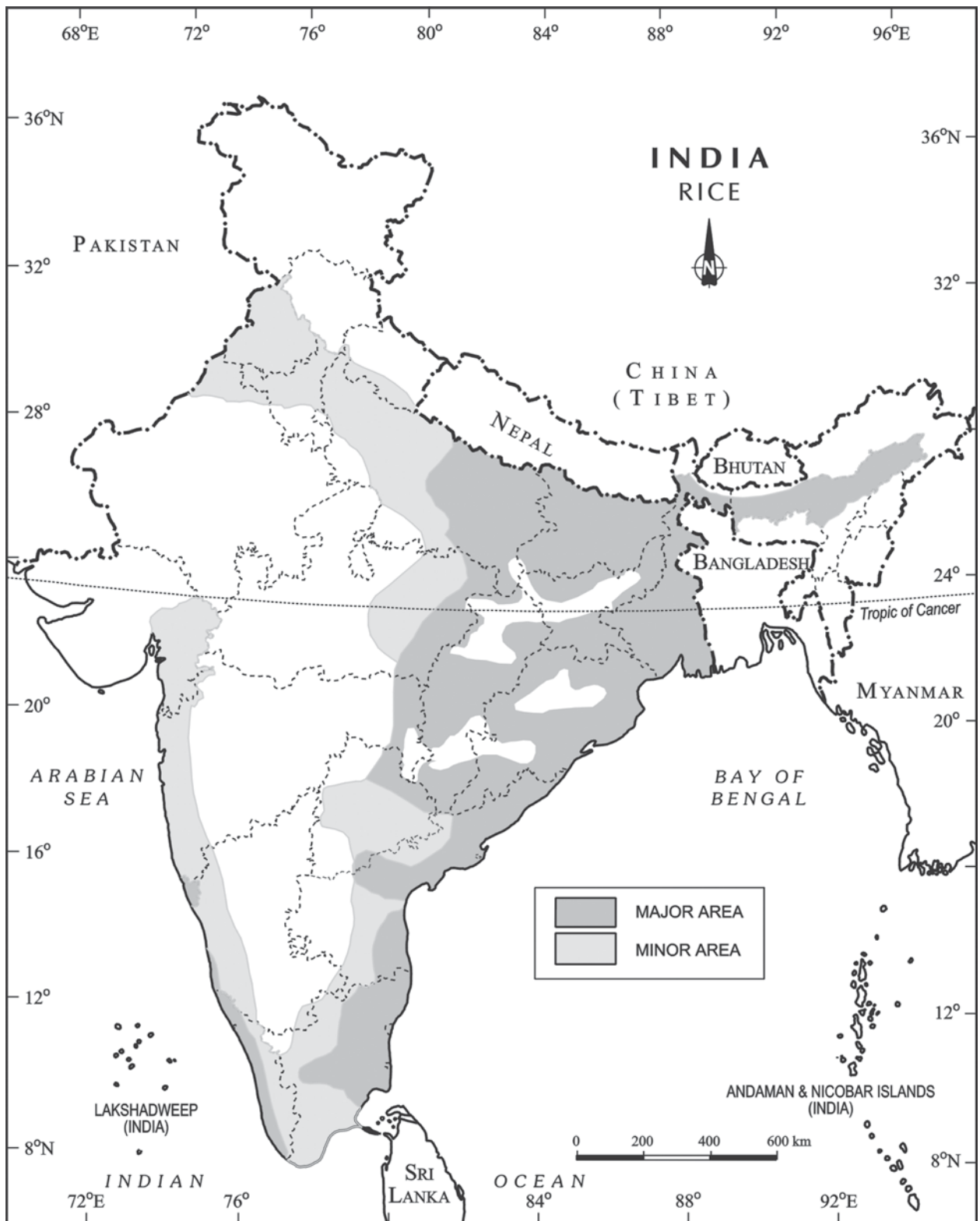
India contributes 21.2 per cent of rice production in the world and ranked second after China in 2014. About one-fourth of the total cropped area in the country is under rice cultivation. West Bengal, Uttar Pradesh, and Punjab were the leading rice producing states in the country in 2015-16. The yield 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.



**Fig. 5.2 : Rice transplantation in southern parts of India**

Rice 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 fertilisers and pesticides and lower levels of susceptibility of the crop to pests due





**Fig. 5.3 : India – Distribution of Rice**



to dry climatic conditions 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 13.1 per cent of total wheat production of world (2014). 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 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. 5.4 : 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 14.9 per cent of the total groundnut production in the world (2014). 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 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. 5.5 : Farmers sowing soyabean seeds in Amravati, Maharashtra





**Fig. 5.6 : 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 '*nama*' in north-western parts of the country. Cotton requires clear sky during flowering stage.



**Fig. 5.7 : Cotton Cultivation**

India ranks second in the world in the production of cotton after China, and accounts for about 23.7 per cent of production of cotton in the world (2014). 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. 5.8 : Sugarcane Cultivation**





**Fig. 5.9 : 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 2014. It accounts for about 19 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. 5.10 : Tea Farming**

Cardamom hills in Western Ghats. India is a leading producer of tea and accounts for about 28 per cent of total production in the world. India's share in the international market of tea has declined substantially. It ranks second among tea exporting countries in the world after

China (2014). 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 3.7 per cent coffee of the world and ranks sixth after Brazil, Vietnam, Colombia, Indonesia and Ethiopia in 2014. 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

Agriculture continues to be an important sector of Indian economy. In 2001 about 53 per cent population of the country was dependent on it. The importance of agricultural sector in India can be gauged from the fact that about 57 per cent of its land is devoted to crop cultivation, whereas, in the world, the corresponding share is only about 12 per cent. In spite of this, there is tremendous pressure on agricultural land in India, which is reflected from the fact that the land-human ratio in the country is only 0.31 ha which is almost half of that of the world as a whole (0.59 ha). Despite various constraints, Indian agriculture has marched a long way since Independence.

### Strategy of Development

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







**Fig. 5.11 : India – Distribution of Tea and Coffee**



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.

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. Lack of development of rural infrastructure, withdrawal of subsidies and price support, and impediments in availing of the rural credits may lead to inter-regional and inter-personal disparities in rural areas.

### **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. India ranked first in the production of pulses and jute in 2011. It is the second largest producer of rice, wheat, groundnut, sugarcane and vegetables.
- 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 increased from 20.85 to 54.66 million ha over the period 1950-51 to 2000-01. Over these 50 years, *area irrigated more than once* in an agricultural year has increased from 1.71 to 20.46 million ha.
- 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. In 2001-02, per hectare consumption of chemical fertilisers in India was 91 kg which was equal to its average consumption in the world (90 kg). But in the irrigated areas of Punjab and Haryana,



the consumption of chemical fertilisers per unit area is three to four times higher than that of the national average. Since the high yielding varieties are highly susceptible to pests and diseases, the use of pesticides has increased significantly since 1960s.



**Fig. 5.12 : Roto Till Drill - A modern agricultural equipment**

## 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:

### 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 inequitous 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. More than 60 per cent of the ownership holdings have a size smaller than one (ha). Furthermore, about 40 per cent of the farmers have operational holding size smaller than 0.5 hectare (ha). The average size

of land holding is shrinking further under increasing population pressure. Furthermore, in India, the land holdings are mostly fragmented. There are some states where consolidation of holding has not been carried out even once. Even the states where it has been carried out once, second consolidation is required as land holdings have fragmented again in the process of division of land among the owners of next generations. The small size fragmented landholdings are uneconomic.

## Lack of Commercialisation

A large number of farmers produce crops for self-consumption. These farmers do not have enough land resources to produce more than their requirement. Most of the small and marginal farmers grow foodgrains, which are

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

## Oilseeds may lose acreage war to sugarcane, pulses

**Ram Sahgal**  
MUMBAI

Indian farmers are likely to increase the acreage of sugarcane and pulses at the cost of oilseeds area (soyabean, rapeseed) in the current kharif season to benefit from the rising prices of these 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% of oilseeds area (26m hectares), leaves BY Meta, executive director of Joint Venture Tractor Association of India.

While this could impact production in oil year '06-07, Mr Meta is quick to add that any shortfall could be met by the 3.4 million-tonne bufferstock of rapeseed-mustard 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 Meta said. "The monsoon and rising prices of other commodities will determine the oilseeds crop in '06-07. The silver lining though is the carryforward stock held by Nafed."

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 oil is expected to be about 12m tonnes in '06

India's dependence on imports will be around 40% of its consumption requirement

**GROWING TALL**

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

In the six months of the current oil year from where it is imported; declaration that it contains GM soyabean oil derived only from round up ready soybean; and GEAC's decision to ban GM soyabean oil dated 11 of June 1999

## Planning Commission lends Vidarbha an ear

**Wants Advisory Against Bt Cotton In The Region**

**By Subodh Ghosh/TNN**

New Delhi: While Bt cotton's prohibitively exorbitant costs were a key reason behind farmers' distress in Vidarbha, the Centre is walking up to an inverse scenario: post-SC's intervention in the Monsanto case, where low prices of Bt cotton may cause crop failure.

The four stem from the apex court's refusal to stay the MRFPC directive to Monsanto which will bring down seed prices. Bt cotton, expert studies have found, is not suitable for rain-fed areas like Vidarbha but only suitable for irrigated regions.

With the Planning Commission

appropriately priced, should be made available to stop farmers from falling in the Bt cotton trap.

Probing crop failures, the PFI's panel found that farmers were not advised on Bt cotton as the latter was sold across Vidarbha with seed packets bearing in small letters "best when used in irrigated areas". The villagers complained they had noticed the manufacturer's warning too late as it was "in very small letters".

Indebtedness being at the heart of rural distress, the issue of credit too has come up for fresh roadmap. The Centre has been advised to provide loans on low inter-



WILL THIS HARD WORK BEAR FRUIT? ...soya bean seeds in Amravati's Shivei village on Sunday.

## In western UP, sugarcane is life

**Avijit Ghosh / IIS**

Amritpur (UP): It's early evening. And a bunch of shining, shiny tractors and tractors are rolling with sugarcane, ready holding up the cane, a NH 66. A little ahead, a small of bullock carts in a line of condition has formed. A sugarcane-headed queue before a sugar mill in this dusty kharif season. It will be hours before the yield is delivered.

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

The wait, from counts, has been "This year, the quantity is good," he says.

## आर्थिक सुधारों का हमसफर बनने की उम्मीदे भी संजोए है

**राशि झा**

कच्चे माल की कमी से अखरोट के निर्यात में बाधा

श्रीनगर से लौटकर। बस धमाकों और आतंकी गतिविधियों के बीच एक और कश्मीर भी कलहट ले रहा है। ऐसा कश्मीर जिसे आर्थिक उदारीकरण के दौर में अपने काफी पोछे छूट जाने का मलाल है और जो अब इस सफर में हमकदम बनने की उम्मीदे संजोए है। जहां वायवानी, हस्तशिल्प और हथकरघा, पर्यटन, सूचना प्रौद्योगिकी, जैवप्रौद्योगिकी आदि क्षेत्रों में विकास की विपुल संभावनाएं हिलोरे ले रही हैं। यही नहीं, फूट प्रोसेसिंग उद्योग, चावल, सेब समेत अन्य स्थानीय फूट और अखरोट जैसे फूट क्षेत्रों में भी विकास और रोज़गार के नए सपने जागृत हो रहे हैं।

ये तो गरीबों के सपने हैं।

**Rubber growers rake in Rs 3,000 crore in 2006**

5 Samardokumar

surplus generated is around Rs 2,800 crore for the year. Interestingly, the rubber prices have broken into the Rs 100 plus range in the current year. Assuming an average price of Rs 100 per kg and a production of 31 lakh tonnes for the current year, the turnover will be around Rs 3,100 crore. The rubber price is expected to rise to Rs 110 per kg by the end of the year. If the fair price is applied for the current year, the turnover should be around Rs 3,400 crore. The rubber price was just Rs 80 per kg in 2005-06.

**What changes have you noticed in agricultural sector and cropping pattern? Discuss in the class.**

meant for their own family consumption. Modernisation and commercialisation of agriculture have, however, taken place in the irrigated areas.

### **Vast Underemployment**

There is a massive underemployment in the agricultural sector in India, particularly in the unirrigated tracts. In these areas, there is a seasonal unemployment ranging from 4 to 8 months. Even in the cropping season, work is not available throughout as agricultural operations are not labour intensive. Hence, the people engaged in agriculture do not have the opportunity to work round the year.

### **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 alkalisation and salinisation of soils and waterlogging. Alkalinity and salinity have already affected about 8 million ha land. Another 7 million ha land in the country has lost its fertility due to 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 fertilisation 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**

1. Choose the right answers of the following from the given options.
  - (i) Which one of the following is NOT a land-use category?
    - (a) Fallow land
    - (b) Marginal land
    - (c) Net Area Sown
    - (d) Culturable Wasteland
  - (ii) What one of the following is the main reason due to which share of forest has shown an increase in the last forty years?
    - (a) Extensive and efficient efforts of afforestation
    - (b) Increase in community forest land
    - (c) Increase in notified area allocated for forest growth
    - (d) Better peoples' participation in managing forest area.
  - (iii) Which one of the following is the main form of degradation in irrigated areas?
    - (a) Gully erosion
    - (b) Wind erosion
    - (c) Salinisation of soils
    - (d) Siltation of land





- (iv) Which one of the following crops is not cultivated under dryland farming?  
(a) Ragi (c) Groundnut  
(b) Jowar (d) Sugarcane
- (v) In which of the following group of countries of the world, HYVs of wheat and rice were developed?  
(a) Japan and Australia (c) Mexico and Philippines  
(b) U.S.A. and Japan (d) Mexico and Singapore
- 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?
- 



## **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. Table 6.1 shows that the Ganga and the Brahmaputra basins, have about 46 per cent of the total replenishable groundwater resources. 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

**Table 6.1 : Basin-wise Groundwater Potential and Utilisation in India (Cubic Km/Year)**

S. No.	Name of Basin Ground Water Resources	Total Replenishable Utilisation (%)	Level of Groundwater
1.	Brahmani with Baitarni	4.05	8.45
2.	Brahmaputra	26.55	3.37
3.	Chambal Composite	7.19	40.09
4.	Kaveri	12.3	55.33
5.	Ganga	170.99	33.52
6.	Godavari	40.65	19.53
7.	Indus	26.49	77.71
8.	Krishna	26.41	30.39
9.	Kuchchh and Saurashtra including river Luni	11.23	51.14
10.	Chennai and South Tamil Nadu	18.22	57.68
11.	Mahanadi	16.46	6.95
12.	Meghna (Barak and Others)	8.52	3.94
13.	Narmada	10.83	21.74
14.	Northeast Composite	18.84	17.2
15.	Pennar	4.93	36.6
16.	Subarnrekha	1.82	9.57
17.	Tapi	8.27	33.05
18.	Western Ghat	17.69	22.88
	<b>Total</b>	<b>431.42</b>	<b>31.97</b>

Source: Ministry of Water Resources, Government of India, New Delhi;  
<http://wrmin.nic.in/resource/gwresource1.htm>





**Fig. 6.1 : India – River Basins**



demands for water would need the supplies. And such situation, will be detrimental to development, and can cause social upheaval and disruptions.

Exercise based on Table 6.1 :

1. Which river basin has the highest total replenishable groundwater resource?
2. In which river basin is the level of groundwater utilisation the highest?
3. Which river basin has the lowest total replenishable groundwater resource?
4. In which river basin is the level of groundwater utilisation the lowest?
5. Draw a bar diagram to show the total replenishable groundwater resources in 10 major river basins.
6. Draw a bar diagram to show the levels of groundwater utilisation of the same 10 major river basins for which you have made the first bar diagram.

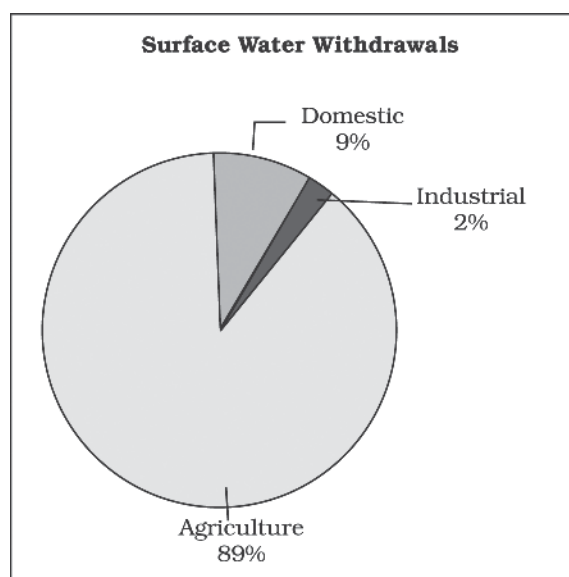
## Lagoons and Backwaters

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

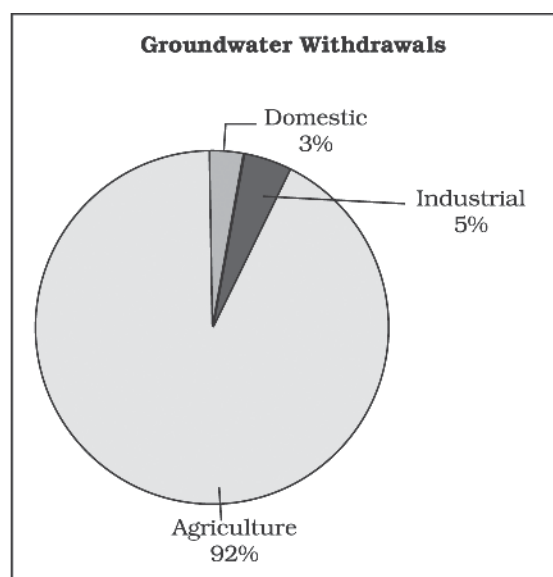
India has traditionally been an agrarian economy, and about two-third of its population have been dependent on agriculture. Hence, development of irrigation to increase agricultural production has been assigned a very high priority in the Five Year Plans, and multipurpose river valleys projects, like 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.

As shown in Fig. 6.2 and 6.3, 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



Source: Earth Trend 2001, World Resource Institute, as given in Government of India (2002) Report

**Fig. 6.2 : Sectoral Usage of Surface Water**



**Fig. 6.3 : Sectoral Usage of Groundwater**



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 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.

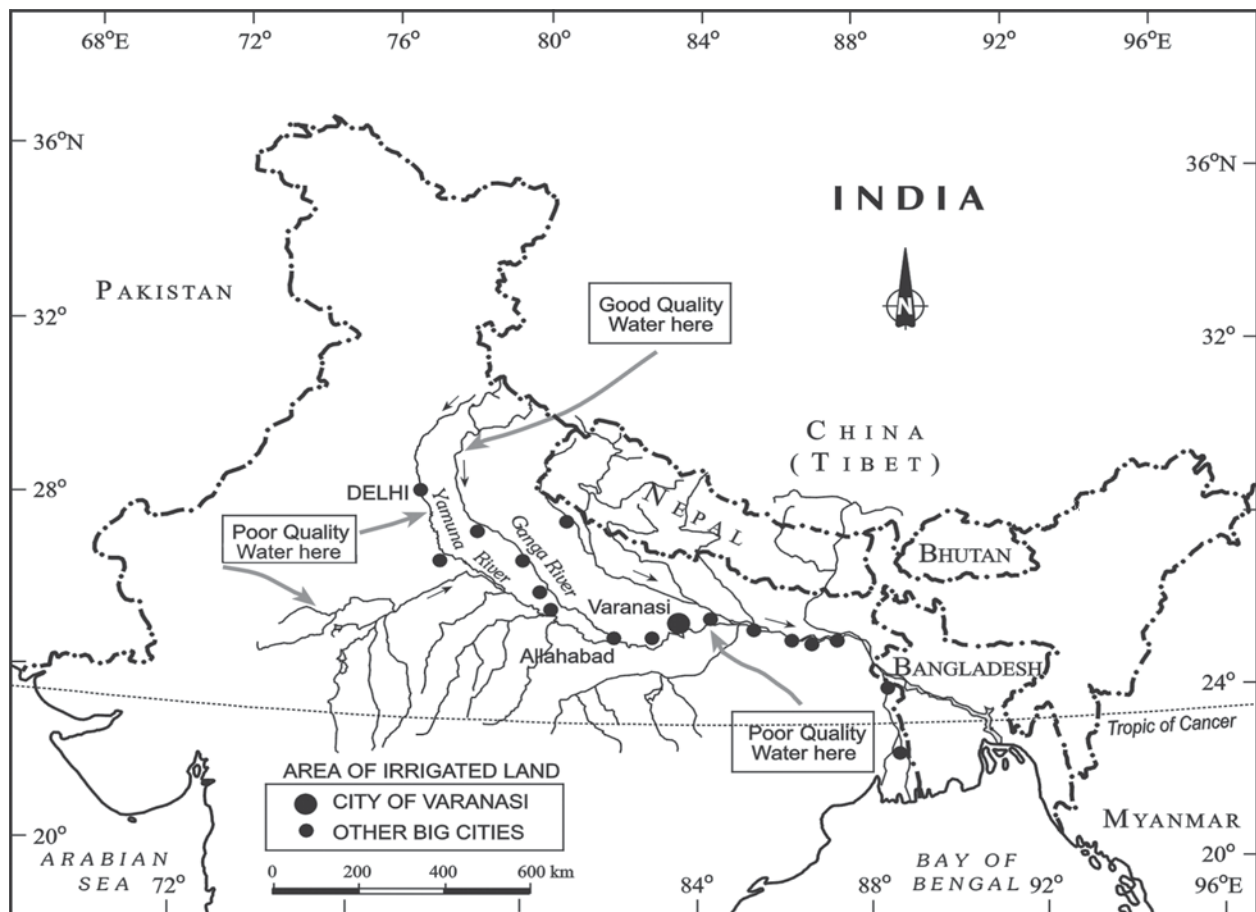


Fig. 6.4 : The Ganga and its Tributaries and Towns Located on them

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 share of area irrigated through wells and tube wells is also very high in the states given in table 6.2.

**Table 6.2 : Percentage of net irrigated area to total by wells and Tube-wells**

State	Percentage
Gujarat	86.6
Rajasthan	77.2
Madhya Pradesh	66.5
Maharashtra	65
Uttar Pradesh	58.21
West Bengal	57.6
Tamil Nadu	54.7

**What is the pattern of well and Tubewell irrigation discernible from the above table?**

**What are the implications of using groundwater in drought-prone area of Rajasthan, Gujarat, Maharashtra and Tamil Nadu?**

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









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.

### 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 with in 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-Meeru** (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



## **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.



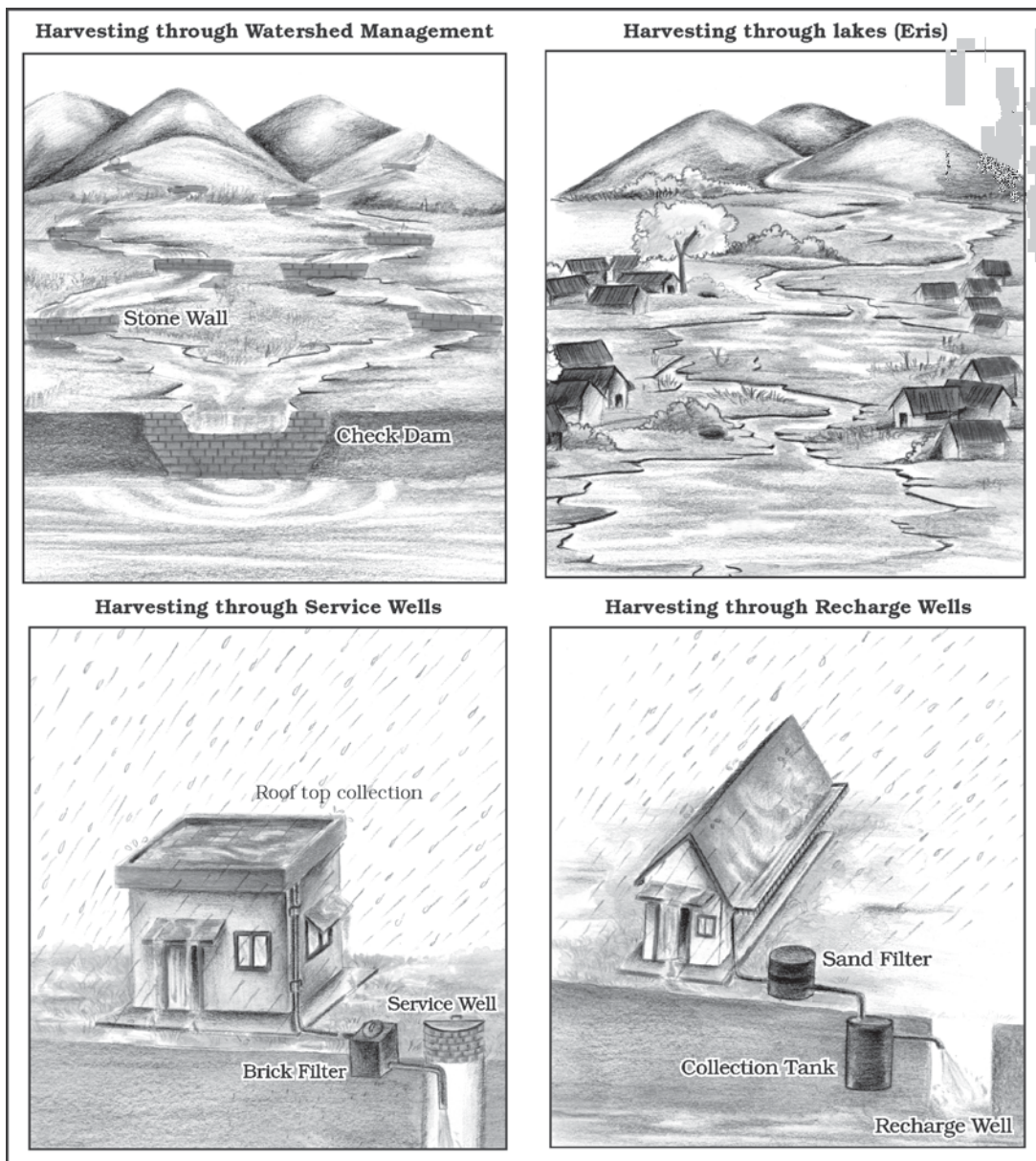
*Ralegan Siddhi before mitigation approach*



*Ralegan Siddhi after mitigation approach*

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. 6.5 : Various Methods of Rainwater Harvesting**

as *Kund* or *Tanka* (a covered underground tank) are constructed near or in the house or village to store harvested rainwater (see Fig. 6.5 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 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 desalinisation 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](http://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
    - (b) Non-renewable Resources
    - (c) Biotic Resource
    - (d) Cyclic Resource
  - (ii) Which one of the following rivers has the highest replenishable ground water resource in the country?
    - (a) The Indus
    - (b) The Brahmaputra
    - (c) The Ganga
    - (d) The Godavari
  - (iii) Which of the following figures in cubic kilometres correctly shows the total annual precipitation in India?
    - (a) 2,000
    - (b) 3,000
    - (c) 4,000
    - (d) 5,000
  - (iv) 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
    - (b) Karnataka
    - (c) Andhra Pradesh
    - (d) Kerala
  - (v) The highest proportion of the total water used in the country is in which one of the following sectors?
    - (a) Irrigation
    - (b) Industries
    - (c) Domestic use
    - (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?



# MINERAL AND ENERGY RESOURCES

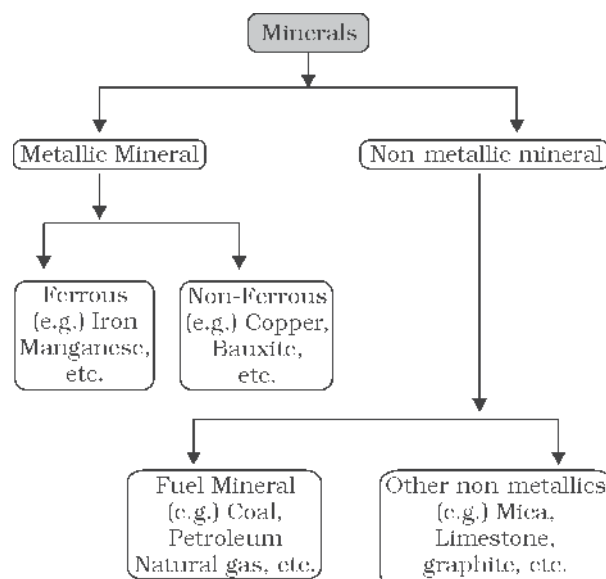


India is endowed with a rich variety of mineral resources due to its varied geological structure. Bulk of the valuable minerals are products of pre-palaezoic age (Refer: Chapter 2 of Class XI, Textbook: “*Fundamentals of Physical Geography*” and are mainly associated with metamorphic and igneous rocks 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. 7.1 : Classification of Minerals**

As, it is clear from the Fig. 7.1 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.

### Agencies involved in the exploration of minerals

In India, systematic surveying, prospecting and exploration for minerals is undertaken by the Geological Survey of India (GSI), Oil and Natural Gas Commission (ONGC), Mineral Exploration Corporation Ltd. (MECL), National Mineral Development Corporation (NMDC), Indian Bureau of Mines (IBM), Bharat Gold Mines Ltd. (BGML), Hindustan Copper Ltd. (HCL), National Aluminium Company Ltd. (NALCO) and the Departments of Mining and Geology in various states.

## 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 packs 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.

The total reserves of iron ore in the country were about 20 billion tonnes in the year 2004-05. 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 Jhar. The important mines are Gurumahisani, Sulaipet, Badampahar (Mayurbhanj), Kiruburu (Kendujhar) and Bonai (Sundergarh). Similar hill ranges, Jharkhand has some of the oldest iron ore mines and most of the iron and steel

## Iron ore mining gets a boost

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

Any industrialised nation requires vast quantities of iron ore, which is the basic raw material from which iron and steel are made. India is no exception. Over the past few decades, India has accumulated huge reserves of iron and steel. Iron ore is produced in approximately 46 countries, and world resources are estimated to exceed 800 billion tons of crude ore containing 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 main producers. One mines and produces iron ore, while the other is engaged in mining activities to extract the ore, largely for the use of producers. Key players include National Mineral Development Corporation (NMDC), Kudremukh Iron Ore Co (KIOCL), Essel Mining & Industries Ltd., and Sesa Goa (Sesa). Other players like the Belgium-based PGC group, which has tied up with the Kolhapur-based Ghoshal Group to form Sesa PGC exports are also making a mark. Iron ore mines are mostly located in Jharkhand, Orissa, West Bengal, Chhattisgarh and Karnataka. Recently, however, some Indian steel manufacturing companies have invested in steel and coal mines abroad, such as in Australia.

Producers are classified into main or integrated producers, and oil-based producers account for integrated steel production in India. L&F (SAIL), Tata Iron and Steel (TISCO), and TIS



the best-known private sector companies in the country. Companies like SAIL and TISCO have their own captive mines. The other or secondary producers include re-rollers and stand alone producers in the organised and unorganised segments, and account for the remaining 58% of India's steel production. Producers are also classified on the basis of the production process and the type of products (long or flat) manufactured by the producers. Stand alone producers produce sponge iron and pig iron to be used by the main producers. India is the largest producer of coal-based sponge iron in the world, and accounts for 15% of the global output. Indian Steel & Power Ltd. is the largest producer of coal-based sponge iron in India. It is also the second largest in the world with a capacity of 600,000 TPA. KIOCL, Sesa Goa and Ultra Inpat are the major producers of pig iron. Integrated steel plants like SAIL and RINL 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 in relatively short supply in India. The Government of India has been taking several steps to promote the growth of the mineral sector under the overall framework of the National Mineral Policy, 1988. The amended Mines and Minerals Development and Regulating Act (MMDRA) 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 of the Tenth Plan (2002-07) will touch 110 mt, with around 40 mt exported annually during the Plan period. The Government also regulates the amount of iron ore to be extracted to counter pollution. Modern excavation heavy blasting techniques have been developed which help minimise damage to the environment.

Export of high-grade iron ore has been so far channelled through the Minerals and Metals Trading Corporation Ltd. (MMTC), and quantitative 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 a very prospect, drawing a large amount of iron ore. India's iron ore production is expected to grow at a significant rate.

Can you find out its reason?

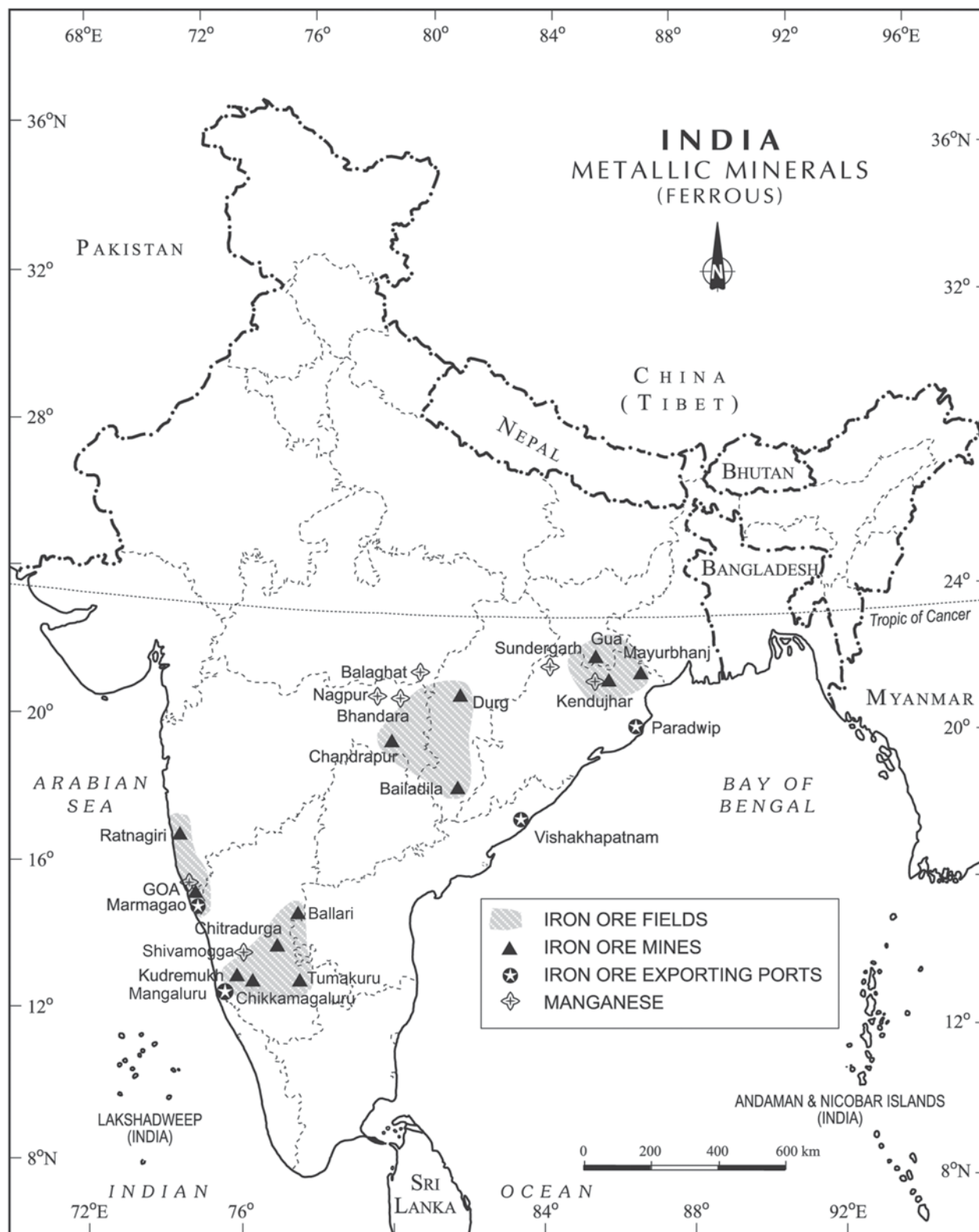
plants are located around them. Most of the important mines such as Noamundi and Gua are located in Poorbi and Pashchimi Singhbhum districts. This belt further extends to Durg, Dantewara and Bailadila. Dalli, and Rajhara in Durg are the important mines of iron ore in the country. In Karnataka, iron ore deposits occur in Sandur-Hospet area of Ballari district, Baba Budan hills and Kudremukh in Chikkamagaluru district and 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







**Fig. 7.2 : India – Metallic Minerals (Ferrous)**

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.

Karnataka is another major producer and here the mines are located in Dharwar, Ballari, Belagavi, North Canara, Chikmagalur, 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 Hasan 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, Telangana 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 Kanniyakumari 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





**Fig. 7.3 : India – Minerals (Non-Ferrous)**

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.

### At Singareni, Canaries to miners' rescue

Singareni collieries, the country's premier coal production company, still uses canaries to detect the presence of deadly carbon monoxide in underground mines. Miners collapse and often die even if small quantities of the highly poisonous CO are present in the air. Though, miners speak lovingly of the canaries, the underground experience is not at all pleasant for the birds. When lowered into mines with CO presence, the birds show distress symptoms such as ruffling of feathers, pronounced chirping and loss of life. These reactions occur even if 0.15 per cent of CO is present in the air. If the content is 0.3 per cent the bird shows immediate distress and falls off its perch in two to three minutes. A cage of birds is a good indicator in air containing more than 0.15 per cent CO, said a coal miner.

The sophisticated hand held CO detectors introduced by the company can detect CO concentrations from as low as 10 ppm to as high as 1,000 ppm. But despite this, the miners trust the birds, who have saved the lives of several of their predecessors.

*Deccan Chronicle, 26.08.2006*



**Fig.7.4 : Neyveli Coalfield**







**Fig. 7.5 : India – Conventional Energy Resources**

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.

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.

There are 21 refineries in India as on June 2011 (Fig. 7.6). Identify the States in which these are located.

### *Natural Gas*

The Gas Authority of India Limited was set up in 1984 as a public sector undertaking to transport and market natural gas. It is obtained alongwith oil in all the oilfields but exclusive reserves have been located along the eastern coast as well as (Tamil Nadu, Odisha and Andhra Pradesh), Tripura, Rajasthan and off-shore wells in Gujarat and Maharashtra.

### **Indications of huge gas reserves in Ramanathapuram (Tamil Nadu)**

According to a newspaper report (*The Hindu*, 05.09.2006) the Oil and Natural Gas Commission has found potential zones of natural gas reserves in Ramanathapuram district. The survey is still in the initial stages. The exact quantity of gas reserves will be known only after the completion of the survey. But the results are encouraging.

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.

### **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.





**Fig. 7.6 : India – Oil Refineries**



# GEOGRAPHY'S CREATING HISTORY



## RIL Seeks GI Status For Jamnagar Petrogoods, KG Basin Gas

G Ganapathy Subramaniam & Soma Banerjee  
NEW DELHI

**W**HAT 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 gas produced from its Jamnagar refinery.

distinct status" of Jamnagar diesel and KG gas in its filling, 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 सैनी

नई दिल्ली

## 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 *livescience.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 that can be moved to a con-



POWER OF FUTURE: Wind turbines in Dronten, the Netherlands

chor. The setup is called a "tension leg platform," or TLP, and would be cheaper than fixed towers.

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

Like the offshore windmills currently in use, the TLPs would use undersea 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 northeastern U.S. they could be placed about 30 to 100 miles out at sea. Because winds are stronger farther offshore, the floating windmills could also generate more energy, the researchers say.

10वीं योजना के अंत तक अक्षय ऊर्जा उत्पादन बढ़ कर 11,000 मेगावाट हो जाएगा

भी अधिक है। श्री सुब्रह्मण्यम का मानना है कि अपारंपरिक ऊर्जा के क्षेत्र में भारत में लघु पनबिजली परियोजनाओं में कोई विशेष उत्साहवर्द्धक परिणाम देखने में नहीं आए हैं लेकिन विंड एनर्जी, (पवन ऊर्जा) बायोमास, कोजेनेरेशन अर्थात् चीनी मिलों के बग़स से अथवा कूड़े कचरे से पिछले चार सालों में बिजली उत्पादन में वृद्धि के अच्छे परिणाम देखने में आए हैं। उन्होंने कहा कि यह और भी अच्छी बात है कि पवन ऊर्जा के क्षेत्र में विद्युत उत्पादन में निजी क्षेत्र की पार्टियों द्वारा अधिक निवेश किया गया है। बायोमास कोजेनेरेशन अथवा पवन ऊर्जा से विद्युत उत्पादन

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

## 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 Kakrapar (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 permanent wind systems such 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. It has an ambitious programme to install 250 wind-driven turbines with a total capacity of 45 megawatts, spread over 12 suitable locations, specially in coastal areas. The Ministry of Non-conventional Sources of Energy is developing wind energy in India to lessen the burden of oil import bill. The country's potential of wind power generation exceeds 50,000 megawatts, of which one fourth can be easily harnessed. 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

1. Choose the right answers of the following from the given options.
  - (i) In which one of the following States are the major oil fields located?
    - (a) Assam
    - (b) Bihar
    - (c) Rajasthan
    - (d) Tamil Nadu
  - (ii) At which one of the following places was the first atomic power station started?
    - (a) Kalpakkam
    - (b) Narora
    - (c) Rana Pratap Sagar
    - (d) Tarapur
  - (iii) Which one of the following minerals is known as brown diamond?
    - (a) Iron
    - (b) Lignite
    - (c) Manganese
    - (d) Mica
  - (iv) Which one of the following is non-renewable source of energy?
    - (a) Hydel
    - (b) Solar
    - (c) Thermal
    - (d) Wind power
2. Answer the following questions in about 30 words.
  - (i) Give an account of the distribution of mica in India.
  - (ii) What is nuclear power? Mention the important nuclear power stations in India.
  - (iii) Name non-ferrous metal. Discuss their spatial distribution.
  - (vi) What are non-conventional sources of energy?
3. Answer the following questions in about 150 words.
  - (i) Write a detailed note on the Petroleum resources of India.
  - (ii) Write an essay on hydel power in India.



# MANUFACTURING INDUSTRIES



We use various items to satisfy our needs. Agricultural products like wheat, rice, etc. are to be processed into flour, husked rice before we consume these. But besides bread and rice, we also require clothes, books, fans, cars, medicines, etc. and these are manufactured in various industries. In modern times industries have become very important part of an economy. They provide employment to large labour force and contribute significantly in the total national wealth/income.

## Types of Industries

Industries are classified in a number of ways. On the basis of size, capital investment and labour force employed, industries are classified as large, medium, small scale, and cottage industries. On the basis of ownership, industries are categorised as : (i) public sector, (ii) private sector, and (iii) joint and cooperative sector, Public sector enterprises are government/state controlled companies or corporations funded by governments. Industries of strategic and national importance are usually in the public sector. Industries are also classified on the basis of the use of their products such as : (i) basic goods industries, (ii) capital goods industries (iii) intermediate goods industries, and (iv) consumer goods industries.

Another method of classifying industries is on the basis of raw materials used by them. Accordingly, these can be : (i) agriculture-based industries, (ii) forest-based industries, (iii) mineral-based industries, and (iv) industrially processed raw material-based industries.

Another common classification of industries is based on the nature of the manufactured products. Eight classes of industries, thus identified are : (1) Metallurgical Industries, (2) Mechanical Engineering Industries, (3) Chemical and Allied Industries, (4) Textile Industries, (5) Food Processing Industries, (6) Electricity Generation, (7) Electronics and (8) Communication Industries. Sometimes, you also read about foot loose industries. What are these? Have they any relationship with raw material location or not?

## Location of Industries

Can you guess the reasons for the location of iron and steel industry in eastern and southern India? Why is there no iron and steel industry in U.P., Haryana, Punjab, Rajasthan and Gujarat?

Location of industries is influenced by several factors like access to raw materials, power, market, capital, transport and labour, etc. Relative significance of these factors varies with time and place. There is strong relationship between raw material and type of industry. It is economical to locate the manufacturing industries at a place where cost of production and delivery cost of manufactured goods to consumers are the least. Transport costs, to a great extent, depend on the nature of raw materials and manufactured products. A brief description of factors influencing the location of industries are given below:

### Raw Materials

Industries using weight-losing raw materials are located in the regions where raw materials are located. Why are the sugar mills in India located in sugarcane growing areas? Similarly, the locations of pulp industry, copper smelting and pig iron industries are located near their raw materials. In iron and steel industries, iron ore and coal both are weight-losing raw materials. Therefore, an optimum location for iron and steel industries should be near raw material sources. This is why most of the iron and steel industries are located either near coalfields (Bokaro, Durgapur, etc.) or near sources of iron ore (Bhadrahati, Bhilai, and Rourkela). Similarly, industries based on perishable raw materials are also located close to raw material sources.

### Power

Power provides the motive force for machines, and therefore, its supply has to be ensured before the location of any industry. However, certain industries, like aluminium and synthetic nitrogen manufacturing industries tend to be located near sources of power because they are power intensive and require huge quantum of electricity.

## Market

Markets provide the outlets for manufactured products. Heavy machine, machine tools, heavy chemicals are located near the high demand areas as these are market orientated. Cotton textile industry uses a non-weight-losing raw material and is generally located in large urban centre, e.g. Mumbai, Ahmedabad, Surat, etc. Petroleum refineries are also located near the markets as the transport of crude oil is easier and several products derived from them are used as raw material in other industries. Koyali, Mathura and Barauni refineries are typical examples. Ports also play a crucial role in the location of oil refineries.

## Transport

Have you ever tried to find out the reasons for the concentration of industries in Mumbai, Chennai, Delhi and in and around Kolkata? It was due to the fact that they initially became the nodal point having transport links. The industries shifted to interior locations, only when railway lines were laid. All major industrial plants are located on the trunk rail routes.

## Labour

Can we think of an industry without labour? Industries require skilled labour. In India, labour is quite mobile and is available in large numbers due to our large population.

## Historical Factors

Have you ever thought of the reasons for emerging Mumbai, Kolkata and Chennai as industrial nodes? These locations were greatly influenced by our colonial past. During the initial phase of colonisation, manufacturing activities received new impetus provided by the European traders. Places like Murshidabad, Dhaka, Bhadohi, Surat, Vadodara, Kozhikode, Coimbatore, Mysuru etc., emerged as important manufacturing centres. In the subsequent industrial phase of colonialism, these manufacturing centres experienced rapid growth due to competition from the goods manufactured in Britain and the discriminatory policies of colonial power.





In the last phase of colonialism, the British promoted few industries in selected areas. This led to larger spatial coverage by different types of industries in the country.

### **Industrial Policy**

India, being a democratic country aims at bringing about economic growth with balanced regional development.

Establishment of iron and steel industry in Bhilai and Rourkela were based on decision to develop backward tribal areas of the country. At present, government of India provides lots of incentives to industries locating in backward areas.

### **Major Industries**

The iron and steel industry is basic to the industrial development of any country. The cotton textile Industry is one of our traditional industries. The sugar Industry is based on local raw materials which prospered even in the British period. Besides the more recent petrochemical Industry and the IT industry will be discussed in this chapter.

### **The Iron and Steel Industry**

The development of the iron and steel industry opened the doors to rapid industrial development in India. Almost all sectors of the Indian industry depend heavily on the iron and steel industry for their basic infrastructure. Can we make tools to be used in agriculture without iron?

The other raw materials besides iron ore and coking coal, essential for iron and steel industry are limestone, dolomite, manganese and fire clay. All these raw materials are gross (weight losing), therefore, the best location for the iron and steel plants is near the source of raw materials. In India, there is a crescent shaped region comprising parts of Chhattisgarh, Northern Odisha, Jharkhand and western West Bengal, which is extremely rich in high grade iron ore, good quality coking coal and other supplementing raw materials.

The Indian iron and steel industry consists of large integrated steel plants as

well as mini steel mills. It also includes secondary producers, rolling mills and ancillary industries.

### **Integrated Steel Plants**

#### *TISCO*

The Tata Iron and Steel plant lies very close to the Mumbai-Kolkata railway line and about 240 km away from Kolkata, which is the nearest port for the export of steel. The rivers Subarnarekha and Kharkai provide water to the plant. The iron ore for the plant is obtained from Noamundi and Badam Pahar and coal is brought from Joda mines in Odisha. Coking coal comes from Jharia and west Bokaro coalfields.

#### *IISCO*

The Indian Iron and Steel Company (IISCO) set up its first factory at Hirapur and later on another at Kulti. In 1937, the Steel corporation of Bengal was constituted in association with IISCO and set up another iron and steel producing unit at Burnpur (West Bengal). All the three plants under IISCO are located very close to Damodar valley coal fields (Raniganj, Jharia, and Ramgarh). Iron ore comes from Singhbhum in Jharkhand. Water is obtained from the Barakar River, a tributary of the Damodar. All the plants are located along the Kolkata-Asansol railway line. Unfortunately, steel production from IISCO fell considerably in 1972-73 and the plants were taken over by the government.

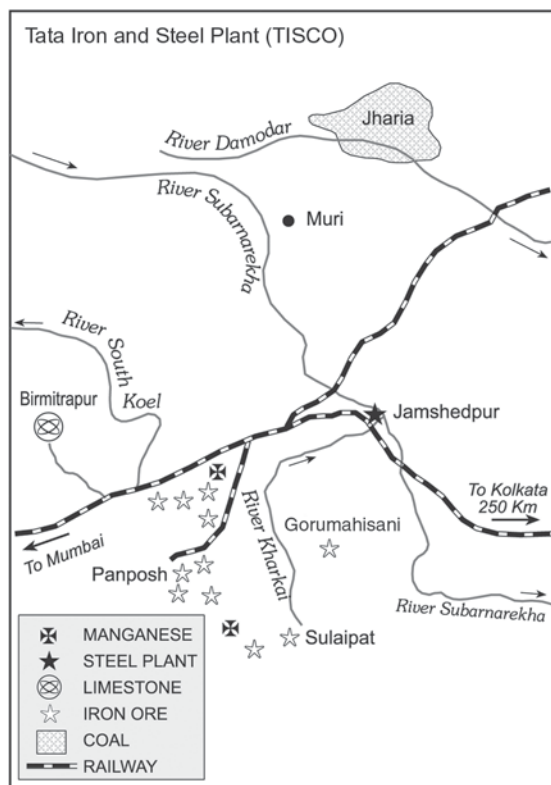
#### *Visvesvaraiya Iron and Steel Works Ltd. (VISL)*

The third integrated steel plant, the Visvesvaraiya Iron and Steel Works, initially called the Mysore Iron and Steel Works, is located close to an iron ore producing area of Kemangundi in the Bababudan hills. Limestone and manganese are also locally available. But this region has no coal. At the beginning, charcoal obtained by burning wood from nearby forests was used as fuel till 1951. Afterwards, electric furnaces were installed which use hydroelectricity from the Jog Falls hydel power project. The Bhadravati river supplies water to the plant. This plant produces specialised steels and alloys.

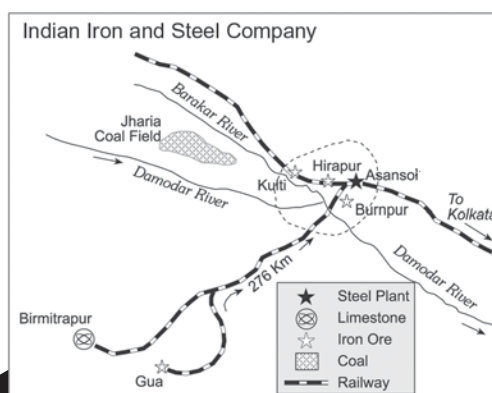




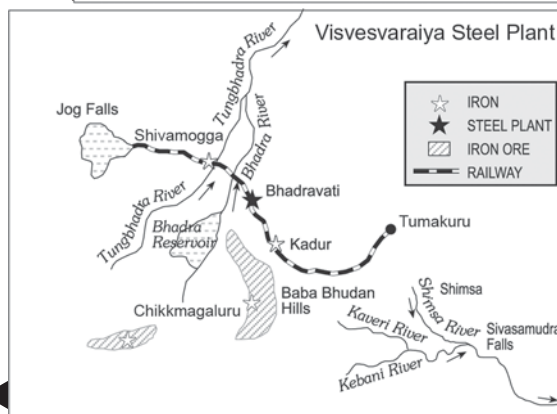
**Fig. 8.1 : India – Iron and Steel Plants**



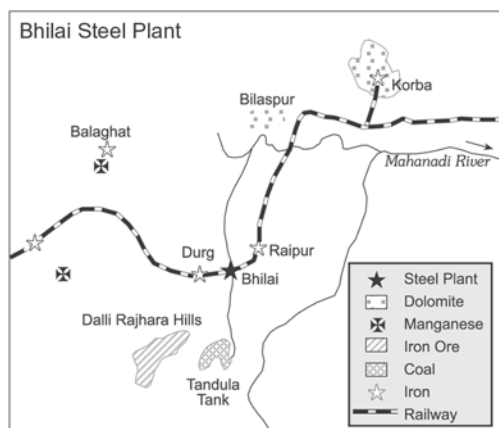
**Fig. 8.2**



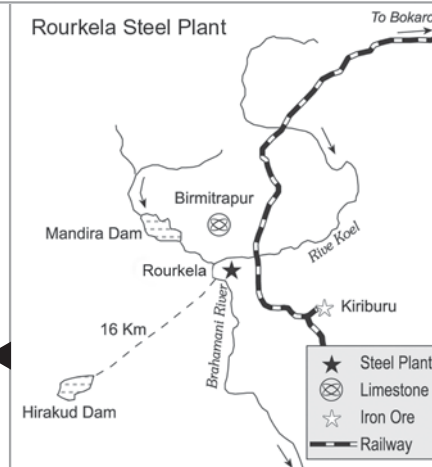
**Fig. 8.3**



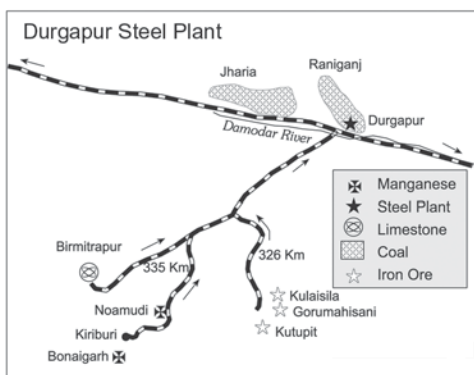
**Fig. 8.4**



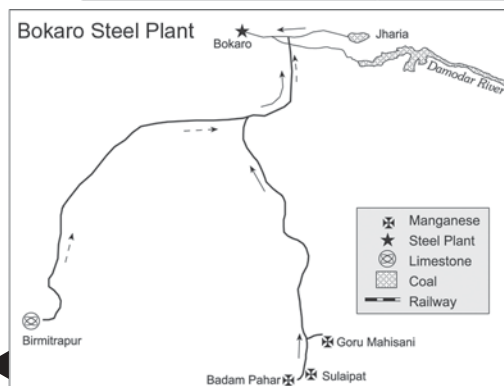
**Fig. 8.6**



**Fig. 8.5**



**Fig. 8.7**



**Fig. 8.8**

After independence, during the Second Five Year Plan (1956-61), three new integrated steel plants were set up with foreign collaboration: Rourkela in Odisha, Bhilai in Chhattisgarh and Durgapur in West Bengal. These were public sector plants under Hindustan Steel Limited (HSL). In 1973, the Steel Authority of India Limited (SAIL) was created to manage these plants.

#### *Rourkela Steel Plant*

The Rourkela Steel plant was set up in 1959 in the Sundargarh district of Odisha in collaboration with Germany. The plant was located on the basis of proximity to raw materials, thus, minimising the cost of transporting weight losing raw material. This plant has a unique locational advantage, as it receives coal from Jharia (Jharkhand) and iron ore from Sundargarh and Kendujhar. The Hirakud project supplies power for the electric furnaces and water is obtained from the Koel and Sankh rivers.

#### *Bhilai Steel Plant*

The Bhilai Steel Plant was established with Russian collaboration in Durg district of Chhattisgarh and started production in 1959. Iron ore comes from Dalli-Rajhara mine (Fig. 8.6) and coal from Korba and Kargali coal fields. Water comes from the Tanduladam and the power from the Korba Thermal Power Station. This plant also lies on the Kolkata-Mumbai railway route. The bulk of the steel produced goes to the Hindustan Shipyard at Vishakhapatnam.

#### *Durgapur Steel Plant*

Durgapur Steel Plant in West Bengal was set up in collaboration with the government of the United Kingdom and started production in 1962. This plant lies in Raniganj and Jharia coal belt and gets iron ore from Noamundi (Fig. 8.7). Durgapur lies on the main Kolkata-Delhi railway route. Hydel power and water is

obtained from the Damodar Valley Corporation (DVC).

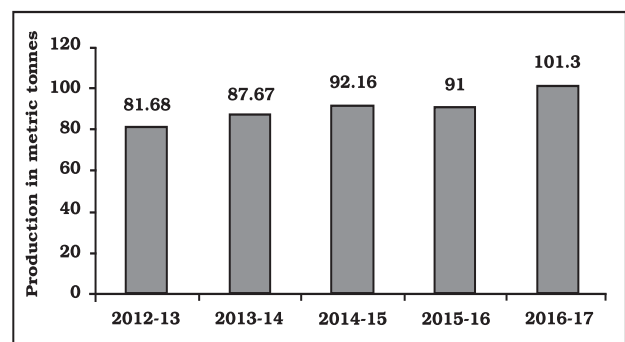
#### *Bokaro Steel Plant*

This steel plant was set up in 1964 at Bokaro with Russian collaboration. This plant was set up on the principle of transportation cost minimisation by creating Bokaro-Rourkela combine. It receives iron ore from the Rourkela region and the wagons on return take coal to Rourkela. Other raw materials come to Bokaro from within a radius of about 350 km. Water and hydel power is supplied by the Damodar Valley Corporation.

#### *Other Steel Plants*

New steel plants which were set up in the Fourth Plan period are away from the main raw material sources. All three plants are located in South India. The Vizag Steel Plant, in Vishakhapatnam in Andhra Pradesh is the first port-based plant which started operating in 1992. Its port location is of advantage.

The Vijaynagar Steel Plant at Hosapete in Karnataka was developed using indigenous technology. This uses local iron ore and limestone. The Salem Steel Plant in Tamil Nadu was commissioned in 1982.



Source : Ministry of Steel, Government of India

**Fig 8.9 : Production of Finished Steel**

Apart from these major steel plants, there are more than 206 units located in different parts of the country. Most of these use scrap iron as their main raw material, and process it in electric furnaces.



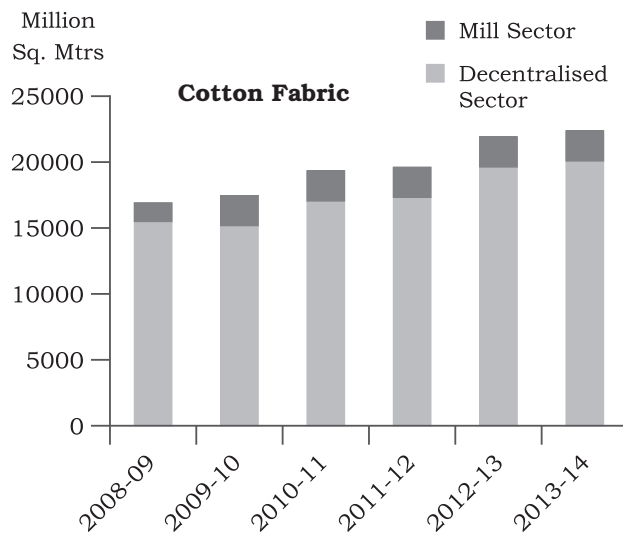


## The Cotton Textile Industry

The cotton textile industry is one of the traditional industries of India. In the ancient and the medieval times, it used to be only a cottage industry. India was famous worldwide for the production of muslin, a very fine variety of cotton cloth, calicos, chintz and other different varieties of fine cotton cloth. The development of this industry in India was due to several factors. One, it is a tropical country and cotton is the most comfortable fabric for a hot and humid climate. Second, large quantity of cotton was grown in India. Abundant skilled labour required for this industry was available in this country. In fact, in some areas the people were producing cotton textiles for generations and transferred the skill from one generation to the other and in the process perfected their skills.

Initially, the British did not encourage the development of the indigenous cotton textile industry. They exported raw cotton to their mills in Manchester and Liverpool and brought back the finished products to be sold in India. This cloth was cheaper because it was produced at mass scale in factories in U.K. as compared to the cottage based industries of India.

In 1854, the first modern cotton mill was established in Mumbai. This city had several advantages as a cotton textile manufacturing



Source : Annual Report 2013-14, (CITI)

**Fig 8.10 : Production of Cotton Fabric**

centre. It was very close to the cotton producing areas of Gujarat and Maharashtra. Raw cotton used to be brought to Mumbai port to be transported to England. Therefore, cotton was available in Mumbai city itself. Moreover, Mumbai even then was the financial centre and the capital needed to start an industry was available there. As a large town, providing employment opportunities attracted labour in large numbers. Hence, cheap and abundant labour too was available locally. The machinery required for a cotton textile mill could be directly



**Spinning yarn in powerloom**



**Handloom Cotton Textile Industry**





**Fig. 8.11 : Cotton Textile Industries**

imported from England. Subsequently, two more mills, the Shahpur Mill and the Calico Mill were established in Ahmedabad. By 1947, the number of mills in India went up to 423 but the scenario changed after partition, and this industry suffered a major recession. This was due to the fact that the most of the good quality cotton growing areas had gone to West Pakistan and India was left with 409 mills and only 29 per cent of the cotton producing area.

After Independence, this industry gradually recovered and eventually flourished.

The cotton textile industry in India can be broadly divided into two sectors, the organised sector and the unorganised sector. The decentralised sector includes cloth produced in handlooms (including *Khadi*) and powerlooms. The production of the organised sector has drastically fallen from 81 per cent in the mid-twentieth century to only about 6 per cent in 2000. At present, the powerlooms on the decentralised sector produce more than the handloom sector.

Cotton is a “pure” raw material which does not lose weight in the manufacturing process. So other factors, like, power to drive the looms, labour, capital or market may determine the location of the industry. At present the trend is to locate the industry at or close to markets, as it is the market that decides what kind of cloth is to be produced. Also the market for the finished products is extremely variable, therefore, it becomes important to locate the mills close to the market.

After the first mills were set up in Mumbai and Ahmedabad in the second half of the nineteenth century, the cotton textile industry expanded very rapidly. The number of units increased dramatically. The *Swadeshi* movement gave a major impetus to the industry as there was a call for boycotting all British made goods in favour of Indian goods. After 1921, with the development of the railway network other cotton textile centres expanded rapidly. In southern India, mills were set up at Coimbatore, Madurai and Bengaluru. In central India, Nagpur, Indore, Solapur and Vadodara became cotton textile centres. Cotton textile mills were set up at Kanpur based on

local investment. Mills were also set up at Kolkata due to its port facilities. The development of hydro-electricity also favoured the location of the cotton textile mills away from the cotton producing areas. The rapid development of this industry in Tamil Nadu is the result of the abundant availability of hydel power for the mills. Lower labour costs at centres like Ujjain, Bharuch, Agra, Hathras, Coimbatore and Tirunelveli also caused industries to be located away from cotton producing areas.

Thus, the cotton textile industry is located in almost every state in India, where one or more of the locational factors have been favourable. The importance of raw materials has given way to market or to a cheaper local labour force or it may be the availability of power.

Presently, the major centres of the cotton textile industry are Ahmedabad, Bhiwandi, Solapur, Kolhapur, Nagpur, Indore and Ujjain. All these centres are the traditional centres and are located close to the cotton producing regions. Maharashtra, Gujarat and Tamil Nadu are the leading cotton producing states. West Bengal, Uttar Pradesh, Karnataka, and Punjab are the other important cotton textile producers. (Fig. 8.11)

Tamil Nadu has the largest number of mills and most of them produce yarn rather than cloth. Coimbatore has emerged as the most important centre with nearly half the mills located there. Chennai, Madurai, Tirunelveli, Tuticorin, Thanjavur, Ramanathapuram and Salem are the other important centres. In Karnataka, the cotton textile industry has developed in the cotton producing areas in the north-eastern part of the state. Davangere, Hubballi, Ballari, Mysuru and Bengaluru are important centres. The cotton textile industry is located in the cotton producing Telangana region, where most of the mills are spinning mills producing yarn. The important centres are Hyderabad, Secunderabad and Warangal in Telangana and Guntur in Andhra Pradesh.

In Uttar Pradesh, Kanpur is the largest centre. Some of the other important centres are





Modinagar, Hathras, Saharanpur, Agra and Lucknow. In West Bengal, the cotton mills are located in the Hugli region. Howrah, Serampur, Kolkata and Shyamnagar are the important centres.

Production of cotton cloth increased almost five times since independence. Cotton textile has been facing tough competition from synthetic cloth. What are the other problems of cotton textile industry in India?

### **Sugar Industry**

The sugar industry is the second most important agro-based industry in the country. India is the largest producer of both sugarcane and cane sugar and contributes about 8 per cent of the total sugar production in the world. Besides, *khandasari* and *gur* or jaggery are also prepared from sugarcane. This industry provides employment for more than 4 lakh persons directly and a large number of farmers indirectly. Sugar industry is a seasonal industry because of the seasonality of raw materials.

Development of the industry on modern lines dates back to 1903, when a sugar mill was started in Bihar. Subsequently, sugar mills were started in other parts of Bihar and Uttar Pradesh. In 1950-51, 139 factories were in operation. The number of sugar factories rose to 662 in 2010-11.

### **Location of the Sugar Industry**

Sugarcane is a weight-losing crop. The ratio of sugar to sugarcane varies between 9 to 12 per cent depending on its variety. Its sucrose content begins to dry during haulage after it has been harvested from the field. Better recovery of sugar is dependent upon its being crushed within 24 hours of its harvesting. Sugar factories hence, are located within the cane producing regions.

Maharashtra has emerged as a leading sugar producer in the country and produces more than one-third of the total production of the sugar in the country.

Uttar Pradesh is the second largest producer of sugar. The sugar factories are concentrated in two belts – the Ganga-Yamuna doab and the tarai region. The major sugar producing centres in the Ganga -Yamuna doab are Saharanpur, Muzaffarnagar, Meerut, Ghaziabad, Baghpat and Bulandshahr districts; while Kheri Lakhimpur, Basti, Gonda, Gorakhpur, Bahraich are important sugar producing districts in the Tarai region.

In Tamil Nadu, sugar factories are located in Coimbatore, Vellore, Tiruvanamalai, Villupuram and Tiruchchirappalli districts. Belagavi, Ballari, Mandya, Shivamogga, Vijayapura and Chitradurg districts are the major producers in Karnataka. The industry is distributed in the coastal regions i.e. East Godavari, West Godavari, Vishakhapatnam districts of Andhra Pradesh and Nizamabad and Medak districts of Telangana.

The other States which produce sugar are Bihar, Punjab, Haryana, Madhya Pradesh and Gujarat. Saran, Champaran, Muzaffarnagar, Siwan, Darbhanga, and Gaya are the important sugarcane producing districts in Bihar. The relative significance of Punjab has declined, although Gurdaspur, Jalandhar, Sangarur, Patiala and Amritsar are major sugar producers. In Haryana, sugar factories are located in Yamuna Nagar, Rohtak, Hissar and Faridabad districts. Sugar industry is comparatively new in Gujarat. Sugar mills are located in the cane growing tracts of Surat, Junagarh, Rajkot, Amreli, Valsad and Bhavnagar districts.

### **Petrochemical Industries**

This group of industries has been growing very fast in India. A variety of products come under this category of industries. In 1960s, demand for organic chemicals increased so fast that it became difficult to meet this demand. At that time, petroleum refining industry expanded rapidly. Many items are derived from crude petroleum, which provide raw materials for many new industries, these are collectively





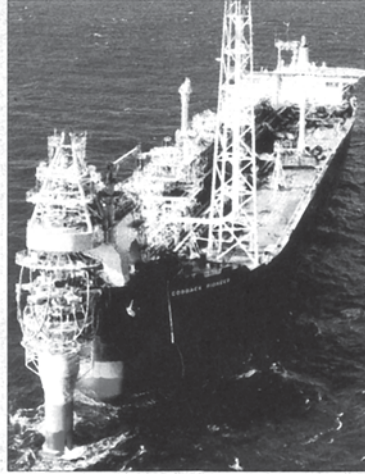
## DO YOU KNOW ?

### भारत पेट्रोलियम उत्पादों के बड़े निर्यातक देश के रूप में उभरा

एस पी सैनी

नई दिल्ली। भारत अब पेट्रोलियम उत्पादों के बड़े निर्यातक देश के रूप में भी उभर रहा है। यहां तक कि अमेरिका, फ्रांस और ब्रिटेन जैसे साधन सम्पन्न विकसित भी भारत से पेट्रोलियम उत्पादों का आयात करते हैं। देश से पेट्रोलियम उत्पादों का निर्यात साल दर साल बढ़ता ही जा रहा है। वित्त वर्ष 2004-05 में देश से 29,928 करोड़ रुपये मूल्य के पेट्रोलियम उत्पादों का निर्यात किया गया था जबकि वर्ष 2005-06 में 46,785 करोड़ रुपये मूल्य के पेट्रोलियम उत्पादों का निर्यात किया गया। पेट्रोलियम उत्पादों के निर्यात में यह वृद्धि केवल सार्वजनिक क्षेत्र में ही नहीं बल्कि निजी क्षेत्र की तेल कम्पनियों के निर्यात में भी वृद्धि हुई है।

वित्त वर्ष 2004-05 में भारत से विभिन्न देशों को 1 करोड़ 82 लाख मीट्रिक टन पेट्रोलियम उत्पादों का निर्यात किया गया था जबकि वित्त वर्ष 2005-06 में बढ़ कर 2 करोड़ 15 लाख मीट्रिक टन हो गया। अधिकृत सूत्रों के अनुसार वित्त वर्ष 2004-05 में सार्वजनिक क्षेत्र द्वारा किया गया पेट्रोलियम उत्पादों का निर्यात 43.8 प्रतिशत था जो वित्त वर्ष 2005-06 में बढ़ कर 49.6 प्रतिशत हो गया। इसी तरह निजी क्षेत्र द्वारा पेट्रोलियम उत्पादों का निर्यात वित्त वर्ष 2004-05 में 56.2 प्रतिशत था लेकिन वित्त वर्ष 2005-06 में यह मामूली घट कर 50.4 प्रतिशत हो गया। सूत्रों के अनुसार 1998 में रिफाइनरी क्षेत्र को लाईसेंस की परिधि से बाहर



अमेरिका, फ्रांस और ब्रिटेन जैसे साधन सम्पन्न विकसित देश भी भारत से पेट्रोलियम उत्पादों का आयात करते हैं

किए जाने के बाद पेट्रोलियम क्षेत्र में व्यापक पैमाने पर ढांचागत सुविधाओं में विस्तार हुआ है। यही नहीं देश में कई स्थानों पर घरेलू रिफाइनरियों की स्थापना भी की गई। इस तरह से भारत को पेट्रोलियम उत्पादों के निर्यातक के तौर पर विश्व में पहचान बनी और आज यह स्थिति है कि भारत पेट्रोलियम उत्पादों के क्षेत्र में अच्छा खासा निर्यातक देश बन गया है।

निजी क्षेत्र में रिलायंस पेट्रोलियम द्वारा जामनगर (गुजरात) में प्रस्तावित सबसे बड़ी रिफाइनरी स्थापित हो जाने के बाद रिफाइनरी के क्षेत्र में भी भारत विश्व का सबसे बड़ा रिफाइनर (तेलशोधक) देश बन जाएगा। रिलायंस पेट्रोलियम द्वारा यह रिफाइनरी अपनी वर्तमान आरआईएल की रिफाइनरी के साथ ही 27,000 करोड़ रुपये की लागत से लगाई जा रही है। तीन वर्ष की अवधि में तैयार होने वाली इस रिफाइनरी की तेलशोधक क्षमता 5,80,000 बैरल प्रतिदिन होगी। यह रिफाइनरी शत-प्रतिशत निर्यातोन्मुखी होगी अर्थात् इस रिफाइनरी में तैयार किए जाने वाले सभी उत्पाद निर्यात किए जाएंगे।

known as petrochemical industries. This group of industries is divided into four sub-groups: (i) polymers, (ii) synthetic fibres, (iii) elastomers, and (iv) surfactant intermediate. Mumbai is the hub of the petrochemical industries. Cracker units are also located in Auraiya (Uttar Pradesh), Jamnagar, Gandhinagar and Hajira (Gujarat), Nagothane, Ratnagiri (Maharashtra), Haldia (West Bengal) and Vishakhapatnam (Andhra Pradesh).

Three organisations are working in the petrochemical sector under the administrative control of the Department of Chemicals and Petrochemicals. First is the Indian Petrochemical Corporation Limited (IPCL), a public sector undertaking. It is responsible for the manufacture and distribution of the various petrochemicals like polymers, chemicals, fibres and fibre intermediates. Second is the Petrofils Cooperative Limited (PCL), a joint venture of the Government of India and Weaver's Cooperative Societies. It produces polyester filament yarn and nylon chips at its two plants located at Vadodara and Naldhari in Gujarat. Third is the Central Institute of Plastic Engineering and Technology (CIPET), involved in imparting training in petro-chemical industry.

Polymers are made from ethylene and propylene. These materials are obtained in the process of refining crude oil. Polymers are used

as raw materials in the plastic industry. Among polymers, polyethylene is a widely used thermoplastic. Plastic is first converted into sheets, powder, resin and pellets, and then used in manufacturing plastic products. Plastic products are preferred because of their strength, flexibility, water and chemical resistance and low prices. Production of plastic polymers started in India in the late fifties and the early sixties using other organic chemicals. The National Organic Chemicals Industries Limited (NOCIL), established in private sector in 1961, started the first naphtha based chemical industry in Mumbai. Later, several other companies were formed. The plants located at Mumbai, Barauni, Mettur, Pimpri and Rishra are the major producers of plastic materials.

About 75 per cent of these units are in small scale sector. The industry also uses recycled plastics, which constitutes about 30 per cent of the total production.

Synthetic fibres are widely used in the manufacturing of fabrics because of their inherent strength, durability, washability, and resistance to shrinkage. Industries manufacturing nylon and polyester yarns are located at Kota, Pimpri, Mumbai, Modinagar, Pune, Ujjain, Nagpur and Udhna. Acrylic staple fibre is manufactured at Kota and Vadodara.



Though plastics have become inseparable items in our daily use and they have affected our life style. But due to its non-biodegradable quality it has emerged as the greatest threat to our environment. Hence, use of plastic is being discouraged in different states of India. Do you know how does plastic adversely affect our environment?

## Knowledge based Industries

The advancement in information technology has had a profound influence on the country's economy. The Information Technology (IT) revolution opened up new possibilities of economic and social transformation. The IT and IT enabled business process outsourcing (ITES-BPO) services continue to be on a robust growth path. Indian software industry has emerged as one of the fastest growing sectors in the economy. The software industry has surpassed electronic hardware production. The Indian government has created a number of software parks in the country.

The IT software and services industry account for almost 2 per cent of India's GDP. India's software industry has achieved a remarkable distinction for providing quality products. A large number of Indian software companies have acquired international quality certification. A majority of the multinational companies operating in the area of information technology have either software development centres or research development centres in India. However, in the hardware development sector, India is yet to make any remarkable achievements.

A major impact of this growth has been on employment creation, which is almost doubled every year.

## Liberalisation, Privatisation, Globalisation (LPG) and Industrial Development in India

The new Industrial Policy was announced in 1991. The major objectives of this policy were to build on the gains already made, correct the distortions or weaknesses that have crept in,

maintain a sustained growth in productivity and gainful employment and attain international competitiveness.

Within this policy, measures initiated are : (1) abolition of industrial licensing, (2) free entry to foreign technology, (3) foreign investment policy, (4) access to capital market, (5) open trade, (6) abolition of phased manufacturing programme, and (7) liberalised industrial location programme. The policy has three main dimensions: **liberalisation, privatisation and globalisation.**

The industrial licensing system has been abolished for all except six industries related to security, strategic or environmental concerns. At the same time, the number of industries reserved for public sector since 1956 have been reduced from 17 to 4. Industries related to atomic energy, substances specified in the Schedule of the Department of Atomic Energy as well as Railways have remained under the public sector. The government also has decided to offer a part of the shareholdings in the public enterprises to financial institutions, general public and workers. The threshold limits of assets have been scrapped and no industry requires prior approval for investing in the delicensed sector. They only need to submit a memorandum in the prescribed format.

In the new industrial policy, Foreign Direct Investment (FDI) has been seen as a supplement to the domestic investment for achieving a higher level of economic development. FDI benefits the domestic industry as well as the consumers by providing technological upgradation, access to global managerial skills and practices, optimum use of natural and human resources, etc. Keeping all this in mind, foreign investment has been liberalised and the government has permitted access to an automatic route for Foreign Direct Investment. The government has also announced changes in the industrial location policies. Industries are discouraged in or very close to large cities due to environmental reasons.

The industrial policy has been liberalised to attract private investor both domestic and multi-nationals. New sectors like, mining, telecommunications, highway construction and





**Fig. 8.12 : Software Technology Parks**



management have been thrown open to private companies. In spite of all these concessions, Foreign Direct Investment has not been up to the expectation. There has been a big gap between approved and actual foreign direct investment, even though the number of foreign collaborations is increasing. Larger parts of this investment have gone to domestic appliances, finance, services, electronics and electrical equipment, and food and dairy products.

Globalisation means integrating the economy of the country with the world economy. Under this process, goods and services along with capital, labour and resources can move freely from one nation to another. The thrust of globalisation has been to increase the domestic and external competition through extensive application of market mechanism and facilitating dynamic relationship with the foreign investors and suppliers of technology. In the Indian context, this implies: (1) opening of the economy to foreign direct investment by providing facilities to foreign companies to invest in different fields of economies activity in India; (2) removing restrictions and obstacles to the entry of multinational companies in India; (3) allowing Indian companies to enter into foreign collaboration in India and also encouraging them to set up joint-ventures abroad; (4) carrying out massive import liberalisation programmes by switching over from quantitative restrictions to tariffs in

the first place, and then bringing down the level of import duties considerably; and (5) instead of a set of export incentives, opting for exchange rate adjustments for promoting export.

A breakup of foreign collaboration approval reveals that the major share went to core, priority sectors while infrastructural sector was untouched. Further, gap between developed and developing states has become wider. Major share of both domestic investment, as well as, foreign direct investment went to already developed states. For example, out of the total proposed investment by the industrial entrepreneurs during 1991-2000 nearly one-fourth (23 per cent) was for industrially developed Maharashtra, 17 per cent for Gujarat, 7 per cent for Andhra Pradesh, and about 6 per cent for Tamil Nadu, while Uttar Pradesh, the state with the largest population has only 8 per cent. In spite of several concessions, seven north-eastern states could get less than 1 per cent of the proposed investment. In fact, economically weaker states could not compete with the developed states in open market in attracting industrial investment proposals and hence they are likely to suffer from these processes.

### Industrial Regions in India

Industries are not evenly distributed in the country. They tend to concentrate on certain locations because of the favourable locational factors.

## Industrial Regions and Districts

### Major Industrial Regions (8)

1. Mumabi-Pune Region, 2. Hugli Region, 3. Bengaluru-Tamil Nadu Region, 4. Gujarat Region, 5. Chotanagpur Region, 6. Vishakhapatnam-Guntur Region, 7. Gurugram-Delhi-Meerut Region, and 8. Kollam-Thiruvananthapuram Region.

### Minor Industrial Regions (13)

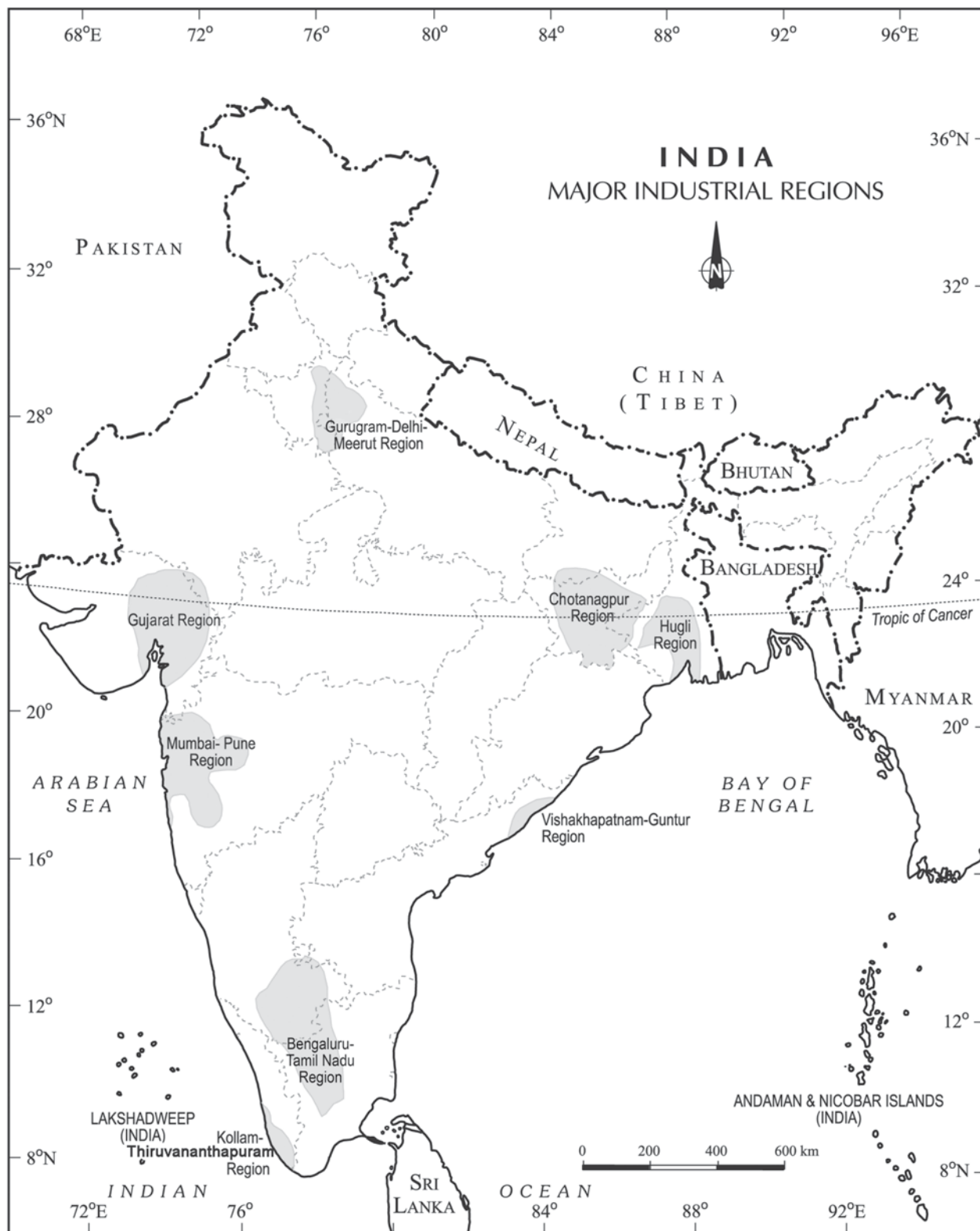
1. Ambala-Amritsar, 2. Saharanpur-Muzaffarnagar-Bijnor, 3. Indore-Dewas-Ujjain, 4. Jaipur-Ajmer, 5. Kolhapur-South Kannada, 6. Northern Malabar, 7. Middle Malabar, 8. Adilabad-Nizamabad, 9. Allahabad-Varanasi-Mirzapur, 10. Bhojpur-Munger, 11. Durg-Raipur, 12. Bilaspur-Korba, and 13. Brahmaputra Valley.

### Industrial Districts (15)

1. Kanpur, 2. Hyderabad, 3. Agra, 4. Nagpur, 5. Gwalior, 6. Bhopal, 7. Lucknow, 8. Jalpaiguri, 9. Cuttack, 10. Gorakhpur, 11. Aligarh, 12. Kota, 13. Purnia, 14. Jabalpur, and 15. Bareilly.







**Fig. 8.13 : India – Major Industrial Region**

Several indices are used to identify the clustering of industries, important among them are : (i) the number of industrial units, (ii) number of industrial workers, (iii) quantum of power used for industrial purposes, (iv) total industrial output, and (v) value added by manufacturing, etc.

Major industrial regions of the country are given below in some details (Fig. 8.13).

#### *Mumbai-Pune Industrial Region*

It extends from Mumbai-Thane to Pune and in adjoining districts of Nashik and Solapur. Besides, industrial development has been rapid in Kolaba, Ahmednagar, Satara, Sangli and Jalgaon districts. Development of this region started with the location of cotton textile industry in Mumbai. Mumbai, with cotton hinterland and moist climate favoured the location of cotton textile industry. Opening of the Suez Canal in 1869 provided impetus to the growth of Mumbai port. Machineries were imported through this port. Hydro-electricity was developed in the Western Ghat region to meet the requirements of this industry.

With the development of cotton textile industry, chemical industry also developed. Opening of the Mumbai High petroleum field and erection of nuclear energy plants added additional pull to this region.

Besides, engineering goods, petroleum refining, petrochemicals, leather, synthetic and plastic goods, drugs, fertilisers, electrical, shipbuilding, electronics, software, transport equipment and food industries also developed. Important industrial centres are Mumbai, Kolaba, Kalyan, Thane, Trombay, Pune, Pimpri, Nashik, Manmad, Solapur, Kolhapur, Ahmednagar, Satara and Sangli.

#### *Hugli Industrial Region*

Located along the Hugli river, this region extends from Bansberia in the north to Birlanagar in the south for a distance of about 100 km. Industries also have developed in Mednipur in the west. Kolkata-Haora from the nucleus of this industrial region. Historical, geographical, economic and political factors

have contributed much to its development. It developed with the opening of river port on Hugli. Kolkata emerged as a leading centre of the country. Later, Kolkata was connected with interior parts by railway lines and road routes. Development of tea plantations in Assam and northern hills of West Bengal, the processing of indigo earlier and jute later coupled with the opening of coalfields of the Damodar Valley and iron ore deposits of the Chotanagpur plateau, contributed to the industrial development of the region. Cheap labour available from thickly populated part of Bihar, eastern Uttar Pradesh and Odisha also contributed to its development. Kolkata, being the capital city of British India (1773-1911), attracted the British capital. The establishment of first jute mill at Rishra in 1855 ushered in the era of modern industrial clustering in this region.

The major concentration of jute industry is at Haora and Bhatapara. The partition of the country in 1947 adversely affected this industrial region. Cotton textile industry also grew along with jute industry, paper, engineering, textile machinery, electrical, chemical, pharmaceuticals, fertiliser and petrochemical industries have also developed within this region. Factory of the Hindustan Motors Limited at Konnagar and diesel engine factory at Chittaranjan are landmarks of this region. Location of petroleum refinery at Haldia has facilitated the development of a variety of industries. Important industrial centres of this region are Kolkata, Haora, Haldia, Serampur, Rishra, Shibpur, Naihati, Kakinara, Shamnagar, Titagarh, Sodepur, Budge Budge, Birlanagar, Bansberia, Belgurriah, Triveni, Hugli, Belur, etc. However, industrial growth of this region has slowed down in comparison to other regions. Decline of the jute industry is one of the reasons.

#### *Bengaluru-Chennai Industrial Region*

This region witnessed most rapid industrial growth in post-Independence period. Till 1960, industries were confined to Bengaluru, Salem and Madurai districts but now they have spread over all the districts of Tamil Nadu except Viluppuram. Since, this region is away from the



coalfields, its development is dependent on the Pykara hydroelectric plant, which was built in 1932. Cotton textile industry was the first to take roots due to the presence of cotton growing areas. Along with cotton mills, loom industry spread very rapidly. Several heavy engineering industries converged at Bengaluru. Aircraft (HAL), machine tools, telephone (HTL) and Bharat Electronics are industrial landmarks of this region. Important industries are textiles, rail wagons, diesel engines, radio, light engineering goods, rubber goods, medicines, aluminium, sugar, cement, glass, paper, chemicals, film, cigarette, match box, leather goods, etc. Petroleum refinery at Chennai, iron and steel plant at Salem and fertiliser plants are recent developments.

#### *Gujarat Industrial Region*

The nucleus of this region lies between Ahmedabad and Vadodara but this region extends upto Valsad and Surat in the south and to Jamnagar in the west. Development of this region is also associated with the location of the cotton textile industry since 1860s. This region became an important textile region with the decline of the cotton textile industry at Mumbai. Located in cotton growing area, this region has double advantage of the proximity of raw materials as well as of market. The discovery of oilfields led to the establishment of petrochemical industries around Ankleshwar, Vadodara and Jamnagar. The port at Kandla helped in the rapid growth of this region. Petroleum refinery at Koyali provided raw materials to a host of petrochemical industries. The industrial structure is now diversified. Besides, textiles (cotton, silk and synthetic fabrics) and petrochemical industries, other industries are heavy and basic chemicals, motor, tractor, diesel engines, textile machinery, engineering, pharmaceuticals, dyes, pesticides, sugar, dairy products and food processing. Recently, largest petroleum refinery has been set up at Jamnagar. Important industrial centres of this region are Ahmedabad, Vadodara, Bharuch, Koyali, Anand, Khera, Surendranagar, Rajkot, Surat, Valsad and Jamnagar.

#### *Chotanagpur Region*

This region extends over Jharkhand, northern Odisha and western West Bengal and is known for the heavy metallurgical industries. This region owes its development to the discovery of coal in the Damodar Valley and metallic and non-metallic minerals in Jharkhand and northern Odisha. Proximity of coal, iron ore and other minerals facilitated the location of heavy industries in this region. Six large integrated iron and steel plants at Jamshedpur, Burnpur-Kulti, Durgapur, Bokaro and Rourkela are located within this region. To meet the power requirement, thermal and hydroelectric plants have been constructed in the Damodar Valley. Densely populated surrounding regions provide cheap labour and Hugli region provides vast market for its industries. Heavy engineering, machine tools, fertilisers, cement, paper, locomotives and heavy electricals are some of the important industries in this region. Important centres are Ranchi, Dhanbad, Chaibasa, Sindri, Hazaribag, Jamshedpur, Bokaro, Rourkela, Durgapur, Asansol and Dalmianagar.

#### *Vishakhapatnam-Guntur Region*

This industrial region extends from Vishakhapatnam district to Kurnool and Prakasam districts in the south. Industrial development of this region hinges upon Vishakhapatnam and Machilipatnam ports and developed agriculture and rich reserves of minerals in their hinterlands. Coalfields of the Godavari basin provide energy. Ship building industry was started at Vishakhapatnam in 1941. Petroleum refinery based on imported petroleum facilitated the growth of several petrochemical industries. Sugar, textile, jute, paper, fertiliser, cement, aluminium and light engineering are principal industries of this region. One lead-zinc smelter is functioning in Guntur district. Iron and steel plant at Vishakhapatnam uses the Bailadila iron ore. Vishakhapatnam, Vijayawada, Vijaynagar, Rajahmundry, Guntur, Eluru and Kurnool are important industrial centres.



### *Gurugram-Delhi-Meerut Region*

Industries located in this region have shown very fast growth in the recent past. This region is located far away from the mineral and power resources, and therefore, the industries are light and market-oriented. Electronics, light engineering and electrical goods are major industries of this region. Besides, there are cotton, woollen and synthetic fabrics, hosiery, sugar, cement, machine tools, tractor, cycle, agricultural implements, chemical and vanaspati industries which have developed on large scale. Software industry is a recent addition. To the south lies the Agra-Mathura industrial area, which specialises in glass and leather goods. Mathura with an oil refinery is a petrochemical complex. Among industrial centres, mention be made of Gurugram, Delhi, Faridabad, Meerut, Modinagar, Ghaziabad, Ambala, Agra and Mathura.

### *Kollam-Thiruvananthapuram Region*

This industrial region is spread over Thiruvananthapuram, Kollam, Alwaye, Ernakulam and Alappuzha districts. Plantation, agriculture and hydropower provide industrial base to this region. Located far from the mineral belt of the country, agricultural products processing and market-oriented light industries predominate the region. Among them, cotton textile, sugar, rubber, matchbox, glass, chemical fertiliser and fish-based industries are important. Food processing, paper, coconut coir products, aluminium and cement industries are also significant. Location of petroleum refinery at Kochchi has added a vista of new industries to this region. Important industrial centres are Kollam, Thiruvananthapuram, Alluva, Kochchi, Alappuzha and Punalur.



## **EXERCISES**

1. Choose the right answers of the following from the given options.
  - (i) Which is not a factor of industrial location?
    - (a) Market
    - (b) Capital
    - (c) Population Density
    - (d) Power
  - (ii) The earliest Iron and Steel Company to be established in India was:
    - (a) IISCO
    - (b) TISCO
    - (c) Visvesvaraiya Iron and Steel Works
    - (d) Mysore Iron and Steel Works.
  - (iii) The first modern cotton mill was established in Mumbai because:
    - (a) Mumbai is a port
    - (b) It is located near cotton growing area
    - (c) Mumbai was the financial centre
    - (d) All of the above.
  - (iv) The nucleus of the Hugli Industrial Region is:
    - (a) Kolkata-Haora
    - (b) Kolkata-Rishra
    - (c) Kolkata-Medinipur
    - (d) Kolkata-Konnagar





(v) Which one of the following is the second largest producer of sugar:

- |                   |                |
|-------------------|----------------|
| (a) Maharashtra   | (c) Punjab     |
| (b) Uttar Pradesh | (d) Tamil Nadu |

**2.** Answer the following questions in about 30 words.

- (i) Why do you think that the iron and steel industry is basic to the industrial development of any country?
- (ii) Name the two sectors of the cottage textile industries. How are they different?
- (iii) Why is the sugar industry a seasonal industry?
- (iv) What is the raw material base for the petrochemical industry? Name some of the products of this industry.
- (v) What is the major impact of Information Technology (IT) revolution in India?

**3.** Answer the following questions in about 150 words.

- (i) How did the *Swadeshi* movement give a major impetus to the cotton textiles industry?
- (ii) What do you understand by liberalisation, privatisation and globalisation? How have they helped industrial development in India?



## **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

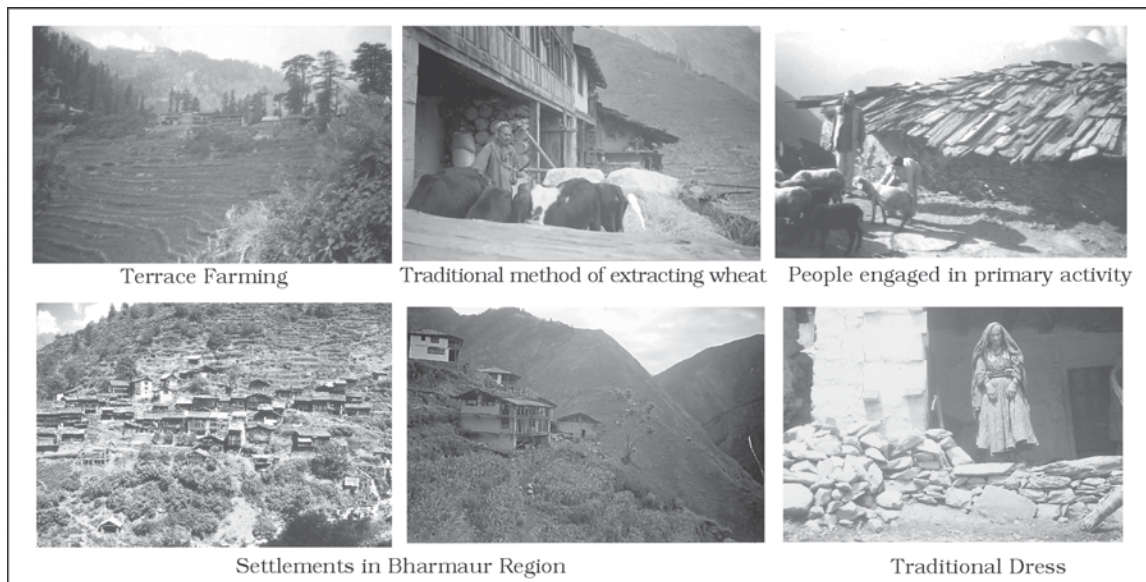
Bharmaur tribal area comprises Bharmaur and Holi tehsils of Chamba district of Himachal Pradesh. It is a notified tribal area since 21 November 1975. Bharmaur is inhabited by 'Gaddi', a tribal community who have maintained a distinct identity in the Himalayan region as they practised transhumance and 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 *Dhaulta Dhar* in the south. In the east, the extension of *Dhaulta Dhar* 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.

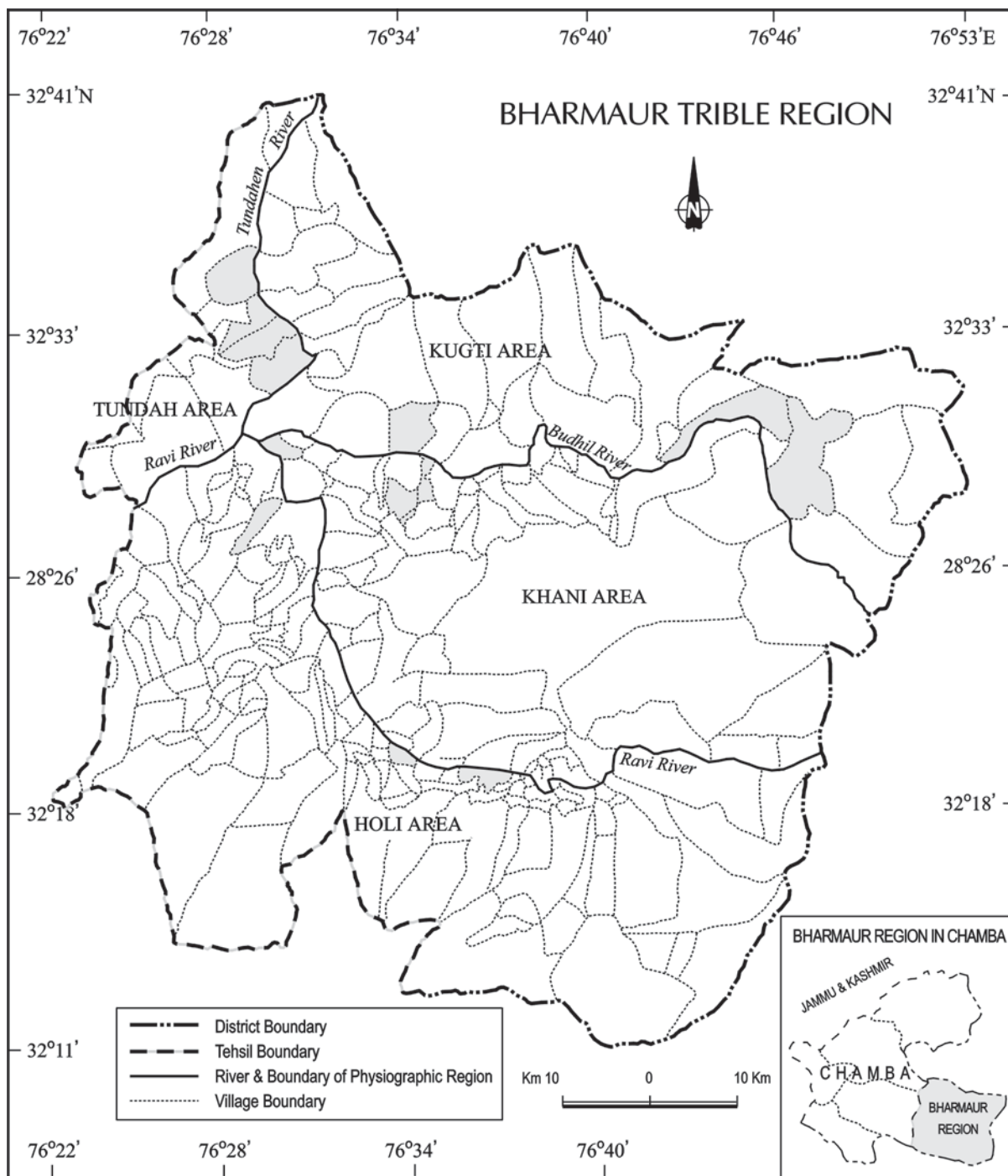
the Fifth Five Year Plan, the tribal sub-plan was introduced in 1974 and Bharmaur was designated as one of the five Integrated Tribal Development Projects (ITDP) in Himachal Pradesh. This area development plan was aimed at improving the quality of life of the *Gaddis*



**Fig. 9.1**

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





**Fig. 9.2**

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

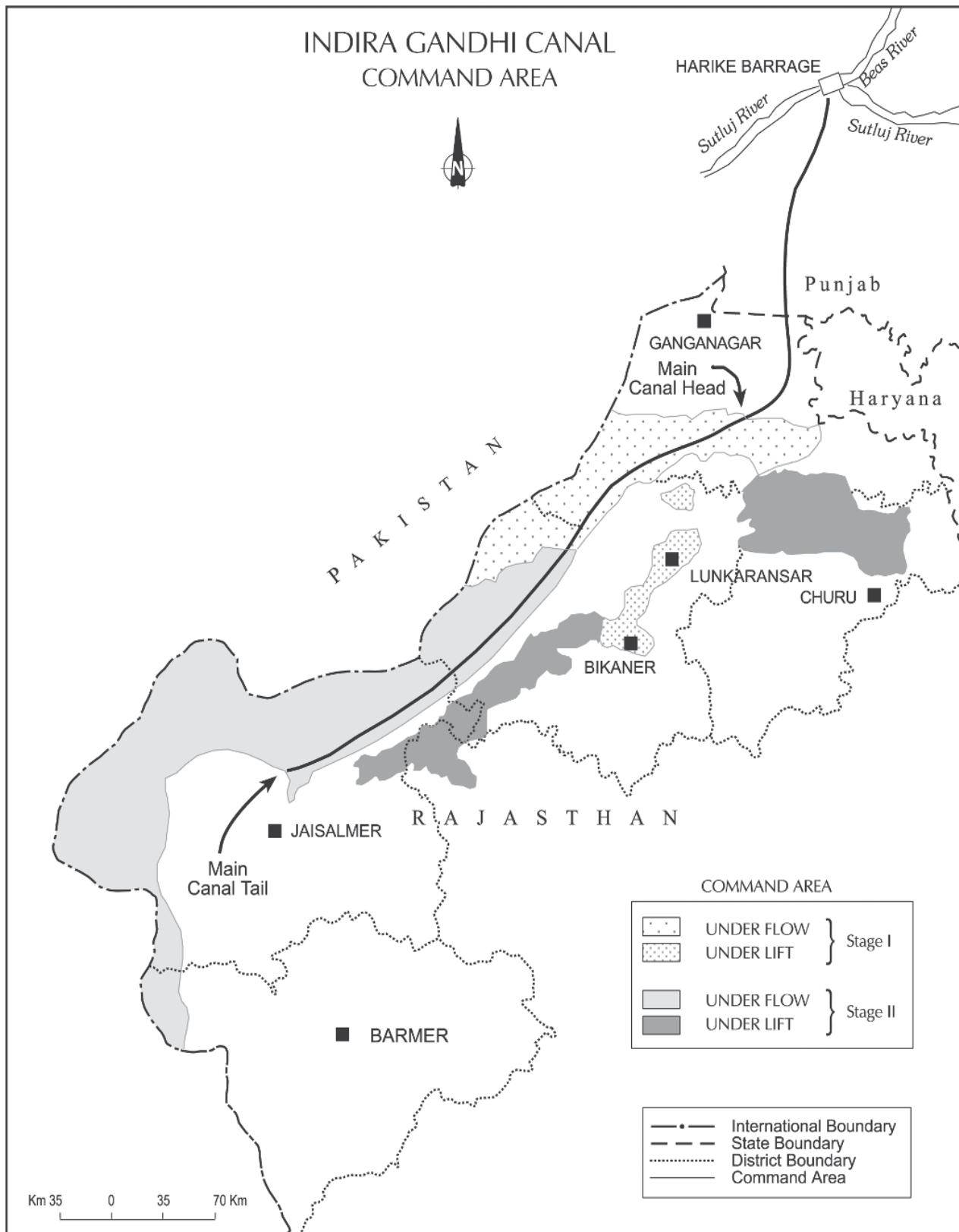
century. In the post World War II era, the concept of development was synonymous to economic growth which is measured in terms of temporal increase in gross national product (GNP) and per capita income/per capita consumption. But, even the countries having high economic growth, experienced speedy rise 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. 9.3**



**Fig. 9.4: 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 (Marusthali) 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. 9.5 : 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.



# TRANSPORT AND COMMUNICATION

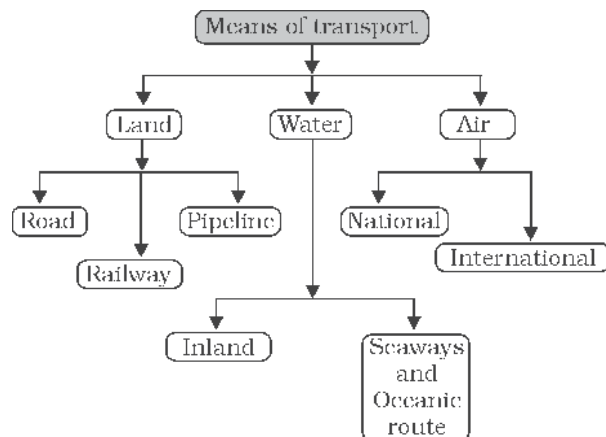


We use many items in our daily life. From toothpaste to our bed tea, milk, clothes, soaps, food items, etc., are required every day. All these can be purchased from the market. Have you ever thought as to how these items are brought from the site of production? All the production is meant for consumption. 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 54.8 lakh km (Economic Survey 2016-17). About 85 per cent

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.

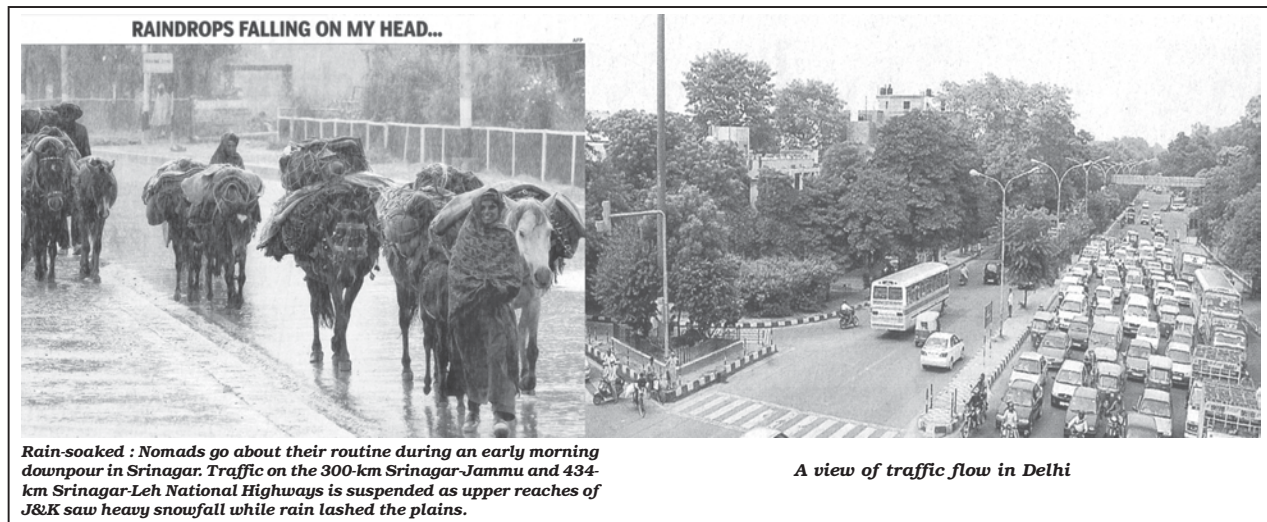


Fig. 10.1

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. It is bifurcated into 2 segments : (a) National Highway (NH)-1 from Delhi to Amritsar, and (b) NH- 2 from Delhi to Kolkata.

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 the princely states and British India. After

### 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 100,475 km in 2015-16. The National Highways constitute only about 2 per cent of the total road length but carry 40 per cent of the road traffic. (Table 10.1)

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 10.1 : Indian Road Network 2015-16**

Serial No.	Road Category	Length in Km
1.	National Highways /Expressways	100475
2.	State Highways	154522
3.	Major District Roads	2577396
4.	Rural Roads	1433577
	<b>Total</b>	<b>4265970</b>

**Source:** Ministry of Road Transport and Highways Annual Report 2015-16. For latest data see website [www.nhai.org](http://www.nhai.org)

### 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 Kanniyakumari 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

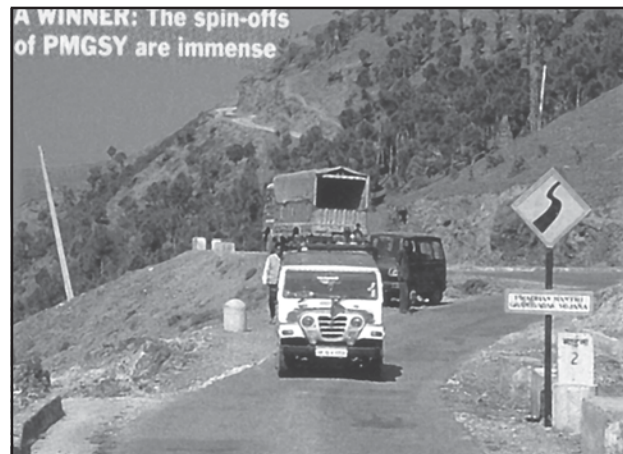
These are constructed and maintained by state governments. They join the state capitals with district headquarters and other important towns. These roads are connected to the National Highways. These constitute 4 per cent of total road length in the country.

### 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.



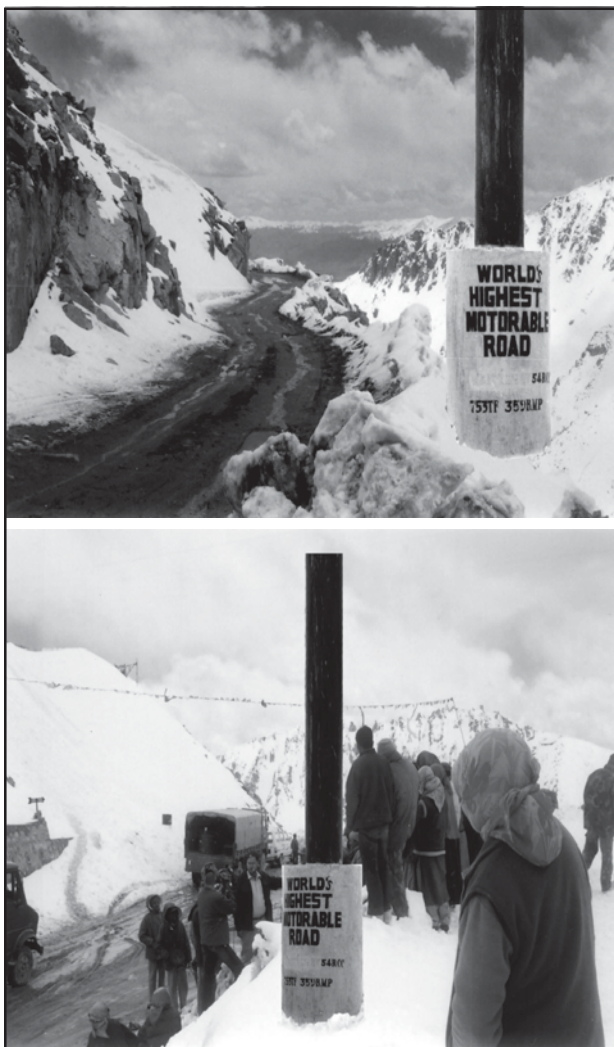
**Fig. 10.2 : Road constructed under the Pradhan Mantri Gram Sadak Yojna**

**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





**Fig. 10.4 : Khardung La Pass in Jammu & Kashmir**

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. 10.5 and 10.6)

The distribution of roads is not uniform in the country. Density of roads (length of roads per 100 square km of area) varies from only 12.14 km in Jammu and Kashmir to 517.77 km in Kerala with a national average of 142.68 km in 2011. The density of road is high in most of the northern states and major southern states. It is low in the Himalayan region, north-eastern region, Madhya Pradesh and Rajasthan. Why does this variation occur? Nature of terrain and the level of economic development are the main determinants of density of roads. Construction of roads is easy and cheaper in the plain areas while it is difficult and costly in hilly and plateau areas. Therefore, not only the density but also the quality of roads is relatively better in plains as compared to roads in high altitude areas, rainy and forested regions.

#### Delhi-Lahore Bus



**Fig. 10.5 : A Bus from Lahore to Delhi at Wagah Border**



**Fig. 10.6 : Aman Setu between Srinagar and Muzaffarabad**



## Activity

List the names of 10 important towns along NH-1 and NH-2.

Which one is the longest National Highway in India?

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 66,030 km as on 31 March 2015. 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 10.3 shows the zone-wise performance of the Indian Railways.

**Table 10.2 : Trends of Freight (in million tonnes) and Passengers (in millions) Handled by the Indian Railways**

Commodities	1970-71	2014-15 Provisional
Coal	47.9	545.8
Raw Material for Steel Plants	16.1	18.3
Pig Iron and Finished Steel	6.2	42.8
Iron ore	9.8	112.8
Cement	11	109.8
Foodgrains	15.1	55.5
Fertilisers	4.7	47.4
Petroleum	8.9	41.1
Other Goods	48.2	121.8
<b>Total Traffic</b>	<b>167.9</b>	<b>1095.2</b>
<b>Passengers Originating</b>	<b>2431</b>	<b>8224</b>

*Indian Railways Annual Report and Accounts 2014-15*

**Table 10.3 : 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 60510 km in March 2016.

**Metre gauge:** The distance between rails is one metre. Its total length was 3880 km in March 2016.

**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 2297 km in March 2016. 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 Kolkata and Delhi. 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.

### 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



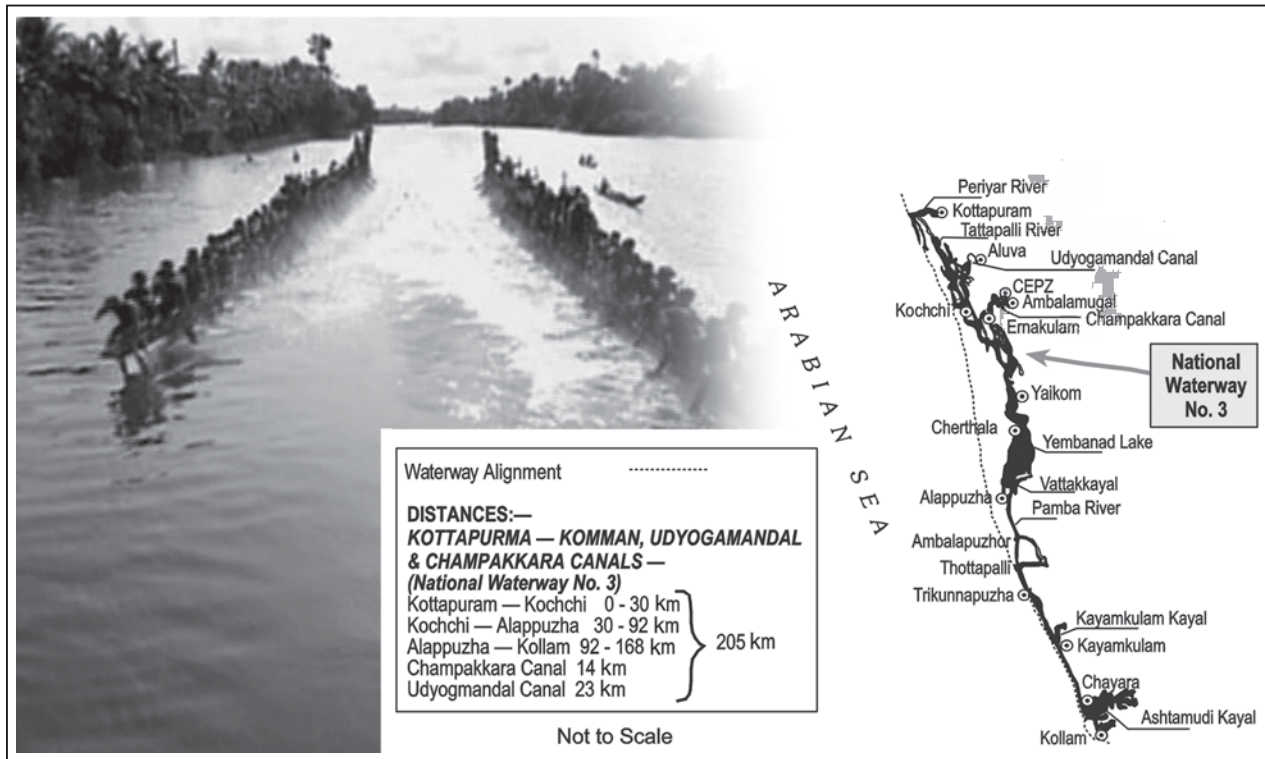
Fig. 10.7 : River navigation in the North-east





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 10.4).



**Fig. 10.8 : Natinal Waterway No.3**

**Table 10.4 ; 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 Champakara canal (14 km) and Udyogmandal canal (23 km).
NW 4	Specified streches 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.

The air transport in India is managed by Air India. Now, many private companies have also started passenger services. Air India provides International Air Services for both passengers and cargo traffic. It connects all the continents of the world through its services. Some private companies have also started operations to foreign countries.

### **History of Indian Airlines**

1911 – Air transport in India was launched between Allahabad and Naini.

1947 – Air transport was provided by four major companies namely Indian National Airways, Tata Sons Limited, Air Services of India and Deccan Airways.

1951 – Four more companies joined the services, Bharat Airways, Himalayan Aviation Limited, Airways India and Kalinga Airlines.

1953 – Air transport was nationalised and two Corporations, Air India International and Indian Airlines were formed. Now Indian Airlines is known as 'Indian'.



The country's largest state-owned domestic carrier, Indian Airlines dropped the word 'Airlines' from its name and is known as 'Indian' w.e.f. December 8, 2005. The new brand name 'Indian' now appears on both sides of the fuselage. The logo on the orange tail depicting 'IA' has also been changed. It has been replaced by a new logo which is a partly visible blue wheel and is inspired by the Sun Temple at Konark (Odisha), symbolising timeless motion, convergence and divergence. It also embodies strength as well as trust that has stood the test of time.

In 2010, domestic movement involved 520.21 lakh passengers and about 23 lakh metric tonnes of cargo.

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.

### Open Sky Policy

To help the Indian exporters and make their export more competitive, the government had introduced an Open Sky Policy for cargo in April 1992. Under this policy, foreign airlines or association of exporters can bring any freighters to the country.

## Oil and Gas Pipelines

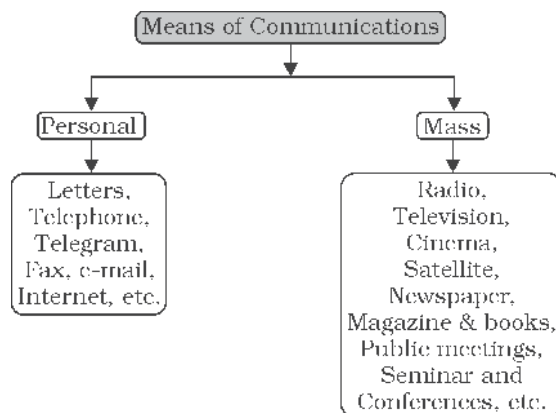
Pipelines are the most convenient and efficient mode of transporting liquids and gases over long distances. Even solids can also be transported by pipelines after converting them into slurry. Oil India Limited (OIL) under the administrative set up of the Ministry of Petroleum and Natural Gas is engaged 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. Another extensive network of pipelines has been constructed in the western region of India of which Ankleshwar-Koyali, Mumbai High-Koyali and Hazira-Vijaipur-Jagdishpur (HVJ) are most important. Recently, a 1256 km long pipeline connecting Salaya (Gujarat) with Mathura (U.P.) has been constructed. It supplies crude oil from Gujarat to Punjab (Jalandhar) via Mathura. OIL is in the process of constructing of 660 km long pipeline from Numaligarh to Siliguri.

## 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. You might have noticed the proliferation of cyber cafes in urban areas.

## 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-DD 1) 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

1. Choose the right answers of the following from the given options.
  - (i) In how many zones has the Indian Railways system been divided?
    - (a) 9
    - (b) 12
    - (c) 16
    - (d) 14
  - (ii) Which one of the following is the longest highway of India?
    - (a) N.H.-1
    - (b) N.H.-6
    - (c) N.H.-7
    - (d) N.H.-8
  - (iii) On which river and between which two places does the National Water Way No. 1 lie?
    - (a) The Brahmaputra, Sadiya-Dhubri
    - (b) The Ganga, Haldia-Allahabad
    - (c) West Coast Canal, Kottapuram to Kollam
  - (iv) In which of the following year, the first radio programme was broadcast?
    - (a) 1911
    - (b) 1936
    - (c) 1927
    - (d) 1923
2. Answer the following questions in about 30 words.
  - (i) Which activity does transportation convey? Name three major modes of transportation.
  - (ii) Discuss advantages and disadvantages of pipeline transportation.
  - (iii) What do you mean by 'communication'?
  - (iv) Discuss the contribution of Air India and Indian in the air transport of India.
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.



## INTERNATIONAL TRADE



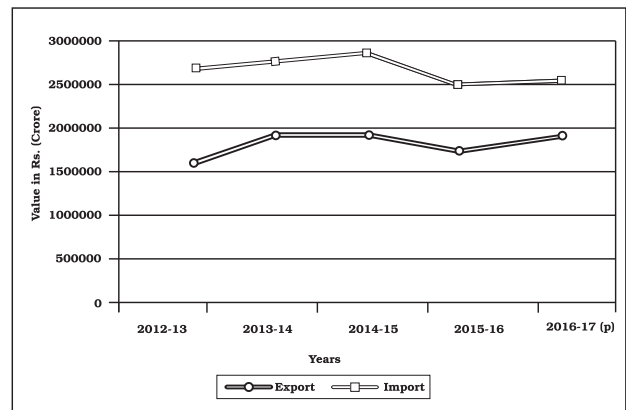
You have already studied about the various aspects of International trade in the book *Fundamentals of Human Geography*. International Trade is mutually beneficial as no country is self-sufficient. India's international trade has undergone a sea change in recent years in terms of volume, composition 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 11.1). 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. 11.1**

**Table 11.1 India's Foreign Trade***Value in Rs. Crores*

Year	Exports	Imports	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 11.2 : 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

As has already been mentioned, 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 11.3 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 11.3 : 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 11.4 and try to comprehend the shifts.

Table 11.4 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 11.5.

Based on table 11.5, 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 11.4 : 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 11.5 : 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 11.6.

**Table 11.6 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. 11.3 : 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 Kutch 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. 11.4 : 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 ports 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. 11.5 : India – Air Routes**

## **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.12.1 : 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 12.1 : Types and Sources of Pollution**

Pollution Types	Pollution Involved	Sources of Pollution
Air Pollution	Oxides of sulphur (SO <sub>2</sub> , SO <sub>3</sub> ), 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 nitrites, 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 12.2 : Sources of Pollution in the Ganga and the Yamuna Rivers**

River and State	Polluted Stretches	Nature of Pollution	Main Polluters
<b>Ganga</b> (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
<b>Yamuna</b> (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,

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

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

### 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 to 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.



## 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
- Mailuu-Suu, Kyrgyzstan
- Norilsk, Russia
- Ranipet, Tamil Nadu, India, (where leather tanning wastes contaminate groundwater with



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

● Rudnaya Pristan, Russia

It caused cancer and a host of other ailments. The risk of being poisoned, deformed and dying is high.

The sites were not ranked by the number of people living near them.

## Air pollution biggest killer in Southeast Asia, says WHO

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

A smoky haze that 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

year, said Michal Krzyzanowski, an air quality specialist at the WHO's European Center 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 800,000 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.





Smoky fog over cities called as urban *smog* is caused by atmospheric pollution. It proves very harmful to human health. Air pollution can also cause acid rains. Rainwater analysis of urban environment has indicated that pH value of the first rain after summer is always lower than the subsequent rains.

### Noise Pollution

Noise pollution refers to the state of unbearable and uncomfortable to human beings which is caused by noise from different sources. This matter has become a serious concern only in recent years due to a variety of technological innovations.

The main sources of noise pollution are various factories, mechanised construction and demolition works, automobiles and aircraft, etc. There may be added periodical but polluting noise from sirens, loudspeakers used in various festivals, programmes



**Fig. 12.2 : 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

## 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.

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 splattered 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. 12.3 : 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,

**'Slum-dwellers are the backbone of labour force'**

**झुग्गीयों व फैक्टरी में आग, दो हताहत**

**...और अब धधक उठा पेट**

**झुग्गीवालों को सावदा घेवरा में फ्लैट**

**Can a slum become a world class township?**

**Have you visited a slum? Visit a slum in your city, and write about the problems faced by slum dwellers.**

The collage features several newspaper clippings. The top clipping is in English, titled "Slum-dwellers are the backbone of labour force". Below it, there are two Hindi headlines: "झुग्गीयों व फैक्टरी में आग, दो हताहत" (Fire in slum and factory, two dead) and "...और अब धधक उठा पेट" (...and now the stomach is rumbling). There are also photos of people in slums, a child, and a map of India. The bottom clipping is in English, titled "Can a slum become a world class township?".



### 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)

### 'One toilet for 1,440 people at Dharavi'

Kounteya Sinha | TNN

#### Diarrhoea: The second biggest killer of children

No. of Deaths (2004) in millions

11

10

9

8

7

6

5

4

3

2

1

0

Acute Respiratory Infection

Diarrhoea

Malaria

Measles

HIV/AIDS

Other diseases and injuries

Infections 36%

Preterm 27%

Asphyxia 23%

Other 14%



of the esti-  
18 million  
who die of  
worldwide  
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A. P. - 11/11/11

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

## Activity

Using information provided in Table 12.3, make a pie-chart showing cultivable wastelands caused by different processes.

**Table 12.3 : Classification of Wasteland by Processes in India**

Categories	% of Geographical Area
<b>Total Wasteland</b>	<b>17.98</b>
Barren & Uncultivable Wasteland	2.18
Natural Degraded CWL	2.4
Natural and Man-Made Degraded CWL	7.51
Man-Made Degraded CWL	5.88
Total Degraded CWL	15.8

Source: Calculated from NRSA Wasteland Atlas, 2000

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.

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. 12.4 : Trees planted on Common Property Resources in Jhabua**

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



**Fig. 12.5 : 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
    - (b) Satluj
    - (c) Yamuna
    - (d) Godavari
  - (ii) Which one of the following diseases is caused by water pollution?
    - (a) Conjunctivitis
    - (b) Diarrhoea
    - (c) Respiratory infections
    - (d) Bronchitis
  - (iii) Which one of the following is the cause of acid rain?
    - (a) Water pollution
    - (b) Land pollution
    - (c) Noise pollution
    - (d) Air pollution
  - (iv) Push and pull factors are responsible for—
    - (a) Migration
    - (b) Land degradation
    - (c) Slums
    - (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.

