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# UNIT 8 NATURAL RESOURCES

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## 8.0 OBJECTIVES

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After going through this unit you should be able to:

- Identify the physical dimensions of our country, such as land area, its utilisation, available soils, water, minerals, etc;
- Discuss how these factors influence the production of resources;
- Enumerate the steps taken and need to be taken to increase the productivity of these resources;
- Identify the economic role of minerals and forests in the Indian economy; and
- Explain the different sources of energy in the Indian economy and their relative importance.

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## 8.1 INTRODUCTION

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As in most other developing countries, a large proportion of population of India is dependent upon agriculture and other primary activities which consist in direct exploitation of natural resources. The natural resources of India, as the following survey indicates, are varied and provide an adequate basis for building a diversified modern economy.

## 8.2 KNOWLEDGE OF NATURAL RESOURCES

Information on stock of natural resources is much better in case of India than in most developing countries. Basic resource survey agencies have been in existence for a century or more and systematic surveys and investigations of resources have been undertaken by them.

Work on mapping and surveys of natural resources has expanded greatly under the Five Year Plans. The older agencies, such as the Survey of India and the Geological Survey, have been expanded in order to enable them to undertake larger programmes of work. New agencies have been created to undertake specialised tasks or surveys in field which had not been covered earlier. The **Indian Bureau of Mines** was established in 1950 to undertake an economic assessment of natural resources and to formulate programmes of development. The **Oil and Natural Gas Commission (ONGC)** was established in the late 1950's to undertake exploration and development of petroleum resources. It has been responsible for major discoveries of oil and natural gas in Assam, Gujarat and Bombay High. The **Central Water and Power Commission** (now bifurcated into two), established in 1945 has the responsibility for the coordination of hydrological investigations and assessment of natural resources. A **Soil Land Use Survey** has been established under the Indian council of Agricultural Research. Systematic soil surveys are being undertaken by it in cooperation with the Departments of Agriculture in various states. The national laboratories and institutes of scientific research also undertake studies relating to evaluation and utilisation of natural resources.

But experience under the plans has demonstrated the need for further expansion or acceleration of work in some directions, a greater use of modern survey and mapping techniques and a more adequate economic assessment of natural resources. Investigations of soil fertility and for ground water will need to be expanded and improved further in order to provide data for an intensive use of chemical fertilisers and efficient water management, which are essential for the successful use of the new high-yielding varieties or other programmes of intensive cultivation.

Modern survey techniques, such as aerial photography, aero-magnetic survey and remote sensing, which have advanced very rapidly in recent years but which are not used adequately by the Indian survey agencies will need to be used much more. The use of these techniques reduces the time requirements of surveys and preparation of maps; makes possible surveys of inaccessible areas and aids location of estimation or reserves of minerals and other natural resources.

### 8.2.1 Classification of Natural Resources

Natural resources can be classified in two groups, viz. (i) reproducible resources, and (ii) non-reproducible resources.

- 1) **Reproducible resources** consist of those objects that are available to us from nature and whose quantity keeps on getting replenished. For example, the availability of both ground and surface water gets replenished by rainfall. Similarly, new trees keep on growing. Replenishment may be a natural process, although it may be helped by a little action on the part of the user. For example, if suitable provisions are made for proper channeling and storage of water, wasteful run-away of water can be prevented.

- 2) **Non-reproducible resources** are available to us in the form of fixed stocks. As we consume more of these resources, our stocks get depleted. Therefore, a suitable policy about the use of these resources is to be formulated. Such a policy should be based on the considerations of a balance between the present consumption and future requirements of these resources. Similarly, there may exist unidentified stock of these resources. Sustained efforts would be required to discover such resources and make them utilisable.

## 8.3 LAND AND SOILS

India measures 3,214 km. from north to south and 2,933 km. from east to west with a total land area of 32,87,782 sq. k.m. It is the seventh largest landowner in the world after Russia, Canada, China, the USA, Brazil and Australia in that order. In brief, India is a vast country and has a considerable strategic significance on account of its location, size and economic resources. Standing at the heart of the Indian Ocean, the country is in a much better position than any other in the area to control the Indian Ocean routes, most of which touch the Indian ports. Most of the air routes between Europe, West Asia and Africa and East Asia, South-East Asia and Japan also pass through India. It gives India an advantage in terms of international mobility of persons and commodities.

### 8.3.1 Land Utilisation in India

The total available land area in a country sets definite limits within which the land-base can be stretched horizontally during the process of economic development. As this process advances, the demand for land increases; new uses for land are found, land gets diverted from its existing use to the newfound uses. More generally, the shift is from the agricultural use to the non-agricultural uses, viz., industrial construction and trading purposes. In the case of a developing, labour-surplus, agriculture crop-based economy, this intrusion on agriculture land assumes serious postures. Any diversion of land from agricultural use to non-agricultural uses may disrupt agricultural supplies and this adversely affects the whole process of growth. Therefore, in the face of increasing requirements of land, what is generally stressed is that the inaccessible, waste and fallow lands and the lands, which have hitherto been lying unutilised, should be commissioned and made serviceable for agricultural and non-agricultural uses. It is in this context that statistics relating to the land utilisation pattern become significant. These are given in Table-1 below.

Table 1: Land Utilisation in India

(Million Hectare)

1. Area under non-agricultural uses	21.2
2. Barren and uncultivable land	19.7
3. New Sown Area	142.2
4. Forest Lands under good tree cover	38.6
5. Miscellaneous tree crops and groves	3.7
6. Forest lands under poor tree cover	29.3
7. Cultivable waste lands	15.0
8. Current Fallows	13.8
9. Old Fallows	9.6
10. Permanent pastures and grazing ground	11.8
* Total	304.9

\* Total geographical area for which land utilisation statistics are available.

These help to determine the contours of future economic development as far as the availability of land resources is concerned. The available land, on the basis of its use, can be classified into two parts, viz., (i) Agricultural land, and (ii) Non-agricultural land.

- 1) **Agricultural land:** It includes net sown area, current fallows and land under miscellaneous tree crops and groves. Agricultural land in India totals a little over 50 percent of the total geographical area in the country. This is the highest among the large or medium-sized countries of the world, indicating: (i) the influence of favourable physical factors such as large area, the extent of plains and plateaus and a very small extent of arid areas, and (ii) the extension of cultivation to a large proportion of the cultivable land. But, because of the large population the **per capita availability is not high; the figure of 0.20 hectares is lower than the average for the world** and is only one-fourth of the U.S. figure. About 15 per cent of the sown area is multi-cropped (sown more than once in a year), while one-fourth of the gross cropped area is irrigated. Most of the multi-cropped area is irrigated and the security provided by irrigation facilities is a major factor in intensive application of labour and inputs to obtain high yields.
- 2) **Non-agricultural Land:** This includes land under forest, permanent pastures, other non-agricultural uses (towns, villages, roads, railways, etc.) and land classified as cultivable waste as well as barren and uncultivated land of mountain and desert areas.

### 8.3.2 Trends in Land Utilisation

Two important changes in the land utilisation witnessed during the last five decades are : (a) **reclamation of waste and fallow lands**, and (b) **a significant increase in the 'area sown more than once'**. Reclamation of waste and fallow lands was relatively rapid during the 1950s, following land reforms, such as the abolition of **Zamindari and Jagirdari system**. The dispossessed Zamindars reclaimed land, which had been left to them for 'personal cultivation' while their former tenants reclaimed waste, and fallow lands to which they had acquired rights. The process was aided by loans and subsidies from the Government.

The **'area sown more than once'** has also shown a significant rise during the last five decades. In view of the fact that (a) demand for land in non-agricultural uses is constantly increasing, and (b) a further increase in the net sown area may not be an easy task, it is imperative that attention is paid towards an improvement in agricultural technology, so that it should be possible to raise three to four crops a year as some countries are doing. With the new agricultural strategy having very much come to stay, the objective should be within an easy reach.

Futurologists have put the estimated requirements of land in the country in the year 2000 A.D. at approximately 46.2 crore hectares on the higher side, and about 42.7 crore hectares on the lower side. It is clear that the total supply of land is a fixed factor. Therefore, what is required is that an effective rationing of land among the varied uses be made. As far as possible, no further encroachments on cultivable land should be allowed. Priority should be given to non-cultivable land for non-agricultural uses. This will not only save cultivable land for agriculture, but will also promote a balanced regional development.

### 8.3.3 Soils

The cropping pattern of the country is greatly influenced by the soils and the elements of the physical environment. **The Indian Council of Agricultural Research (ICAR)** divides the soils found in the country into eight major groups which are; (i) alluvial soils including the coastal and deltaic alluvium; (ii) black soils of varying types; (iii) red soils including red loams; (iv) laterite and laterising soils; (v) forest soils; (vi) arid and desert soils; (vii) saline and alkaline soils; and (viii) peaty and organic soils. Keeping in view their extent and agricultural importance, the first four, viz., alluvial, black, red and laterite soils in that order, form the most important soil groups in the country. Almost the entire cultivated area in the country is covered by these soils. Alluvial soils are suitable for the cultivation of almost all kinds of cereals, pulses, oilseeds, cotton, sugarcane and vegetables. Black soils are known for their fertility. They give good yields despite continued cultivation and without proper manuring. Cotton, cereals, oilseeds and many kinds of vegetables and citrus fruits are some of the crops suited to black soils. Similarly, almost all kinds of crops can be grown on red soil, although it seems to be more suitable for the cultivation of rice, ragi, tobacco and vegetables. Laterite soils are suitable, among others, for rice and sugarcane.

Different types of soils distributed evenly throughout the country, abounding in fertility and higher yields, and highly responsive to improved inputs are found in the country. For example, we find the desert-like region of Rajasthan on the one hand and the rich cultivable land of Gujarat on the other. The variety of soils coupled with the fact that we have in the east the world's highest rainfall zone and in the west one of the driest regions along with every shade of climate throughout the country makes possible the production of almost every kind of crop starting from those of the temperate zone to tropical production.

### 8.3.4 Problem of Soil Erosion

Through constant use, the quality of the available soils in India has deteriorated slightly. Moreover, large tracts of land have been eroded. It has been estimated that about 80 million hectares is suffering from varying degrees of soil degradation. Localised soil water logging and salinity are most severe in India (27 per cent of irrigated land), Pakistan (20 per cent ) and China (15 per cent).

Although our plans have given priority to soil conservation and land stock improvement, we can identify the following difficulties in containing the degradation of land resources and bringing them back to productive uses: (a) management of community land; (b) lack of infrastructural development; (c) high investment and long gestation; and (d) non-availability of institutional finance due to low credit worthiness of the beneficiaries having marginal and sub-marginal lands.

#### Check Your Progress 1

1) What is the use of statistics relating to land utilisation ?

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2) What do you mean by "area sown more than once" ?

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- 3) Mention different types of soils available in India.

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- 4) Discuss the importance of the availability of different types of soils in India.

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## 8.4 WATER RESOURCES

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Water is the most important source of energy in the Indian economy. About 25 per cent of electricity generated in the economy is from the hydel sources. The other important use of water is in irrigation. In a country where agriculture gives twists and turn to the whole economy, provision of water can make all the difference; it can either stimulate the economic activity or depress it altogether.

The important sources of water can be classified into two parts: (i) **surface water**, and (ii) **ground water**. Surface water is available from such sources as rivers, lakes etc. Ground water is available from wells, springs, etc. Other sources of water, which have not yet been tapped in the country, but nevertheless represent potential sources are: saline lakes, saline springs, snow and ice fields. Surface water sources are replenished by rainfall.

Of the two sources, surface water is more important and possess potential of growth in future. Surface water is available in the form of vast network of rivers available in the country.

### 8.4.1 Rivers

The rivers in India may be classified as (i) The Himalayan rivers, (ii) Deccan rivers, (iii) Coastal streams, and (iv) Rivers of the inland drainage system. The **Himalayan rivers** are generally snowed and have, therefore, a continuous flow throughout the year. During the monsoon months, the Himalayas receive a very heavy rainfall and the rivers discharge the maximum amount of water causing frequent floods. The **Deccan rivers** are generally rain-fed and, therefore, fluctuate in volume. The **coastal streams** specially of the West coast are short in length and have limited catchment areas. Most of them are non-perennial. The streams of the inland drainage basin of Western Rajasthan are few and far between. Most of them are of seasonal character.

The **Ganga basin** is the largest river in India, receiving water from an area, which comprises about one-quarter of the total area of the country. The second largest river basin is that of the Godavari. It covers an area, which comprises about 10 per cent of the total area of India. Two other, although small, yet, important from the agricultural point of view, are those of **Tawi** in the North and the **Panner** in the south.

### 8.4.2 Problem of Inadequate Availability

It would be seen that India possesses large reservoirs of water, but these are inadequate as compared to their requirements. For instance, taking a long-term projection, the total cropped area is expected to go up from 165 million hectares in 1970-71 to 210 million hectares in 2025 A.D. The total irrigation potential, on the other hand, is expected to go up to only 113 million hectares in 2025 A.D. i.e., only 52 per cent of the cultivable area will get the supply of water. In view of complete inadequacy of resources to meet the agricultural and other requirements, it becomes a matter of great national importance that the available resources are conserved and utilised most judiciously and economically.

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## 8.5 FOREST RESOURCES

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Forests produce the requisite raw materials for industries, defence, communications, domestic use and other public purposes. They contribute to the country's exports and create a large volume of employment in the primary, secondary and tertiary sectors. They also provide materials like fuel wood, small timber, fodder etc., for direct use by the agriculturists. The benefits from forests in the matter of soil conservation, recreation, wildlife, etc., have been well recognised. Forests have multifarious uses, some of which can be identified as follows:

- i) Trees and forests have many uses, and are, therefore, considered as one of the important natural resources of a country. Plants through photosynthesis convert the solar energy into various forms of energy like food, fuel, oil products, raw materials for industries, and other indirect sources of renewable energy, which can be directly used by us.
- ii) The thick foliage-mix prevents soil erosion, and holds moisture content in both the soil and the atmosphere. This prevents an area turning into desert. As 1980 FAO (Food Agricultural Organisation) report on Forest Resources of Tropical Area clearly states, **forests harbour wildlife, stabilise soil, water and climatic regiments.**
- iii) Forests meet the basic needs of the poor people of the country in many ways. A large section of the country's population depends on forests for firewood, which is basic for human survival. Failure to meet the basic needs of rural people may compel them to depend on the firewood in the near future also. But, the scarcity of firewood is being felt already in various parts of the country especially in Indo-Gangetic plain and Himalayan-Assam region. It is estimated that at current rates of increase in firewood consumption and depletion of forestland, the country may require 182 million cubic metres of firewood by 2000 A.D. Obviously, this may put millions of women - who go out to collect the firewood everyday to forests - into serious difficulties.
- iv) Forests offer good employment opportunities too, mainly to the rural population. It is believed that forests have much more capacity to give gainful employment, provided we spare enough funds and efforts for their development. **The National Commission on Agriculture (NCA)** in 1976 estimated that if the programmes recommended by it were implemented by the government, our forests would provide direct employment of 15 million man-days or 2.5 lakh man-years in addition to the present one. In addition, indirect employment would be created. What is still more important, the new employment would be created where it is exactly wanted, in rural areas, backward regions and hilly tracts. The importance of this social gain cannot be over-emphasised.

- v) It is easy to justify huge investment in development of forests on purely economic grounds. Returns on such investments have been found to be quite substantial in comparison to the returns on similar types of investments in agriculture, etc.
- vi) Among other things, forests supply pure oxygen, prevent environmental and sound pollutions, maintain ecological balance by providing shelter both to wildlife and birds, and finally add to the aesthetic beauty of the country.
- vii) Calling tropical forests the “**great chemical factory of the natural world**”, the Washington based **World-Watch Institute**, in a recent report, noted that 40 per cent of the prescription drugs have active ingredients derived from wild plants, animals, or microorganisms, many of them from forests.

Above all, to the “silent majority” among whom number the conservation minded, the forest is a treasure house of knowledge as well as a place that provides the peace and quite which is so absent in the artificial world of man’s other jungle - “the concrete jungle”.

### 8.5.1 Present Position

Forests occupy about 752.9 lakh hectares or about 19 per cent of the total geographical area. Of these about 389 lakh hectares or about 52.0 per cent are exploitable; another 160 lakh hectares or about 12 per cent are potentially exploitable. A variety of major and minor products are obtained from forests. **Industrial wood and fuel wood are two major products.** Among the **minor products** we may include **all other products obtainable from forests other than wood.** In these we may include **bamboos, canes, Tendu leaves, grasses, essential oils, medicinal plants, lac, resins, gums, tanning materials, dyes, animal products,** etc. The total production of major forest product during 1997-98 amounted to 157 lakh cubic metres (M<sup>3</sup>) from which the State Forest Departments received Rs.353 crore as royalty. Another sum of Rs.113.2 crore was received by the State Forest Departments as royalty from the minor products. Net contribution of forest revenue was estimated at Rs.1,853 crore during 1997-98.

### 8.5.2 Problem of Deforestation

The area under forests in India is low not only as compared to the forest area in countries like Japan (67%), Sweden (68%), Canada (49%), Brazil (65%), and USA (32%), but is also much less than the norm of 33 per cent of the total reporting area recommended in the National Forest Policy of 1952. The per capita forestland in India is 0.08 hectares as against the world average of 2.08 hectares. What is of critical concern is the fact that in the wake of rising population and economic growth the pressures on forest wealth have been building up. Over the years trees have been recklessly cut down both for their own sake as also for vacating the land, and thereby diverting the land to non-forest uses. This process is known as deforestation. Deforestation is the result of man’s need and greed both. The net result is that in spite of concerted efforts in our plans, it has not been possible to increase the area under cultivation. Further, the productivity of Indian forests is very low i.e. 1.2 cubic metre per hectare per year as against the world average of 2.1 cubic metre. In future, the demand for forest products is likely to increase fast. The domestic requirements of industrial wood and fuel wood in 1985 was 35.18 lakh M<sup>3</sup> and 202 lakh M<sup>3</sup> respectively. As per the estimates available from the National Commission on Agriculture, the aggregate requirements of industrial wood are projected to go up to 64.45 lakh M by the year 2000. It is necessary, therefore, that we review comprehensively the National Forest Policy.



### 8.5.3 National Forest Policy, 1952

The National forest policy was first enunciated in 1952 and subsequently revised in 1988. In 1952 the policy was formulated on the basis of six paramount needs of the country. The **first** necessity was evolving a system of balanced and complementary land use. The **second** was checking the denudation of mountain regions, the erosion of space along the treeless banks of the great rivers leading to ravine formation, and the invasion of sea and coastal tracts. The **third** was establishment of tree lands, wherever possible. The **fourth** was the need for ensuring progressively increasing supplies of grazing fields, small wood for agricultural implements and in particular firewood to release cattle-dung for manure. The **fifth** was the need for sustained supply of timber and other forest produce required for defence, communication and industry. And, **finally**, there was the need for the realisation of the maximum annual revenue in perpetuity consistent with the fulfillment of the other needs enumerated above.

Since then developments of far-reaching importance have taken place in the economic, social and political fields. The increase in population has given rise to diversified demands for a large variety of products on the one hand, and built up a heavy pressure on land on the other. The concept of saving trees is foreign to the Indian psyche. Foresters tend to see forests as wood factories.

### 8.5.4 New Forest Policy, 1988

In response to the changing requirements of the economy, the national forest policy has been revised and a new policy announced in December, 1988. Two important distinguishing features of this policy, which make it different from the 1952 policy, are as follows:

**First**, the policy lays emphasis on the conservation of forests, and meeting the requirements of the tribal and rural people. The 1952 policy had stressed the production objective and consequently the stipulation of bringing one-third of the geographical area under forest cover. This objective could not be achieved for various reasons including lacunae in the law. These have been sought to be corrected in the new policy.

Similarly, the earlier policy had given priority to the national needs and had categorically stressed that where conflict occurred between the local requirements and the national needs, the latter would get priority. It has been realised by now that conservation objective could be met only if bonafide requirements of the local people were met. This aspect has been emphasised in the 1988 policy. The policy pays due attention to what may be called **social forestry**. The policy lays down that tribals and other local people can get their basic domestic requirements of fuel wood, fodder, minor forest produce and construction timber from forests. Tribals will also be associated with the protection, regeneration and development of forests, and cooperatives run by them or by the Government will replace the present contractor system, which has resulted in unchecked devastation of reserved forests.

**Second**, major departure in the revised forest policy is with regard to meeting the demand for industrial materials. Realising the fact the uncontrolled expansion of forest-based industries would adversely affect the conservation objective, the revised policy has made the following stipulations (i) No forest-based industry, except in the small-scale and cottage sectors, would be permitted unless sustained availability of raw material was ensured; (ii) As far as possible, a forest-based industry should

produce its own raw material requirements; (iii) Natural forests would not be made available to industries for undertaking plantations and for other objectives; and (iv) Forest produce would not be supplied to industries at concessional rates.

The **Central Forestry Board's** decision made earlier in 1988, to stop all clear felling of forests will greatly strengthen the efforts to regenerate the forest wealth. However, it is not entirely clear how the Government will meet the needs of the existing wood-based industries without endangering reserved forest or depriving the poor of their rights over common lands by diverting them for monoculture plantations for industry as has been done in some States.

The initial results of the new policy have been quite encouraging. The fourth biennial review of the forest cover has shown that the forest cover has increased, although marginally.

**Check Your Progress 2**

1) Identify the different sources of water in India.

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2) What are the main river systems in India ?

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3) Mention four major advantages of forests in an economy.

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4) What are the basic differences in the National Forest Policy of 1952 and that of 1988?

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**8.6 MINERAL RESOURCES**

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The mineral resources of India encompass a wide range of products that are necessary for a modern developed economy. There are according to the **Geological Survey of India, 50 important minerals and 400 major sites where these minerals occur.** These can be divided into four categories as follows:

- i) minerals of which India's exportable surplus can dominate the world market; to this category belong iron-ore and mica;
- ii) minerals of which the exportable surplus forms an important factor; these include manganese ore, bauxite, gypsum and others;

iii) minerals in which it appears that the country is self-sufficient, like coal, sodium salts, glass sand, phosphates, bauxite, etc.; and

iv) minerals for which India has to depend largely or entirely on foreign markets like copper, nickel, petroleum, lead, zinc, tin, mercury, platinum, graphite, etc.

The various minerals can also be classified into three categories on the basis of their nature and end use. These three categories are:

- a) Fuels like coal, lignite, natural gas and petroleum;
- b) Metallic minerals like bauxite, iron-ore, manganese, etc.; and
- c) Non-metallic minerals like phosphorite, graphite, gypsum, limestone, mica etc.

The value of minerals production in India has increased considerably over the last five decades as can be seen from Table-2 below:

**Table 2: Value of Mineral Production  
(Rs. Crore)**

Year	Value
1951	83.3
1961	81.2
1971	502.91
1975	227.4
1980	2310
1985	9122
1990	16456
1992-93	20180
1993-94	24554
1994-95	27940
1995-96	28350
1996-97	31,185

Source: India: Annual Reference Year Book.

As would be seen from **Table-2**, there has been a manifold increase in the production of minerals in the country. More important, in terms of value, among these are fuels, which group accounts for about 85 per cent of the total value of mineral production in the country. Next in importance are Metallic and Non-metallic minerals, each of which group accounts for about 6 to 7 per cent of the value of minerals production. Among the fuels, the more important are Coal and Petroleum; Coal alone accounting for more than 55 per cent of the total value of fuel minerals.

Minerals provide a base for the rapid industrialisation of the economy. The changeover to an open market economy has opened up further avenues for faster industrial growth and greater requirement of minerals. It is imperative, therefore, that proper attention is paid to their development. There are a few essential aspects that need to be worked into a proper mineral policy. **First**, the mineral resources are very unevenly distributed. The Great Plains of Northern Indian are almost entirely devoid of any known deposits of economic minerals. On the other hand, south Bihar and Orissa and areas on the north-eastern parts of peninsular India possess large concentration of mineral deposits accounting for nearly three-fourths of the country's coal deposits

and containing highly rich deposits of iron-ore, manganese, mica, bauxite, and radioactive minerals. Minerals deposits are also scattered over the rest of the peninsular India and in parts of Assam and Rajasthan. **Secondly**, the country is deficient in certain minerals like crude oil or petroleum; a large part of the present demand is being met by imports. In view of the rising prices of these minerals in international markets, it would be necessary, on the one hand, to curb their growing use in the economy, and, on the other hand, sustained efforts should be made to explore the domestic sources of supply of these minerals. **Thirdly**, there are minerals, which are lucrative foreign exchange earners. Efforts should be made to devise a suitable policy to have a proper utilisation of these minerals keeping in view the national interest. **Finally**, due to paucity of funds, the mining industry is mired in obsolete technology, now for decades.

### 8.6.1 New Mineral Policy

The National Mineral Policy was announced on August 9, 1990, and was further modified on March 5, 1993. The major objectives of the New policy are as follows: (i) to strike a balance between conservation and development ; (ii) to promote necessary linkages for smooth and uninterrupted development of the mineral industry to meet the needs of the country ; (iii) to minimise the adverse effects of mineral development on forests, environment and ecology through appropriate protective measures and ensure conduct of mining operations with due regard to the safety and health of all concerned; (iv) while planning development of mineral resources, to take into account national and strategic considerations and ensure their adequate supply and best use keeping in view present needs and future requirements; and (v) to ensure establishment of appropriate educational and training facilities for human resource development to meet the manpower requirements of the mineral industry.

**Features:** The major features of the New Policy are as follows:

- 1) The Government has thrown open the entire mining industry for private sector participation, barring uranium and mineral oil. The de-reserved areas now include the 13 minerals that had earlier been reserved for exclusive exploitation by the public sector. These are: iron ore, manganese, chrome, sulphur, gold, diamond, copper, lead zinc, molybdenum, tungsten, nickel and platinum.
- 2) The ceiling on foreign equity in the mining industry has been raised by providing for up to 50 per cent foreign equity participation in Indian companies engaged in mining activities.
- 3) The policy also permits minerals and metal processing units that wish to develop captive mines to secure assured supplies of raw materials to invite foreign equity to the extent already permitted to such processing units.
- 4) The Government would not allow strip mining in forest areas unless the companies undertook time-bound reclamation programmes.
- 5) No mining lease would be given to anyone without a proper mining plan including the environmental management plan approved and enforced by the statutory authorities.
- 6) Exploitation of sea bed mining in the Indian Ocean is not permitted.

### 8.6.2 New Economic Policy and Privatisation

With the onset of liberalization, the pressure to permit the private and foreign sector into all areas of mining has risen sharply. **The Mines and Minerals Regulation and**

**Development Act (MMRD)** specially debarred foreign nationals and companies from virtually all minerals. But this restriction came under fire because a number of foreign companies interested in setting up power plants want to develop coal mines merely to ensure regular supply. In response, the Government has amended the MMRD Act. It now permits entry to private capital, both domestic and foreign, in the field.

### Check Your Progress 3

Tick (✓) the correct answer among the following:

- 1) India has a exportable surplus of:
  - a) Mica
  - b) Crude Oil
  - c) Gold
  - d) Copper
  
- 2) India is self-sufficient in following minerals:
  - a) Petroleum
  - b) Mercury
  - c) Bauxite
  - d) Tin
  
- 3) Tick the odd one out of the following:
  - a) bauxite
  - b) iron-ore
  - c) manganese
  - d) mica
  
- 4) Tick the odd one out of the following:
  - a) gypsum
  - b) copper
  - c) iron-ore
  - d) glass sand

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## 8.7 ENERGY RESOURCES

The need for energy in a developing economy can hardly be over-emphasised. It is a basic input required to sustain economic growth and to provide basic amenities of life to the entire population of a country. It is energy, which is the dividing line between a subsistence economy and a highly developed economy. In the affluent United States, the per capita consumption of energy is nearly 40 times than in India. Empirically, it has been established that “inadequate supplies of energy can inhibit development and that assurance of an adequate supply and mix of energy inputs can be a great stimulus to development”.

Energy in India is produced from different sources. These sources can be classified into two groups: (i) **commercial sources**-like thermal power, hydel power, power from oil, gas, nuclear fuels, etc.; and (ii) **non-commercial sources** like firewood, dungcakes etc. Of the two sets of sources, commercial sources occupy a more prominent position.

## 8.7.1 Sources of Commercial Energy

### A) Coal

Coal is the largest naturally occurring source of commercial energy in India and has been one of the principal sources of power production. Presently, coal-based **thermal power stations** contribute about 74.0 per cent of the total power generation. The energy policy of the country provides that to the extent practicable and economical, coal will be the principal source of commercial energy.

India's coal reserves are mainly clustered around belt extending over the western part of West Bengal, south Bihar, Orissa, north-eastern and central Madhya Pradesh, and the eastern fringe of Andhra Pradesh. There are also some scattered deposits in Assam. There has been a systematic attempt to assess reserves of coal. The latest estimates place the total resources at 193.8 billion tonnes and proven reserves at 64.9 billion tonnes. Of these, about 27 per cent are of **coking** variety and 73 per cent of non-coking coal, its use is being limited to metallurgical purposes. The **non-coking coal** available in the country is generally suitable for power generation.

The country has some lignite and tertiary coal deposits also. The total lignite reserves are estimated at about 21,000 million tonnes; the reserves of tertiary coal are estimated at about 900 million tonnes.

Coal production, which was around 33.9 million tonnes in 1950-51, increased to 295.9 million tonnes in 1997-98. The total requirement of coal is likely to increase to 400 million tonnes by 2000 A.D. It implies that more concerted efforts will be required to meet the increased requirement of coal a few years hence. The main problem, which is being faced by the coal industry at present, is **lack of suitable means of transportation**. Almost the entire amount of coal is being carried by the railways. Non-availability of railway wagons often leads to accumulation of stocks at pitheads and shortage in consumer areas. The transport planners will have to pay adequate attention to this aspect of the problem.

### B) Oil (Petroleum)

The second half of the present century may well be called the oil-age. In 1950, the world oil consumption was only 650 million tonnes whereas by 1973 it had increased to nearly 3000 million tonnes. This trend in oil consumption was reversed in 1973 following an upward revision of crude prices by oil-producing countries. The demand for crude oil being inelastic but persistently increasing, a rise in its prices blew up what came to be known as an international oil crisis. India was no exception. Even since oil exploration work has been stepped up, an aggressive campaign has been mounted to discover oil and gas in the on-shore as well off-shore areas.

**Reserves and Production:** India's total proven reserves of crude oil are estimated at 993.0 million tonnes. These reserves are located in **Assam and Gujarat, Bombay High, Arunachal Pradesh and Tamil Nadu areas**. Bombay high off-shore accounting for about 70% of the country's total oil production has emerged as the leading centre. Off-shore oil is being produced at Bombay basin, Krishna-Godavari and Cauvery basins. Oil has also been discovered at a few other off-shore places. As a result of these successes, production of crude oil in India recorded a marked improvement during eighties; it slowed during early nineties but recovered much of the lost ground during 1994-95, although a clear upward trend is still far away, as would be seen from Table -3.

Table 3: Crude Oil Production  
Million tonnes

Year	Output
1960-70	4517
1979-80	11770
1984-85	29000
1989-90	34090
1993-94	26400
1994-95	32200
1995-96	35200
196-97	32900
1997-98	33900

Source: Economic Survey

### C) Natural Gas

Natural gas has aptly been termed as the **Prince of Carbons**. It occurs either as **associated gas or free gas**. Associated gas is produced from underground reservoirs along with crude oil and the level of production depends entirely on the level of crude oil production. Contrary to that, free gas, though occurring in the underground reservoirs, is not associated with crude oil and can be produced as required. It has the advantage of convenience and efficiency in use and is environmentally benign.

Natural gas can be used for both domestic and industrial purposes. It finds expression in the fertiliser and petrochemical industries. While government policy in the past has favoured the reservation of natural gas for fertilisers, petrochemicals and other non-fuel uses, the picture on the supply side and in terms of the potential demand for natural gas has changed substantially in recent years.

#### Production and Consumption

In India, exploration for oil and gas was taken up first in 1955 after the ONGC was formed on a national scale. Substantial reserves of gas have been located in different parts of the country, more important among which identified are Cambay basin, Upper Assam, Bombay High, South basin and other areas of Indian sedimentary basin such as Krishna - Godavari, Jaisalmer, Tripura, Cachar, Bengal and the Himalayan foothills. The geological reserves of gas are being estimated at 1154 million tonnes (as oil equivalent) presently. The production of gas was somewhat slow in the past; it increased from 2.1 billion cubic metres in 1974-75 to a mere 2.8 billion metres in 1980-81, of which only 1.8 billion cubic metres was used. The rate of production and effective utilisation has, however, increased much faster since then. Total gross production increased to 24.80 billion cubic metres in 1997-98. In view of the increasing significance of gas in the energy scenario, the government has set up an organisation called the **Gas Authority of India Limited (GAIL)**, to look after the functions of processing, transportation and marketing of natural gas. The GAIL implemented the first, major high-pressure, cross country gas pipeline, called the HBJ project at an estimated cost of Rs.1700 crore. Three gas-based fertiliser plants along the pipeline have already gone on stream.

## D) HYDRO-POWER

Hydro-electric power plays a major role in the field of power development in the country. Its present contribution to total electricity generation is about 20 per cent. The present knowledge of availability of hydro-electric resources in the country is based on the survey, which was conducted by the Central Water and Power Commission during the period 1953-59. These studies place the annual potential **economically utilisable hydro-power potential at 25.26 billion kwh**, corresponding to the annual energy of 221 billion kwh. The present level of hydro-electricity generation is about 72.6 billion kwh. On the basis of assessed energy potential, the scope for further development of hydro resources is considerable. This assessment would undergo a substantial upward revision if factors like advanced technology, development of high voltage transmission systems, changing economic pattern and an increase in cost of fuel generation from alternative sources are taken into consideration.

In view of the intrinsic advantages of hydro resources, they warrant development to the maximum extent possible. In areas where adequate hydel resources can not be developed, thermal generation will have to be resorted to.

## E) NEW SOURCES

A few new sources of energy are **nuclear energy, gohar gas, wind power and geothermal energy**. Nuclear power generation was initiated in India in year 1969. Since then, India has acquired all the capabilities needed to pursue this vision, from basic research, plant designs, equipment manufacture, heavy water manufacture, fuel fabrication, plant construction, operation and control systems to fuel reprocessing. The energy potential available from the nuclear fuels is much more than that from the coal deposits.

**Gobar gas** plants were designed as early as 1962; but they acquired significance only after 1974-75. Presently, there are more than 17 lakh such plants in operation.

**Solar energy** is increasingly being used for varied purposes, such as water heating, distillation of water, timber seasoning, etc. Likewise, **wind pumps** and wind farm projects are being vigorously promoted in the wake of energy crisis that the country has been faced with. Efforts have been intensified to explore other supplementary sources. The more this trend catches on, the better would be India's power situation.

### 8.7.2 Sources of Non-Commercial Energy

Sources of non-commercial energy include fuel-wood, agricultural waste and animal dung. According to the **Working Group on Energy Policy**, the relative proportion of the three sources is 65 percent, 15 percent and 20 percent respectively. About 82 percent of non-commercial energy is used in the domestic sector. For the rural households, non-commercial energy accounts for more than 80 percent of the total energy consumption, for urban households the proportion is about 51 percent.

For the year 2000 AD, the estimates of fuel-wood demand are estimated at between 111 million tonnes and 173 million tonnes. The current annual availability is estimated to be in the range of 50 to 63 million tonnes. India is thus passing through a fuel-wood crisis. The worst affected are the poor.



1) Mention three sources of commercial energy in India.

.....  
 .....  
 .....

2) Mention three sources of non-commercial energy in India.

.....  
 .....  
 .....

3) Pick up the correct statements:

- a) India is self-sufficient in production of crude oil.
- b) India does not produce petroleum products.
- c) Natural gas has been described as “prince of Hydrocarbons”
- d) Solar energy is an important source of non-commercial energy in India

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## 8.8. LET US SUM UP

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We have reviewed above a brief profile of the major natural resources of India. Undoubtedly, India is blessed with a variety of resources. But the supply of these resources is to be viewed against their requirements on the one hand and possible utilisation within the given range of technology on the other. The potential available in the number of resources falls short of the requirements. Therefore, what is immediately required is that intensive surveys should be undertaken within the country to explore and to identify the hitherto unknown utilisable resources. This is true in the case of both renewable and non-renewable resources. This will require chalking out an integrated multi-pronged national policy. Secondly, equally important is the need to make an efficient use of available resources. This requires several interrelated steps: better technology, use of by-products, multipurpose use of resources, location of industries such that the transport cost of combining resources from different areas are minimized, etc. Thirdly, there is the need to take such conservation measures that sustain the output over a longer period. Finally, all the above considerations will call for an effective organisational set-up. In the interests of swift economic development these considerations can not be ignored.

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## 8.9 KEY WORDS

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**Gross sown area:** Net sown area plus the area, which is multi-cropped.

**Ground water:** Water available from such sources as wells, springing, etc.

**Multi-cropped area:** Land area where more than one crop are raised during a year.

**Natural Resources:** All the objects available in nature, either on soil or under the soil, for exploitation by labour to produce goods of value to mankind.

**Net sown area:** The size of land put under cultivation during a year.

**Privatisation:** A policy decision whereby private enterprise and capital can enter those areas of production which till had been reserved exclusively for the public sector.

**Single-cropped area:** Land area where only one crop is raised during a year.

**Social Forestry:** Implies rational afforestation and deforestation compatible with economic and social needs and values of community.

**Surface Water:** Water available from such sources as rivers, lakes, etc.

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## 8.10 SOME USEFUL BOOKS

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Bose Ashish (ed.): *Population in India's Development, 1947-2000.*

Government of India (1995): Ninth Five Year Plan 1997-2002. Planning Commission, New Delhi.

Dhingra Ishwar C.: *The Indian Economy* (Sultan Chand, New Delhi, 2000). Ch.4.  
Government of India (1976): Report of the National Commission on Agriculture, Ministry of Agriculture, New Delhi.

Government of India (2000): Economic Survey (Annual), Deptt. Of Economic Affairs, Ministry of Finance, New Delhi.

World Bank (1993) : *Toward An Environmental Strategy for Asia.*

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## 8.11 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress 1

- 1) See Sub-Section 8.3.1
- 2) See Sub-Section 8.3.2
- 3) See Sub-Section 8.3.3
- 4) See Sub-Section 8.3.4

### Check Your Progress 2

- 1) Read introduction to Section 8.4
- 2) See Sub-Section 8.4.1
- 3) Identify the four points from those given in section 8.5
- 4) See Sub-section 8.5.3

### Check Your Progress 3

- 1) a      2) c      3) d      4) d

### Check Your Progress 4

- 1) a) coal, b) oil, and c) Natural gas.
- 2) i) fuel wood, ii) agricultural waste, and iii) animal dung.
- 3) c)

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## UNIT 9 DEMOGRAPHIC FEATURES

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### Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Vital Statistics in India
- 9.3 Role of Population in Economic Development
  - 9.3.1 Effect of Population Growth on Economic Development
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- 9.4 Trends in Population Growth
  - 9.4.1 Extent of Population Growth
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- 9.5 Rural-Urban Distribution and Growth
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  - 9.7.4 Migration
- 9.8 Adverse Effects of High Population Growth Rate
- 9.9 India's Population Policy
  - 9.9.1 Clinical Approach
  - 9.9.2 Family Welfare Approach
  - 9.9.3 National Population Policy, 2000
  - 9.9.4 Assessment of Population Policy
- 9.10 Let Us Sum Up
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- 9.12 Some Useful Books
- 9.13 Answers/Hints to Check Your Progress Exercises

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## 9.0 OBJECTIVES

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After going through this unit you would be able to:

- Explain the role of population in economic development;
- Reproduce the trend of population growth in India;
- Summarise the composition of population in terms of sex and age;
- Explain the factors influencing population growth in India; and
- Describe the population policy in India.

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## 9.1 INTRODUCTION

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The development of any economy, to a significant extent, depends on the availability of natural and human resources. In the previous unit, we discussed the status of natural resources available in India. In this unit, we will focus on population or human beings as a resource or as input for the development of an economy. You might have noticed that population in a country performs two roles - first, it contributes an important input that is labour, in the production of goods and services; second, it is the ultimate consumer of goods and services produced.

The development of an economy depends upon the quality of human resource, that is the quality of population, it has. Size, growth rate and composition of population, migration, standard of living of people, etc., are some of the factors that influence the development pattern of a country.

In this unit, we will highlight some of these issues in Indian context. But before that let us look into the availability of data on vital statistics in India.

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## 9.2 VITAL STATISTICS IN INDIA

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Vital statistics means data on births and deaths. Availability of accurate data on these vital events is quite important for studying the features of population. In India, there are two important sources of vital data. One, the population census of India conducted every 10 years. The second is the vital registration system where every birth and death is recorded on a continuous basis.

The beginning of census taking in India can be traced back to 1872 when the results of censuses conducted for different parts of the country around that time were aggregated. A complete and synchronous (that means, at the same time) Census has been held in India since 1881 once in every 10 years. Thus, the 2001 census represents the 14th census of India and the 6th after Independence. The census is quite comprehensive covering the whole population of the country on a number of economic and social characteristics. The census is conducted by the census organisation, which has been functioning on a permanent basis. The results of the census are summarised in hundreds of tables published in a number of volumes. Thus, it becomes an important source of data on the Indian economy. The major limitation of the census data, however, is that it is not available for the inter-census years. Only we can have some estimates for the years between two censuses.

The other source of data is through vital registration system. As you may be aware, it is obligatory on the part of every citizen of India to report births and deaths in a family to the Registrar's office. However, many deaths and births remain unreported, as many do not realise the importance of such registrations. Thus, the data available through vital registration system in India is less than the actual (underestimate).

In order to provide reliable estimates of birth rates and death rates at state and national levels, the office of the Registrar General, India initiated the Sample Registration System (SRS) scheme in 1964-65 on pilot basis in a few states. SRS was extended to all the states from 1969-70. Under the SRS, a sample of the population (instead of the entire population, as is done in the census) is surveyed on a continuous basis. The SRS data is very helpful in forecasting future size, distribution and growth pattern of population.

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## 9.3 ROLE OF POPULATION IN ECONOMIC DEVELOPMENT

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There is close relationship between growth rate and composition of population and economic development of an economy. The relationship is two-way. It means growth rate of population affects economic development and, in turn, economic development influences growth rate of population of an economy.

### 9.3.1 Effect of Population Growth on Economic Development

As mentioned above population provides an important input, namely labour. Thus, we can say that greater the size of population, greater is the labour force. From

microeconomic theory we have learnt that as the level of labour input is increased in a firm, the level of output produced increases, provided marginal product of labour is positive. But law of diminishing returns operates and marginal product of labour could be negative after certain level. In such a situation application of more labour actually reduces the output. Thus a firm stops application of labour before its marginal product is zero. Now let us consider the repercussion of excess supply of labour for an economy.. Faster population growth over a limited period may help economic development by providing the necessary manpower, if the size of the population is much below the capacity based on natural resources. But, if the economy has a large size of population and is accompanied by high growth rate in population, economic development may get affected adversely.

There are two main channels through which population growth affects economic development. One, it **decreases rate of savings** and two, it **changes the composition of investment**.

A **higher rate** of growth in population reduces the rate of savings in the economy. With high birth rate and low mortality in the younger age group, the proportion of children in the economy goes up. Again, with increase in longevity, the proportion of aged people in the economy increases. The overall effect is a higher dependency ratio (that is the ratio of dependents or non-working population to working population). Since both dependents and working population must consume, a larger proportion of income is devoted towards consumption. Consequently savings rate declines.

With an increasing population, a share of investible resources has to be devoted towards basic necessities of life. For the additional people, minimum facilities like health care, education, housing, justice, law and order, etc. have to be provided. Very little is left for investment in production of goods. Thus, economic development gets slowed down.

High population growth also implies that a major part of the growth in national income is distributed over the additional population, and the growth rate in per capita income slows down. Suppose, an economy is growing at 5 percent per annum and population is increasing at 2.3 per cent per annum, then per capita income of people will increase at 2.7 percent per annum only. Had the growth rate of population been lower, say 1.5 percent, then per capita income would be growing at 3.5 percent per annum.

### 9.3.2 Effect of Economic Development on Population Growth

The above discussion shows that high population growth rate adversely affects economic development. However, the impact of economic development on birth rate is also not insignificant. It is observed world over that less developed economies are characterised by 'high population growth' and 'low level of economic development'. On the other hand, all developed countries are experiencing low population growth rate. In Table 9.1 you may notice that in developed countries like Japan and U. S. A. birth rate is much lower than developing economies like Uganda and Zimbabwe.

There are some evidences to show that higher level of per capita income and high literacy, particularly female literacy, are associated with low birth rate.

**Table 9.1: Demographic Feature of Selected Countries (for the year 1997)**

Country	Birth Rate (per 1000)	Death Rate (per 1000)	Natural Increase (percent)	Infant Mortality Rate*	Life Expectancy (in years)	Per Capita GNP** (in US \$)
1. India	29	10	1.9	75	59	340
2. Bangladesh	31	11	2.0	77	58	240
3. Pakistan	39	11	2.8	91	61	460
4. Uganda	51	22	2.9	81	41	240
5. Zimbabwe	40	14	2.7	53	51	540
6. Japan	10	7	0.2	4	80	39,640
7. U. S. A.	15	9	0.6	7.3	76	26,980
8. Germany	10	11	-0.1	5.1	77	27,510
9. Russia	9	14	-0.5	18	65	2,240
10. Australia	14	7	0.7	1.8	75	18,720

\* Per thousand of live birth. \*\* For the year 1995 in US \$.

*Source:* Population Reference Bureau, 1997.

There are some other indicators of economic development, which have a negative relationship with birth rate, and size of family. It is seen, within a developing country itself, that urban areas have a lower birth rate and higher standard of living than rural areas. Also, higher income families have lesser number of children. Parents, with improved awareness, plan their family size so as to provide better education to children. These facts hint that reduction in birth rate is possible with economic development.

Empirical evidences lead to the view that economic development is a must for reduction in birth rate. Thus, a school of thought advocates that a country should concentrate on economic development. However, development of an economy is a long run process, and cannot be achieved in the short-run. Hence, a developing country must plan its population growth along with economic development. This is the reason why population policy finds an important place in the overall development process of an economy. This fact is recognised since the first Five Year Plan in India. We will discuss the approaches to the population policy pursued in India later, in Section 9.9.

## 9.4 TRENDS IN POPULATION GROWTH

Let us bring out the important features of population growth in India during the 20th century. We will highlight the growth in total population and factors influencing this growth pattern.

### 9.4.1 Extent of Population Growth

India is the second most populous country in the world and comes next only to China. The ten most populous countries in the world, in 1997, are China 1237 million, India 970 million, U.S.A. 268 million, Indonesia 204 million, Brazil 160 million, Russia 147 million, Pakistan 138 million, Japan 126 million, Bangladesh

122 million and Nigeria 111 million. According to the 1997 estimates, out of the world's total population of 5,840 million, India accounted for 970 million persons. The population of the world is distributed in an inhabited land area of 135.2 million square kilometers. While India accounts for only 2.4 per cent of this area, its share in the world's population is 16.6 per cent. Thus, the density of population in India is nearly 7 times the world's average density. On an average, there are 324 persons per square kilometer in India, according to the 2001 census.

**Table 9.2: Population of India and its growth 1901-1991**

Year	Total population (in million)	Total Increase during the Decade (in million)	Growth Rate (percent)	
			Decadal	Annual (Exponential)
1901	238.40	-	-	-
1911	252.09	13.69	5.75	0.56
1921	251.32	-0.77	-0.31	-0.03
1931	278.98	27.66	11.00	1.04
1941	318.66	39.68	14.22	1.33
1951	361.09	42.43	13.31	1.25
1961	439.23	78.15	21.51	1.96
1971	548.16	108.92	24.80	2.20
1981	683.33	135.17	24.66	2.22
1991	846.37	163.04	23.86	2.14
2001	1027.02	180.65	21.34	1.93

Source: Ninth Five Year Plan, 1992-97.

India's estimated population of 1027 million persons in 2001 was more than 4 times the size of the 1901 population of 238 million, and nearly 3 times the number of 1951, the year planning started in India. As you can see from Table 9.2, the population growth of India has shown three distinct phases. Up to 1921, there was a fluctuating growth. In fact, there was a decline in total population during the decade 1911-21. Widespread famine and epidemics were the main cause of such a decline. After 1921, up to 1951, there was a steady but low population growth. Population growth during the decade 1941-51 was 13.31 per cent. However, beginning from 1951, there was a sudden increase in population growth. During the decade 1951-61, the population growth rate was 21.51 per cent. This went up to 24.8 per cent during 1961-71. Although there is a marginal decline in the rate of population growth since 1971, it still continues to be high. If the present rate continues, India's present population will be doubled in coming 36 years.

The increase in India's population by 181 million (from 846 million in 1991 to 1027 million in 2001) was more than the population of Brazil, the fifth most populous country in the world (see Section 9.4.1 for five most populous country in the world). Every year India adds to her a population, which is more than the total population of Australia.

There is much variation across in decadal growth rate in population. Bihar has witnessed the highest rate of population growth during the decade 1991-2001 while Kerala has experienced the lowest at 9.42%. Some of the high growth states are Bihar, Rajasthan and Haryana. On the other hand low growth states are Kerala (9.42%), Tamil Nadu (11.19%) and Andhra Pradesh (13.86%).

## 9.4.2 Three Phases of Demographic Transition

Historical evidence from presently developed countries indicates that an economy has to pass through three stages of demographic transition. They are:

- 1) High birth and high death rates
- 2) High birth and low death rates
- 3) Low birth and low death rates

In the first stage, which coincides with very low level of development, the birth rate is quite high. At the same time, the death rate is also quite high. As a result, the population growth rate (i.e., birth rate minus death rate) is very low. In India we see that till 1921, population growth rate was low even though both birth rate and death rate were high. Thus, the period before 1921 can be considered as the *first stage of demographic transition* in case of India.

As an economy develops, there is an improvement in the standard of living. People get better nutrition, living place, work condition and sanitation. Also, more resources are diverted towards establishment of hospitals and availability of medicines. As a consequence, quality of health improves and death rates decline. However, birth rate is not influenced as quickly as death rate. Birth rate, to some extent, depends on another set of variables such as family expectations, awareness, values and culture, which require a longer time period to change. The result is high population growth rate, which is the *second stage of demographic transition*. In fact, this is the phase of population explosion. A glance at Table 9.2 will show that India is passing through this phase at present. The death rate has declined while birth rate is still high.

The *third stage of demographic transition* is marked by low birth rate and low death rate and the growth rate of population again slows down. As an economy proceeds on its development path, there is increased standard of living, high female literacy, high mobility of people, increase in cost of rearing a child, participation of women in workforce, increase in the age of marriage, adoption of birth control devices, etc. These are some of the factors, which are supposed to bring down birth rate. Most of the developed economies have reached the third stage of demographic transition. Some parts of India, such as Kerala, can be considered to have reached this stage of demographic transition.

## 9.4.3 Inter-State Differences

As you know, India is a vast country. There are marked differences between states in terms of population density, birth rate, death rate, life expectancy, etc. Thus, it would be useful if we analyse the population growth patterns in various states. Table 9.3 presents data on some important population characteristics at the state level.

In the Table 9.3 given below you can see that most of the states have witnessed lower increase in population (in percentage term) during 1981-91 compared to the previous decade. However, there were some states where the decadal increase during 1981-91 was higher than that in the previous decade. These states are Andhra Pradesh in the South, Madhya Pradesh in the Central, West Bengal in the East, Maharashtra in the West, and Assam, Arunachal Pradesh, Nagaland and Tripura in the North-Eastern region. In some of the major states, the decline has been substantial, for example, Gujarat, Karnataka, Kerala and Rajasthan.



Table 9.3 : State - Wise Distribution of Population and Vital Rates

Sl. No.	State	Decadal variation 1971-81(%)	Decadal variation 1981-91(%)	Population 1991 (in million)	Crude Birth Rate (1996)	Crude Death Rate (1996)	Crude Rate (1996)	Infant Mortality Rate (1996)	% Urban Area (1991)	Total Fertility Rate (1991)	Year by which TFR of 2.1 will be achieved	Life Expectancy in year (1992)
1.	Andhra Pradesh	23.10	23.82	66.30	22.7	8.3	66	26.84	3.00	2002	60.6	
2.	Arunachal Pradesh	35.15	35.86	0.86	21.9	5.6	61	-	-	-	-	
3.	Assam	23.36	23.58	22.29	27.7	9.5	75	11.08	3.50	2015	54.9	
4.	Bihar	24.06	23.49	86.34	32.1	10.2	72	13.17	4.40	2039	58.5	
5.	Goa	26.74	15.96	1.17	14.1	5.8	13	-	-	-	-	
6.	Gujarat	27.67	20.80	41.17	25.5	7.6	62	34.40	3.10	2014	60.1	
7.	Haryana	28.75	26.28	16.32	28.8	8.1	68	24.79	4.00	2025	62.9	
8.	Himachal Pradesh	23.71	19.39	5.11	23.0	8.0	62	8.70	-	-	63.6	
9.	Jammu & Kashmir	29.69	28.92	7.72	-	-	-	23.83	-	-	-	
10.	Karnataka	26.75	20.69	44.82	23.0	7.6	53	30.91	3.10	2006	61.9	
11.	Kerala	19.24	13.98	29.01	17.8	6.2	13	26.44	1.80	1988	72.0	
12.	Madhya Pradesh	25.27	26.75	66.14	32.4	11.1	97	23.21	4.60	2060	54.0	
13.	Maharashtra	24.54	25.36	78.71	23.2	7.4	48	38.73	3.00	2008	64.2	
14.	Manipur	32.46	28.56	1.83	19.4	5.7	27	-	-	-	-	
15.	Meghalaya	32.04	31.80	1.76	30.4	8.9	45	-	-	-	-	
16.	Mizoram	48.55	38.98	0.67	-	-	-	-	-	-	-	
17.	Nagaland	50.05	56.86	1.22	-	-	6	-	-	-	-	
18.	Orissa	20.17	19.50	31.51	26.8	10.7	95	13.43	3.30	2010	55.5	
19.	Punjab	23.89	2.26	2.19	23.5	7.5	52	29.73	3.10	2019	66.4	
20.	Rajasthan	28.07	43.88	32.3	9.1	86	22.88	4.60	2084	58.0	-	
21.	Sikkim	50.77	27.57	0.40	20.0	6.5	47	-	-	-	-	
22.	Tamil Nadu	17.50	14.94	55.64	19.2	7.9	54	34.20	2.30	1993	64.2	
23.	Tripura	31.92	33.69	2.74	18.3	65	45	-	-	-	-	
24.	Uttar Pradesh	25.49	25.16	138.76	34.0	10.2	85	19.89	5.10	2100	55.9	
25.	West Bengal	23.17	24.55	67.98	22.8	7.8	55	27.39	3.20	2009	61.5	

There is wide difference in terms of birth rate among states. While birth rate continues to be as high as 34.80 per thousand of population in Madhya Pradesh and Rajasthan, it has declined to a level of 17.70 in Kerala and 20.70 in Tamil Nadu. **Infant mortality rate (IMR)** (it is the number of children who die within one year of age per thousand live births) is quite high in Orissa (95), Madhya Pradesh (97), Rajasthan (86) and Uttar Pradesh (85). **Life expectancy** (which is a measure of average life span of people) is also quite low in these three states. Note that these three are amongst the poorer states in India.

Generally it is seen that in a majority of states with high population growth rates, the performance in the social and economic sector has been poor. Illiteracy, poverty and poor development seem to co-exist and reinforce each other in these states.

## 9.5 RURAL-URBAN DISTRIBUTION AND GROWTH

Table 9.4 presents the rural-urban distribution of India's population from the beginning of the present century. In 1901, only 10.8 per cent people lived in urban areas. The proportion declined slightly to 10.3 per cent in 1911, after which it increased steadily, and rose to 25.7 per cent in 1991. This increase in percentage of urban population over a period of seven decades seems modest when compared with the urbanisation rates of many developing countries. However, if seen in absolute numbers, the urban population increased from 25.8 million in 1901 to 217.1 million in 1991, which is not small by any standard. As per projections, India's urban population comprises 26 percent of the total for the year 1997. Thus, in India 252 million persons (in 1997) reside in urban areas. This population is much larger than the total population of any country except China and USA.

Table 9.4: Rural-Urban Population Distribution

Year	Total Population			Percentage		Growth Rate (percent)	
	Total	Rural	Urban	Rural	Urban	Rural	Urban
1901	238.4	212.6	25.8	89.2	10.8		
1911	252.1	226.2	25.9	89.7	10.3	0.62	0.04
1921	251.3	223.2	28.1	88.8	11.2	0.13	0.82
1931	279.0	245.5	33.5	88.0	12.0	0.95	1.76
1941	318.7	274.5	44.2	86.2	13.8	1.12	2.99
1951	361.1	298.6	62.4	82.7	17.3	0.84	3.45
1961	439.2	360.3	78.9	82.0	18.0	1.88	2.35
1971	548.2	439.1	109.1	80.1	19.9	1.98	3.24
1981	683.3	523.8	159.5	76.7	23.3	1.78	3.87
1991	844.3	627.2	217.1	74.3	25.7	1.82	3.13

### 9.5.1 Urbanisation Process

The increase in urban population can take place in the following ways:

- i) natural increase (i. e., birth minus death) of the urban population
- ii) migration into urban areas from rural areas
- iii) establishment of new urban colonies (industrial townships, for example)
- iv) transformation of rural areas into urban areas.

While the first two reasons add to the existing population in the existing cities and towns, the latter two reasons add to the number of urban places.

It is seen that percentage of urban areas has increased over time because of the above reasons. As you see from Table 9.4, in case of India, the growth rate of the urban population has been higher than that of rural population since 1911. Secondly, the rate of growth of the urban population has increased over time.

Urbanisation is considered to be good because of higher per capita income, developed infrastructure, awareness, and overall economic development compared to its rural counterpart. If urbanisation can be considered as a contributing factor to modernisation and social change, a higher proportion of urban population should lead to somewhat greater decline in fertility.

However, there is a growing concentration of urban population in larger towns. The population in Class I cities has continued to increase at faster rate (47 percent during 1981-91 compared to 35 per cent for all urban areas). This is a matter of concern because land is a major constraint in mega and metro cities. The scarcity of land impedes development works. The key concern in urban areas is the growing gap between demand and supply of basic facilities like houses, roads, electricity, water, public transport, etc.

Looking back at Table 9.3, you can observe that there is a considerable variations in the level of urbanisation across states. Among the major states Maharashtra is the most urbanised state with 38.7 percent followed by 34.4 per cent in Gujarat and 34.2 per cent in Tamil Nadu. Urbanisation is lowest in Himachal Pradesh with 8.7 per cent population residing in urban areas. A certain degree of historical development in the pattern of establishment of industries, availability of raw materials, development of transport systems, etc., have largely contributed to the observed pattern of urbanisation of different states.

**Check Your Progress 1**

- 1) Tick mark (✓) the correct answer in the following statements:
    - a) The second most populous country in the world is:
      - i) China, ii) Russia, iii) India, iv) Japan
    - b) India's population increased by ..... million between 1991 to 2001.
      - i) 210, ii) 181, iii) 112, iv) 161
    - c) At the turn of the century in 1901, India's urban population comprised ..... per cent.
      - i) 10.8, ii) 13.8, iii) 5.0, iv) 18.0, v) 7.2
- .....
- .....
- .....
- .....
- .....

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**9.6 SEX AND AGE COMPOSITION**

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We need to study the sex and age composition of population because these two are basic demographic determinants of a nation's manpower supply. They also influence the pattern of goods and services demanded in the economy. For example, the age

of school going children is an important factor to plan the additional need of schools, school buildings, teachers, etc. The sizes of the school going population, school enrollment, etc., are resultants of particular sex and age structure.

The sex-age structure of a population at any time is the result of past trends in fertility, mortality and migration.

### 9.6.1 Age Structure

Populations are generally classified as young or old according to their age structure. A *young population* is one, which has a relatively higher proportion of children, adolescents, and young adults than aged persons. In contrast, an old population has relatively high proportion of middle aged and aged people.

Table 9.5: Age Distribution of Population in India, 1911-1996 (in percent)

Year	Sex	Age Groups			
		0-14	15-44	45-59	60+
1911	M	38.8	46.5	9.9	4.8
	F	38.1	46.9	9.4	5.6
1921	M	39.4	45.5	10.1	5.0
	F	39.0	46.0	9.5	5.5
1931	M	40.0	46.2	9.9	3.9
	F	40.1	46.4	9.4	4.1
1941	M	38.1	46.1	10.9	4.9
	F	38.4	46.1	10.6	4.9
1951	M	37.1	46.3	11.1	5.5
	F	37.9	45.7	10.6	5.8
1961	M	40.9	43.0	10.6	5.5
	F	41.2	43.3	9.7	5.8
1971	M	41.9	41.5	10.7	5.9
	F	41.9	42.4	9.7	6.0
1981	M	39.6	43.2	11.0	6.1
	F	39.8	43.5	10.4	6.3
1996	M	37.7	44.8	10.9	6.7
	F	37.8	46.2	10.4	6.7

India's population has a young age structure where nearly 38 per cent of the people are below the age of 15 and only 6 to 7 per cent are 60 years old or older

Table 9.5 gives the age distribution in India during the period 1911-96 for four broad age groups: 0-14, 15-44, 45-59 and above 60 years. It shows that the proportion of children is quite high in India.

The high proportion of children has resulted in an adverse dependency ratio. For example, the proportion of children (below the age of 15) to working population (between the age 15 and 60) comes to 73 per cent in India in 1981 and 67 percent in the 1996. In developed countries this proportion is generally found between 35 to 40 per cent. In simple terms a high dependency ratio would imply relatively higher number of consumers than workers. A high dependency ratio tends to reduce saving and investment and inhibits the rate of economic and social development as a large proportion of scarce resources are diverted towards consumption. Also, an increasingly large number of persons continue to enter the working ages every year, swelling the ranks of the unemployed.

## 9.6.2 Sex-Ratio

Sex ratio is defined as *number of females per 1000 males*. Generally it is seen that the males outnumber females at younger ages because biologically more male babies are born than female babies (between 103 to 107 males per 100 females) in almost every society of the world. But female babies have a higher survival rate. Because of this, females outnumber the males from about the age of 20-25 onwards. But the overall effect is that the number of males and females should be equal in a population. In developed countries, the number of females is more than the number of males. In contrast to this, as Table 9.6 shows, India's sex ratio has been unfavourable to females. The number of female has gradually decreased over time.

Table 9.6: Sex Ratio in India, 1901 - 1991

Year	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991	2001
Sex Ratio	972	964	955	950	945	946	941	930	9634	927	933

This picture of sex ratio of India's population is very different from that in the developed countries and a majority of the developing countries. This is, perhaps, mainly due to the neglect of female babies and young girls (both in terms of medical care and nutrition) and has been so even after general improvement in the availability of medical facilities in both rural and urban areas and improvement in living conditions.

Some of the states, particularly Kerala has more females than males. This is perhaps due to better socio-economic development of the state and high female literacy. Kerala has achieved a literacy rate of 91 per cent as per 2001 census. On the other hand, Bihar, which has registered the highest population growth rate, has literacy as low as 47 per cent. Recently concerted efforts are being made to provide equal socio-economic status to women. Empowerment of Women (through reservation in jobs, legislature, and other facilities) is stated to be one of the primary objectives of the Ninth Plan.

### Check Your Progress 2

1) List out the adverse effects of a high dependency ratio.

.....

2) i) Why is the sex ratio of a population generally favourable to females?

ii) What is responsible for a high proportion of children below the age of 15?

.....

.....

.....

3) i) When do we call a population "young"?

ii) When do we consider a population "old"?

.....

.....

.....

## 9.7 DYNAMICS OF POPULATION GROWTH

After examining the population growth pattern, distribution, sex and age composition and economic characteristics in the earlier sections, we would like to discuss the dynamics of population growth through such factors as fertility, mortality and migration, which affect the size and composition of the population.

### 9.7.1 Measures of Fertility

Fertility refers to the actual performance of women in bearing children during the childbearing ages. There are various concepts to measure fertility. We will discuss some important measures below.

#### Crude Birth Rate

Conventionally fertility is measured by crude birth rate (CBR), which is defined as follows:

$$\text{CBR} = \frac{\text{Number of live births in a calendar year in a given geographical area}}{\text{Mid - year population of that area}} \times 1000$$

In the above definition of CBR, the numerator consists of *live births* only. This is because only live births affect the size of population of any given area. There are always certain proportions of *still births* in a population, but they are excluded from the computation of CBR.

In the denominator, total population is taken at the mid-point of the year because the population is continuously changing by births, deaths and migration. If we take the population at the beginning of the year in the denominator it will be a little less than the actual and the CBR will accordingly be high. In contrast, if we take the population at the end of the year, it will be a little more and the CBR will be lower than the actual. Hence, we divide the number of live births by the mid year population which gives the average picture.

According to the convention, we multiply the ratio by 1,000 because in any population, the maximum number of births in a year for every 1,000 persons does not exceed 60 and has generally not been less than 10. If we have the rate per 1,000 persons, we can talk in whole numbers; but if we multiply the figures by 100 instead of 1,000 the rate would become one-tenth and use of decimal point would become necessary.

The above measure of CBR gives a rough idea of fertility rate but it is inappropriate because its denominator consists of all persons of both sexes, of all ages. In practice, it is the women in childbearing ages (from 15 years to 45 years) that can produce children. Moreover, within the reproductive age child bearing capacity varies across age groups. Thus a more refined measure of fertility is, therefore, age specific fertility rate, which is explained below.

#### Age Specific Fertility Rate

The fertility rate computed on the basis of specifications with respect to age is called *age specific fertility rates* (age-SFR). Age-SFR is usually found out for a particular age group. Suppose, we want to find out the age-SFR for the state of Orissa for the year 1997 for the age group 19-24. What we do is to divide the total *female population* of Orissa in 1997 into different age groups, e.g., 15-19, 20-24, etc. Next, in the age

group 19-24, in Orissa, we find out the number of females. Third step is to find out the number of live births that has taken place during 1997 in this age group. Finally, we divide the total number of births by total female in 19-24 age group and multiply by 1000. In a similar manner, we can find out age-SFR for any state or for India, for any age group.

Age-SFRs point out the contributions of each age group to population growth rate in the country.

### Total Fertility Rate (TFR)

TFR is a more practical measure of population growth. This is obtained by combining the age-SFRs in different age groups within the reproductive age.

One of the objectives of population policy has been to bring in stability (i.e., neither increase nor decrease in the size) to the level of population. Such a stability is possible when Net Reproduction Rate reaches unity (NRR=1). In recent years, this target has been changed and objective has been defined as a TFR of 2.1 at the state level. This is the reason why we found it important to include TFR figures for the states in Table 9.3. From the TFR, it is possible to predict the year when a TFR=2.1 will be achieved for different states. In fact, states of Kerala and Tamil Nadu have already achieved it, whereas the states of Uttar Pradesh and Madhya Pradesh are quite far from it.

### Fertility Trend in India

Table 9.7 below depicts the fertility trend in India over the century. As you see, there has been a decline in birth rate in India.

Table 9.7: Average Decadal Birth and Death Rates in India, 1901-1991

Decade	Birth rate	Death Rate
1901-11	49.2	42.6
1911-21	48.1	48.6
1921-31	46.2	36.3
1931-41	45.2	31.2
1941-51	39.9	27.4
1951-61	41.7	22.8
1961-71	41.1	19.2
1971-81	37.2	15.0
1981-91	32.5	11.4

Looking back at Table 9.3 you can ascertain the state-wise variation in birth rates. It has remained high (well above the national average) in Uttar Pradesh, Bihar, Rajasthan and Madhya Pradesh. In contrast, birth rates have been comparatively low in Andhra Pradesh, Kerala, Tamil Nadu and West Bengal.

### 9.7.2 Reasons for High Birth Rate

The high birthrate realised in India arises out of many reasons. The prominent among these are:

- The infant mortality rate in India is quite high (see Table 9.1). As a result, the survival rate of children is comparatively low. Thus parents reproduce more children with the hope that some of them will survive.
- Traditionally parents in India have shown a preference for male child, so that the son will provide security during old age. Thus parents wait for a male child even after one or two girl children.
- Children provide an economic advantage to their parents. Some studies, however, contrast this with the view that children provide emotional advantage. It is seen that children in agricultural and business families help their parents in household activities and family farm or business at an earlier age thereby generating additional income.
- There is a lack of awareness among parents about the clinical facilities available to control or terminate birth. Some consider it a taboo.
- The age of marriage is low in India thereby providing parents a longer reproductive period.

As discussed in Section 9.3, female literacy has a positive impact on reducing birth rate. Generally females particularly working in the formal sector, have to plan the timing and number of children. The expectation of parents to bring up their children with good education and other facilities have also helped plan the number of children.

### 9.7.3 Measures of Mortality

As human beings are mortal, they have to die at some age or other. Death means permanent extinction of all signs of life from a human body after a live birth has taken place. The process of death keeps the population of a given area in some sort of a balance. This happens even when population may be growing in numbers. In order to measure death rates in a society demographers have come up with several measures. We discuss some of these measures below.

#### Crude Death Rate

The crude death rate (CDR), like the CBR, is perhaps the most commonly used measure of mortality. It is defined as:

$$\text{CDR} = \frac{\text{Total number of deaths in a calendar year in a given geographical area}}{\text{Mid - year population of that area}} \times 1000$$

The reasons for using mid-year population in the denominator and for multiplying the ratio by 1000 are the same as explained while defining CBR.

The difference between CBR and CDR is called natural rate of increase of a population. This tells us the rate at which the population of any particular area is growing in a natural manner.

#### Infant mortality Rate

Generally children are put to greater risk of death during the first year of life. In the absence of proper health facilities such a risk is higher. Thus the percentage death of children within one year of their life is an important indicator judging the health care in a society. Infant mortality rate (IMR) is one such measure. It is defined as:

$$\text{IMR} = \frac{\text{Number of children who die within one year of life}}{\text{Number of live births}} \times 1000$$



The implication of IMR is as follows: If 1000 children were born on a day, IMR would indicate the number of children, who are likely to die before completion of first birth day. It has been a concerted effort of the government to reduce IMR at the national and regional levels. As you can see from Table 9.3 IMR is quite high in states of Orissa, Madhya Pradesh and Rajasthan. But the states of Kerala and Goa have been quite successful to bring it down to the level of 13.

### Expectation of Life

Demographers estimate *expectation of life at birth* (or Life Expectancy) to understand the mortality pattern of different countries. It gives an idea of the average life span of people. It is measured in years. Life expectancy is estimated for male and female separately and for different states. In fact, expectation of life at birth has an inverse relationship with death rate. As you can see from Table 9.3, states with higher death rate have a lower life expectancy and vice versa.

### Mortality trend in India

Table 9.7 gives the crude death rate in India during 1901-91. You can see that death rate in India up to 1921 was very high. This was mainly due to large scale famines and epidemics. Health facilities and access to medicines were also not so good. The development of a better communication system after 1921 and more organised efforts to control epidemics like small pox, cholera and plague, and diseases like malaria, helped in the decline in CDR. We see an unmistakably declining trend in our CDR during the past fifty years.

We had mentioned earlier that there is much variation in death rates across states. If you look back at Table 9.3, you can point out that death rate is much higher, above the national average, in Bihar, Madhya Pradesh, Orissa and Uttar Pradesh compared to death rate in Kerala.

#### 9.7.4 Migration

Migration can be either from one country to another (international migration) or from one state/region to another (internal migration). Migration can be ascertained through change in residence. Migration affects certain population characteristics such as sex composition, age structure and occupational structure. As migration is a continuous process like events of birth and death, it is necessary to record all permanent or semi-permanent changes in residence.

In the absence of continuous recording of the details of migration, estimates of in and out migration are obtained by asking questions in a population census about 'place of birth' and 'place of last residence' or both. However, this definition of migration comprises a substantial portion of female migration due to marriage. There are three other factors, namely, *employment, income and rapid population growth* that determine the extent and pattern of migration flows. Migrants move out of areas where employment opportunities are stagnant, where income is low and where rate of population growth is very high. Conversely, they are attracted to areas of new industrial development and higher per capita income.

The available data from censuses show that both internal and international migration has been negligible in India. However, this may not be so in the future if there is further widening of disparity between states in terms of economic growth and employment opportunities. Because of the low income, poor employment opportunities and low literacy, there may be an increasing migration from rural to urban areas and

from poorer states to richer states, particularly of unskilled labour. You might have read newspaper reports on migration of agricultural labourers from poorer states to richer states. In the short run, such migration may assist the migrants in overcoming their economic problems. But in the long run, the migrant workers may face problems in securing shelter, education and health care.

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## 9.8 ADVERSE EFFECTS OF HIGH POPULATION GROWTH RATE

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As mentioned in the beginning (Sub-section 9.3.1), a high growth rate in population has an adverse effect on economic development.

- During the first 40 years of planning (1950-90) growth rate in GDP was around 4.0 percent per annum. However, the population growth rate was about 2 percent per annum. The outcome of such a feature is that the per capita GDP increased at a rate of 2.0 percent per annum only. Had population growth rate been lower, per capita income would have increased at a higher rate.
- The food production in India has gone up from 50.8 million tonnes in 1950-51 to 198 million tonnes in 1996-97, nearly 4 times. However, the per capita availability of food grains has increased only by 46 percent, from 140 kilogram in 1950-51 to 205 kilogram, during the same period.
- There is heavy pressure on existing infrastructure like health, education, electricity, water and housing. In order to maintain these facilities at the existing level, the government has to incur huge investments. Had population growth rate been lower, this expenditure could have been diverted towards directly productive activities.

### Check Your Progress 3

- 1) Why is the ratio in the definition of CBR or CDR multiplied by 1000?  
.....  
.....  
.....
- 2) Why do demographers consider TFR as a better measure of fertility than CBR?  
.....  
.....  
.....
- 3) Name two states in India, which have experienced low fertility rate, and two states, which have experienced high fertility rate.  
.....  
.....  
.....

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## 9.9 INDIA'S POPULATION POLICY

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While discussing the influence of high growth rate of population on economic development (Section 9.3) we stressed the need for a population policy to bring down birth rate. Soon after Independence, the Government of India appointed the Planning Commission to formulate a plan for most effective and balanced utilisation

of natural resources for economic development. While formulating the First Five Year Plan, the Planning Commission recognised the need of a population policy towards restraining population growth rate in relation to economic development. The objective of such a policy was to raise the living standards of people and improvement in health, particularly of mothers and children. In that plan, a provision of Rs.65 lakh was made for the family planning programmes and to discover effective techniques of family limitation and to suggest methods by which knowledge of the techniques could be widely disseminated. Thus, India became the first country in the world to formulate and implement the National Family Planning Programme in 1952.

### 9.9.1 Clinical Approach

During the first four Five Year Plans, the approach to family planning was mostly clinic-based. There was sharp shortage of infrastructure and manpower for improving health and family welfare services. The government put emphasis on creation of necessary infrastructure for provision of health care.

By the year 1975, the Government recognised that in order to promote family planning at a faster pace, it would be necessary to involve itself more directly. A comprehensive "National Population Policy" was, therefore, declared in 1976. This policy statement introduced a series of fundamental measures so as to achieve the planned target of reducing the birth rate from an estimated 35 per thousand in the beginning of the Fifth Plan to 25 per thousand at the end of the Sixth Plan. These measures included i) setting aside 8 per cent of central assistance to state plans specifically against performance in family planning, ii) freezing of the representation in the central and state legislatures on the basis of the 1971 census population for the next 25 years, iii) raising the age at marriage to 18 years for girls and 21 years for boys, iv) higher grades monetary compensation against sterilisation, v) higher priority for girls' education upto the middle level and vi) child nutrition.

A population policy consists of both the formulation and articulation of population objective that maximise the public welfare and levels of living. This involves the commitment and manipulation of resources in pursuit of these population objectives. One may also say that population policies are measures and programmes designed to contribute to the achievement of economic, social, demographic, political and other collective goals. This is possible through affecting critical demographic variables, namely, the size and growth of population, its geographic distribution (national or international) and its demographic characteristics. It can be easily seen that the National Population Policy Statement of 1976 covered these aspects quite comprehensively.

Special measures were adopted by several states to make this programme a success by introducing incentives and disincentives to encourage the people and at least the state and central government employees to go in for sterilisation. There was, however, severe criticism of the compulsion aspect in the family planning programme during 1976, and the same went into disrepute, and its achievement fell down very sharply during 1977 and 1979.

The country was not prepared for harshness and compulsion. There was a change in political power at the Centre and in several states in 1977. While the new Government stressed the importance of limiting population growth for the country, it emphasised the voluntary nature of the family planning programme.

## 9.9.2 Family Welfare Approach

Since 1977, the earlier approach of family planning has been geared towards development based family welfare approach. In Sub-section 9.3.1 we have discussed the two-way relationship between economic development and population growth rate. To repeat, economic development (mainly through female literacy, low infant mortality, maternal health and awareness) helps in reducing birth rate. Let us look into the routes through which female literacy reduces birth rate. It is generally seen that literate women tend to marry later than illiterate women do. Attendance at school and colleges thus increases age of marriage. It is projected further that increase in age of marriage has an inverse relationship with number of children. Secondly, literate women are more likely to enroll their children in schools. You may have observed that in many families, children do not go to school or drop out of school and start earning for the family (the case of child labour). School attendance tends to reduce labour value of children. Consequently, there is a reduction in the motivation to have more children. Thirdly, literate women are more aware of health and hygiene. So, more of their children survive, thus reducing the number of births to attain a couple's desired family size. They are also more aware of family planning and therefore, are more likely to use such devices. Finally, educated women are likely to have other interests apart from family and child rearing (such as a job). These interests compete with children for time and attention. Hence, this also tends to have a depressing effect on number of children.

The government has put emphasis on these factors apart from adoption of contraceptives. Some of the premises on which the family welfare programme is based are as follows:

- i) Acceptance of family welfare is voluntary without involving any coercion.
- ii) The role of the government is supposed to be creation of a favourable environment for people to adopt small family norm. This is done by spreading awareness, information and education of people. The government has put emphasis on easy and convenient availability of family planning aids and welfare services, like infrastructure, essential drugs, vaccines and contraceptives. The government has been giving incentives to people for adopting family planning.
- iii) The family welfare programme has integrated maternal and child health (MCH) services. The MCH is being implemented through countrywide network of primary health centres and supporting institutions.

## 9.9.3 National Population Policy, 2000

Recently the government has announced National Population Policy, 2000 which emphasises on adequate provision of contraception facilities, health care infrastructure, health personnel and integrated service delivery. While the long-term objective of the policy is to stabilise population of the country by the year 2045, the medium-term objective is to bring down total fertility rate (TFR) to replacement level by 2001.

In order to achieve these objectives it is planned to encourage small family norm, particularly, two children per couple. It adopts a policy of rewarding Panchayats and Zila Parishads for such encouragements. On the other hand, it proposes strong action against child marriage. A National Commission on Population is to be set up with the Prime Minister as its Chairperson.

The National Population Policy 2000 extends the moderate stand taken earlier by the government. It does not spell out steps to be taken against individuals or non-fulfilment of policy guidelines.

### 9.9.4 Assessment of Population Policy

In spite of the massive efforts by the government, the performance of the family welfare programme has not been satisfactory. Right from the First Five Year Plan the set goals have not been realised in time. This has resulted in the re-setting of the goals again and again. For example, let us consider the targets set in Plan documents regarding crude birth rate (CBR). In 1962 the target was to achieve a CBR of 25 by the year 1973. By the year 1968 it was further revised to achieving a CBR of 23 by 1978-79. However, the actual CBR in 1973 was 34.6. In 1974 (beginning of Fifth Plan) the planners moderated the target to achieving a CBR of 30 by the year 1979 and 25 by the year 1983-84. However, the CBR in 1985 was 32.9, much higher than the target. In 1998, the target set by the government is to bring down the TFR to 2.1 by the year 2026 from the present level of 3.60.

There are quite a few reasons for the poor performance of family welfare programme.

- The programme has remained a government programme, the community's involvement and participation being marginal.
- Regional variations and diversities are not generally taken into consideration. Health infrastructure is weak in many states, which has contributed towards poor implementation of the programme.
- There is a shortage of contraceptive devices in the country, which has contributed to high birth rate. About 20 percent of the population increase is due to unwanted births in the country. Many parents do not want a child, but births take place because of lack of awareness or unavailability of contraceptive measures.
- The monitoring mechanism under the programme has been reduced to a routine target reporting by officials. As a result, identifying the loopholes in the programme and rectifying it, has not been possible.

The Ninth Plan has addressed itself to these programmes. With death rate having reached a plateau, an accelerated decline in birth rate can present a feasible solution to the growing burden of increasing numbers.

#### Check Your Progress 4

- 1) Why is India known to be the first country in the world to have "population growth control" programme?

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- 2) List out the major aspects of the "National Population Policy" statement of 1976.

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### 9.10 LET US SUM UP

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In this unit we started with a discussion of the inter-relationship of population size and growth and economic development, and indicated as to when faster population growth may help economic development and when it may impede the same. After

indicating that India's current population size and growth rate impede economic development in the country, the role of urbanisation, particularly its growing pace, in economic development, was emphasised.

After a period of fluctuating growth of India's population upto 1921, the same began to increase gradually after 1921. The period since Independence has witnessed a very high population growth rate. Its impact is clearly visible in the young age structure of the country's population with nearly 40percent population below 15 years. India's urban population has also expanded at a fast pace during the past four decades. An important aspect of Indian urbanisation is the concentration of population in a few metropolitan and other cities. In addition, larger cities are growing at a higher rate than smaller towns.

The dynamics of population growth was discussed under the subheadings of fertility, mortality and migration that directly affect the size and growth rate of any population. The various measures of fertility and mortality were explained and the trend over time was discussed. Regional variations in the crude birth rate and crude death rate were also presented.

India was the first country in the world to formulate and implement the population policy in 1952. However, approach, adopted in this policy was clinic based. The population policy 1976 took series of measures to promote family planning at faster rate. These include setting aside 8 per cent of central assistance to states for family planning, raising the marriage age to 18 years for girls and 21 years for boys, higher priority for girls education etc. The performance of these measures has not been upto the mark.

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## 9.11 KEY WORDS

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**Crude Birth Rate:** It relates the total number of live births in a year in a given geographical area to the mid-year population of that year and area.

**Crude Death Rate:** It relates the total number of deaths in a calendar year in a given geographical area to the mid-year population of that year and area.

**Fertility:** It refers to the actual performance of women in bearing children during their childbearing ages. Conventionally, fertility is measured by crude birth rate. However, general fertility rate is a better index of measuring fertility.

**General Fertility Rate:** This takes into account the size of female population in the childbearing age, which effectively determines the fertility of a population of a given geographical area in a year.

**Infant Mortality Rate:** The number of deaths in the age group 0-1 during a calendar year per 1000 live births during the same calendar year within a geographical area.

**Law of Diminishing Returns:** Level of other inputs remaining constant, if level of an input is increased, a stage may arise when the marginal product of that input will decline. As a result, total output may decline after a stage.

**Migration:** It refers to the mobility of individual(s) from one geographical area to another. It may be in the form of, say, rural-urban migration when an individual moves from a rural to an urban area. It may also be in the form of intra-rural migration when a person moves from one village to another. If an individual migrates from, say, Bangladesh to India, it is international migration.

**Old Population:** A population that has a relatively high proportion of middle aged and aged people. Ours is not an old population as only 6 per cent of India's population is 60 years of age or higher.

**Sex Ratio:** It refers to the number of females per thousand males. In India, it was 929 in 1991. In most developed countries, however, sex ratio exceeds 1000, as female mortality rate is lower in developed countries compared to that in developing countries like India.

**Urban Areas:** According to the 1991 census, urban area is defined as, i) all places with a municipality, corporation, cantonment board or notified town area committees, etc.; and ii) all other places which satisfy the following criteria:

- i) a minimum population of 5,000;
- ii) at least 75 per cent of the male working population engaged in non-agricultural pursuits; and
- iii) a density of population of at least 400 persons per sq. km.

**Vicious Circle of Poverty:** In developing countries, the level of saving is low. As a result investment is low. Low investment gives rise to low level of capital formation. Low rate of capital per labour results in low output. Low output, in turn, gives rise to low saving.

**Young Population:** A population that has a relatively high proportion of children, adolescents and young adults. Ours is a young population as 40 per cent of our population is less than 15 years of age.

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## 9.12 SOME USEFUL BOOKS

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Cassen, R. H., (1978), *India: Population, Economy, Society*, Chapter 4, The Macmillan Co. of India Ltd. Delhi.

Datt, R. and KPM Sundharam, (2001), *Indian Economy*, (Chapter 4) S. Chand & Co. New Delhi

Dhingra, I.C (2001) *The Indian Economy: Environment and Policy*, (Chapter 5), Sultan Chand & Sons, New Delhi.

Government of India, (1998), *Ninth Five Year Plan 1997-2002*, Planning Commission, New Delhi.

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## 9.13 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress 1

- 1) a) iii    b) ii    c) i

### Check Your Progress 2

- 1) A higher dependency ratio implies higher number of consumers than workers. This has the adverse effect of reducing the rate of savings and investment rates. Consequently, the rate of economic growth slows down.
- 2) i) Sex ratio is favourable to females as the female babies have a better survival rate.  
ii) A high growth rate of population is responsible for a high proportion of children in the society.
- 3) i) A population is considered young if it has a high proportion of children and adolescents.  
ii) A population is considered old if it has a high proportion of middle aged and aged.

### Check Your Progress 3

- 1) In order to avoid decimal numbers, the ratio in CBR or CDR is multiplied by 1000.
- 2) TFR takes into account age specific variations in birth rate. Also it considers only female population in the reproductive age.
- 3) Low fertility: Kerala and Goa.  
High fertility: Uttar Pradesh and Madhya Pradesh.

### Check Your Progress 4

- 1) India was the first country in the world to formulate and implement a population policy in 1952.
- 2) The National Population Policy of 1976 suggested a number of fundamental measures to reduce birth rate. These measures included funding of state plans on the basis of performance in family planning, freezing the size of legislative representatives on the basis of 1971 census, raising the age of marriage, and incentives for female education.



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# UNIT 10 HUMAN RESOURCES DEVELOPMENT

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## Structure

- 10.0 Objectives
- 10.1 Introduction
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  - 10.2.1 The Importance of Education
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- 10.3 Health Care in India
  - 10.3.1 Basic Health Scenario in India
  - 10.3.2 Allocation in Health Care
  - 10.3.3 Finance for Health Care Services
  - 10.3.4 Structure and Component of Spending in Developing Countries
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- 10.5 Let Us Sum Up
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- 10.7 Some Useful Books
- 10.8 Answer and Hints to Check Your Progress Exercises

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## 10.0 OBJECTIVES

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You have learnt about population and demographic aspects in the previous unit. This unit talks about the quality of that population. It deals with humans as productive capital, and discusses investment in human capital by the State through education, health and social security. This investment is intended to enhance the productivity and quality of human capital. We discuss the health care scenario in India as well as the education sector. Of course, we limit our discussion mainly to economic aspects pertaining to these sectors. We also discuss how successfully the state has been able to provide social security to the deserving among the Indian populace. After going through the unit, you should be able to:

- Describe and discuss the education policy and the education situation in India;
- Explain the relation between poverty, health and development;
- Describe the health care policy of the State in India;
- Evaluate some important components of the health care policy, as well as its outcomes in terms of the health status of the Indian people; and
- Elucidate the various components of social security as relevant and pertinent to India and discuss the degree of success achieved.

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## 10.1 INTRODUCTION

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Many countries in Asia, Africa and Latin America gained independence from colonial rule in the 1940's and 1950's. India was one of them. Almost all of these countries were desperately poor after decades of foreign rule. Economic development became the primary focus of the newly independent states, and raising national income was

seen as the path to development. For this, the greatest attention was paid to accumulation of physical capital like machines and heavy industry. Later, it was found that social development was just as important and became a desired objective of policy. Initially labour, and then education was considered the quintessential human capital. Later, as research in development proceeded, health also acquired tremendous importance as human capital. Moreover, education and health are important indicators of human development and welfare in their own right. Related to this is the idea that a nation can, and must invest in human resources in the hope of future returns on investment in much the same way as investment in any physical or financial asset.

In this unit, you will be acquainted with some of these policies concerning social development. In particular, we will take up education, health and social security policies for discussion and many policy measures lend themselves to this description. Having gone through the earlier units, you would presumably have arrived at the conclusion that the ultimate objective of all development processes and activities is to improve the quality of life of the people. You would be quite correct to do so.

Along with the idea that human capital is as important as physical capital, arose the idea that the appropriate measure of development was not merely an economic indicator like Gross National Product; the view quickly gained acceptance that there ought to be indicators that measure human development. In an earlier unit, you have studied about indicators like Physical Quality of Life Index (PQLI) or the United Nations' Human Development. These indices are of direct relevance in our present discussion. Please refer to that material.

In this unit, we shall also discuss some aspects of the provision by the state of what are called welfare measures in terms of human resources. Of course, these measures can be, and are, provided by the private sector, even in India to a certain extent. However, we focus our attention chiefly on what the state has done and how successful it has been in this endeavour. The unit will attempt a description and analysis of the Indian experience but will also need to bring in some conceptual analysis as well.

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## **10.2 THE PROVISION OF EDUCATION IN INDIA**

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We begin this section by looking at the reasons why education is so important in the development of a nation and its people. Education is now considered akin to capital goods that will provide human capital in the form of better-equipped workforce. As a consumer good, education also improves vastly the quality of life. So how is education important?

### **10.2.1 The Importance of Education**

First, education has intrinsic importance. Being educated is a valuable achievement in itself. Secondly, if a person gets education, it enables him or her to do many other valuable things other than being educated. It may increase the person's chances of getting a job, for instance. This, in turn, would raise the person's earnings, which increases his or her purchasing power that increases his or her standard of living. Thirdly, being educated enables a person to discuss social needs and make it easier for the person to place demands of social groups collectively. Fourthly, education, particularly schooling, can have aims that go beyond formal education. Schooling not only widens the horizons of children by bringing them in contact with other children; by keeping children in school, it reduces child labour. Finally, education has empowering and distributive roles. Education allows deprived and disadvantaged

groups to protest against injustice, to resist oppression and to organise politically. In fact, even if one person is educated that person can help the others to get organised. Education helps also to reduce other forms of deprivation. For example, in Kerala, education has led to lowering of caste barriers and reduced gender bias.

## 10.2.2 India's Record in Educational Achievement

Successive five-year Plans have stressed the importance and role of education in economic development. India has managed significant gains in certain areas of education, like higher education; technical and managerial education; and research and development. People often speak of a brain drain in the form of an exodus of bright, trained scientists, engineers, doctors, computer professionals and managers (apart from brilliant students in other areas) to developed countries. But, we have to remember that India has been producing this stream of 'brains' over the years in the first place. Thus, India produces six times the number of graduates that China does. But we have to look at India's overall achievements in education.

India has managed to diversify provisions in education and increase education infrastructure in terms of institutions, enrolments and teachers.

### Institutions

The number of primary schools in the country has increased from 2.1 lakhs in 1951 to 5.9 lakhs in 1995, an increase of 181 per cent. The number of upper primary schools has gone up from 13 thousand in 1951 to 1.71 lakhs in 1995, a rise of 1216 per cent. There were 72 thousand secondary schools in 1995. The number of higher secondary schools has risen from 17 thousand in 1961 to 24 thousand in 1995 (an increase of 460 per cent) according to Economic survey 2000-2001. The number of universities has climbed upwards from 27 in 1951 to 185 in 1995, an increase of 740 per cent. There are also 42 deemed universities and 5 institutions of national importance. There are about 11000 colleges.

According to the Sixth All India Educational Survey (1993), 83.4 per cent of the rural habitations had a primary school within the habitation or within a distance of 1 km. in 1993.

### Teachers

The number of teachers working in elementary and secondary schools went up six times, from 7.5 lakhs in 1951 to 43.98 lakhs in 1995, with female teachers forming 34 per cent of the total in 1995.

### Enrolment

Enrolments in all types of institutes have registered a substantial growth. Enrolment in the primary stage went up from 19.2 million in 1951 to 109.73 million in 1995 while that of upper primary stage went up from 3.1 million to 41.01 million. At the higher secondary stage, the enrolment went up from 1.5 million in 1951 to 24.9 million in 1995-96, an increase of 1560 per cent. The share of girls' enrolment in the total enrolment rose from 13 per cent in 1951 to 25 per cent in 1995-96.

In 1951, the gross enrolment ratio was 42.6 per cent for the 6-11 age group while it was 12.7 per cent for the age group 11-14. This went up to 104.3 per cent and 67.6 per cent respectively in 1995. Taking a perspective of gender, we find that in 1995, the gross enrolment ratio in the 6-11 age group was 93.3 per cent in the case of girls while it was 114.5 per cent in the case of boys. In the age group 11-14 in the same

year, it was 54.9 and 79.5 for girls and boys respectively. However, the National Council of Educational Research and Training has considerably lower estimates than the ministry estimates, and finds that in 1997, the overall gross enrolment ratio in the primary stage was 90 per cent, with girls' enrolment ratio being 73 per cent. For 1998-99, the All-India overall enrolment ratio at the primary level (Class I-V) was 92.14 per cent. For boys, it was 100.86 while for girls it was 82.85. However, at the upper primary level (Class VI- VIII), the gross enrolment was still low at 58 per cent overall with 65.27 per cent for boys and 49.08 per cent for girls.

Let us now consider the position concerning Scheduled Castes' and Scheduled Tribes' enrolment. In 1980-81 for classes I-V, the gross enrolment for boys was 105.4 per cent for SCs, 94.2 per cent for STs and 95.8 for All-India. For girls, the corresponding percentages were 57.8 per cent, 45.9 per cent and 64.1 per cent. For total population, the percentages were 82.2, 70.0 and 80.5 respectively. Now let us consider a more recent year, 1995-96. For boys, the percentages were 129.9 for SCs, 130.0 for STs and 114.5 for All-India. For girls, the percentages were 94.9 for both SCs and STs and 93.3 for All-India. Now think about classes VI-VIII and take 1980-81. The figures for boys were 41.4 per cent for SC, 28.2 per cent for STs and 54.3 per cent for all-India.

For girls these figures were 16.2, 10.8, and 28.6 for SCs, STs and all-India respectively. For total population, boys and girls together, the figures were 29.1, 19.5 and 41.9 for SCs, STs and all-India respectively. Come to a more recent year 1995-96 now. In the case of boys the percentages were 60.7, 60.8, and 79.5 for SC, ST and all-India respectively. For girls, the percentages were 37.1, 37.1 and 55.0 for SC ST and all-India respectively. For the total population, the enrolment percentages for SC ST and all-India were 49.2, 49.2 and 67.6 respectively.

### Literacy

Let us now talk about the progress made over the years with respect to one of the most important, and perhaps the most basic, of all indicators related to education, and that is, literacy. India has made considerable progress in literacy, particularly in the 1980s and 1990s. In 1950, the literacy rate was less than 20 per cent. Even in the mid-1970s, the literacy rate was about 30 per cent. But from 1991, to 1997, the overall literacy rate climbed from 52 per cent to 64 per cent. For males, the rate rose from 64 per cent to 73 per cent while for females, it went up from 39 per cent to 50 per cent. What is somewhat heartening is that relatively poorer states like UP, Bihar and Rajasthan showed significant improvements in literacy, although from low levels. Thus, Rajasthan and Bihar, which were states right at the bottom in the ranking in terms of literacy levels in 1991, increased their literacy rates from 39 to 55 per cent, and 38 to 48 per cent between 1990 and 1996. Another state to show significant increase in literacy levels is West Bengal, which raised its literacy rate from 58 per cent in 1990 to 72 per cent in 1997.

It is estimated that currently the All-India literacy rate is growing at 2.75 per cent per year, but even then it will be more than a decade before India catches up with the literacy levels enjoyed by countries like Sri Lanka and China today. There seems to be an increased awareness as well as commitment on the part of state governments to raise literacy levels. The sustained effort made by the National Literacy Mission in the 1990s is beginning to show results. The non-Formal Education Programme was launched to meet the needs of school dropouts, working children, and those belonging to Scheduled Castes and Scheduled Tribes.

What have been the main achievements of India's educational system? First, access to education has increased for a large number of persons at the primary, secondary as well as the tertiary level. The government has sought to provide access to as well as incentives for education. Secondly, India has a huge pool of trained scientists and professionals. This is related to the third point, namely India has developed excellent institutions at every level, particularly the tertiary level. This is the reason why India is able to provide a huge corpus of talented people working in cutting-edge technology area in computer software, and have made a mark as a community even in the Silicon Valley in the USA.

### 10.2.3 Some Shortcomings of India's Educational Performance

**First**, average literacy rates are low: 64 per cent for males and 39 per cent for females at the all India level. India's literacy rates are low compared to China, lower than that of low income countries as a whole, and not higher than that of sub-Saharan Africa. Also, the percentage of people attending educational institutions is very low. Less than 3 per cent of people in the relevant age group, attend college or university. In school, the retention rate is low, and the dropout rate is very high. About 47 per cent of the children entering school make it to the end of primary level, and less than 3 per cent complete class XII.

**Secondly**, there is widespread inequality in educational achievement across states. For instance, female literacy rate is 20 per cent in Rajasthan and 25 per cent in Uttar Pradesh whereas it is 86 per cent in Kerala. This is a reflection of different policies, and varying efforts to raise literacy levels in the states.

**Thirdly**, there are large inequalities in educational achievements between different social groups and regions, between males and females, between urban and rural areas and across class and caste groups. This feature, combined with low average rates of literacy implies that disadvantaged groups in society have very low educational levels. For example, Scheduled Caste women, who comprise 16 per cent of the Indian population, have a literacy rate of only 19 per cent. Women, who belong to Scheduled Tribes, comprise 8 per cent of the total population, have a literacy rate of only 16 per cent. In many backward areas of the states such as Bihar, Madhya Pradesh, Uttar Pradesh and Rajasthan, the literacy rates for all females aged 7 and above are less than 10 per cent. Often different sources of being disadvantaged combine, such as being female, belonging to a backward caste and living in a backward region to display extremely low literacy rates.

**Fourthly**, illiteracy is widespread in all age groups and not only in the older age groups. For example half of all females in the age group 0-14 years in India are illiterate. The persistence of widespread illiteracy in the younger age groups is one of the disturbing features of the education scenario in India.

**Fifthly**, enrolment rates in India are distressingly low. Over half of the rural females in the age group 12-14 years in India have never been enrolled in any school. This proportion is two-thirds for Bihar, Madhya Pradesh and Uttar Pradesh, while it is 82 per cent for Rajasthan. For India as a whole, only 42 per cent of rural females in the age group 10-14 are attending school.

**Finally**, the cost of education, particularly higher education, is very high. Coupled with this is the fact that the quality of much of the education provided is very low. Also, the system is quite rigid. There also seems to be the case that the state has stressed on higher education in urban areas to the relative neglect of primary education in rural areas.

The mismatch between the economy's employment needs and the supply of trained manpower, has given rise to the increasing load of the educated unemployed, particularly of those with general arts degrees. On the other hand, there has been a sustained outflow, the brain-drain, of the best scientific and professional manpower to advanced countries—a subsidy paid by us to the developed countries. This included personnel in medicine as well as engineering. This has strengthened the argument in favour of privatisation of higher education, at least withdrawal of the public subsidies. These subsidies, it is argued, tend to widen socio-economic inequality. Withdrawal of such subsidies would, however, have to be balanced by suitable assistance to meritorious students, particularly from the relatively poorer strata. Similar arguments have been advanced in favour of privatised, expensive and high-tech medical facilities also, which have tended to proliferate over the last decade. These are the consequence of the increasingly unequal distribution of income, both in town and country, and tend, in turn, to accentuate such inequities. Private consumption expenditure on medical care and education has grown much faster than per capita consumer expenditure.

The distorted expansion of general higher education, and the rising backlog in primary/basic education, vocational education and adult literacy have led to relatively lower productivity-effects of public investment in education compared to that of such investment in, say, electricity, irrigation, or fertilisers.

There is also a high degree of complementing of the different components of human resource development, such as between education and health inputs, housing, and access to adequate nutrition etc. This has normally gone by default even in our policy-planning stages, thereby reducing the efficiency of public expenditure across these sectors.

#### **10.2.4 Education Policy and Strategy in India**

Education policy derives its focus from the Directive Principles of State Policy in the Indian Constitution. Article 45 of the constitution urges the State to provide free and compulsory education till the age of 14. This was to be done by 1960. Universalisation of Elementary Education (UEE) has been the cornerstone of education policy in India. This goal turned out to be too ambitious, and the measures taken in this regard have fallen far short of that required. Till date, no state in India has been able to implement compulsory education. Recently, the Supreme Court has declared right to education as a fundamental right.

Education was placed in the Concurrent List in the Constitution to facilitate smooth co-operation between the Centre and the states. There have been some later initiatives such as the Operation Blackboard, launched in 1986 to promote primary education. Or the District Primary Education Programme (now in operation in about 150 districts), launched to increase government efforts to provide education to children in the 6-11 age-group, with emphasis on girl children, marginalised communities and those with disabilities. Other recent changes include greater utilisation of Panchayati Raj Institutions functioning under the framework envisaged by the 73rd and 74th Amendment to the Constitution.

One shortcoming of Indian education policy has been that the government has repeatedly declared lofty goals without spelling out the practical steps that the policymakers proposed to take in order to realise those goals. In fact, there have often been inconsistencies between stated goals and actual policy. There are also sometimes conflicting objectives. Furthermore, there has been contradiction between stated goals and resource allocation. By international standards, India has spent

somewhat less on education. In 1996-97, the Central and state governments spent about 4 per cent of GDP on all levels of education, or 13.5 per cent of total government revenue expenditure. What the trend in education under liberalisation will be is not clear, but there will probably a greater role played by the private sector in the provision of education, and government spending on education may not rise very fast, due to the need to cut budget deficits as also the basic philosophy underlying reforms.

### Check Your Progress 1

1) Why is education important for national development?

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2) State some of the shortcomings in the performance of education in India.

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3) Briefly mention the essential features of educational policy in India.

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## 10.3 HEALTH CARE IN INDIA

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India does not have an enviable record in health care provision as well as the health status of the people; in fact, the performance has been quite poor.

A good health status of the people is a desirable goal in itself, apart from leading to higher productivity levels of the labour force because, other things being the same, healthier workers are more productive and efficient.

The very definition of poverty as followed in India requires that a certain minimum level of nutritional energy levels be met. A very low nutrition level for a large number of people implies that a substantial proportion of the Indian people still live below the poverty line. Moreover poor people are relatively more vulnerable to infectious diseases. Added to this is the fact that poverty in terms of poor nutrition resulting from very low purchasing power goes hand in hand with poor sanitation, inadequate access to drinking water and poor housing. Poverty, poor nutrition and low levels of health are almost always found together in India. In this section, we discuss the provision of health care by the State to raise the health standards of the Indian people.

### 10.3.1 Basic Health Scenario in India

After India attained Independence, health related progress has been significant in several directions. For example, the crude death rate in India declined from over 27 per thousand to less than nine, over the past 50 years. Life expectancy at birth

increased from 31-32 years in 1941-51 to an estimated 62.36 for males, and 63.99 for females. The infant mortality rate has declined from around 160 per thousand live births to 70 in 1999. Small pox has been eliminated and mortality from malaria and certain other communicable diseases has been controlled significantly. The government has launched a vigorous pulse polio programme to eliminate polio.

Considering the limited availability of health care system in the country and practically its absence in the rural areas, the Government of India had taken fairly early steps to establish a "primary health centre" (PHC) in each community development block. By the end of the Second Five-Year Plan, over 5,000 PHCs were established in the country. India became a signatory to the Alma Ata Declaration (1978) of the World Health Organisation, whereby we have been committed to achieving "Health for all by 2000 AD." Following this, the Government of India adopted a "National Health Policy" in 1982. The Ninth Five Year Plan (1997-2002) identifies health as one of the six priority areas and stresses combining various health programmes; better surveillance and control of diseases; an improved information management system; and greater use of Panchayati Raj Institutions in the delivery of primary health care.

### 10.3.2 Allocation in Health- Care

India and most other developing nations have had the explicit goal of providing health services to the entire populations by 2000 AD. But the fact remains that the trend in spending on basic public health facilities, in these countries, proved very much inadequate for realising this goal. Moreover, there is little private spending on low cost public services, like health education, immunisation, etc.

Per capita spending on health is very low in the low-income countries. As income rises, demand for health-care rises more than proportionately. This happens partly because the composition of diseases (or the case mix) gradually changes from more of preventable infections to green of diseases like cardio-vascular diseases. This phenomenon is called epidemiological transition. The latter types of diseases are very expensive to treat. Thus, in the developed countries, greater effect in lower morbidity and mortality can be brought about by preventive measures, which are inexpensive. For instance, much before the invention of penicillin, mortality rates significantly come down in the present day developed or rich countries, due to the provision of sanitation and basic (or primary) health-care services. In the early 19th century, even those countries had very high proportion of infectious diseases. Modern medicine played a lesser role in those societies. All this is important to remember, when one examines the amount of allocation made to preventive and to curative medical care in the developing countries today.

Another feature of health care facilities in the developing countries is that the funds for such services are still provided largely by private individuals. In countries like India and Bangladesh, about 60 to 70 per cent of the total expenditure on health services is provided by private individuals.

But in terms of the quantum of services provided, the share of the private sector is likely to be less because its services tend to be quite expensive when compared to the services provided in the government facilities. Actual service output of private and public sectors is not available, at present. No system exists to collect such statistics systematically.



### 10.3.3 Finances for Health Care Services

General tax revenues support health financing by most of the governments in the developing countries. Many countries have social security systems for a section of their population. For example, in India, the Central Government employees can avail of the Central Government Health Scheme (CGHS) facility and the industrial workers in the organised sector have the benefit of the Employees' State Insurance (ESI) to meet their health care needs. General cost recovery and user charges form a very small portion of the government's revenue for direct financing of health care services. Fees charges in the government hospitals, in India, covered less than two per cent of the expenditure on hospitals in 1990-91. This in fact, fell from around six per cent in the early seventies.

In the private sector, on the other hand, the physicians and other health personnel are financed completely by fees for services and other user-charges. In most developing nations, third party payments and medical insurance is rare, though in some countries, India for instance, medical insurance is gradually making an appearance. In particular, the employees of the public sector undertakings and private corporate sector are covered by a number of company-sponsored insurance schemes. The magnitude of these schemes is not known.

### 10.3.4 Structure and Component of Spending in Developing Countries

What is the kind of spending and its structure that is required for the developing countries? For this, it is essential to estimate the cost of a package of basic health intervention like immunisation, prenatal and post - natal care, and other primary health interventions. But these estimates can vary over time and across regions. In India, there is a general belief that, proportionately, more is spent on the curative rather than preventive services. But the funds cannot be entirely redirected from the curative to the preventive services, or from the tertiary to the primary care. Hospitals are necessary, too. What could be done is that the referral system should be improved which is almost non-existent at present.

If we take the type of the patients that are admitted to hospitals, we find that a large part consist of those suffering from diarrhoea, gastrointestinal diseases, respiratory diseases, tuberculosis, complications from malnutrition, and so on. These diseases can be prevented easily by laying greater stress on sanitation and preventive public health-care, and by strengthening the primary health centres in the rural areas, local dispensaries in the urban areas, and the secondary level hospitals (district hospital). Thus, if we do a cost effectiveness analysis for most hospitals in the developing countries, we shall find that although a necessary expenditure, the hospital system it is likely to be highly cost ineffective in comparison to the primary level facilities and preventive services.

What is the basic reason for the paucity of funds in the health sector? The main reason seems to be that in most developing countries, the health-care system is highly centralised. Moreover, the pricing mechanism is very poorly utilised as a revenue-generating process if and as a method to enforce a rational referral system. We shall touch upon this point in detail a little later. Apart from insufficient spending on health -care, the quality of services is poor, too. One reason is that health-care personnel in the government and public sector are often poorly paid and poorly equipped in terms of other support facilities. For instance, drug budgets and essential maintenance expenditure are often not fully met. This happens particularly when

there are budget cuts. Since salaries cannot be cut, any budget cut is met by reducing expenditure on support expenditure such a medicine, equipment and maintenance.

### 10.3.5 Health Plans and Policies in India

The overall health planning aspiration has oriented itself to being biased towards preventive public oriented services, with greater emphasis on the rural areas. At least, this is what all plan documents emphasise. The picture, in reality, is very different. The health service in India is urban-biased, elite-oriented, and curative in nature. Expenditures on health flow a lot to urban hospitals. However, some success has also been achieved in the public preventive services.

In terms of expenditure, health includes medical and public health expenditures. Health - related expenditures include family welfare, nutrition, etc. Health in India is primarily the concern of the State Governments. Family welfare, however, is looked after by the Central Government. The Ministries of Health and Family Welfare, Labour and the Department of Social Welfare are the agencies at the centre primarily concerned with health. Other specific programmers like the minimum Needs Programme, which has nutrition as a component, also have a bearing on the health policies.

In conclusion, we can make the point that the Planning Commission, which has stressed public preventive services, and the Health Ministry, which has usually emphasised curative facilities, have some times appeared to have worked at cross purposes. Another point we can make is that family welfare has assumed increasing importance, especially with respect to expenditure. Finally, the share of the government budget expenditure going to health has not seen any dramatic increase.

#### Check Your Progress 2

- 1) The National Health Policy was adopted in  
a) 1950 (b) 1969 (c) 1982 (d) 1991
- 2) Why is there usually a shortage of funds in the health sector?

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- 3) What is epidemiological transition?

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### 10.4 SOCIAL SECURITY IN INDIA

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Before we begin the discussion on the social security measures that have been taken in India in the years after Independence, we must have an idea of what exactly is meant by social security, what kind of services are provided, who are the beneficiaries, which are the institutions through which they are provided, and so on. Also, and very important, why social security measures need to be provided?

### 10.4.1 What is Social Security?

Let us begin with the last question first. For a large number of people in India, particularly for those in the rural areas and those who are poor, deprivation and vulnerability are facts. Many of the specific public actions to ameliorate deprivation and vulnerability can be considered part of the range of social security measures.

In defining or explaining what social security is, one runs the danger of being too specific or too general. In developed countries, certain instruments have been found to be important, like unemployment insurance, old age pensions and invalidity benefits. This approach may not be altogether useful and appropriate when we study developing countries. The other danger in explaining the concept of social security is to be too general. Instead of approaching the definition in terms of means, we could define social security in terms of objectives of removing deprivation and reducing vulnerability. Taking this approach, we could end up including anything that contributes towards these objectives as social security measures, that is, part of the social security system. This approach would not take us very far because human well-being is affected by many social and economic factors and not all of them are included in the definition of social security.

Experiences of the operation of markets in various countries have shown that there are certain groups in society which are vulnerable to ill-health, disease and general poverty and deprivation as the economy functions. In this regard, the state undertakes certain set of actions, which some authors put under the rubric of social security. This is a much broader idea of social security than is usually used. Usually social security is seen as measures designed to prevent hardships to members in the organized workforce, due to circumstances that cause a disruption in the earning activities. For example, a lady proceeding on maternity leave should continue to get all monetary benefits she was getting earlier. Similar is the case of provident funds or pension to provide for workers in the organized sector in their old age. However, some social scientists have argued that in poor countries where the proportion of people in the organised sector is very low, it makes sense to talk of social security as including measures for alleviating the basic vulnerability that the poor and unorganized have i.e disruption or snatching away of earning capacity or assets.

Public action is not simply action by the state. It includes actions by the public for itself. During disasters but also otherwise, the actions of NGOs, charitable and religious institutions must be mentioned here. In many traditional societies in India, the family, too, has acted as a provider of social security. Some times it can be taken to mean the checks and the pressures that, say, the print media keeps on the government. Involvement and activism by the public is necessary. The public must act as a watchdog.

### 10.4.2 Approaches in Providing Social Security

Governments can adopt two broad approaches to social security measures. The first way is to promote general economic growth and use the general benefits accruing from growth to help vulnerable sections of the population. The other approach is to take public action measures directly in terms of social sectors such as education and health and also promote better income distribution patterns, and generate employment. It is possible to argue that checking inflation also helps in mitigating adverse effects of prices on the vulnerable sections of the population. The first approach seems to have worked very well in East Asian countries like Hong Kong, Singapore, Japan and South Korea, as also for countries like Kuwait and United Arab Emirates. Cuba

is a classic example of the second approach as also is China. In fact, some observers argue that in China, when liberalisation led to very high growth rates in the eighties and nineties, social indicators like the infant mortality rate actually displayed a rise. Perhaps there has been a tradeoff between growth and social security.

Although we have contrasted between social security through growth and direct public action-based security measures, the relation between these approaches is somewhat more complex. First, in many cases the two go together. Second, in some cases, there is not so much the question of choosing between the two as of getting the timing and sequence right. For instance, it is possible for a country to first undertake direct public action for social security and not stress all that much on growth, and only later emphasise growth.

Second, it is not true that the former approach necessarily means relying on and encouraging the private sector while direct public action implies a big role for the government. India is a case in point. In the 1950s, India chose a path of development that emphasised economic growth but relied on the public sector as the engine of growth and let this sector occupy the 'commanding heights' of the economy. This measure assumed that growth will automatically trickle down. By the late sixties, it began to be felt that the benefits of growth had not reached every section of society. Incomes were still highly inequitable and skewed. Poverty levels were distressingly high. Policies had to include direct action. This led the way for direct anti-poverty and employment-generation programmes, as well as a programme to provide basic minimum needs including drinking water, housing etc. The wheel seems to have turned again in the nineties as, ever since 1991, faith has once again been placed on economic growth, although this time around with a much larger role of the private sector and foreign investors.

### 10.4.3 Social Security in the Organised Sector in India

The 1997-98 Annual Report of the Ministry of Labour has defined social security as "protection which society provides for its members through a series of public measures against the economic and social distress caused by stoppage or substantial reduction of earnings resulting from sickness, maternity, employment injury, unemployment, invalidity, old age and death and to provide for medical care and to subsidies such medical care for families with children". Social security programmes are designed to provide benefits, both in cash and kind, on occurrence of such contingencies." It is clear that this definition sees vulnerability in terms of stoppage or reduction of earnings, not as a lack of or very low levels of earnings. Also insofar as it considers situations such as ill-health. This consideration is limited to its impact on earnings and not directly as reduction of welfare.

Laws related to social security in India are mainly applicable to the organized sector and are designed to benefit workers and employees. The important laws are the following:

- The Workmen's Compensation Act, 1923
- The Employees' State Insurance (ESI) Act, 1948
- The Employees' Provident Fund & Miscellaneous Provisions, Act, 1952
- Maternity Benefit Act, 1961
- The Payment of Gratuity Act, 1972

**The Workmen's Compensation Act, 1923**, has as its objective the provision of compensation to workmen in cases of industrial accidents or in cases of occupational diseases resulting in disablement or death. It is given as compensation for death or temporary disablement to persons employed in factories, mines, plantations, the Railways and other sectors, which have been mentioned in the second schedule of the Act. The main beneficiaries of the Act are workers/dependants not covered by the ESI Act. The amount of compensation is 50 per cent of wages for a maximum period of five years in cases of temporary disablement; a minimum of Rs. 60,000 to a maximum of Rs. 2,74,000 in cases of permanent disablement; and a minimum amount of Rs. 50, 000 to a maximum amount of Rs.2,28,000 in cases of death.

**The Employees Provident Fund Act** came into force with effect from 14th March, 1952. At present, three schemes are in operation under the Act:

- The Employees' Provident Funds Scheme, 1952
- The Employees' Deposit-Linked Insurance Scheme, 1976
- The Employee' Pension Scheme,1995

Thus, the objectives of the programme are to provide compulsory provident fund, pension and deposit linked insurance. It is applicable to those factories and establishments employing 20 or more employees in scheduled industries; and such other establishments as are notified by the Central Government. Only those employees whose monthly income is not greater than Rs 5000 are eligible. This income ceiling is applicable since 1994. The earlier ceiling was Rs. 3500. Provident fund is paid at the rate of 12 per cent or 10 per cent whichever is applicable. There are monthly or family pension schemes. Other than payment at the terminal point of the working span, withdrawals can be made for life insurance or house-building purposes.

This Act is now applicable in 177 classes of factories/establishments. Each of these factories/establishments employs 20 or more workers. At the end of March 1997, 2.77 lakh establishments with 20.29 million subscribers were covered under the Employees' Pension Scheme. All persons who were members of the family pension scheme are to be compulsorily under the Employee's Pension Scheme. It is also compulsory for those who became members of the Provident Fund Scheme from 16 November 1995. The Scheme came into operation from 16 November 1995, but the employees, including those covered under the Voluntary Retirement Scheme have an option to join the scheme with effect from 1 April 1993. To be eligible under the Scheme, the person should have a minimum 10 years' contributory service. Normal pension is payable on superannuation but pension on a discounted rate is payable on attaining the age of 50 years. Under the scheme, pension is payable under the following circumstances:

- Superannuation
- Retirement
- Death during service
- Permanent total disablement
- Death during service
- Death after retirement or superannuation
- Children pension
- Orphan pension

Monthly payment is made according to the formula:

$$\text{Pension} = \text{pensionable salary} \times (\text{pensionable service} + 2) / 70$$

where pensionable salary is the average of the last twelve months' salary.

**The Payment of Gratuity Act, 1972** is applicable to factories and other establishments employing not less than 10 persons. On completing 10 years of service, employees are entitled to pension @ 15 days' wages for every completed year of service or part of the year more than six months subject to a maximum of Rs. 2.5 lakh.

**The Employees State Insurance Act 1948** is a typical social security measure and provides for a crude form of health insurance to workers. It provides for health care and cash benefit payment in the event of sickness, maternity benefit and employment injury. It applies to factories using power and employing 10 or more persons and factories and certain other establishments, which do not use power and employ not less than 20 persons. Till 1997, about 73 lakh employees were covered under the Act.

A statutory body called the Employees' State Insurance Corporation administers this Act. The ESIC has members representing employers, employees, the Central and state governments and the parliament, as also the medical profession. The Union Labour Minister is its chairperson. A standing Committee formed from among the members acts as the executive body for the ESI scheme and is chaired by a Secretary in the Ministry of Labour. There are now 20 regional Boards and about 310 Local Committees in operation.

The ESI scheme is financed mainly by contributions from employers and employees. The State Governments' share in the expenditure in the provision of medical benefits is 12.5 per cent. The expenditure on medical care has been enhanced from Rs. 410 to Rs. 500 per Insured Person Family Unit per annum from 1.4.97. From this per capita ceiling, an amount of Rs. 165 is earmarked for drugs and dressings.

The medical care under the ESI scheme is administered by the state governments except for the National Capital Region.

**The Maternity Benefit Act 1961** is designed to provide benefits to working mothers in the organised sector. Currently a proposal to extend this Act to women employees in agricultural and construction sectors in Madhya Pradesh has been approved.

#### 10.4.4 Social Security in the Un-Organised Sector

##### Land Reform Programmes

We can consider two types of policies in this context: ceiling-cum-redistribution policies and tenancy reform.

In India tenancy laws were passed in the 1950's. By the mid-1980's, about 1.5 per cent of the cultivated land had been acquired under these ceiling acts, and less than 80% of it had been actually distributed. According to the agricultural census of 1980-81, the total operated area was 163 million hectares. Of these, only 2.97 million hectares were declared surplus, but only 1.82 million hectares could actually be distributed by the mid-1980's. On an average, around 1.3 acres of land was received by nearly 3.4 million persons. The sense of security of these people was thus increased, especially as many of them belonged to the Scheduled Castes and Scheduled Tribes. However, the total amount of land distributed was itself very small, and hence a negligible proportion of the rural poor could be assisted. Implementation of ceiling laws has been very poor.

A large part in the success in tenancy reforms, where it has taken place, has been played by political imperatives and will. Two of the biggest success stories in this regard have been Kerala and West Bengal.

### Employment Generation Programmes

In India, the principal self-employment programme for the rural poor has been the Integrated Rural Development Programmes. Launched in 20 blocks in 1976, this programme was first extended to 2300 blocks in 1978 and then started all over the country in 1980. The target group was the rural poor. The programme aimed at asset creation through self-employment of the poor and the objective was to raise the poor above the poverty line through a one shot intervention. There were other programmes like Development of Women and Children in Rural Areas (DWCRA) and Training of Rural Youth for Self Employment (TRYSEM).

Wage Employment Programmes include the Employment Guarantee Scheme 1972, the Food For Work Programme, 1977, National Rural Employment Programme, 1980, and Rural Landless Employment Guarantee Programme, 1983. The last two were merged to form the Jawahar Rozgar Yojana, 1989. There have been several later programmes such as Nehru Rozgar Yojana (NRY), Prime Minister's Rozgar Yojana (PMRY), Prime Minister's Integrated Urban Poverty Eradication Programme (PMIUPEP) etc. There have been some changes, too, in the operation of earlier programmes. The Jawahar Gram Samridhi Yojana is a new programme launched in April 1999, as a successor to the Jawahar Rozgar Yojana, as a centrally sponsored scheme on a cost sharing ratio of 75:25 between the Centre and the states. The Swarna Jayanti Swarozgar Yojana (SGSY) was launched in April 1999 by restructuring and combining the Integrated Rural Development Programme and the Million Wells Scheme into a single self-employment programme. To provide benefits of social assistance to poor households affected by old age, the government launched the National Social Assistance Programme (NSAP) on 15 August 1995 as a 100 per cent centrally sponsored programme. There are other programmes like the Employment Assurance Scheme (EAS) started in 1993 in 1772 backward blocks situated in drought prone, desert, hilly and tribal areas; and the Pradhan Mantri Gramodaya Yojana (PMGY) and the Swarna Jayanti Shahari Rozgar Yojana (SJSRY). These differ among each others in objectives, breadth, and coverage. We have listed these programmes only as illustration, and have not provided any description and analysis.

These programmes are sometimes studied as poverty alleviation programmes and employment generation programmes. But it is clear, and as mentioned above, some writers hold this view, that for the poor, basic needs, employment, access to assets like land, and as you will study in the next block, food security, are all components of social security.

Apart from these there are particular measures for unorganised labour, such as the Beedi Workers' Welfare Fund Act, 1976 and the Cine Workers' Welfare Fund, 1981. There is also a very elaborate Minimum Needs Programme which aims to provide necessities like clean drinking water, sanitation, and housing. A programme that aims to provide housing for the poor, Indira Awaas Yojana also is in operation.

### Check Your Progress 3

1) What do you understand by social security?

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- 2) Mention some of the important social security measures in operation in the organised sector in India.

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- 3) What kind of social security can be provided to the poor and vulnerable in the unorganised sectors?

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## 10.5 LET US SUM UP

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This unit discussed some aspects of education, health and social security in India. Economic and social development depends to a greater extent upon the quality of labour force, which in turn, can be improved through better education and health facilities.

Realising the importance of education, the framers of Indian Constitution have included the provision of free and compulsory elementary education as a Directive Principle of State Policy. Although universalisation of elementary education and eradication of illiteracy have been repeatedly stated as a plan objective, it has not yet been achieved. However, there is significant growth in educational facilities and enrolment. There are perceptible disparities in enrolment and literacy to the disadvantage of the female sex. The inter-state variation in literacy shows a positive association between literacy and level of development barring a few poor states like Kerala, Tamil Nadu, Karnataka and Himachal Pradesh having higher literacy. Keeping in view the imbalances in different faculties of higher education and the pressing unemployment situation, there is recent stress on vocationalisation of education at the ten-plus-two level.

There is considerable growth in primary health care in terms of coverage of population. The expanded medical infrastructure in both rural and urban areas and the strategies to control various diseases through immunisation, provision of safe drinking water, improved nutrition of mother and child, and maternal and child health services have reduced the morbidity and mortality in the population. This has increased life expectancy and reduced infant mortality.

There are substantial regional variations in the availability of medical infra-structure. In terms of quality and quantity, urban areas are much better-off than rural areas. Considering the limited availability of health care system in the country and practically its advance in the rural areas, the Government is committed to achieve 'Health for All by 2000 AD.' But the present patterns of both educational and health facilities do not answer to the requirements of the rural and urban poor.

The unit gave an expanded notion of social security. The unit not only discussed about social security in the organised sector but also the notion of social security applicable to the poor and vulnerable in the non-organised sector, such as measures regarding land reforms, food security, and provision of poverty alleviation and employment generation programmes.



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## 10.6 KEY WORDS

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**Infant Mortality Rate:** Rate of death during first year of age per thousand of live births.

**Literacy Rate:** Percentage of literate to total population.

**Non-plan Expenditure:** Non-plan expenditure is those expenditure, which do not form part of the current five-year plan. Therefore, non-plan expenditure is a kind of committed expenditure on the projects completed during earlier plans. Sometimes, non-plan expenditure is also designated as maintenance expenditure.

**Plan Expenditure :** All those expenditure, which are included in the current five-year plan, are known as plan expenditure. For example, expenditure on educational projects included in the Eight Plan will be known as plan expenditure during the period of ixth Plan.

**Privatisation:** Activities organised in the Public Sector from public resources in the form of productive enterprise, or utilities and service facilities, particularly those sub serving public, community needs, have sometimes been, transferred to the private sector. Thereby, these activities become subject to the usual market forces of cost, price and profit determination, which the public sector cannot always adhere to in pursuance of social objectives. This process of transferring activities from the public to the private sector is called privatisation.

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## 10.7 SOME USEFUL BOOKS

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Ahmad, Ehtisham, Jean Dreze, John Hills, and Amartya Sen (eds.) 1991. *Social Security in Developing Countries* Claredon Press: Oxford.

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## 10.8 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress 1

- 1) See Sub-section 10.2.1
- 2) See Sub-section 10.2.3
- 3) See Sub-section 10.2.4

### Check Your Progress 2

- 1) c)
- 2) See Sub-section 10.3.2

### Check Your Progress 3

- 1) In broad sense, Social Security refers to all measures (including public and private) which aim to remove deprivation and reduce vulnerability of the people.
- 2) See Sub-section 10.4.3
- 3) See Sub-section 10.4.4

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# UNIT 11 INFRASTRUCTURE

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## Structure

- 11.0 Objectives
- 11.1 Introduction
- 11.2 The Concept: Meaning and Definition
  - 11.2.1 Meaning
  - 11.2.2 Definition
- 11.3 The Distinction between Physical and Social Infrastructure and their Scope
- 11.4 Role of Infrastructure in the Economy
  - 11.4.1 Infrastructure and Economic Development
  - 11.4.2 The Social Dimensions
- 11.5 Development of the Infrastructure at the Aggregate Level
- 11.6 Development of Physical Infrastructure in India
- 11.7 Development of Social Infrastructure in India
- 11.8 Let Us Sum Up
- 11.9 Key Words
- 11.10 Some Useful Books
- 11.11 Answers/Hints to Check Your Progress Exercises

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## 11.0 OBJECTIVES

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After going through this unit, you will be able:

- To explain the meaning and definition of infrastructure and its role in the economy;
- To describe the development of infrastructure in Indian economy and its shortcomings; and
- To differentiate between infrastructure sectors and other sectors of the economy.

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## 11.1 INTRODUCTION

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Infrastructure plays an important role in the development of an economy. The adequacy or lack of it determines an economy's success or failure in increasing production, expanding trade, reducing poverty and improving environmental conditions. In this unit, we shall, therefore, introduce to you the concept and definition of infrastructure, its role and importance in the development of economy. Distinction between physical infrastructure and social infrastructure will be explained. You will also be appraised of the progress of infrastructure made over the last 50 years and its evaluation.

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## 11.2 THE CONCEPT: MEANING AND DEFINITION

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In the present section, we explain the meaning and also define the term infrastructure.

### 11.2.1 Meaning

Man, with the help of natural resources and capital, produces goods in the form of raw materials, intermediate goods and final goods. These goods have to be moved from the place of production to the place of use or place of consumption. Not only the goods, but also even men have also to travel from their residence to their place of work. Thus, we need means of transportations like road transport, railways, airways and shipping for transporting goods and persons. This means that the production

process will be completed only with the help of transportation. Similarly in modern production process, factors of production have to be paid in money form. Business is also possible with money transactions. Broadly, the banks facilitate these transactions. We also need power, not only for domestic lights but also for production. Power, in the modern production process, is a very essential requirement.

All the industries, which are not themselves producing goods, but are very essential for carrying out and the completion of the modern production process are called infrastructure sector. The infrastructure sector either complements the production of goods or supplements the production process. Infrastructure sector includes all that processes which are essential in the completion of the production process.

### 11.2.2 Definition

Infrastructure is generally defined as the physical framework of facilities through which goods and services are provided to the public. Its linkages to the economy are multiple and complex, because it affects production and consumption directly, creates positive and negative spillover effects (externalities), and involves large flows of expenditure. Infrastructure is an umbrella term for several activities referred to as 'social overhead capital' by development economists such as Paul Rosenstein-Rodan, Ragnar Nurkse and Albert Hirschman. Neither term is precisely defined, but both comprise activities that share technical features (such as economies of scale) and economic features (such as spillovers from users to non-users). Social overhead capital, by definition, includes all those, which are not directly productive activities, but are necessary for the development of directly productive activities such as agriculture and industry. They are, usually, in the Nature of universal inputs, that is inputs required for the production of most goods and services. These inputs are distinct from product-specific inputs like cotton for cotton cloth production, iron-ore for steel production, etc.

#### Check Your Progress 1

- 1) Explain in one sentence the meaning of the term infrastructure.  
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- 2) What is the difference between a producer sector and an infrastructure sector?  
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- 3) Name the development economists who have referred Infrastructure as social overhead capital.  
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## 11.3 THE DISTINCTION BETWEEN PHYSICAL AND SOCIAL INFRASTRUCTURE AND THEIR SCOPE

In the current economic thinking, distinction is made between the physical infrastructure and social infrastructure. In this section, we shall explain you the distinction between these two terms and their scope in the economy.

To start with, we may reclassify the sectors (as classified in the National Accounting) into four main-categories. These are:

(i) Commodity producing sectors, (ii) physical infrastructure, (iii) social infrastructure and (iv) other sectors. The details of these sectors grouped into these four categories are given below in Table 1.

**Table 1 : Classification of Economic Sector**

<b>A) Commodity Producing Sectors</b>
1) Agriculture, forestry and fishing.
2) Mining and quarrying.
3) Manufacturing.
4) Construction.
<b>B) Physical Infrastructure</b>
1) Power
2) Transport
3) Communication
4) Trade
5) Banking and insurance.
<b>C) Social Infrastructure</b>
1) Health
2) Education
3) Supply of drinking water
4) Sanitary conditions
5) Social and personal services.
<b>D) Other Sectors</b>
1) Public Administration and Defence.
2) All other activities.

From the sectors listed under (A), you can easily find that these sectors produce goods. Agriculture produces agricultural products like wheat, rice, cotton, jute, etc. Construction produces houses and other buildings, bridges, etc. Manufacturing converts goods from their original form produced by agriculture, mining, etc., to a new form. For example, cars, bicycles, fridges, TVs, etc. are manufactured goods. The various sectors covered under physical infrastructure under group (B) help in the production process. Power, transport, communication, trade, etc. help in the production process. The households consume electricity, use transport for pleasure trip and also directly consume the services produced by these sectors.

However, basically these sectors are taken to help the production process. Social infrastructure under group (C) includes those sectors, which help the production

process in an indirect way. For instance, health services will help to keep persons healthy, cure their diseases, etc. This will reduce absenteeism at the work places. A low rate of absenteeism, in turn, will help in raising production. Similar is the role played by the education, which basically trains persons and imparts skills. This training helps in raising the workers' efficiency. Thus, the sectors listed under (C) are helpful in the production process but in an indirect way. Not only that, in many case the services of these sectors may be consumed directly. For instance, after getting education, a person may not enter into the production process, as in the case of educated housewife. These examples could be multiplied. Moreover, a person may receive education for self-development rather than for skill formation. Finally, in Table 1, under group (D) we have listed other sectors like Public Administration and Defence, and the remaining activities in the society. It is hoped that a student, with a little knowledge of the economic sectors in an economy will be in a position to distinguish between the infrastructural sectors and other sectors in the economy. With this background, let us now shift to the role of infrastructure in the economy.

### Check Your Progress 2

1) State the sectors covered under physical infrastructure:

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2) What are the sectors covered under social infrastructure?

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## 11.4 ROLE OF INFRASTRUCTURE IN THE ECONOMY

Infrastructure is essential for households, firms and governments to function. The social overhead capital has a pervasive impact on economic development and human welfare. The adequacy or lack of infrastructure largely determines an economy's success or failure in increasing production, expanding trade, coping with population growth, reducing poverty or improving environmental conditions. Adequate infrastructure helps in raising productivity and lowering costs in the directly productive activities of the economy. It has to expand fast enough to accommodate and facilitate growth.

### 11.4.1 Infrastructure and Economic Development

The precise links between infrastructure and economic growth are still open to debate. However, the historical experience reveals that the level and rate of growth of aggregate output is related positively with the level and rate of growth of infrastructure activity. The World Bank Development Report for 1994, which focuses on infrastructure for development, brings out a strong positive relationship between the level of GDP and infrastructure stocks per capita. The World Bank study reveals that 1 per cent increase in the stock of infrastructure is associated with 1 per cent increase in the GDP in an economy. Infrastructure contributes to economic development both by increasing productivity and by providing amenities, which enhance the quality of life. The services provided lead to growth in production in several ways. The availability of adequate infrastructure facilities is imperative for the overall economic development of a country. Infrastructure adequacy helps determine success in diversifying

production, expanding trade, coping with population growth, reducing poverty and improving environmental conditions. They raise the productivity of other factors, including labour and capital. Infrastructure is thereby often described as an “unpaid factor of production”, since its availability leads to higher returns obtainable from other capital and labour. Infrastructure services are intermediate inputs to production and any reduction in their costs raises the profitability of production, thus permitting higher levels of output, income and/or employment. Typically, as incomes rise, the composition of infrastructure changes significantly. For low-income countries, more basic infrastructure - water, irrigation, and (to a lesser extent) transport is important. As these economies mature, most of the basic Consumption demands for water are met; the share of agriculture in the economy shrinks, and more transport infrastructure is provided. The share of power and telecommunications is greater in high-income countries.

Further, as an economy develops, infrastructure must adapt to support changing patterns of demand. The shares of different components of infrastructure such as power, road, railways and telecommunications in the total stock of infrastructure increase as compared to those of basic services such as water supply and irrigation with economic development.

The kind of infrastructure put in place also determines whether economic growth can eliminate or reduce poverty. Most of the poor reside in rural areas, and the growth of farm productivity and non-farm rural employment is linked closely to infrastructure provision. An important factor in China’s success with rural enterprises has been a minimum package of transport, telecommunications, and power at the village level. Rural enterprises in China now employ more than 18 per cent of the labour force and produce more than a third of China’s GDP.

## **11.4.2 The Social Dimensions**

### **11.4.2.1 Impact on the Environment**

The relationship between infrastructure sector and the environment is complex. Infrastructure’s linkages to the environment, as to poverty, are felt both through its effects on the quality of life and on economic productivity. These effects may be positive as well as negative depending on the nature of infrastructural development. Negative environmental impacts often result from a failure to take account of interdependence among infrastructure sectors. For example, under-investment in sewage relative to water supply in many places has led to harmful contamination of water reserves, exacerbated flooding, and reduced the health benefits from investments in water supply. Poor management of solid waste and inappropriate disposal further complicates wastewater disposal and urban street drainage. There are also many positive aspects for synergies among activities in infrastructure and other sectors to increase both environmental and economic benefits in urban areas. For example, reclaimed landfill sites and wetlands used for sewage treatment can be developed into recreational parks. Duckweed ponds can serve both as wastewater treatment and a source of high-quality protein feedstock for animals. Methane can be extracted from sewage treatment plants and from the decomposition of organic matter in landfills and used as fuel. Compost from organic solid waste can restore soils, and properly treated municipal sewage and wastewater can be used for irrigation. Recycling of municipal solid waste can reduce the requirements for virgin raw materials, such as trees for pulp. Technical and economic requirements may not make these options attractive or feasible in all cases, but examples do exist of their current application even in some of the least developed countries.

### 11.4.2.2 Impact on Health

Inadequate infrastructure can have multiple effects on health, and thereby on labour productivity as well as quality of life. Improvements in water supply and sanitation have a large impact in reducing death rate from major water-borne diseases and reducing the severity of disease when it occurs. It is interesting that the health benefits are not assured merely by access to the physical infrastructure of water supply. Adequate sanitation is critical to the reduction in incidence and severity of diseases and thus planning for both water supply and sanitation needs to be better integrated. In addition to the obvious linkage between water and sanitation and health, the quality of transport and communication infrastructure can affect access to health care. Air pollution and safety hazards connected to motor transport - accidents on congested routes - also affect death rate, particularly in densely populated areas, where the poor are often concentrated.

### 11.4.2.3 Impact on Work Efficiency of Man

Infrastructure developments, such as improved transport, which reduce workers' time spent on non-productive activities or which improve health status (for instance, through better access to clean water and sanitation), raise the economic returns on labour. By the same token, the lack of affordable access to adequate infrastructure is a key factor in determining the nature and persistence of poverty. Inadequate access affects the time allocation of the poor and thus inability to engage in income-earning activities or activities which would have a greater impact on the household's welfare.

### 11.4.2.4 Linkages to Poverty

The main point from the above discussion of infrastructure's linkages to productivity and health, and its implication for poverty is not that the provision of infrastructure is often highly unequal, as is so often the case with other resources as well. Rather, the way in which infrastructure is provided and especially the way in which it is financed, have implications for the potential to mitigate poverty and reduce inequalities in the longer term. The impact on low-income individuals' access to infrastructure depends on the options available, and the poor as a group have fewer or less attractive options than the rich.

### Check Your Progress 3

- 1) Adequate infrastructure helps in raising .....
- 2) Briefly state the relationship between the infrastructure and economic development.  
.....  
.....  
.....
- 3) Explain the impact of infrastructure development on environment of a nation.  
.....  
.....  
.....
- 4) How a lack of health facilities affect the labour productivity and thereby the development of the economy?  
.....  
.....  
.....



## 11.5 DEVELOPMENT OF THE INFRASTRUCTURE SECTOR AT THE AGGREGATE LEVEL

In this section, we will discuss the development of the infrastructure in India at the aggregate level i.e. adding all the components like, transport, banking, communication, etc. This is analysed by considering the total value added by it (or total income generated by this sector), annual growth rates and its share in the Gross Domestic Product of India. Data for this, for the period 1950-51 to 1994-95 for different years are given below in Tables 2 and 3.

Table 2 : Growth of Infrastructure in India - At 1980-81 Prices  
(Rs. in crore)

Year	Physical Infrastructure	Social Infrastructure	Total
1950-51	8,728	2,561	11,379
1960-61	13,503(4.46)	3,581(3.05)	17,084(4.15)
1970-71	21,213(4.62)	5,261(3.92)	26,474(4.48)
1980-81	33,298(4.61)	7,041(2.96)	40,339(4.30)
1990-91	64,241(6.79)	12,128(5.59)	76,369(6.59)
1994-95	82,248(6.37)	14,896(5.27)	97,144(6.20)

Data Source: Based on National Account Statistics for various years.

Note: Figures in parentheses are annual growth rates.

The income generated by the infrastructure sector over a period of 44 years at 1980-81 prices, has increased, by about 8-9 times whereas at current prices the increase is by 252 times. At constant prices, the growth rate for the first three decades i.e. during 1950s 1960s and 1970s was 4.15, 4.48 and 4.30 per cent per annum. During the eighties, there was an acceleration in the growth, which rose to 6.59 per cent per annum. In the first 4 years of the current decade, the growth is slightly lower at 6.20 per cent.

**Share in the GDP:** Percentage shares in the Gross Domestic Product (GDP) of the infrastructure sector are given in Table-3. At the beginning of the plans in India, the share of infrastructure in the GDP at constant prices was 26-27 per cent. Over the period this percentage share has grown to about 38 per cent by 1994-95. In terms of current prices during the same period, the relative share has increased from about 26 per cent to more than 38 per cent.

Table 3 : Share of Infrastructure in the GDP  
(Percent)

Year	At 1980-81 prices			At current prices		
	Physical	Social	Total	Physical	Social	Total
1950-51	20.36	6.18	26.54	20.26	6.03	26.29
1960-61	21.47	5.69	27.16	24.61	5.74	30.35
1970-71	23.46	5.82	29.28	24.30	5.32	29.62
1980-81	27.20	5.75	32.95	27.20	5.75	32.95
1990-91	30.26	5.71	35.97	30.38	5.86	36.24
1994-95	32.77	5.93	38.70	32.27	5.97	38.24

Data Source: Based on data contained in the National Account Statistics for various years.

A split into physical infrastructure and social infrastructure reveals that both at constant and current prices, it is the share of the physical infrastructure which has increased. The share of physical infrastructure increased from about 20 per cent in 1950-51 to about 33 per cent by 1994-95. Against this increase, the share of social infrastructure in the GDP, both at constant and at current prices, has remained at around 6 per cent.

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## 11.6 DEVELOPMENT OF PHYSICAL INFRASTRUCTURE IN INDIA

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Now we proceed to discuss the development of infrastructure in India at the disaggregated level. For the sake of simplicity, we shall confine to discuss important components such as Power, Telecommunications, Road, Rail and Port transport. Electricity generation in the country, which was only 4.1 billion units (kwh) in 1947 increased to about 480 billion units for the year ended March, 2000, marking a compound annual growth rate of 7.5 per cent. Despite this, the power supply has lagged behind the growth in demand. At the commencement of the Ninth Five Year Plan (April 1997), country faced shortage of around 21 per cent during peak hours and a shortage of about 9 per cent on an average. Corresponding figures at the end of March 2000 were 20 per cent and 8.5 per cent. The main reasons for the shortfall in supply and demand are deficiencies in project management, problems related to externally aided projects, law and order problems and resource constraints. Although coal, oil, gas and hydroelectric potential constitute the conventional sources of electricity generation, coal-based thermal power plants and hydropower have been the mainstay. It is assessed that 78 per cent of the country's hydel potential remains as yet unexploited. Besides, wind and solar energy are also available for tapping. There is little doubt that coal-based generation will continue to be the bedrock of India's power sector for the foreseeable future. But with logistic and environment-related issues coming to the fore, an integrated medium- and long-term fuel policy for power needs to be hammered out urgently.

Households and agricultural sectors have shown maximum growth in consumption in the last three decades. Household consumption is certain to remain a high-growth area whereas growth in agricultural consumption is expected to stabilise. Long-term projections indicate a fairly stable division of demand with the domestic and agricultural sectors together accounting for about 47 per cent of the total with commercial, industrial and others making up the remaining 53 per cent.

**Telecommunications:** Telecommunications is now universally acknowledged as one of the prime movers of the modern economy. Hence it has a vital importance for a developing economy like India. There is a large unsatisfied telecommunication demand, which needs to be addressed at the earliest.

The telecom network in India today is one of the largest telecom network in Asia. With over 35 million lines, it is the 14th largest in the world. Yet, in India, there are only 1.3 telephones per 100 persons while the world average is over 10. In India, more than 21 lakh consumers are in the queue waiting for a telephone line. The demand for telephones services is expected to be of the order of 310 lakh lines by the year 2001 and 640 lakhs by 2006. The current services network of the Bharat Sanchar Nigam Ltd., and Mahanagar Telephone Nigam Ltd. has been around 122 lakh subscribers, with another 21 lakh in the waiting list. Thus an additional 190 lakh telephone lines would be required to be added in the next five years and another 330 lakh in the subsequent five years to meet the expected demand. Of this, BSNL and the MTNL aims at putting in an additional 103 lakh lines by 2001 and another 190 lakh by 2006 through internal accruals (assuming a growth rate of 13 per cent

sustainable through internal accruals beyond 1996). The rest of the demand, which should be about 90 lakhs by 2001 and an additional 140 lakh by 2006, is expected to be met by the private sector. Added to this, there is the demand for cellular mobile services in India. This is expected to be of the order of 20 lakhs by 2001 and grow to 50 lakhs by 2006.

**Transport:** Roads in India, for the purpose of their management and administration, are divided into National Highway, State Highways, district roads and village roads. Under the Constitution, responsibility for the development and maintenance of National Highways rests with the Central Government, while all other roads are the responsibility of the state governments concerned. While the National Highways are intended to facilitate medium and long-haul intercity passenger and freight traffic across the country, State Highways are supposed to carry the traffic within the state. Together, they provide the main mobility function in the transportation system. District roads and village roads serve to connect villages to provide accessibility and market linkages. Major district roads provide the secondary function of linkages between the main roads and the rural roads.

Presently, the National Highways are being developed, maintained and managed under an agency system. The overall responsibility including planning, budgeting, standardisation is handled by the Ministry of Surface Transport. The Government of India has, however, under an Act of Parliament in 1988, established the National Highways Authority of India (NHAI) for developing, maintaining and managing the National Highways as a single agency. Presently, the functions relating to externally-aided projects, implementation of the policy of private sector participation and development of wayside amenities along the National Highways have been assigned to NHAI. From 1951 to 2000, the average yearly growth of road traffic has been of the order of 8 to 10 per cent. Freight traffic has increased from 6 BTK (billion tonne kilometer) in 1951 to 850 BTK in 2000 and passenger traffic from 23 BPK (Billion Passenger Kilometers) to 2000 BPK during this period. Factors that contributed to this are flexibility, door-to-door service, reliability and speed. In line with the increase in traffic carried by roads, the total number of vehicles has also grown from 3 lakh in 1951 to 372 lakh in 2000. It is expected that the total number of registered vehicles will increase to 600 lakh by the year 2005. However, the main road network comprising of National and State Highways has not matched this traffic growth. Much of the expansion of the road network has been through building the rural roads constructed to provide connectivity to rural masses, although 50 per cent of the villages are still to be connected with all-weather roads. The expansion of National Highways has been only about 55 per cent from about 20,000 km. in 1951 to 34,800 km. in 2000 and of State Highways by 118 per cent from 60,000 km. in 1951 to 137,100 km. in 2000.

The main roads have also not kept pace with the traffic demand in terms of their quality. Out of the total 165,000 km. length of National and State Highways, only 2 per cent of their length is four-lane, 34 per cent two-lane and 64 per cent single-lane.

Inadequate road networks have led to higher transportation costs, which have also severely eroded international competitiveness of the Indian economy.

**Ports:** India has 12 major ports and the primary responsibility for development and management of these ports rests with the Central Government. These ports are governed by the Major Port Trusts Act, 1963, which enables these ports to conduct regulatory as well as commercial functions. The State Governments administer 139

intermediate and minor ports. Each major port has a Board of Trustees representing various interests.

The total capacity as on March 31, 2000 in all major ports was about 258 million tones. Most Indian ports are operating at more than 100 per cent capacity utilisation, and yet are inefficient when compared to other ports in the region. One reason for this anomaly is that due to certain economic compulsions, the general cargo berths are often used to load or unload bulk cargo such as coal. This temporarily increases capacity utilisation of the ports.

The major ports account for 95 per cent of total traffic handled. During the decade 1951-61, traffic growth was only around 5.2 per cent per annum. Between 1961 and 1971, it increased to around 6.8 per cent per annum and slowed to 4.4 per cent in 1971-1981. However, between 1981 and 1991, traffic grew faster by 8-9 per cent per annum. It further increased by 7.1 per cent during the period 1992-93 to 1999-2000.

Over time, the commodity composition of traffic handled at major ports has also undergone a substantial change. Petroleum and petroleum products accounted for only 8 per cent of the total traffic in 1950-51 but today account for over 41 per cent.

**Railways:** Till 1994, railways including its allied services have been entirely in the public sector. However, from 1993-94, some of the services like catering in the coaches have been privatised. Still Railways, in spirit, continues to be Government controlled. The Annual Budget of the Ministry of Railway is put-up before the Parliament for its approval.

For the purpose of administration, Railways in India, is divided in 6 zones. These are Central, North-Eastern, North-East Frontier, Southern, South Central and Western.

Over the period 1950-51 to 2000-01, the railways have made substantial progress. Over the period of 50 years, the freight traffic of the railways have increased by more than 8 times and the passenger traffic by 6 times.

As far as rolling stock is concerned, there is a decline in the total number of locomotives (Engines) from 8,209 in 1950-51 to 6400 by end-March, 2000. This is mainly due to a decline in the steam engines from 8,120 in 1950-51 to just 160 by 1999-2000. Over the period these steam engines have been replaced by diesel and electrical locomotives. Diesel locomotives have increased from just 17 to 4500 and electricals from 72 to 2500 between 1950-51 and 1999-2000.

In line with the shift from steam engines to diesel and electrical engines, there is an increase in electrical coaches from 460 to 3,692 about 9 times over the 50 years period. There is an increase in the conventional coaches by about 8 times, from about 88 thousand in 1950-51 to 725 in 1999-2000. As against these, the increase in wagons is about 36 per cent only i.e. from 206 thousand in 1950-51 to 298 thousand in 1999-2000.

Thus the increase in wagons, which are used for transportation goods is very low. This is both a cause and consequence of shift in the goods traffic from railways to the roadways. Whereas in 1950-51 the distribution of goods traffic between the railways and the roads was 75:25 by 1999-2000, this has turned to 25:75. This means the total goods traffic originating in India, whereas in 1950-51, 75 per cent was carried by the railways, in 1999-2000 only 25 per cent went to railways.

Plan allocation to the railways, starting from the 1st Plan are given in the following:

**Table 4 : Plan Expenditures  
(Rs. Crore)**

Plans	Expenditures			Percentage shares	
	Railways Transport	Total Transport	Total Plan	Transport as % to total Plan	Railway
1. First	217	434	1,960	22.1	11.07
2. Second	723	1,100	4,672	23.5	15.48
3. Third	1,326	1,983	8,577	23.1	15.46
4. Fourth	934	2,522	15,779	16.0	5.92
5. Fifth	1,523	4,078	18,991	14.1	5.25
6. Sixth	6,585	13,841	109,292	12.7	6.02
7. Seventh	16,437	29,582	220,216	13.4	7.46
8. Eighth	27,202	53,966	434,100	12.4	6.20

Whereas in current prices and in absolute terms the Plan expenditures of Railways have increased by 125 times, the share has declined from more than 11 per cent to about 6.3 per cent.

#### Check Your Progress 4

- 1) Write a very brief note on development of the power sector in India.

.....  
 .....  
 .....

- 2) The telecommunication sector in India is not small in absolute term. Explain.

.....  
 .....  
 .....

- 3) For the purpose of their management, the roads in India are divided into .....Parts.

.....  
 .....  
 .....

- 4) India has ..... major ports and the primary responsibility for development and management of these ports rests with the .....

- 5) Write a brief note on the development of railways in India since 1951.

.....  
 .....  
 .....

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## 11.7 DEVELOPMENT OF SOCIAL INFRASTRUCTURE IN INDIA

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We have seen above in Section 11.3 that Social Infrastructure comprises of health, education, drinking water supply, sanitary conditions and social and personal services. Here, we will discuss briefly, the development of some of these sectors over the period.

**Health:** In India there has been manifold increase in the health facilities. There has been a development in all types of pathology: Allopathy, Ayurveda, Homeopathy and Unnani. All these various methods of treatment of human illness have developed over the period. However, data on development are available only for allopathy.

These data reveal that over a period of 50 years i.e. 1951 to 2000, number of doctors per lakh of population have increased by three fold i.e. from 17 doctors in 1951 to 52 doctors per lakh of population. This gives an annual growth rate of only 2.43 per cent. For the same period, number of beds for lakh of population have increased from 32 in 1951 to 101 in 2000, which gives an annual growth rate of 2.56 per cent. Similarly, number of hospitals have increased from 0.75 in 1951 to 1.66 in 2000. This gives a growth rate of only 1.73 per cent per year.

**Education:** Education is another important social infrastructure. When we look at the figures of expansion in schools, we find that number of schools (these are primary, middle, high and higher secondary and senior secondary schools) have increased from 2.31 lakh in 1951 to 11.56 lakhs in 2000. This gives an annual growth rate of about 3.22 per cent.

### **Expenditures on Social Infrastructure**

Expenditures by the government both by the central and states, have increased substantially over the successive plans. These figures are, however, at current prices. These data reveal that expenditures on education in terms of per capita increased from mere Rs.5 in 1950-51 to Rs.564 in 1999-2000, an increase of more than 9 per cent per annum. Per capita expenditures on health have increased from Rs.2 to Rs.96, an annual increase of about 8 per cent between 1950-51 and 1999-2000. Finally, on social security per capita expenditures between 1950-51 and 1999-2000, have increased from Re.1 to Rs.69, an increase of about 10 per cent per annum.

### **Check Your Progress 5**

- 1) In India doctors per lakh of population have increased from ..... in 1951 to ..... in 2000.
- 2) Per capita expenditure on education has increased from ..... in 1950-51 to ..... in 2000.

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## 11.8 LET US SUM UP

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Infrastructure plays an important role in the development of an economy. The social overhead capital has a pervasive impact on economic development and human welfare. The adequacy or lack of infrastructure largely determines an economy's success or failure in increasing production, expanding trade, coping with population growth, reducing poverty or improving environmental conditions. Adequate infrastructure helps in raising productivity and lower costs in the productive activities of the economy. It has to expand fast enough to accommodate and facilitate growth. Further, as an

economy develops, infrastructure must adapt itself to support changing patterns of demand. The shares of different components of infrastructure such as power, transport and telecommunications in the total stocks of infrastructure increase as compared to those of basic services such as water supply and irrigation with economic development.

The kind of infrastructure put in place also determines whether economic growth can eliminate or reduce poverty. Most of the poor reside in rural areas, and the growth of farm productivity and non-farm rural employment is linked closely to infrastructure provision. An important factor in China's success with rural enterprises has been a minimum package of transport, telecommunications, and power at the village level. Rural enterprises in China now employ more than 18 per cent of the labour force and produce more than a third of China's GDP.

Infrastructure contributes to economic development both by increasing productivity and by providing amenities, which enhance the quality of life. The services provided lead to growth in production in several ways.

In India, however, infrastructure has not received due attention, it deserves. The share of infrastructure in the total GDP in India has been very low. The share of physical infrastructure in the GDP remained below 25 per cent. Even now the share is below even 33 per cent. This is much lower when compared with 50-55 per cent in the industrialised countries and 45-50 per cent in many developing countries. Electricity generation in the country which was only 4.1 billion units (kwh) in 1947 increased to about 480 billion units for the year ended March 2000, marking a compound annual growth rate of 7.5 per cent. Despite this, the power supply has lagged behind the growth in demand. At the end of March 2000, the country faces shortage of around 19 per cent during peak hours and a shortage of about 8 per cent on an average. Although, coal, oil, gas and hydro-electric potential constitute the conventional sources of electricity generation, coal-based thermal power plants and hydro-power have been the mainstay. It is assessed that 78 per cent of the country's hydel potential remains as yet unexploited.

The main reasons for the shortfall in supply and demand are deficiencies in project management, problems related to externally-aided projects, law and order problems and resource constraints.

The telecom network in India today is not small in absolute terms. With over 12 million lines, it is the 14th largest in the world. Yet, In India, there are only 1.3 telephones per 100 persons when the world average is over 10. In India, more than 21lakh consumers are in the queue waiting for a telephone line.

The main road network comprising of National and State Highways has not matched this traffic growth. Much of the expansion of the road network has been through building the rural roads constructed to provide connectivity to rural masses, although 50 per cent of the villages are still to be connected with all-weather roads. The expansion of National Highways has been only about 55 per cent from about 20,000 km. in 1951 to 34,1000 km. in 2000 and of State Highways by 11.8 per cent from 60,000 km. in 1951 to 131,000 km. in 2000.

The main roads have also not kept pace with the traffic demand in terms of their quality. Out of the total 165,000 km. length of National and State Highways, only 2 per cent of their length is four-lane, 34 per cent two-lane and 64 per cent single-lane.

Inadequate road networks have led to higher transportation costs, which have also severely eroded international competitive-ness of the Indian economy.

Railways in India have been developed so far only in the public sector. However, there has not been development of this sector at the required rate. Consequently it is fast losing its traffic to the road transport, specially the goods traffic. The increase in wagons, which are used for transportation of goods is very low. This is both a cause and consequence of shift in the goods traffic from Railways to the Roadways. Whereas in 1950-51 the distribution of goods traffic between the Railways and the Roads was 75:25 by 1999-2000, this has turned to 25:75. This means of the total goods traffic originating in India, whereas in 1950-51, 75 per cent was carried by the Railways, in 1999-2000 only 25 per cent went to railways. The key problem faced by Indian ports is low productivity.

The major factors contributing to lower productivity of ports are:

- Operational constraints such as frequent breakdown of cargo handling equipment due to obsolescence and wrong
- Inadequate dredging and container-handling facilities;
- Inefficient and non-optimal deployment of port equipment;
- Lack of proper coordination in the entire logistics chain.

Containerization, which brought about a technological revolution in the transportation world is still to make an impact in India. By 1993-94, container traffic was accounting for only 6.8 per cent of total traffic. Indian ports are costlier than other ports in the region for handling containers. The additional cost burden due to use of second- and third-generation vessels has been estimated at US \$ 250 million a year. Container delays at Indian ports cost US \$ 70 million a year.

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## 11.9 KEY WORDS

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**Natural Resources:** These are provided by the nature to an economy, free of cost.

**Commodity Producing Sector:** These are sectors in the economy whose output are goods in physical form. These are basically agriculture, mining, manufacturing, construction, etc.

**Working Efficiency of Man:** It is the ability of a man to produce goods and service when employed in a factory.

**Tonne Kilometer:** Movement of one tonne of goods for one kilometers. Arithmetically = Tonne × kilometers.

**Person Kilometers:** Person × kilometers.

1 billion = 1,00,00,00,000 = 100 crore = 1 Arab.

1 milion = 1,000,000 = 10 lakh.

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## 11.10 SOME USEFUL BOOKS

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World Bank - World Development Report,

C.S.O. - National Accounts Statistics.



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## 11.11 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress 1

- 1) Read Sub-section 11.2.2. and answer
- 2) Read Sub-section 11.2.1 and answer
- 3) Paul Rosenstein- Rodan, Ragnar Nurkse and Albert Hirschman.

### Check Your Progress 2

- 1) Power, Transport, Communication, Trade, Banking and Insurance.
- 2) Health, Education, Drinking Water, Sanitary, Social and Personal Services etc.

### Check Your Progress 3

- 1) GDP of the economy
- 2) Read Sub-section 11.4.1 and answer
- 3) Read Sub-section 11.4.2.1
- 4) Read Sub-section 11.4.2.2

### Check Your Progress 4

- 1) Read Section 11.6 and answer
- 2) Read Section 11.6 and answer
- 3) 4 parts- national Highways, State Highways, District Roads, Village Roads
- 4) 11 ports, central government
- 5) Read Section 11.6 and answer

### Check Your Progress 5

- 1) From 17 doctors in 1951 to 50 doctors in 2000.
- 2) from Rs.5 in 1951 to Rs.284 in 2000.

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# UNIT 12 ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

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## Structure

- 12.0 Objectives
- 12.1 Introduction
- 12.2 Carrying Capacity
- 12.3 Sustainable Development
  - 12.3.1 Forestry
  - 12.3.2 Biodiversity
  - 12.3.3 Agriculture
  - 12.3.4 Water Resources
  - 12.3.5 Industry
  - 12.3.6 Energy
  - 12.3.7 Transport
- 12.4 Strategies for Sustainable Development
  - 12.4.1 Environmental Impact Assessment
  - 12.4.2 Natural Resource Accounting and Budgeting
- 12.5 Let Us Sum UP
- 12.6 Key Words
- 12.7 Some Useful Books
- 12.8 Answers/Hints to Check Your Progress Exercises

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## 12.0 OBJECTIVES

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After going through this unit, you should be able to:

- Summarise the evolution of the meaning of 'development';
- Explain what 'sustainable development' means and how it is a part of any meaningful development process;
- State the notion of 'carrying capacity' and how sustainable development involves respecting the carrying capacity of ecosystems;
- Outline methods by which the process of development can become sustainable;
- Identify the main issues relating to sustainable development for some of the major sectors of the economy;
- Describe two of the strategies that can be applied to projects, activities and policies to work towards making them more environmentally friendly.

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## 12.1 INTRODUCTION

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"Development" is a major objective of governments and societies across the world. Countries and societies have, for many years, been classified in terms of their state of development as underdeveloped and developed and then as developing and developed. More recently, the terms "south" and "north" are being used to categorise "developing" and "developed" countries respectively. Nevertheless, whatever the language, the primary preoccupation is with the status of development.

The term 'development' actually refers to a process rather than a state of reality, and even the term developed is misleading for it suggests that the countries so described have reached a stage such that no further development is required. However, this is not true and all societies and nations, however developed, can develop further and are only developed in comparison to those less developed than them.

The notion of development has had an interesting history. When it first began being used to describe countries, it referred almost exclusively to the levels of economic development or growth that had been achieved. Therefore, countries were considered developed in direct proportion to how rich they were in economic terms. European countries, with many colonies and, consequently, with large revenues, were described as more developed than those which did not have colonies and, consequently, were economically poorer.

However, at the turn of the century and especially after the First World War (1914-1918), many people began to question this understanding of 'development'. It was felt that economic growth alone could not be considered development unless it promoted equity. Consequently, a country that had, as a part of its 'empire', colonies that were impoverished, could not be considered developed. Similarly, if within a country, the wealthy were few and the many poor, then again such a country could not be considered developed, even if its wealth was very great.

In recent times such thinking has been translated into what are known as social or human development indicators, which include education, health, sanitation, access to drinking water, nutritional levels, and civil rights. The United Nations Development Programme (UNDP) now brings out a Human Development Report that ranks countries in terms of their development status with regard to these various social and human indicators.

In the 1960s, another type of concern started being expressed about the definition of development. With the growing realisation of what we were doing to our natural resources, people started questioning whether a country could be considered developed if its economic growth was based on the destruction of nature and natural resources. Considering natural resources are the most fundamental of resources, even more fundamental than financial resources, any process of growth which destroyed these resources is bound to fail in the medium to long run. Such a development strategy is not likely to be sustainable. The destruction of natural resources may result in development of present but the future of the economy is in jeopardy. Out of such realisations has grown the notion of sustainable development.

Development therefore was redefined to mean only that economic and social growth that was equitable and that could be sustained over time. The term "sustainable development" began to be used to distinguish between the old idea of development and the new, sustainable, one.

Sustainable development has been described as development which:

*"...meets the needs of the present without compromising the ability of future generations to meet their own needs."* (Our Common Future 1987)

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## 12.2 CARRYING CAPACITY

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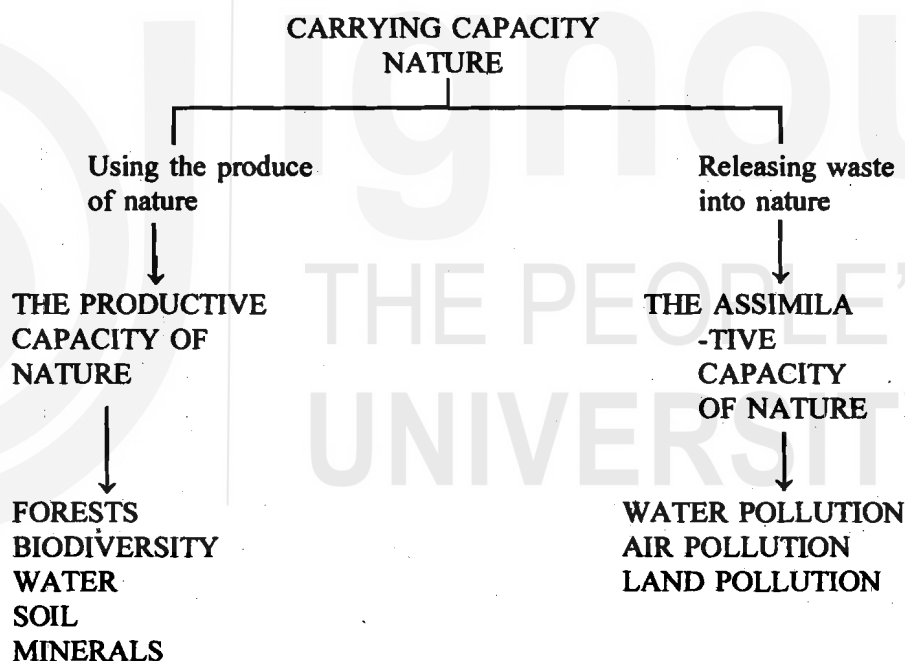
To fully understand what sustainable development means, we must first understand the notion of carrying capacity. The carrying capacity of an organism or a system is its ability to meet demands and withstand pressures without doing permanent damage to itself or compromising its ability to meet future demands and withstand future pressures.

For an ecosystem, this could mean its ability to tolerate extraction (its productive capacity) and withstand pollution (its assimilative capacity) without getting degraded.

To understand this better, consider that even human beings have a carrying capacity. We can donate only those amounts of blood safely that our body can replace in a short time. Similarly, we can assimilate a certain amount of caffeine or other pollutants, without they permanently damaging our health. However, if our body was drained of blood or if we were exposed to the type and quantity of pollutants that were beyond our ability to assimilate, then we would not only seriously injure ourselves, but in extreme cases also die. In any case, our ability to produce and function would be impaired. If this draining and polluting our body continues over time, we are very like to die.

A similar thing happens in nature. For example, take a river. The river has an ability to function without permanent damage even if a certain amount of water is withdrawn from it and taken for human consumption. However, if we drain the river of most or all of its water, then the river, as an ecosystem, dies or gets permanently damaged. Also, a river has the ability to assimilate some pollutants and to biodegrade them so that they do not damage the ecosystem. However, if we dump the types or quantities of pollutants that are beyond the assimilative ability of the river, then the river gets seriously damaged and even dies.

The diagram below shows how we interact with nature and assess its carrying capacity:

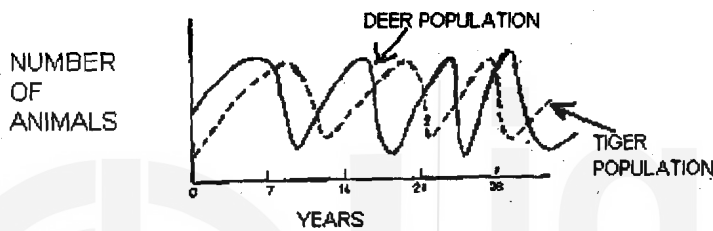


Therefore, one way of ensuring sustainable development is to ensure that the process of economic growth does not take from nature more than it is able to regenerate, and does not pollute nature beyond its ability to assimilate.

The carrying capacity of a resource is not finite. Through better management and technology, the carrying capacities of various natural ecosystems can be enhanced. For example, through the application of genetic engineering, mainly in the form of better seeds and faster growing strains of crops, the productivity of cultivated plants and of the land on which they grow can be increased. The application of fertilisers and irrigation can also enhance the productivity of land. Similarly, the assimilative abilities of an ecosystem can also be enhanced. Recently, there have been successful experiments with earthworms - called wormiculture - where the introduction of earthworms in compost pits can significantly enhance the ability of the ecosystem to break down the waste matter and assimilate the biodegradable substances, consequently enhancing the quality of the soil.

Human beings are perhaps the only living creatures on Earth that have the ability to exceed the carrying capacities of ecosystems to a point where these ecosystems get degraded or destroyed. In the rest of nature, there are in-built checks and balances to prevent the over-utilisation of natural resources. The consumption of resources by animals is determined by the availability of such resources.

So, for example, if the number of deer in a particular area increase to a point where they start consuming more grass than can be regenerated, then the availability of grass goes down and this, in turn, adversely affects the population of deer. Similarly, if the number of tigers in an area increases to a point where they eat up the other prey animals faster than these animals can reproduce, then, very soon there is not enough food for these tigers and their population begins to decline. Their population rapidly reaches a point where the balance between their population and the population of the prey animals is restored without any permanent damage being done. This cycle is endlessly repeated. The diagram below explains this relationship.



Also, in nature, nothing is waste. The 'waste' of one creature is the food of another and is finally an input to one part or another of the ecosystem. Therefore, a whole host of insects and microorganisms live in and off the excrement of various animals. These insects and microorganisms break down (biodegrade) this excrement to a point where it becomes nourishment for the soil. Similarly, dead plants and trees and even the carcasses of animals, become homes and food for other creatures who, in the process, help them to be assimilated by the ecosystem.

Only human beings, because of the rate at which they consume, the technologies that they have developed for facilitating consumption, and the nature and quantum of the waste they throw out, have a tendency of exceeding the carrying capacity of the ecosystems they depend on. The problem is aggravated by the fact that human beings have the ability to immunise themselves from the consequences of degrading their immediate environment by transferring their attention to other, remote, ecosystems, once their immediate ones are destroyed. Therefore, it is important to devise ways and means by which the interaction of human beings with the rest of nature is kept at sustainable levels.

**Check Your Progress 1**

1) What do you understand by the term "carrying capacity".

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2) How can the carrying capacity of natural ecosystem be enhanced?

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## 12.3 SUSTAINABLE DEVELOPMENT

Sustainable development is not something that can be achieved overnight. The path to sustainability is through ensuring that every project, every activity, every scheme and every policy is progressively made environmentally friendly till it itself becomes sustainable and promotes overall sustainability. Given below are some of the issues, listed sector wise that need to be focussed on in our search for sustainable development

### 12.3.1 Forestry

Sustainable development within and through the forestry sector means that we should harvest from forests only that much of timber and non-timber produce that it can regenerate. So, for example, if a forest grows at the rate of 2 % a year, our harvest should never be greater than the increment. This is similar to the principle of judicious financial management where people are expected not to eat into the capital of their savings but live off its interest.

*Take not from the capital of nature, but only from its interest.*

What we take and how we take is also important. For example, if we harvest the young and growing trees, then in the long term, the forest will die. Similarly, if we concentrate our harvesting on only one part of the forest, then even though overall we might not have extracted more than what is regenerated, the area from which we have over harvested might become barren.

### 12.3.2 Biodiversity

Biodiversity or biological diversity is defined as the variability of ecosystems, species and genes. It is now recognised that the maintenance of biodiversity is critical for human well-being and survival.

There are many types of ecosystems on earth. For example, there are the seas and oceans, rivers and lakes, forests, deserts, grasslands, islands, and mountains. Within these categories, there are sub-categories. In India, for example, there are sixteen major types of forests and hundreds of subtypes. Similarly, there are tropical oceans and temperate oceans; there are cold and hot deserts and various types of mountain ranges and grasslands. Biodiversity at the ecosystem level means the variability of ecosystems.

Within each ecosystem, there are various species. Human beings are one such species, but there are others like tigers, lions, elephants, peepal trees, deodar trees, gulmohar and neem trees, peacocks, crows, bees, flies, etc. Biodiversity at the species level means the variability of species.

Within each species, each individual is different. Among human beings, for example, though we are all of one species, each one of us is physically and mentally different from the other: genetically variable. There are similar variations among individual members of all species. Biodiversity at the genetic level means the variability of individuals of the same species.

Conservation of biodiversity implies ensuring that the variability among ecosystems, species and genes does not become less than what is natural and that, in any case, no ecosystem or species becomes extinct.

There are many reasons why it is important to conserve biodiversity. Some of the major ones are described below.

**Medicine:** a large proportion of the medicines that are used in the world, especially the non-allopathic ones, are derived from plants and animals. Yet, we have only investigated about one percent of the known species for their medicinal and other values. And of the species likely to exist on earth, perhaps only twenty percent have so far been discovered and identified. If specie that has either not yet even been identified, or whose medicinal and other uses have not yet been investigated, becomes extinct, then the cure to some of the diseases that are currently plaguing the world, like AIDS and cancer, might be lost for ever.

Even if species that we have already investigated and found to be of no use, becomes extinct, there are grave dangers. For, though these species might be of no use in curing the ailments we know about today, what is the guarantee that some new diseases might not appear in the future, just as AIDS did some years back. And then we might discover that its cure died with the extinction of the species that we thought was valueless. Therefore, in order to ensure that our options are not foreclosed, we need to ensure that each and every species is conserved. This is the option value of biodiversity.

**Agriculture:** All the plants we cultivate or the animals we domesticate, are derived from wild species. In order to keep open the option of developing new strains for cultivation and domestication, we have to ensure that wild species are conserved. Also, if cultivated or domestic strains have to be immunised against pests or diseases, then most often wild species have to be used to create such immune strains.

**Biotechnology:** This is a new area, which perhaps offers the greatest promise, among all technologies, to provide answers to some of the major problems facing the world: those of poverty, hunger and disease. However, the 'raw materials' of biotechnology are wild plants and animals. It is from the various plants and animals that genes can be found which, through genetic engineering, give new hope of solving many of the old problems. For example, the green revolution in India was a result of genetic engineering and, whatever might be the problems with it, has certainly raised the productivity of food grains in India. However, if species in the wild became extinct, then this 'raw material' of genetic engineering would no longer be available. We, therefore, must keep this option open also.

**Web of life:** All life is interconnected like the web of a spider. Each species is directly or indirectly dependent on all others. Therefore, if one species becomes extinct, then this affects all the species. The effect might not be felt immediately, but eventually the chain reaction starts.

For these and other reasons, it is important that biodiversity is conserved if development has to be sustained.

### 12.3.3 Agriculture

The soil and water resources that are a basis for agriculture, also need to be sustainably used. Soils are susceptible to wind and water erosion and to degradation. When the vegetative cover on soils is destroyed, the binding that such a cover provides to the soil is removed. These exposed soils become prone to erosion. Further, with the removal of vegetative cover, the soils get exposed to the direct rays of the sun and dry up quickly. This also lowers their productivity and makes them susceptible to erosion. The leaf and vegetative litter that is generated by the green cover enriches the soil and provides it with humus. When the vegetative cover disappears, the soils also degrade.

Cultivation and ploughing on slopes, without adequate measures to prevent soil erosion also aggravates the loss of soils. Another factor that degrades soil is unsuitable cropping patterns. If the soils are not allowed to rest adequately between crops, they lose their productivity. Also, if the nutrients of the soil are not replenished through natural fertilisers, the soil degrades.

Though chemical fertilisers can, for a short time, enhance the productivity of soils over a long period, they are not able to replenish all the trace elements in a soil and therefore cannot sustain long-term productivity. Eventually, more and more chemical fertilisers have to be applied to support a declining productivity. This not only reduces productivity but also significantly raises the financial costs of cultivation.

The over use of chemical pesticides or the use of inappropriate pesticides, also degrades the soil. Such pesticides, apart from killing crop pests, also kill the various insects, birds and microorganisms needed for regenerating the soils. The residues of such pesticides find their way into the water and the atmosphere, significantly degrading the environment and adversely affecting human health. If applied carelessly, they also contaminate the crops and become an additional health hazard.

Water logging is another threat to soils. Whereas this problem would be discussed in detail in the section on irrigation, suffice it to say here that large tracts of productive lands have become fallow because of salts and alkali contamination caused by rising ground water tables.

Deforestation in the catchment areas also results in floods and droughts, further compromising the productivity of our soils. Where catchments are denuded of their forest and other vegetative cover, the soils become susceptible to wind and water erosion. The summer sun dries them and when the rains come, they all flow down with the water. The lack of vegetative cover on the slopes also results in very rapid water runoff resulting in inadequate recharging of the underground aquifers. This means that where catchments are degraded, there is much greater water in the streams and rivers in the rainy season than there was when the catchments were vegetated. In addition, the topsoil and other debris, which was stabilised on the hillsides by the vegetation also now flows off the barren landscape. The resulting volume of water and silt is too much for the riverbeds to contain and so there are floods.

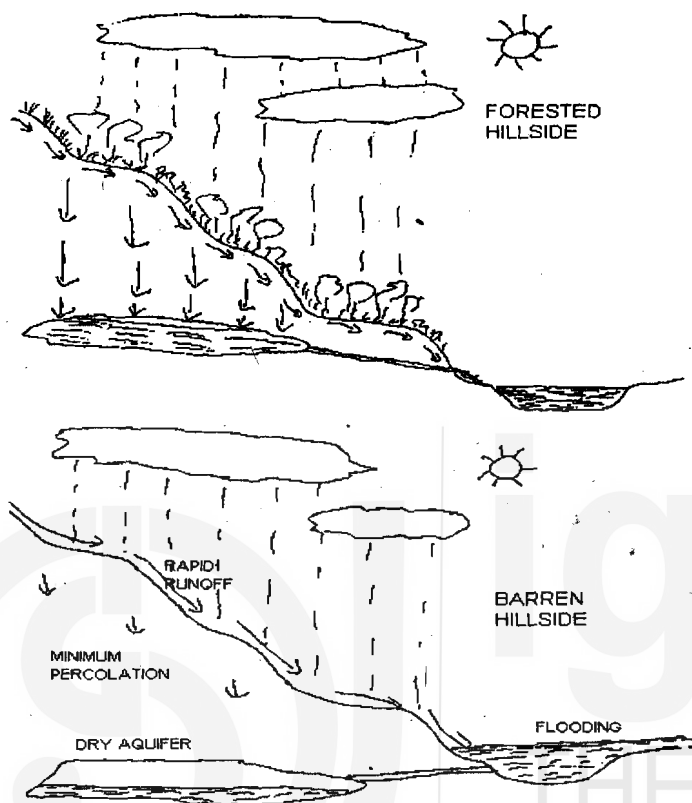
Also, as this silt reaches the plains and the river slows down, the silt sinks to the bed of the river, silting it up. This results in the capacity of the riverbed becoming less so that even normal flows of water cannot be contained and there are again floods.

Conversely, in the dry season, as the aquifers have not been properly recharged, there is little water in the streams and a drought occurs. Initially floods might enhance the quality of land in the flood plains, as they bring down the topsoil from the catchments. However, in a few years, all the topsoil has been eroded and only rubble is deposited. This significantly lowers the productivity of soils (see figure on next page).

Another threat to sustainable agriculture is the destruction of wild biodiversity. All the plants we cultivate today are derived from the wild. In the case of hybrid varieties, like the green revolution varieties, the cultivated strains are derived from the genes of wild plants. In order to ensure food security and to keep open the options of developing new strains of cultivable plants, we need to ensure that wild plant varieties are conserved. We also need the wild varieties to meet threats to our existing cultivable varieties (for details see section on biodiversity).



Water is, after air, perhaps the most critical human resource. The location of human settlements, throughout history, has more often been determined by the location of water sources than by any other single factor. And historically many societies and cultures have perished because they could not manage their water resources properly.



Water is essentially a renewable resource, much of it subject to yearly or half yearly cycles. The water (or hydrological) cycle moves water from one place to another and changes some of it from one form to another. The monsoon winds pick up moisture from the Indian Ocean and distribute it, as precipitation, throughout the country. In this process, they also convert salt water into fresh water. There is also the melting of snows and glaciers, in the Himalayas, which feed many of our rivers.

To ensure that water is sustainably used, it has to be ensured that the hydrological cycle does not go awry. This involves, to start with, ensuring that rainfall patterns do not get disrupted. Though the relationship between deforestation and macro climatic changes is not yet well understood, there is good evidence to believe that deforestation can cause serious disruption in micro rainfall patterns.

But, more important, the degradation of vegetative cover in the catchments seriously disrupts, as already described, the water cycle and causes floods and droughts. Deforestation and degradation of the upper reaches of the Himalayas also causes micro climatic changes, which affect the ice and snow, melt regimes, thereby disrupting the hydrological cycle.

So, the first task is to ensure that water is available where required, in the right quantity and at the right time. The second task is to ensure that this water is clean and wholesome. Ordinarily, the water that comes down as rain or through ice or

snow melt is pure and not polluted. However, certain types of air pollutants can contaminate rainwater even before it reaches the ground. A common result of such pollution is called 'acid rain'. Acid rain occurs when the atmosphere is polluted with sulphur dioxide and nitrogen oxides, which mix with rainwater to form sulphuric acid and nitric acid. Such rain, instead of nourishing the soil and vegetation, destroys them. Thousands of hectares of forests in Europe and North America have been 'burnt' by acid rain. The soil there has become acidic and lost much of its productivity and the lakes and rivers have been polluted, resulting in extensive fish kills.

Apart from atmospheric pollution, water is also subjected to pollution on the ground. Silt, domestic wastes, agricultural run off and industrial wastes pollute our lakes, streams, rivers and even the ocean. Such polluted waters become unfit for most human uses. Due to rampant water pollution in India, most of the surface water is unfit for human consumption. Much of it is also unfit for bathing and some of it even for agricultural use. When polluted water is fed into industries, there is a danger that it would damage the machinery or otherwise adversely affect the industrial process. Polluted water also degrades the environment, particularly affecting the fauna and flora that either live in that water or partake of it.

Water is stored or conveyed on the surface of the earth in or through various water bodies. These natural bodies have an ecological process of their own and include lakes, ponds, seas, oceans, springs, streams and rivers. These are not mere receptacles or passages of water but also habitats for hundreds of living creatures: fish, insects, plants, snakes and reptiles. These water bodies also energise the water, just as they are energised by it. Water, as it rests in or passes through them, is oxygenated, cleaned and mineralised. If there are pollutants in the water, the ecological processes act to biodegrade them and to clean up the water again. Rocks and rapids in the streams and rivers help mix oxygen in the water, which the fish and other creatures living in the water then breathe for their survival.

When the water is polluted beyond its capacity to assimilate the pollutants, then these various functions of the aquatic and marine ecosystems get compromised. Similarly, if large quantities of water are extracted from such water bodies, then again the ecosystem gets affected and cannot perform normally. Where excessive pollution or extraction continues over time, the ecosystem gets irretrievably damaged, sometimes becoming incapable of supporting even the most basic life forms. Apart from the loss of fish and other life forms, this means that the water body is no longer able to cleanse the water and the water either becomes useless for human use. It has to be subjected to an expensive process of artificial cleansing before it can again be used.

Polluted water also poses a threat to its users. The threat to the environment has already been explained. It also threatens human health and it is estimated that 10,000 children die every day in India due to water related diseases. Also, water that contains large quantities of silt does damage to human made structures, silting up dams and tanks and damaging hydroelectric turbines.

Given the growing human population and the consequent increase in the demand for water, controlling the use and wastage of water, especially 'treated' water, is a high priority. What is required is 'demand side management' of water. The current patterns of water use are not only inequitable but also wasteful and unsustainable. While the well to do in a city throw away 12 to 16 litres of 'treated' water every time they flush their cistern, the poor in the same city have to line up for hours to get even one bucket of water. Our houses and industries are not designed to be water efficient and millions of litres of water are wasted because of leaking taps or outdated industrial processes.

### 12.3.5 Industry

Industrial growth is seen as central to economic development. However, in order for industry to be environmentally sustainable and for it to contribute to overall sustainable development, it must be environmentally friendly, or 'green', from 'cradle to grave'. This means that right from the setting up of the industry and the extraction of raw material and the generation of energy, through its production process and the nature of the produce, to the decommissioning of each plant and the final disposal of each product, the sector must be green.

If the Industrial sector is not environmentally friendly, it puts unsustainable pressures on the environment, both by using more natural resources than can be replaced and discharging more waste than can be assimilated. By using natural resources inefficiently and by polluting needlessly, an industry takes away the opportunity for additional production out of the same natural resources and the consequent additional discharge of pollutants. So, industries that are green not only negatively affect the environment but also take away the opportunity for additional industrial production.

In India, both water and electricity are subsidised, in the sense that their true cost, especially if you include the environmental costs, are not recovered from the consumers. Water and electricity are also two of the resources that are most often wastefully used. It is therefore imperative to conduct environmental audits of industries and of the industrial sector. To make such audits meaningful, standards must be prescribed for the quantity of water and electricity to be used in the production of various types of goods and the provision of various services.

It is preferable to prevent pollution, rather than to try and control it once it has happened. In order to prevent pollution, it is important that production technologies must also be green. The use of green technologies is not only good for the environment but also economically beneficial. Environment friendly technologies consume less water and electricity per unit of production and produce less waste. The costs of raw materials and of waste disposal are also, therefore, minimised, along with the expenditure on electricity and water. Besides, many green processes link up production processes in a way that the wastes of one process become the raw materials of another. Therefore, industries can be located and designed in ways such that the quantity of waste is minimised and the cost of purchasing raw materials is cut down

Another area of concern is that of packaging. Again, because garbage collection and disposal is done at public cost, not chargeable to the industry, many industries pack their products in an environmentally unfriendly manner. The use of plastics and other toxic or non-biodegradable materials as packaging material, needs to be controlled. The products themselves must be such that they or the materials they are made of, could be recycled once their life was over. This would not only save on raw materials but also lessen the problem of garbage control.

### 12.3.6 Energy

Power projects have historically had significant social and environmental costs associated with them. The two most common types of such projects in India are hydro and thermal power projects.

*Hydroelectric projects:* Hydroelectric projects, especially those involving large dams, usually have the more significant environmental and social impacts. Some of the main impacts are listed below:

***Upstream of the dam***

- 1) Degradation of the catchment. This can be due to the project, partly because of project activities and partly because of increased pressures on the remaining catchment, once a part has been submerged under the reservoir. Apart from the adverse impacts, this has on the biodiversity of the region, it also often has critical implications on the livelihood needs of the local people.
- 2) Of course, degraded catchments, whatever be the cause of degradation, can also have significant impacts on the dam project itself by, among other things
  - Increasing the silt load
  - Causing erratic water runoffs
  - Posing a possible threat of surplussing due to sudden increase in water flow
- 3) There is the threat of backwater build-ups and consequent floods and destruction.
- 4) There is also the threat of reduced water availability upstream, as the water is required to fill the reservoir

***At the reservoir and project site***

- 5) Dust Pollution
- 6) The threat to rim stability
- 7) The potential for breeding vectors
- 8) Adverse impact on the aquatic ecosystem and biodiversity
- 9) Possible adverse Impact on fisheries
- 10) Impact on the water quality including potential for mineral contamination of water
- 11) Submergence and destruction of flora and fauna
- 12) Submergence of agricultural land
- 13) Submergence of grazing land
- 14) Submergence of sources of local fuel wood and other non timber forest produce
- 15) Reservoir induced seismicity
- 16) Adverse micro climatic changes
- 17) Human Displacement

***Downstream***

- 18) Adverse impacts on aquatic ecosystem and biodiversity downstream
- 19) Adverse impact on fisheries downstream
- 20) Adverse impact on water availability downstream
- 21) Adverse impact on water pollution levels downstream, especially due to reduced river flow
- 22) Possible salt water ingress
- 23) Threat from sudden releases of water
- 24) Threat from dam failure

***Command Area (in multipurpose projects)***

- 25) Threat of water logging and salinity
- 26) Threat of vector breeding

Unfortunately, there are many projects in India and in other parts of the world, which manifest one or more of these adverse impacts.

Hydroelectric projects in India are often not investigated properly for their environmental and social impacts. Their environmental and social viability is, therefore, not clearly established. Besides, the measures to mitigate the social and environmental impacts are often inadequate. Also, activities related to the assessment and mitigation of environmental and social costs are often started very late and then hurried along so as not to delay project implementation.

There has been an unfortunate tendency, in recent years, to grant hydroelectric projects "conditional clearance", with the stipulation that environmental assessment and the mitigation of adverse impacts be carried on *pari passu*. Some prominent beneficiaries of such clearances are the Sardar Sarovar Project in Gujarat, the Indira Sagar Narmada Project in Madhya Pradesh, and the Tehri Project in Uttar Pradesh.

What such conditional clearances imply is that the project is given a go ahead before its environmental impacts have been assessed and, consequently, its viability established. It also usually means that the assessment is never properly done and mitigative measures are delayed to a point where they become ineffective.

**Rehabilitation:** Hydroelectric projects also take a heavy toll of the human beings living in the submergence areas, who are made homeless in the thousands. Till recently, there were very inhumane rehabilitation policies, where, by and large, the "oustees" were handed a small amount of money in lieu of their homes, livelihood and heritage, and asked to fend for themselves. Recently, there has been a serious effort to change all this. Some of the newer projects, notably the Sardar Sarovar Project in Gujarat, offer land for land and other facilities to the "project affected people".

Despite this, the cost paid by the project affected people, mostly poor villagers and tribals, is horrific. The benefits of the electricity generated goes mostly to the rural rich and to the urban populations.

**Coal Based Thermal Power Projects:** Though the adverse environmental and social impacts of thermal power projects are not as dramatic as that of dams, they are still significant. This is especially so if one assesses the impacts from "cradle to grave", i.e., including the impact of mining the coal and of its transportation to the power plant.

The major environmental and social impacts of thermal power stations are listed below.

#### **Construction phase**

- 1) Displacement of people
- 2) Dust pollution
- 3) Local level disturbance
- 4) Destruction of fauna and flora

#### **Operational phase**

- 5) Air pollution
- 6) Water pollution
- 7) Withdrawal of water
- 8) Land pollution, mainly through fly ash
- 9) Noise pollution
- 10) Micro climatic changes

Unfortunately, thermal power plants are often not properly assessed for their environmental and social impacts, and alternative sites and technologies are rarely explored.

Many examples of thermal power plants, which were posed for environmental clearance without a proper appreciation of the environmental issues, are available. Some of the notable examples are described below.

### **The Dholpur Thermal Power Project, Rajasthan**

This power project is to be located on the banks of the Chambal River, adjacent and, in part, within the National Chambal Sanctuary. The efforts of the Environmental Appraisal Committee to get the state government to shift this power station even a few kilometres, so that the impact on the sanctuary could be minimised, were unsuccessful. Consequently, the project was not accorded clearance for many years and has only recently managed to get cleared, in its initial location, but with very stringent environmental conditions. The loss of time and the additional costs of environmental safeguards could all have been prevented if the project had initially been shifted to a more suitable site.

### **Kayamkullam Power Project, Kerala**

This project is to be located adjacent to a fragile system of Kayals (backwaters) in the state of Kerala. The project envisages dredging the Kayals in order to get earth fill material for the project site. Such dredging would destroy the kayal as an ecosystem and have significant adverse impact on the fisheries in the region. Again, efforts to have the site shifted by a few kilometres were not successful. The project was, therefore, not recommended for clearance. Later, the Ministry of Environment and Forests cleared the project, over ruling the recommendations of its own appraisal committee. However, if the project does come up it will have unacceptable environmental costs.

Perhaps the three most critical issues concerning thermal power stations, in terms of their social and environmental impacts are:

- 1) The location of the plant. Inappropriate locations imply heavy environmental and social costs and an inability to adequately mitigate these costs without making the project economically non-viable.
- 2) The use and discharge of water. As water is a scarce commodity in most parts of the country, the use of water by power stations results in greater, sometimes critical, deprivations for the local populations.
- 3) The dumping of fly ash. Fly ash is perhaps the single greatest hazard to the environment, to land and to human health.

### **12.3.7 Transport**

The contribution to air pollution levels, especially urban air pollution levels, of the transport sector is significant. This is primarily because of the concentration of vehicles in urban areas, the technology prevalent, the poor state of maintenance of vehicles, the poor quality of fuel and, sometimes, local climatic conditions.

Air pollution levels in most of our cities are much above the prescribed limits, especially for suspended particulate matter (SPM). Some recent statistics are given below.

Agra	451.93
Mumbai	226.00
Delhi	543.00
Dhanbad	364.64
Ludhiana	380.17

Patna	230.91
Pune	226.07
Calcutta	394.00
Surat	283.81
Varanasi	489.23

Source: Reports of the National Environmental Engineering Research Institute and of the Central Pollution Control Board

In the last few years, the government has taken some important steps in tackling this problem. They have notified motor vehicle emission standards and introduced a system by which motor vehicles need to have pollution checks regularly. They have banned the sale of cars, which are not fitted with catalytic converters, in the metropolitan cities. They have introduced lead free petrol. Efforts are also on to improve the quality of fuel being supplied to upgrade motor vehicle technology, to ban the sale of loose oil at petrol pumps and to phase out of Delhi, for example, public vehicles which are over fifteen years old.

However, as long as the number of vehicles on the road keep increasing, the problem will only get worse. The only sustainable answer lies in improved public transport, which makes the use of private vehicles, or of individual public transport like taxis and three wheelers, less popular. Along with these, the other options like better and different fuels, and greener technologies, must be pursued.

For travel and transportation between towns and cities and across the country, some of the greenest options are no longer available. River transportation, if properly managed, can be a very environmentally friendly method of travel. Unfortunately, many of our rivers have now become too silted to be able to allow this option. However, if the earlier discussed methods of catchment area treatment and afforestation are implemented, then it might again become viable to desilt our rivers and other waterways and make them navigable for transporting people and goods.

Rail transport is also preferable to road transport. However, in the last few decades, there has been a much greater focus in developing the roadways sector rather than the railways. This strategy also needs to be reconsidered.

### Check Your Progress 2

1) What is biodiversity?

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2) Discuss the basic issues regarding sustainable development in the area of water resources?

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3) Discuss the economic & social costs associated with hydroelectric power projects.?

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## 12.4 STRATEGIES FOR SUSTAINABLE DEVELOPMENT

The strategy for making the development process greener and environmentally sustainable involves ensuring that each sector and, within a sector, each project, scheme or activity, is environmentally friendly and contributes to a development process, which is sustainable.

There are various methods and instruments available to assess the environmental impact of such projects and activities and to ensure that they are environmentally viable. Two of these are environmental impact assessments and natural resource budgeting and accounting.

### 12.4.1 Environmental Impact Assessment (EIA)

Conducting an EIA of a project or an activity involves developing an environmental impact statement and then assessing the expected impacts of the project or activity.

An environmental impact statement (EIS) usually contains a list of the activities and processes that might have an adverse impact on the environment. These are then described in terms of the nature and severity of impact on the various elements of the environment. So, for example, an EIS of a proposed power station may look something like this:

ENVIRONMENTAL PARAMETERS

Activities	Air quality	Water availability	Water quality	Land	Soil	Ground water	Local inhabitants
Clearing of site	L	L	L	H	H	L	H
Land filling	L	L	M	H	H	L	M
Transportation of building materials	H						M
Construction of buildings	H			M	M		
Withdrawal of water		H	H			H	H
Discharge of water		M	H				H
Discharge of flyash	H	H	H	H	H	H	H
Discharge of SO <sub>2</sub>	H		M		M		H
Transportation of coal	H			H	H		H

H = high impact, M = medium, L = low, Blank = no impact

An assessment of the impacts, as laid out in the statement, is based on various factors. The purpose is to determine whether the proposed activity or project is environmentally viable and, as such, deserves environmental clearance. To decide this, various questions are considered. These include whether it is possible to prevent



or mitigate the anticipated adverse impacts? How severe are the final impacts? How valuable or unique is the affected ecosystem? And whether the benefits from the proposed activity or project justify such impacts?

#### 12.4.2 Natural Resource Accounting and Budgeting

Till recently, environmental costs were rarely taken into consideration in the national planning exercises. This is because financial and economic experts do the planning and they do it in primarily a financial and economic context. However, natural resources are the most fundamental of human resources, certainly more fundamental than financial and economic resources.

Given the rapid environmental degradation, the world over, in the last few decades, many countries have begun to realise that unless environmental costs are incorporated into their national accounting system, a true picture of the health of their economy would not emerge. Perhaps motivated by this, the Government of India, in its policy statement on sustainable development, has undertaken to present before Parliament, each year, a natural resources budget.

Also, the Government of India has prepared a National Environmental Action Programme (NEAP) and is a party to Agenda 21. Both these documents further reiterate the commitment of the government to move towards a model of sustainable development.

In countries of the North, environmental economics is now a popular and fast growing discipline. Unfortunately, the models developed in these countries are not always appropriate to India. Despite this, there has been a concerted effort by various countries of the North and many international agencies to persuade India and other countries to accept their model of natural resources accounting.

The imperative for natural resource accounting seems, on the face of it, to flow from an urge to integrate natural resource parameters into the national accounting systems. This means that the GNP calculations of a country would reflect, each year, the use and accrual of natural resources. For specific projects and activities, a system of natural resource accounting would mean that the financial and economic costs of natural resources will be reflected in the cost benefit analysis carried out to assess the viability of the project.

Unfortunately, the methods currently being used by many countries of the North for generating natural resource accounts, have many problems. Some of them are outlined below:

**Classification of Nature:** The first problem relates to classification of nature into that which has economic value or, as economists sometimes describe it, has alternate uses, and that which has no economic value for it has no alternate use. The belief that some elements of nature have no alternate use and therefore no economic or financial value seems misplaced. Perhaps, if one takes a very narrow definition of "value" and "use", then one could argue this. However, it is well established that each individual living organism represents a unique element of biodiversity. Therefore, it is difficult to imagine even a single plant or creature that has no use.

**Attaching Value:** Even more difficult is the method by which economic and financial value is attached to elements of nature. Unfortunately, economics as a science can only put a replacement value to those goods and services, which are inputs into, or

outputs of, an economic process. Much of nature, critical as it is to human survival, is not an input or an output of an economic process. Therefore, for economists, it is either invaluable or valueless. As economics cannot handle the notion of invaluable, it tends to consider much of nature as valueless.

As an example, how can economics ascribe a realistic financial or economic value to the last surviving pair of a species of a bird, which currently might have no known economic function? Given the present methodology, such a pair would ordinarily be considered without economic value. Yet, this very species might, if it survives, become of very great economic value in the future. Nevertheless, as there is no way of predicting with any certainty whether this would happen or not, ascribing value becomes an impossible task.

***The North-South Divide:*** Though the difficulties in ascribing economic value to elements of nature are common all over the world, their implications are far greater for countries of the South. Whereas in countries of the North most people have enough surpluses after meeting their immediate basic needs, to be willing to pay for recreation and long term needs like environmental conservation, this is not so in countries of the South. Therefore, if the economic value of the environment was to be determined through market forces, as is envisaged in many of the prevailing methodologies, it is unlikely that in countries like India the poor people would be in a position to choose long term needs over their immediate ones. Market forces would, consequently, make it difficult to conserve and protect anything.

Also, given the vast differences in the buying power of different segments of society in countries of the South, and between the North and the South, it is difficult to ensure socially just utilisation of natural resources. This is especially so if decisions were to be made solely or primarily on an economic basis.

***Undervaluing Nature:*** There is also a tendency of governments, dominated by imperatives for economic growth, to systematically undervalue the contributions of natural ecosystems to the economy and to human welfare in general. For example, a forest can be contrasted with a human made industry. Whereas the human made industry requires inputs of capital, energy, raw materials, maintenance, replacement, and a labour force to make it productive, the forest, as an industry, produces goods and services critical to humanity without requiring any of these. It generates its own energy, produces its own raw materials, maintains and replaces itself, and goes on for eternity without needing any human input. However, the economic value attributed to forests never reflects this miracle of productivity and renewability.

***The Solution:*** But what is the solution? Perhaps one way out is to adopt a dual approach of both budgeting and accounting. The elements of this approach are described below.

First, a natural resource, say water, needs to be budgeted in physical terms and allocations made to meet the basic ecological and social requirements. This means that, in a river, the minimum flows required for maintaining the ecological balance of the river and consequently its ability to cleanse itself and support life, must be assured.

Once this is done, then the surplus water must next be allocated for meeting the basic needs of the human populations dependent on the river. This includes their drinking water requirements and other basic needs. If any 'surplus' remains, this can then be subjected to market forces and its use determined based on the paying capacity of the various contenders.

In such a model, where there is industrial demand for water, then the industrial sector must pay for enhancing lean season flows by, for example, regenerating catchments, in order to produce larger surpluses. There is also, then, an economic incentive to invest in water saving technology, as the real cost of water is being charged.

### Check Your Progress 3

1) What is Environment Impact Assessment?

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2) What are the methods of natural resources accounting and budgeting?

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## 12.5 LET US SUM UP

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In this unit we started by discussing how the term ‘development’ was used over the years and how its meaning expanded from mere economic growth to growth with equity and, now, growth which is sustainable. We then went on to discuss the notion of ‘carrying capacity’.

We discussed how every ecosystem has a limited capacity to produce and assimilate. When these limits are exceeded, the ecosystem degrades and becomes dysfunctional. A dysfunctional ecosystem cannot sustain its contribution and slowly dies.

We then went on to discuss how the carrying capacity of an ecosystem defines the limits within which the development process can be sustained.

Next, we looked at various sectors of the economy and discussed how each sector can be made more environmentally friendly, thereby contributing to sustainable development. We saw that making sectors environmentally friendly not only helped the environment but directly and indirectly boosted the economy.

Finally, we discussed two of the strategies that could be used to ensure that development activities, projects and policies were environmentally friendly and thereby supportive of sustainable development. The first of these strategies, conducting environmental impact assessments, involved assessing the impacts of activities, projects and policies on different elements of the environment. Based on such an assessment, a decision can be made about which of these are environmentally viable.

The developing of natural resource accounts and budgets is another strategy, which allows us to make sure that natural resources are optimally allocated and are sustainably used.

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## 12.6 KEY WORDS

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**Acid Rain:** Precipitation that has been polluted by acid.

**Aquatic:** Of water, living in or near water.

**Aquifer:** A natural underground or sub-surface water reservoir.

**Biodegrade:** To break down something into ingredients that can be assimilated by nature.

**Carrying Capacity:** The capacity of an organism or a system to meet demands and withstand pressures without doing permanent damage to itself or compromising its ability to meet future demands and withstand future pressures.

**Catchment Area:** The area from which the water flows into a river, lake or other water bodies.

**Development:** The process of economic growth, which is equitable and sustainable.

**Equitable:** Just to all sections of the society.

**Marine:** Relating to the sea.

**Runoff:** The flow of water down a slope or off a surface.

**Sustainable Development:** A process of development that "...meets the needs of the present without compromising the ability of future generations to meet their own needs."

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## 12.7 SOME USEFUL BOOKS

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*Human Development Report, 1998:* United Nations Development Programme, Oxford University Press, Delhi.

Ismail Serageldin and Andrew Steer (editors)(1994), *Making Development Sustainable: From Concept to Action*, 1994, The World Bank, Washington DC.

*National Environmental Programmes - India*, 1994, Ministry of Environment and Forests, Government of India, New Delhi.

*National Strategy for Conservation and Sustainable Development*, 1990, Report of the Core Committee, Ministry of Environment and Forests, Government of India, New Delhi.

*Our Common Future (1987)*, The World Commission on Environment and Development: Oxford University Press, Delhi.

*Report of the Task Force on Conserving Ecologically Fragile Systems*, 1996, Planning Commission, Government of India, New Delhi.

*Sustainable Development*, 1995, Special Issue of The Administrator, Journal of the Lal Bahadur Shastri Academy of Administration, Mussoorie, New Age International (P) Limited, Publishers, New Delhi.

*Towards Sustainable Development of Society - Imperatives and Perspectives*, 1993, Special Issue of the Indian Journal of Public Administration (IJPA), Indian Institute of Public Administration, New Delhi.

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## 12.8 ANSWERS AND HINTS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress 1

- 1) Read Section 12.2 and answer
- 2) Read Section 12.2 and answer

**Check Your Progress 2**

- 1) Read Sub-section 12.3.2 and answer
- 2) Read Sub-section 12.3.4 and answer
- 3) Read Sub-section 12.3.6 and answer

**Check Your Progress 3**

- 1) Read Sub-section 12.4.1 and Answer
- 2) Read Sub-section 12.4.2 and Answer



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