UNIT 3 NATURAL RESOURCES AND ENVIRONMENT

Structure

3.0 OBJECTIVES

After reading this unit, you should be able to:

- state the meaning and significance of natural resources in the process of economic development in India;
- comment on the state of natural resources in India as it has emerged out of the growth process during the last sixty years;
- analyse the government policy in regard to the use of natural resources; and
- explain the concept of sustainable development and the set of policies required to achieve this goal.

3.1 INTRODUCTION

The availability of resources, their utilisation and the capacity to mobilise more resources determine an economy's ability to overcome the various problems.

Resource profile of the economy concentrates on four broad categories of resources viz., **natural, infrastructure, human and financial.**

Natural resources, as conventionally understood, include all those objects and products that human labour combined with inputs of capital and enterprise, can extract from nature and make use of them to produce more goods and services. Natural resources are not static in nature; they are dynamic and keep on changing. As the process of economic development gathers momentum, the demand for natural resources increases; it becomes critical that both the urgency and temptation to exploit natural resources to the hilt for the sake of short-term gains are avoided; instead a holistic view is taken, so that the interests of the future generations are not compromised. "Sustainable development" should be the goal.

As in most other un-developed 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.

3.2 KNOWLEDGE OF NATURAL RESOURCES

Information on stock of natural resources is much better in case of India than in most under-developed countries (UDCs). 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. The new agencies have been created to undertake specialised tasks for surveys in fields 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 progrmmes of development.

- The *Oil and Natural Gas Commission*, established in the late 1950's to undertake exploration and development of petroleum resources, 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 co-ordination 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 co-operation with the State Departments of Agriculture.
- The national laboratories and institutes of scientific research also undertake studies relating to evaluation for utilisation of natural resources.
- The newly-introduced Forest Survey, the state of Forest Report, which is published at intervals, as also remote sensing and satellite imageries through valuable data of immense use to policy makers.

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 groundwater will need to be expanded and improved. This will 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. It also makes possible surveys of inaccessible areas and aids location or estimation of reserves of minerals and other natural resources.

3.3 LAND AND SOILS

India measures 3,214 kms. from north to south and 2,933 kms from east to west with a total land area of 32,87,782 sq.kms and a coastline measuring 7516.5 kms, plus 1,197 islands. It is the seventh largest landowner in the world after Russia, Canada, China, the U.S.A., 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.

3.3.1 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 new-found 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, agricultural crop-deficit economy, this pressure on agricultural land is a matter of serious concern. Any diversion of land from agricultural use to non-agricultural uses may disrupt the balance of 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, wastelands and the land 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.

Table 3.1: Land utilisation in India.

		(m.hec.)
1.	Area under non-agricultural uses	23.57
2.	Barren and uncultivable land	19.26
3.	Net area sown	141.10
4.	Forest lands under good tree cover	69.41
5.	Miscellaneous tree crops and groves	3.37
6.	Cultivable wastelands	13.66
7.	Current fallows	14.80
8.	Old fallows	10.19
9.	Permanent pastures and grazing grounds	10.90
	Total*	**306.25**

*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., (1) Agricultural land, and (2) Non-agricultural land.

Agricultural Land: It includes net sown area[1], current fallows and land under miscellaneous tree crops and groves. Agricultural land in India accounts a little over 50 per cent of the total geographical area in the country. This is the highest among the large or medium-sized countries of the world, indicating

- the influence of favourable physical factors such as large area, the extent of plains and plateaus and a very small extent of arid areas (about 15.8 per cent of the country's geographical area is arid.)
- the extension of cultivation to a large proportion of the cultivable land.

But, because of the large population of the country, arable land per capita is not high; the figure of 0.14 hectares is lower than the average for the world (0.22) and is only one-fourth of the U.S. (0.59) figure.[2] About 15 per cent of the sown area is irrigated. Most of the multi-cropped area is irrigated and the security provided

[1] Net sown area is being estimated at 141 million hectares; about 47 million hectares is sown more than once. The gross sown area is about 188 million hectares.

[2] In some other countries, the per capita arable land in hectares is as follows: Australia 2.75, Brazil 0.33, Canada 1.53, Japan 0.03, etc.

by irrigation facilities is a major factor in intensive application of labour and inputs to obtain high yields.

Non-agricultural Land: This includes land under forests, permanent pastures and 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.

3.3.2 Trends in Land Utilisation

Two important changes in the land utilisation witnessed during the last five decades are:

- reclamation of waste and fallow lands
- 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 systems. 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.

Perspective: 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 the use of non-cultivable land for non-agriculture uses. This will not only save cultivable land for agriculture, but will also promote a balanced regional development.

3.3.3 Soils

Long ago Aristotle described soil as the stomach of the plant. Even now over 90 per cent of the world's food comes from the soil and less than 10 per cent comes from both inland water and the oceans.

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 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 lateritic 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 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.
- 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.

However, through constant use the quality of these soils has deteriorated slightly. Moreover, large tracts of land have been eroded. It has been estimated that about 106 million hectares is suffering from varying degrees of soil degradation. Localised soil waterlogging 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:

- management of community land;
- lack of infrastructural development;
- high investment and long gestation;
- non-availability of institutional finance due to low creditworthiness of the beneficiaries having marginal and sub-marginal lands.

Check Your Progress 1

1) State the constituents of natural resources.

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2) Bring out the importance of natural resources in economic development.

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3) What are the important uses of land resources?

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3.4 WATER RESOURCES

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 irrigation. In a country where agriculture gives twists and turns 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 as yet been tapped in the country, but nevertheless represent a potential source are: saline springs, snow and ice-fields. Surface water sources are replenished by rainfall.

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

Overall India possesses large reservoirs of water, but these are inadequate as compared to their requirements. Compared to countries such as the USA, which stores about 5,000 cubic meters per capita and China, which stores around 1,000 cubic meters per capita, India's dams can only store 200 cubic meters per person. A UN report (Water for People, Water for Life, 2003) ranks India 133rd in a list of 180 countries for its poor water availability. It also ranks India 120th for water quality in a list of 122 countries.

A recent World Bank report reveals that per capita availability of water in India is 1,185 cubic meters (cm), against 9,628 cm in the USA, 3,371 cm in Japan, and 2,183 in China.

A late-2009 report by the US National Aeronautical and Space Administration brings out that the withdrawal of water in India is far higher than the recharge. This amounts to mining underground reserves built over thousands of years. 360 districts have reported water level decline of over 4 meters during the past 20 years. In nearly one-third of the blocks in the country, ground water reserves have been or are close to exploitation and this figure is likely to cross 60 per cent in another 25 years.

As brought out by The UN World Water Development Report, 2009, the consequences are harrowing: drought and famine, loss of livelihood, the spread of water-borne diseases, forced migrations and even open conflict.

3.4.1 Water Issues

The principal issues facing the country are as follows: (i) Demand for water is increasing from all sectors, (ii) Lack of a rational water pricing policy between and within sectors is further driving demand, (iii) Policies and institutions mandated to solve conflicts are directly or indirectly contributing to further conflicts, (iv) New conflicts are increasingly arising within states rather than between states, and (v) conflicts over ground water are widespread across the country.

Solutions: The following solutions are suggested :

1) The one over-riding lesson from the global resolution in the provision of public services is that competition matters. Hence, it is important to unbundle

the bulk provider of the irrigation system from the distribution function. Further, there should be variety of forms – co-operatives, and private sector players –to handle water distribution to farmers.

2) There is a need to increase user charges for the services provided, as well as to increase budgetary support. But user charges or tariffs linked to costs can only be possible if services are provided in an efficient and accountable manner.

3) It is by ensuring the economic and social development of local communities that India can hope to build major dams.

4) The government should give formal water entitlements to people as with land and other property rights. Once established, such entitlements give rise to a fundamental and healthy changes.

Four interconnected programmes as follows assume significance in this context: (i) watershed development programme, (ii) renovation of all water bodies linked to agriculture which have fallen into disuse, (iii) correcting the deterioration of public irrigation works, notably state canal systems due to cumulative neglect of maintenance and repair over the years, and (iv) rain water harvesting.

3.4.2 National Water Policy

The National Water Policy, 2002 was announced on April 1, 2002. Its main features are as follows. (i) Stress on maintenance of irrigation projects; (ii) River Basin organisations to ensure development and management of inter-state river basins; (iii) Calls for dam safety legislation to ensure proper inspection, maintenance and surveillance; (iv) Calls for national policy for resettlement and rehabilitation of project affected people; (v) Ecology given priority in water allocation; minimum flows in perennial streams mandated; (vi) Provides for participatory approach to water management including water users associations, private sector and modern information systems; (vii) Private sector participation should be encouraged in planning, development and management of water resources projects for diverse uses. It would help in introducing innovative ideas, generating financial resources and introducing corporate management and improving service efficiency and accountability to users; (viii) Non-conventional methods of water conservation like rain harvesting, artificial recharge of ground water, inter-basin transfers, desalinisation of brackish or seawater stressed.

The policy has invited much criticism. It is apprehended that the policy may turn out to be a 'paper policy'. What it includes is unlikely to get implemented without major reforms in water institutions. Such as a strategy for sustainable management of groundwater irrigation — makes the policy lopsided, if not irrelevant.

The water policy is currently under review. The new water policy will take a big leap if it puts into place an effective performance management system for public water infrastructure.

3.5 FOREST RESOURCES

3.5.1 Benefits of Forests

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 fuelwood, 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:

1) 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. Forests meet nearly 40 per cent of our energy needs.

2) The thick foliage-mix, that both trees and shrubs attract, prevents soil erosion, and holds moisture content in both the soil and the atmosphere. These are also described as hydrological benefits of forests.

3) Forests meet the basic needs of the poor people of the country in many ways. Forests provide 30 per cent of our fodder needs. A large section of the country's population – Ignancy Sachs calls them 'eco-system people' – depends on forests for firewood which is basic for human survival. Failure to meet the basic needs of rural people may put millions of women – who go out to collect the firewood everyday to forests – into serious difficulties.

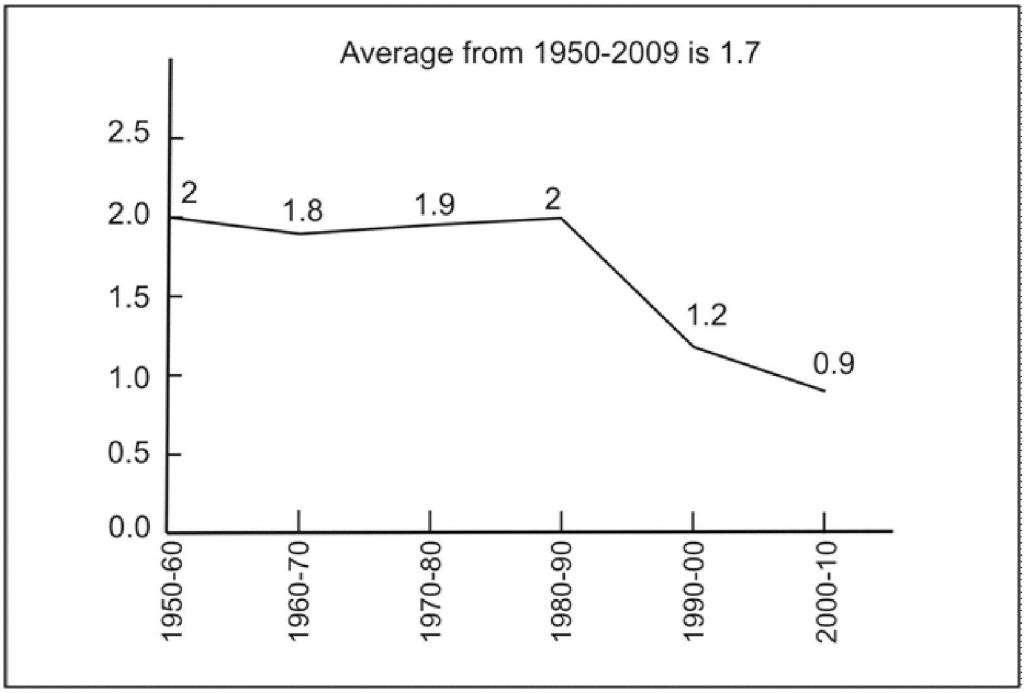


Figure 3.1: Share of Forestry in Total GDP.

4) Forests offer good employment opportunities too, mainly to the rural population. 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.

5) 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.

6) 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 micro-organisms, many of them from forests.

7) 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.

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 quiet which is so absent in the artificial world of man's other jungle – 'the concrete jungle'.

3.5.2 Present Position

Forests occupy about 783.7 lakh hectares or about 23.84 per cent of the geographical area. (Of this dense forest category, i.e., 40 per cent or more of the area covered by trees, amounts to about 58.0 per cent.) Of these about 433 lakh hectares or about 61.0 per cent are exploitable; another 178 lakh hectares or about 25 per cent are potentially exploitable. Among the States, Madhya Pradesh has the maximum forest area of 77,265 sq.km., followed by Arunachal Pradesh (68,045 sq.km.) and Chhattisgarh (56,448 sq. km.).

The area under forests in India is low not only as compared to the forest area in countries like Japan (64 per cent), Sweden (66 per cent), Canada (27 per cent), South Korea (63 per cent), and USA (25 per cent), but is also much less than recommended in the National Forest Policy of 1952. The per capita forest land in India is 0.06 hectares as against the world average of 2.06 hectares. Further, the productivity of Indian forests is very low: 1.2 cubic meters per hectare per year as against the world average of 2.1 cubic meters. In future the demand for forest products is likely to increase fast.

It is necessary, therefore, that we review comprehensively the national forest policy.

3.5.3 National Forest Policy

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. (i) Evolving a system of balanced and complementary land use. (ii) 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. (iii) Establishment of tree lands, wherever possible. (vi) Need for ensuring progressively increasing supplies of grazing fields, small wood for agricultural implements and in particular firewood to release cattle-dung for manure. (v) Need for sustained supply of timber and other forest produce required for defence, communications and industry. (vi) Need for the realisation of maximum annual revenue in perpetuity consistent with the fulfilment of the other needs enumerated above.

Since then developments of far-reaching importance have taken place in the economic, social and political fields. Foremost has been the growth of population. Where there were 6.6 persons per hectare of forest land in 1961, the figure for 2011 was 16. Their integration with the monetary economy, exposure to market forces and growing aspirations in an increasingly liberalised economy have only helped to further fuel the pace of resource extraction. The concept of saving trees is foreign to the Indian psyche. Forestries tend to see forests as wood factories.

All these developments resulted in heavy deforestation (in place of much-required aforestation).

i) Over 20 million hectares of land have already been converted into a virtual desert.

ii) It has affected the climatic pattern of the country.

iii) The run-off rate of water has increased because there are now fewer trees to slow its downward course. A higher run-off rate has meant that less of the available rainfall is percolating into the ground. The soil dries up more rapidly after every rain and crops begin to wither faster. Thus, agriculture is becoming much vulnerable to the vagaries of the monsoon.

3.5.4 New Forest Policy, 1988

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

1) The policy lays emphasis on the conservation of forests, and meeting the requirements of the tribal and rural people. The Scheduled Tribes and Other Forest Dwellers Act, 2006 has been enacted in pursuance of this policy.

2) Tribals will also be associated with the protection, regeneration and development of forests, and co-operatives run by them or by the Government will replace the present contractor system which has resulted in unchecked devastation of reserved forests.[3]

3) Realising the fact that uncontrolled expansion of forest-based industries would adversely affect the conservation objective, the revised policy has made the following stipulations:

   — No forest-based industry, except in the small-scale and cottage sectors, would be permitted unless sustained availability of raw material was ensured.

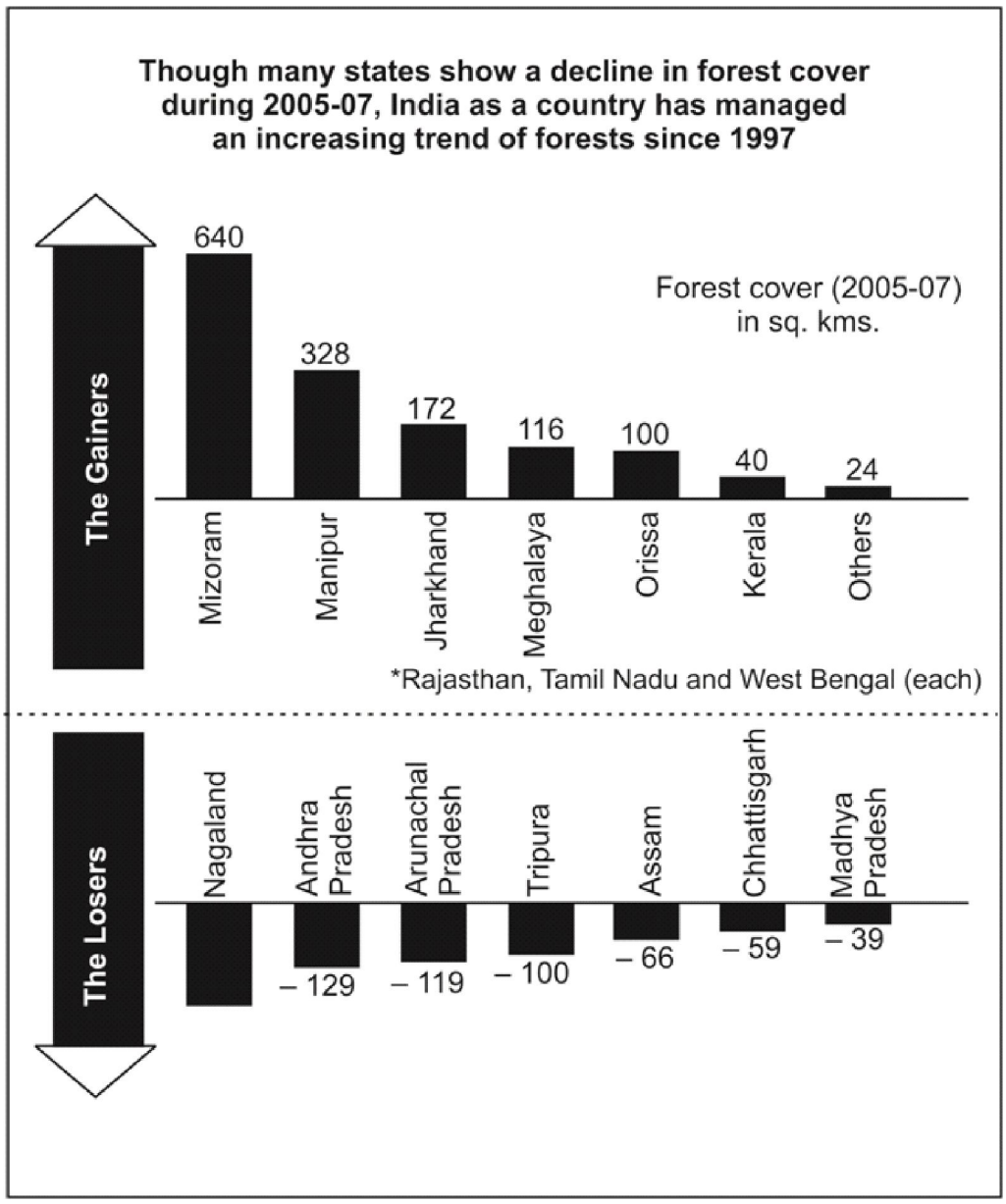
   — As far as possible, a forest-based industry should produce its own raw material requirements.

   — Natural forests would not be made available to industries for undertaking plantations and for other objectives.

   — Forest produce would not be supplied to industries at concessional rates.

[3] We can distinguish between 'protected forests' and 'reserved forests'. In protected forests the rights of the community such as collection of timber, fuel wood, and minor forest products are suspended for specified terms, not exceeding 30 years, whereas in case of reserved forest the local community enjoys the privileges of forest rights, subject to certain restrictions. Also see Roger Jeffery and NandiniSundar (eds.): A New Moral Economy for India's Forests? (Sage, New Delhi, 1999)

The initial results of the new policy have been quite encouraging.



Source: State of Forest Report, 2009.

Figure 3.2: Some Pluses, Some Minuses.

3.5.5 National Forestry Action Plan (NFAP)

NFAP is a five-pronged strategy to manage the forests in a sustainable manner. The five points are as follows:

i) Protection of existing forest resources of the country;

ii) Increase the productivity of forests;

iii) Reducing the demand for forest products;

iv) Expanding the existing forest areas; and

v) Strengthening the policy and institutional framework.

Launched in 1999, the objective of the NFAP is to bring 25 per cent of the land area under tree cover by 2007 and 33 per cent by 2012, through afforestation

and by arresting deforestation by achieving sustainable development of 76.5 million hectares of forests. This includes bringing over 29 million hectares of non-forest area under tree cover through forestry, farm forestry and urban forestry. The NFAP will make two major departures from the existing policies:

- Non-governmental organisations and local communities living in and around the forests are to be involved in the afforestation work.
- Foreign funds are to be used for the first time for the greening of forests.

Check Your Progress 2

1) Identify the different issues relating to water being encountered by India.

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2) Bring out the main features of the National Water Policy, 2002.

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3) Briefly state the significance of forests in an economy.

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3.6 MINERAL RESOURCES

3.6.1 Types and Output of Minerals

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 occur. (Out of total land area of 3.28 million sq. kms, hard rock area covers 2.42 million sq.kms.). These can be divided into four categories as follows:

1) Minerals of which India's exportable surplus can dominate the world market; to this category belong iron-ore and mica;

2) Minerals of which the exportable surplus forms an important factor; these include manganese ore, bauxite, gypsum and others;

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

4) 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: (i) Fuels like coal, lignite,

natural gas and petroleum; (ii) Metallic minerals like bauxite, iron-ore, manganese, etc.; (iii) Non-metallic minerals like phosphorite, graphite, gypsum, limestone, mica, etc.

The value of mineral production in India has increased considerably during the last five and a-half decades as can be seen from Table 3.2 below:

Table 3.2: Value of mineral production.

(Rs. Crore)

Year	1951	1961	1971	1980	1990	00-01	05-06	09-10
Value	83.3	81.2	502.9	2310	16456	46700	72760	94597

Source: India Annual.

As would be seen from Table 3.2, there has been a manifold increase in the value of mineral production 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 mineral production. Among the fuels, the more important are coal and petroleum; coal alone accountable for more than 55 per cent of the total value of fuel minerals.

3.6.2 Features of Minerals

Minerals provide a base for the rapid industrialisation of the economy. It has opened up further avenues for faster industrial growth and greater requirement of minerals "besides the fact that the geological setting of the country holds great promise for a boom in mineral production." [Expert opinion is that given the size of deposits in South Africa and Australia, large reserves can be expected in India also (because of similar geological structures). A recent Price Waterhouse Report has identified India as the most promising mining location worldwide.]

Notwithstanding this, India's spending on exploration is only about 0.8 per cent of the global spending with private sector only contributing 3 per cent of this. There are a few essential aspects that need to be worked into a proper mineral policy.

1) The mineral resources are very unevenly distributed.

   — The Great Plains of Northern India are almost entirely devoid of any known deposits of economic minerals.

   — Jharkhand and Orissa 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.

   — Mineral deposits are also scattered over the rest of the peninsular India and in parts of Assam and Rajasthan.

   — With the implementation of the new UN laws on the exclusive Economic Zone (EEZ), new areas in deep seas, hitherto unexplored, would become available to us. These areas are believed to contain rich deposits of oil, gas, manganese and modules of nickel, cobalt and copper.

2) 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.

3) 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 interests.

4) Due to paucity of funds, the mining industry is mired in obsolete technology, now for decades.

3.6.3 National Mineral Policy, 1993

The National Mineral Policy was announced on August 9, 1990, and modified on March 5, 1993. Further modification was announced on October 17, 1996. The major objectives of the 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) tominimise the adverse effects of mineral 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;

v) to ensure establishment of appropriate educational and training facilities for human resources development to meet the man-power 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.

2) The Mines and Minerals Regulation and Development Act which debarred private participation in virtually all minerals, has been amended to permit entry of private capital, both domestic and foreign.

3) The ceiling on foreign equity in the mining industry has been raised by providing for up to 74 per cent foreign equity participation in Indian companies engaged in mining activities.

4) The policy also permits minerals and metal processing units that wish to develop captive mines to secure assured supplies of raw materials. It promotes foreign equity to the extent, already, permitted to such processing units.

5) The Government would not allow strip mining in forest areas unless the companies undertook time-bound reclamation programmes.

6) 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.

7) Exploitation of sea-bed mining in the Indian Ocean is not permitted.

Limitations and Suggestions

The Government must proceed with the privatisation of mineral exploitation and export carefully so that short-sighted private greed does not do undue damage to the long-term national interest. At the same time, the government need to take a pragmatic, rather than theological approach. If the Government fails here, it will be nothing short of courting disaster, as many other countries have found out, like Nigeria, Zaire, Persian Gulf countries, Nauru and many others.

3.6.4 New Mineral Policy, 2008

A committee was set up in the late-2005 under the chairmanship of Anwar-ul-Hoda. The New Mineral Policy, 2008 has incorporated most of the recommendations made in the Hoda Committee Report. The important points of new mineral policy, 2008 are:

i) The new policy recognises that private sector will be the main source of investment in reconnaissance and exploration. It takes a pragmatic view of the risks associated with the business of finding/producing minerals and therefore ensures security of tenure and rights of transferability of various awards — reconnaissance permits (RPs), prospecting licences (PLs) and mining leases (MLs).

ii) The new policy provides for introducing Long Area Prospecting Licences to help the investors achieve economies of scale. These licences will be given only with regard to non-bulk minerals which, from the investors' point of view, is a high-risk, high reward area.

iii) The policy emphasises that mining is a standalone industrial activity, it can thrive in conjunction with value-addition activities.

iv) Export policies will be formulated after taking stock of the mineral inventories and short, medium and long-term needs of the country. It is stated in the policy document that efforts shall be made to export minerals in value-added forms as far as possible.

v) The policy envisages steps to be taken for the governments to facilitate financing of mine development and exploration which are integral to the mining projects.

vi) There is also a plan to develop appropriate capital market structures to attract risk investment in survey and prospecting. Flow of 'risk funds' – from capital market and venture funds – will be eased with Policy interventions. The public private partnership model would be useful for building mining infrastructure.

vii) The policy seeks to bring certain level of uniformity in mineral administration in the country.

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 a number of resources matches requirements, but the present utilisation of almost all resources falls short of the requirements. Therefore, what is immediately required is:

1) 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.

   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 minimised.

2) There is the need to take such conservation measures that sustain the output over a longer period. Our forefathers designed institutions to cope with the divergence between the individual and social rates of discount and its adverse effect on sustainable resource use. In good times and bad, by invoking the spirits or scriptures, and by creating institutions for conservation from above or below, our forebearers ensured sustainable use of natural resources. It is possible even now to revive the institutions by nurturing community consciousness.

3) All the above considerations will call for an effective organisational set-up. Privatisation by itself cannot be an end. In the recent past there has been clear evidence of deals and attempts to transfer publicly-owned resources to private hands on terms which are more than generous to the private parties and involve substantial losss in potential income as well as other costs to the public exchequer.

In the interest of swift economic development, these considerations cannot be ignored.

3.7 BIODIVRSITY

India contains a great wealth of biological diversity in its wetlands and in its marine areas. There are about 350 species of mammals, 1,224 species of birds, 408 species of reptiles, 197 species of amphibians, 2,456 species of fishes, and 15,000 flowering plants. The importance of these biological resources cannot be overestimated for the continued welfare of India's population.

A large number of both flora and fauna are faced with threat of extinction because of the increasing demand being made on natural resources.

The Government has responded by taking a number of measures including legislative measures, among which the more important is the Biological Diversity Act, 2002.

3.7.1 Biological Diversity Act, 2002

The Act covers conservation, use of biological resources and associated knowledge occurring in India for commercial or research purposes or for the purpose of bio-survey and bio-utilisation. It provides a framework for access to biological resources and sharing the benefits arising out of such access and act.

3.8 ENVIRONMENT AND ECONOMIC DEVELOPMENT

3.8.1 What is Environment?

Environment has been defined as the aggregate of all the external conditions and influences affecting the life and development of an organism. It comprises the whole range of external influences acting on an organism, of both the physical and the biological forces of nature surrounding the human individual. All living beings are part of balanced and interacting ecosystem: they draw sustenance from the solid, liquid and aerial resources on the earth. They undergo passage through the phases of reproduction, sustenance and extinction. The ultimate source of energy for the entire ecosystem is the solar energy. The ecosystem consists of subsystems such as sea, forests, water reservoirs, plants, trees, insects, animals in a forest—all of them are inter-connected in a network of devourer-devoured relationship. None of the elements in the network is useless or purposeless. Each of them helps to regulate the balance of the subsystem. Bio-gas-chemical cycles are essential for the process of reproduction in the physical environment. The process of reproduction is held in balance as long as the natural cycles, their interrelations and the hierarchy of the food-chain are not disturbed.

Man's desire for more joy and comfort has led him to exploit nature's free goods to the extent of reducing its natural capacities for self-stabilisation. As countries industrialise, they increase their global footprint, which is the pressure they put on the earth's resources. The footprints of Europe and Japan are abut 4.7 global hectares per person, and the USA's is 9.7. India's footprint at present is 0.8 and China's has reached 1.6. Mankind's overall global footprint, which was about 60 per cent of the global biocapacity in the 1960s, has already reached 130 per cent. This gets reflected in growing environmental problems. Environmental problems centre on human activities resulting in pollution of the atmosphere, oceans and land. These range from the global (greenhouse warming and ozone depletion) to the regional (acid rain and desertification), national (deforestation) and local (soil erosion, contamination of fresh water resources and urban pollution). The relevance of such concerns and the priority attached to each varies between the developing and developed countries.

We will have a brief look of case of these problems.

1) **Climate Change** - Climate change is a change in the statistical properties of the climate system when considerd over long periods of time, regardless of cause. Accordingly, fluctuations over periods shorter than a few decades such as El Nino, do not represent climate change. The most important factor causing climate change is human activities and it is largely irreversible. Among these we may mention such factors as land use, ozone depletion, deforestation, etc.

2) **Food Security** - Food security refers to the availability of food and one's access to it. A household is considered food-secure when its occupants do not live in hunger or fear of starvation. Inadequate food security arises from such factors as soil degradation and erosion, declining productivity of such inputs as fertilisers and HYV seeds, diversion of arable land to non- cultivation, etc.

3) **Global Water Crisis -** Water tables are falling in scores of countries (including India, China and the US) due to widespread over-pumping, using powerful diesel and electric pumps. This will eventually lead to water scarcity and reduction in grain harvest.

4) **Energy Security -** Energy security is a term for an association between national security and the availability of natural resources for energy consumption. Access to cheap energy has became essential to the functioning of modern economies.Threats to energy security arise from the factors like manipulation of energy suppliers, the competition over energy sources, attacks on supply infrastructure as well as accidents, natural disaster, foreign oil supply, etc.

3.8.2 Protection of Environment and Sustainable Development

The protection of the environment is an essential part of development. Without adequate environmental protection, development is undermined. There are two ways in which this can happen:

1) Environment quality – water that is safe and plentiful and air that is healthy – is itself part of the improvement in welfare that development attempts to bring. If the benefits from rising incomes are offset by the costs imposed on health and the quality of life by pollution, this cannot be called development.

2) Environmental damage can undermine future productivity. Soils that are degraded, aquifers that are depleted, and ecosystems that are destroyed in the name of raising incomes today jeopardise the prospects for earning income tomorrow.

In view of these considerations, economists have evolved the concept of sustainable development. This term was popularised by the 1987 Brundtland Report, Our Common Future, although it had been around earlier in the decade. This Report by the UN-created World Commission on the Environment and Development was significant in so far as it was the first such initiative to involve social scientists. The Brundtland Report and other independent writers highlighted the growth rates on the basis of net national product, where net takes into account depreciation of natural resources.

The concept of sustainable development was also paraphrased for the first time in these writings. Today, there are a large number of definitions of sustainable development (some think the number is over 100).

We take development to be a vector of desirable social objectives; that is, it is a list of attributes which society seeks to achieve or maximise. The elements of this vector might include: (i) increases in real income per capita, (ii) improvements in health and nutritional status, (iii) educational achievement, (iv) access to resources, (v) a 'fairer' distribution of income, and (vi) increases in basic freedom.

Sustainable development is then a situation in which the development vector D does not decrease over time.

The necessary condition for sustainable development to be taking place is a non-negative change in the stock of natural resources and environmental quality. The sustainability condition can be briefly summarised by saying that 'the environment should not be degraded further but improvements would be welcome'. The above condition can scarcely be applied on a project by project basis since it would lead

to rejecting almost every project. It has to be allowed that most productive projects use up resources and hence deplete the natural base. Advocates of sustainable development would apply the condition on an across the board basis to assess the net desirability of all current projects.

3.8.3 Policies for Environment

Two broad sets of policies are needed to attack the underlying causes of environmental damage:

1) **Policies Built on the Positive Links:** These seek to harness the positive links between development and the environment by correcting or preventing policy failures, improving access to resources and technology, and promoting equitable income growth. Such policies include the following.

   i) Removing subsidies that encourage excessive use of fossil fuels, irrigation water and pesticides and excessive logging.

   ii) Clarifying rights to manage and own land, forests and fisheries.

   iii) According higher priority to provision of sanitation and clean water, eduction (especially for girls), family planning service, and agricultural extension, credit and research.

   iv) Taking measures to empower, educate, and involve farmers, local communities, indigenous people, and women so that they can make decisions and investments their long-term interests.

2) **Policies Targeted at Specific Environmental Problems:** Specific policies are required to induce or require resource users to take account of the spillover effects that their actions have on the rest of society. Policies designed to change behaviour are of two broad types: those based on incentives, which tax or charge polluters according to the amount of damage they do, and those based on quantitative restrictions, which provide no such flexibility.

The appropriate choice among varied instruments of policy will depend on circumstances. However, several lessons, as follows, can be drawn from recent experience.

i) Trade-offs between income and environmental quality need to be carefully assessed, taking long-term, uncertain and irreversible impacts into account. Carefully balancing costs and benefits is especially important for developing countries, where resources are scarce and where basic needs still must be met.

ii) Standards and policies need to be realistic and consistent with the monitoring and enforcement capacity and the administrative traditions of the country.

iii) Blunt and more self-enforcing policies are likely to be attractive in developing countries. Policies need to work with the grain of the market rather than against it using incentives rather than regulations where possible.

iv) Governments need to build constituencies for change — to curb the power of vested interests, to hold institutions accountable, and to increase willingness to pay the costs of protection. Local participation in setting and implementing environmental policies and investments will yield high returns.

v) The costs of protecting and improving the environment are high in absolute terms, but they are modest in comparison with their benefits and with the potential gains from economic growth.

3.8.4 Environmental Protection in India

India is ranked a disappointing 101st out of 146 countries for which the Environmental Sustainability Index (ESI) was prepared in early 2005. (The most sustainable country is Finland and the least sustainable is North Korea). The ESI is based on 21 indicators and 76 measurements, including natural resource endowments, past and present pollution levels, and policy efforts.

State-wise, the best performing state in India in terms of the ESI is Manipur, followed by Jammu and Kashmir and Tripura. All these states are sustaining their stocks of natural resource. They face less stress on their environmental systems and are exerting lower impacts on environment and health. The lowest ranking states are Gujarat, Punjab and Haryana. These states have diminished stocks of natural resources, especially in terms of air and water quality. They also score low on land use pattern.

3.8.5 National Environment Policy 2006, (NEP)

The NEP 2006 is being described as a statement of India's commitment to making a positive contribution to international efforts.

The NEP builds on the earlier policies, like the National Forest Policy, 1988, National Conservation Strategy and Policy Statement on Environment, 1992, National Agricultural Policy, 2000, National Population Policy, 2000, and National Water Policy, 2002.

Its major features are as follows:

i) The dominant theme of the policy is to ensure that the livelihood of people dependent on forest products is secured from conservation than from degradation of the resources.

ii) To achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

iii) To achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

iv) Environmental Impact Assessment will continue to be the principal methodology for appraisal and review of new projects.

v) The assessment processes are being revised. Under the new arrangement, there will be significant devolution of powers to the State/Union Territory level.

vi) It also seeks to revisit the Coastal Regulation Zone notifications to make the approach to coastal environmental regulation more holistic and, thereby, ensure protection to coastal ecological systems, waters and the vulnerability of some coastal areas to extreme natural events and potential sea level rise.

vii) Involvement of Panchayati Raj Institutions and urban local bodies has been highlighted.

Check Your Progress 3

1) State the important issues relating to minerals that need to be covered in the National Mineral Policy.

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2) Explain the concept of sustainable development.

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3) State the major features of National environment policy, 2006.

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3.9 LET US SUM UP

Natural resources availability, their utilsation and the capacity to mobilise more resources determine an economy's ability to overcome the various problems. Information on stock of natural resources in India is provided by basic resource agencies i.e. Survey of India and Geological Survey, Indian Bureau of Mines, Oil and Natural gas commission, Central water and Power commission, Soil Land Use Survey etc.

Keeping in view the fact supply of land being fixed and its demand increases, effective rationing of land among the various uses is required.

Water being the most important source of energy in Indian economy needs a water policy ensuring effective performance management system for public water infrastructure.

Forests produce the requisite raw materials for industries, defense, domestic use and other public purposes and create a large volume of employment and thus have multifarious uses. Hence there is need to review the national forest policy comprehensively addressing several issues particularly heavy deforestation.

The mineral resources of India encompass a wide range of products putting into three categories based on their nature and use – (i) fuels like coal, lignite, natural gas and petroleum, (ii) metallic minerals like bauxite, iron-ore manganese, (iii) Non-metallic minerals like phosphorite, graphite, gypsum, limestone, mica, etc. Several issues relating to the minerals like intensive survey to identify unknown utilisable resources, conservation measures to sustain the output over a longer period and effective organisational set up need to be addressed by the policymakers.

The protection of environment is an essential part of development. Two broad set of policies are needed to counter the underlying causes of environmental damages: polices built on the positive links, and policies targeted at specific environmental problems.

3.10 EXERCISES

1) Discuss the importance of forest resources in the Indian economy.
2) Examine the efforts made by the Government to develop forest resources, and suggest the parameters of a suitable forest policy.
3) What do you mean by 'sustainable development'? Do you think that sustainable development will be possible in the present growth scenario?
4) Discuss in brief the salient features of changes in the cropping pattern in India.

3.11 KEY WORDS

Natural Resources : These include all those objects and products that human labour, combined with inputs of capital and enterprise, can extract from nature and make use of them to produce more goods and services.

Net Sown Area : Refers to the total land area that is put under cultivation.

Gross Sown Area : Net sown area plus that part of the net sown area which is cultivated more than one time during a year.

Sustainable Development : A process of development that ensures that the future requirements of natural resources will not go unsatisfied due to over-exploitation of resources in the present.

El Nino : It is a quasiperiodic climate pattern that occurs across the tropical pacific ocean roughly every year.

Biodiversity : Variability of the ecosystmes, species and genes.

3.12 SOME USEFUL BOOKS

1) Dhingra Ishwar C. (2012): *The Indian Economy: Environment and Policy*, Sultan Chand, New Delhi.
2) Chopra Kanchan and Swaminathan M.S. (eds.) (2008): *Growth Equity, Environment and Policy,* Sage, New Delhi.
3) Krishna K.L. and Kapila Uma (eds.) (2009): *Readings in Indian Agriculture and Industry,* Academic, New Delhi.
4) Dutt Lahiri and Wasson Robert J.(2009): *Water First—Issues and Challenges for Nations and Communities in South Asia,* New Delhi, Sage.
5) Government of India: state of Environment Report.

3.13 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) See Section 3.1

2) See Section 3.1

3) See Section 3.2

Check Your Progress 2

1) See Sub-section 3.4.1

2) See Sub-section 3.4.2

3) See Sub-section 3.5.1

Check Your Progress 3

1) See Sub-section 3.6.2

2) See Sub-section 3.8.2

3) See Sub-section 3.8.5