UNIT 19 DEVELOPMENT AND ENVIRONMENT

Structure

19.1 INTRODUCTION

You have already learnt that our interference with the environment should be limited to the extent that it may not impair the quality of our environment. In the previous unit you have read how information on various aspects such as communities, geology, climate and research activities related to environment is essential for successful environmental management. Public awareness as well as governmental agencies are the key factors in the management of our environment aimed at dealing with the current environmental problems.

In this unit you will study how the development of human societies, from hunting and gathering societies to the advanced technological societies has caused a disruption in the natural interactions of physical and biological processes in our environment, thereby, endangering the very existence of life on the earth. In many parts of the world, population is growing at rates that cannot be sustained by available environmental resources. Current environmental problems can be understood by various conceptual models which are discussed in this unit. It is, therefore, imperative that to save our biosphere we should adopt the concept of sustainable development by using appropriate and simpler technologies based on renewable resources and suitable for local needs. We have also discussed the role of international economy in our environment and the need for a sustainable world economy which will help in creating a clean and healthy environment. Sustainable development will meet the needs of the present without compromising on the ability of future generations to meet their needs.

Objectives

After reading this unit you should be able to:

- understand the relationship between developmental activities of human societies and environmental degradation,
- list and explain the conceptual models to understand the current environmental problems,
- discuss the role of poverty in degrading the local environment,
- define and explain the concept of sustainable development,
- give a sequence of relationship to show that international economy dictates the developmental activities and state of our environment,
- define and explain the concept of a new sustainable economy at global level.

19.2 A THREATENED FUTURE

Human environment and the problems arising from human interactions with environment were discussed in details in the previous units. Environmental problems, which are caused over a period of time due to disregard for and careless handling of our environment and sudden increase in human population in the last two centuries, are growing in number day by day.

As you know, various living and non-living components of the environment are interdependent. The environmental problems usually arise due to the disruptions of the natural interactions between physical and biological processes.

The interactions of human beings with their environment have changed during the course of development of human societies. You have already read in Block 2 how the most primitive human societies, i.e. hunters and gatherers, did not adversely affect the environment, but exploited the same to meet their basic needs. Although it is believed that extinction of many prehistoric animal species, such as cave bear, giant bison, mammoth and saber-toothed tiger is mainly due to human activities (Fig. 19.1).

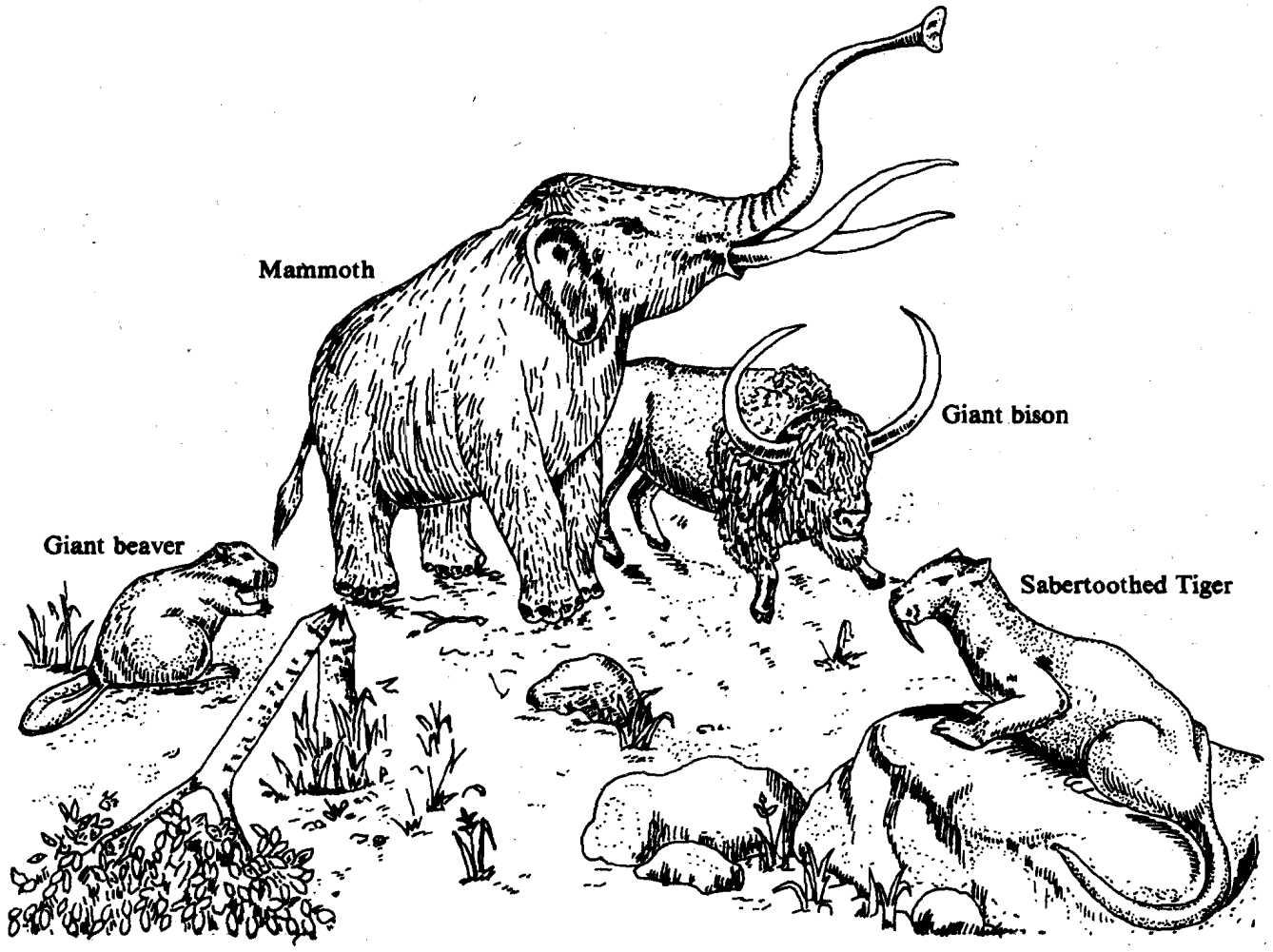
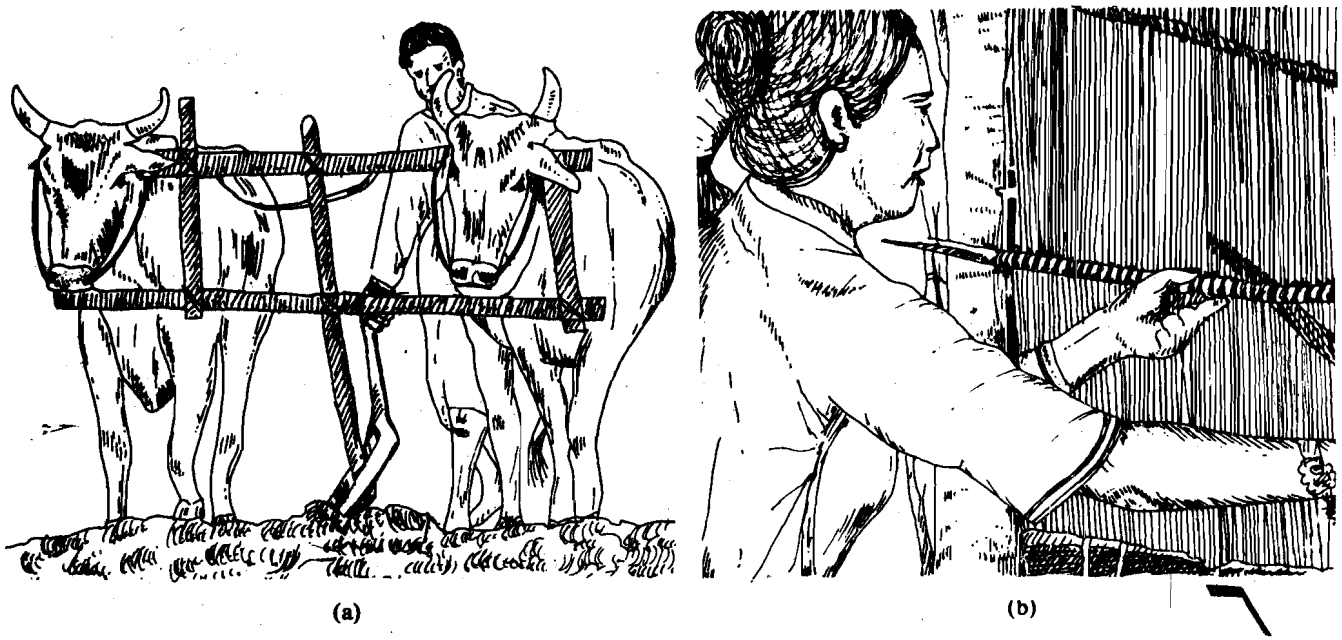


Fig. 19.1 : Sketch diagrams of a few animal species that became extinct in prehistoric times, mainly due to human activities. Other factors may have been the climatic changes.

Later, the development of agricultural societies led to an increase in productivity. With the development of plough, farmers started using rich grasslands for agricultural purposes (see Fig. 19.2 a). Population grew but fewer people were needed for cultivation. So people moved from villages to cities and took up craft and small-scale manufacturing (see Fig. 19.2 b). This placed more demands on environment for food and other resources. The city became a centre of trade, commerce, governmental and religious activities. Increased exploitation of resources accompanied by poor land management resulted in the destruction of natural

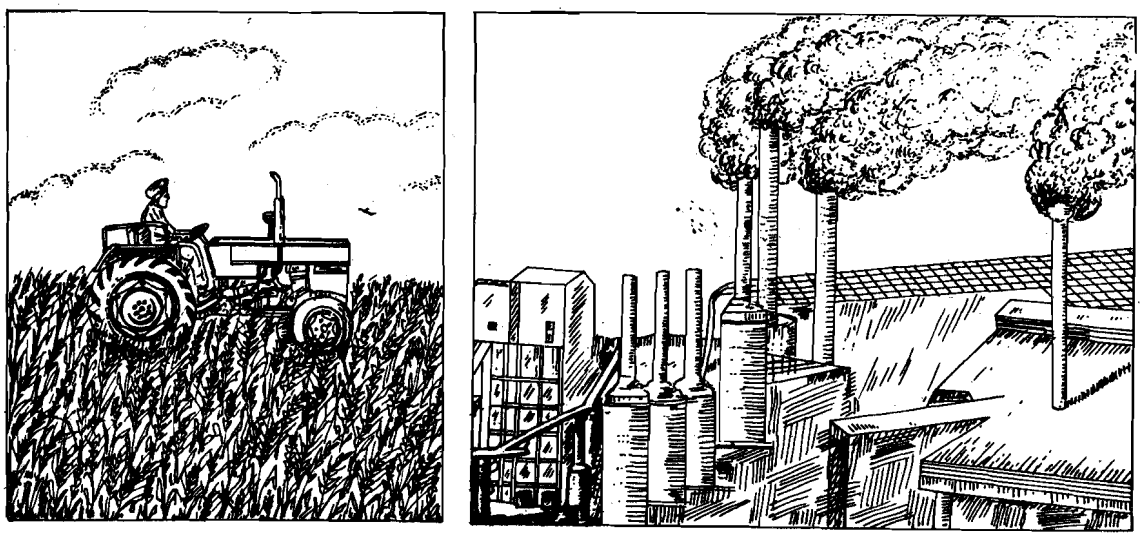
environment. Overgrazing, excessive timber cutting and poor agricultural practices added to further environmental problems.



(a) (b)

Fig. 19.2 : (a) The advent of plough allowed the use of rich grasslands for agriculture; (b) abundance of food with the help of farming led the people to develop craft — a weaver. People traded their goods for food and other items.

Industrial revolution, which means a change from small-scale manufacturing by hand to large-scale manufacturing by machine, led to the development of industrial society. Manufacturing of various articles became more capital and energy-intensive and less labour intensive. Mechanisation of the farms displaced more farm workers. This led to the influx of more people into the cities. This shift from an agricultural to an industrial society drastically altered the human interactions with the environment, damaging it further. And as you have read earlier, environmental problems such as air pollution, water pollution, soil erosion, destruction of wildlife, etc. are the results of increasing demands placed by industrial societies on the environment (see Fig. 19.3).



(a) (b)

Fig. 19.3 : (a) Mechanised modern agriculture depends heavily on energy and other resources; (b) air pollution is one of the major environmental problems caused by industrial revolution.

Today, we are all a part of an industrial society with much advanced technology. This is characterised by a marked rise in production and consumption, a shift towards non-degradable synthetics such as plastics and increased use of non-renewable resources such as petroleum products. There has been a huge increase in energy demands and, of course, in environmental problems of pollution, depletion of resources, global warming, nuclear hazards, health hazards, over population, exploitation of poor by rich etc.

The deterioration of biological and physical systems is not an issue of concern only to environmentalists. It has social, economic and political implications affecting not just one country but the entire world. Extensive utilisation of earth's resources has not only been causing depletion of non-renewable resources and unprecedented pollution but threatens depletion of these resources in due course of time. The welfare of human species depends upon the optimum interaction between man and his environment. Unfortunately, as technology has advanced, we have acquired the ability to influence the earth's ecosystem in various drastic ways without understanding the mechanism of their functioning. Nature has a vast capacity to recover from environmental damage. There is, however, a limit to the nature's capacity to recover from continuous abuse. Because of our ignorance of the fundamental laws governing the survival of populations and use of resources, the ecological balance of our biosphere is being upset continuously.

By now you are aware that we all depend on a common biosphere for our sustenance. Yet each community, each country, strives for survival and prosperity with little regard for its impact on others. Some consume the earth's resources at a rate that would leave little for future generations. Others, many more in number consume far too little and live with the prospect of hunger, squalor, disease and premature death. The failures that we need to correct, arise both from poverty and short-sighted way in which we have often persued prosperity. The prosperity attained in some parts of the world is often precarious, as it has been secured through developed farming, forestry, industries, etc. bringing profit and progress only for a short period. Today, our intervention in natural processes is increasing and sometimes decisions have their impact beyond the national frontiers.

However, still there is hope. People can co-operate to build a future that is more prosperous, just, and secure, so that a new era of economic growth can be attained. But for this we must understand the symptoms of environmental stress and identify their causes so that environmental resources can be better managed. Thus, the human development can be sustained by adopting new approaches towards our environment. In the following sub-section we will try to understand the symptoms and causes of environmental problems and new approaches to deal with them, but before that you may like to try the following SAQ.

SAQ 1

Fill in the blanks with appropriate words from the text .

i) Agricultural production increased with the development of .....

ii) With the development of machines production became more .....

iii) Advanced industrialisation is also marked by a shift towards the production and use of .....

iv) Nature's capacity is .....in order to recover from continuous abuse.

19.2.1 Symptoms and Causes

As you have read in the earlier units, global warming, deteriorating quality of air, water, soil and food-stuffs, poverty, increasing job dissatisfaction, overexploitation of resources and nuclear hazards are related directly or indirectly to the environmental problems today. Opinions of people differ as far as environmental issues are concerned. Some people find these issues complex and confusing. Others blame politics, technological development, misuse of energy, peoples' attitude towards nature for the present state of our environment. In this sub-section we will discuss three conceptual models to understand the environmental problems.

Population, Resource and Pollution Model

Population, Resource and Pollution Model (PRP model) show that all organisms and

human populations from all the societies; hunting and gathering, agricultural and modern societies, acquire and use the resources from the environment for their survival and development.

The acquisition and use of resources often lead to pollution of air, water and soil, threatening life by affecting a variety of environmental components. For example, water pollution may kill fishes, mining and building of dams destroy the land ruining the habitat of many animals. In order to minimise pollution and help other organisms to share the planet, it is necessary to adopt a scientific approach in acquisition and use of natural resources.

Oil slick in the recent gulf war has endangered various species of birds and other marine life forms

As shown in Fig. 19.4, human populations acquire and use resources from the environment. Careful use of these resources has led to improving the quality of life and promotion of population growth. This response is an example of positive feedback loop, in which one factor leads to the growth of another and is shown by

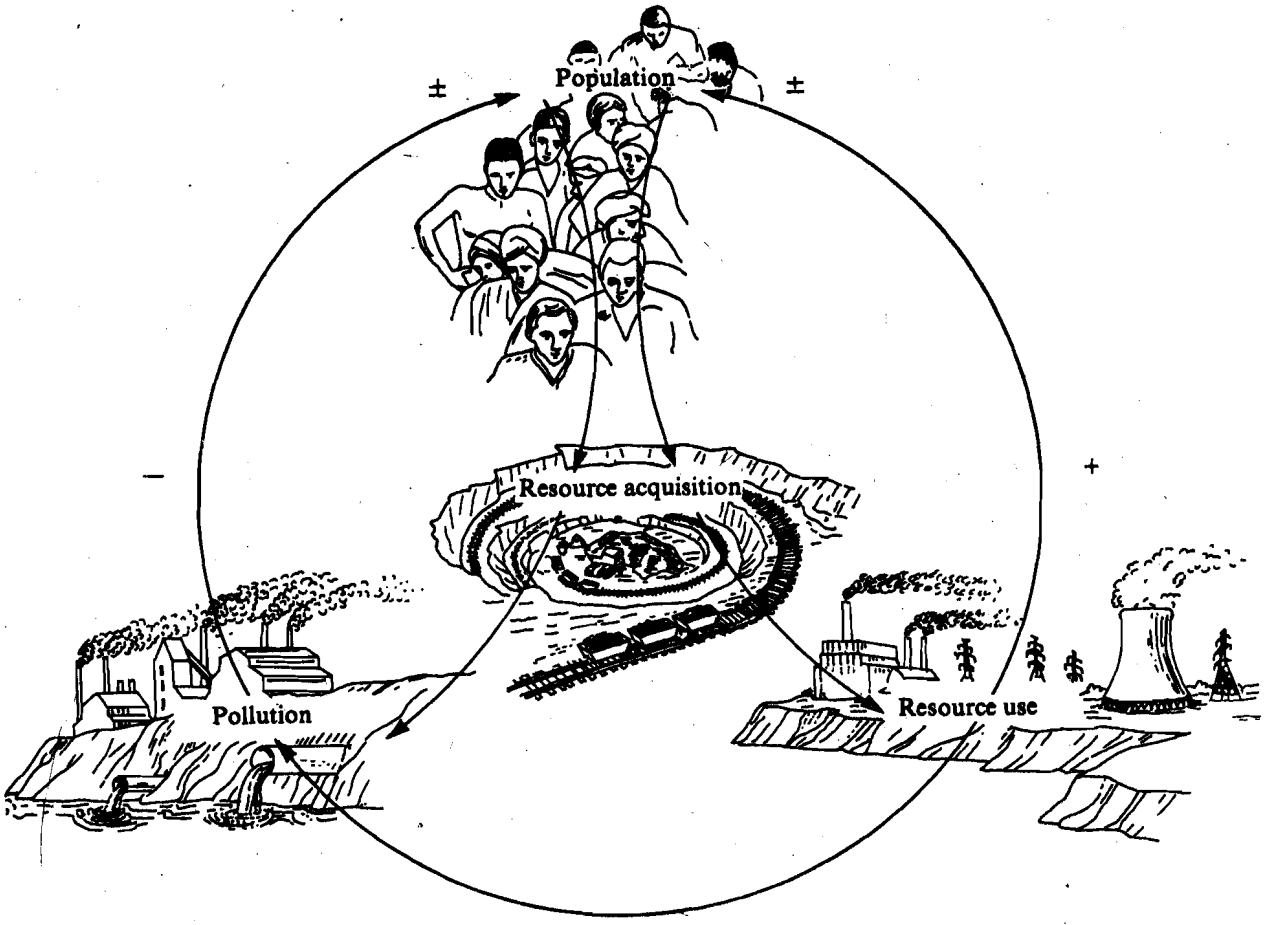


Fig. 19.4 : Population, Resource and Pollution model. Positive feedback loops and negative feedback loops are shown with arrows showing + mark and − mark respectively.

arrow with plus mark in the model. In some cases acquisition and use may deplete the natural resources or pollute the environment seriously affecting the populations. These are the examples of negative feedback loop in which one factor causes another to decrease and is shown by arrow with minus mark in the model. The PRP model is one way of conceptualising the problems caused by human-environment interaction. The interactions of population, resources and pollution are summarised in Table 19.1.

Table 19.1 : Summary of the Interactions of Population, Resources and Pollutions

1. Effects of Population on Resources

Resource acquisition and use are determined by the population size and socio-economic and technological development of a country. Resource demands in rapidly growing population may result in less concern for the consequences in resource acquisition and use, thus, causing more damage than population with slower growth. Resource supply and use are affected by population distribution.

2. Effects of Population on Pollutions

Populations through resource acquisition and use create pollution. The amount and ways in which resources are used determine the amount of pollution. This leads to environmental degreadition.

3. Effects of Resources on Population

Positive effect—discovery and use of new resources can increase population growth, technological development and allow habitation in otherwise unfavourable environments.

Negative effect—depletion and degradation of resources can limit population growth and technological development.

4. Effects of Resources on Pollution

More amount and various ways of resource acquisition and use create more pollution. However resource depletion can reduce pollution.

5. Effects of Pollution on Population

Pollution can increase mortality and limit population growth and thus technological development. On the other hand pollution can change attitudes which can help to change the laws and ways of resource acquisition and use.

6. Effects of Pollution on Resource

Pollution of one abiotic factor such as air can contribute to the destruction of another factor such as soil. New laws framed to control pollution can bring out changes in resource demand, supply, acquisition and use.

Multiple Cause and Effect Model

Multiple cause and effect model is aimed at understanding the current environmental problems at individual level and show that these problems are caused by various factors like population, per capita consumption, economics, technology, public policies, politics, biology, psychology and culture (See Fig. 19.5). We will discuss these factors very briefly.

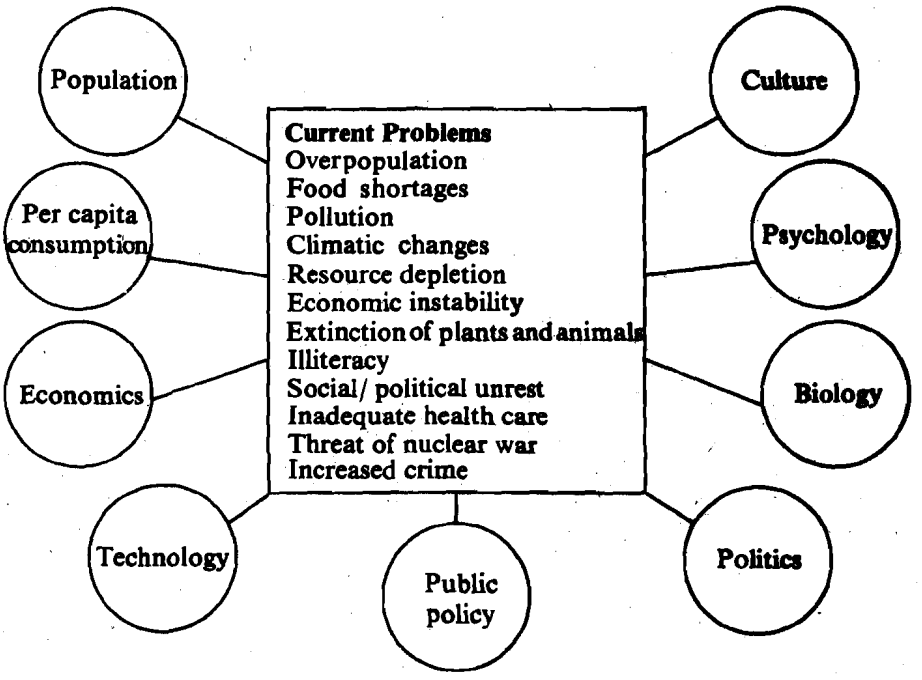


Fig. 19.5 : Multiple cause and effect model to study the individual environmental issues which contribute to the current environmental problems

The human **population** destroys wildlife habitat and pollutes the environment in many ways in order to satisfy its ever-growing need for food, clothing and shelter. The developmental process such as building of roads, and houses by cutting forests and polluting the water and air with factory effluents also adds to the ever-growing problems. The larger the human population the greater is the environmental damage caused.

The rapid increase in the amount of resources used by each member of the society, i.e. **per capita consumption** has strained the earth's renewable and non-renewable resources.

Economics also plays an important role in wildlife extinction. For example, surface mining of coal which is cheaper than underground mining is more destructive for natural habitat. In business, economics often does not account for the external cost, i.e. the costs of controlling pollution, habitat destruction and other environmental impacts in the production cost. External cost must be included in the production cost so that only those who consume the products pay higher prices for the use of energy and goods. Otherwise these external costs will be borne by the public who along with wildlife suffer due to environmental degradation, which public pays in the form of increased taxation.

About 8 tons of ash was daily emitted from the Indraprasth Power Station in Delhi. The installation of Cottrel precipitators in the chimneys has reduced these emissions. Of course the process which depends on electrostatic precipitation is costly.

Technology has helped us in our struggle for survival. It has made us prosper in environments where survival otherwise might have been impossible. But at the same time inapt use of technology has contributed to the shrinking of wildlife habitat and overexploitation of earth's resources.

Public policies, through the legal system play an important role in the prevention of wildlife extinction and deforestation. There are laws which affect hunting, poaching, destruction of wildlife, cutting of forests, population growth, resource acquisition and use. For example, there were very few legal controls on surface mining before the 1970s and the result was that a lot of surface-mined land was left barren. Now of course, there are new laws which require revegetation and reclamation of surface-mined lands, before they are disposed of by mine contractors. You will read more about the legal aspects, management and preservation of human environment later in this course. However, the fact remains that legal provision ensuring conservation of wildlife and forests are often disregarded due to **political** interference.

Various **biological factors** such as adaptability, number of offspring produced, varied sensitivity to environmental pollution etc., play an important role in wildlife extinction. For example highly specialised species are generally unable to adapt to a changing environment resulting from human activities.

The **psychology** of our behaviour towards the environment is that we are concerned more about the immediate needs and comforts rather than the future of our planet. Since our population is large and technologies are now available for extensive exploitation of natural resources, this short-sightedness leads to many environmental problems.

Culture would determine whether you have a caring attitude or self-centred attitude. Caring attitude would mean concern for one's fellow beings and also for the environment. Whereas self-centred attitude would mean self-advancement exclusively.

Impact Analysis Model

Impact Analysis Model shows the impact of human activities on both, abiotic environmental factors, i.e. air, water and land; and biotic factors, i.e. plants, animals and other organisms on this planet.

The impact of human activities on our environment and biota is summarised in Fig. 19.6. Biota are affected directly by the human activities as well as indirectly through the environmental degradation caused by human activities.

We will discuss the impact analysis model by taking the example of mining and use of coal as fuel.

Impact on Environment includes air, water and land pollution. Mining or related activities such as heavy vehicles commuting on dirty roads near mines may cause air pollution. Air pollution due to the combustion of coal in a thermal power-station is of greater intensity. A single 1000-megawatt coal-fueled power plant which serves roughly one million people, emits approximately 1,500 to 30,000 metric tons of particulates, as smoke and ashes and 11,000 to 110,000 metric tons of sulphur dioxide gas every year.

Coal mining also causes water pollution. For example, in abandoned underground coal mines, certain sulphur containing minerals such as iron pyrites react with oxygen and water to produce highly corrosive sulphuric acid. This acid drains from the mines and pollutes rivers and lakes downstream.

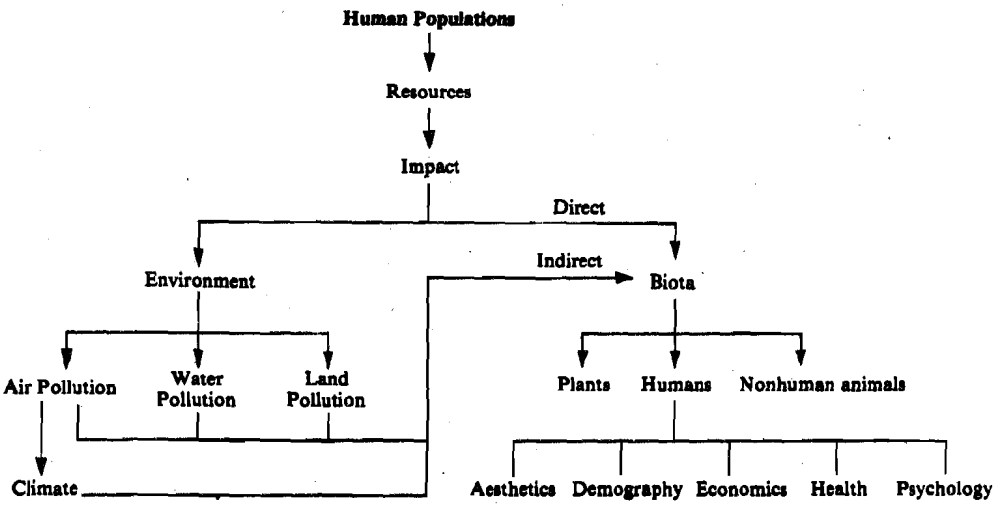


Fig. 19.6 : Impact analysis model showing the direct and indirect impact of human activities on our environment and biota.

The process of coal mining leads to land degradation. Digging out of the coal mines rips up the surface and in the process destroys the normal soil structure as well as vegetation cover (see Fig 19.7).

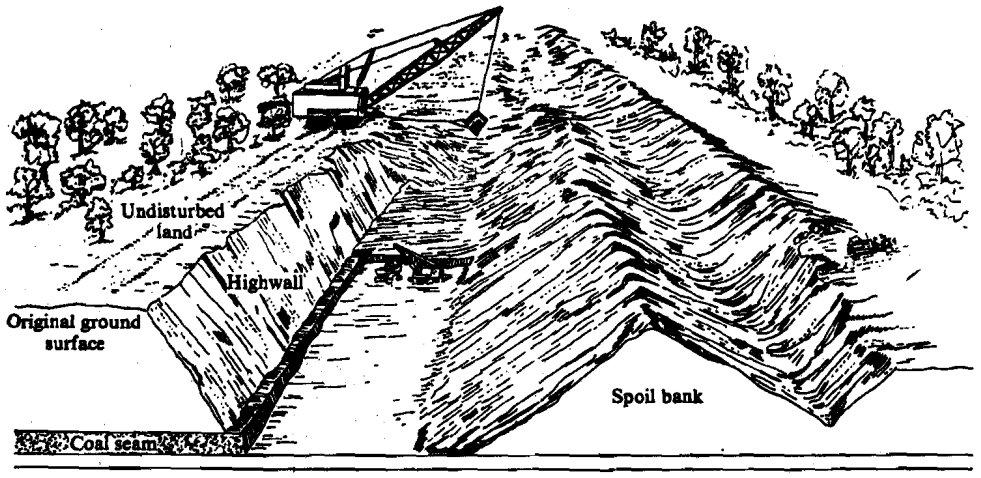


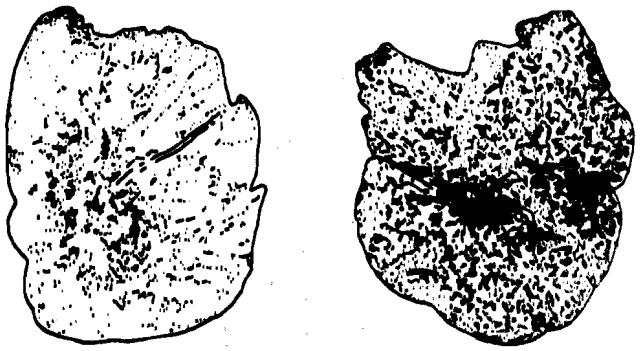
Fig. 19.7 : Digging out of the coal mines destroys the normal soil structure. The land is permanently ruined if it is not carefully reclaimed.

All forms of environmental pollution caused by human activities have **indirect impact on biota** of our planet. For example, sulphur dioxide produced by coal-fueled power plants is converted into sulphuric acid in the atmosphere and is carried down by rain or snow. This process of acid precipitation has destroyed many lakes by turning them acidic and virtually destroying all life forms in them. Acid draining from coal mines causes water pollution killing the aquatic biota. It also corrodes bridges, pumps and other metallic structures thus, increasing the cost of repairs and replacements. Destruction of natural vegetation and unreclaimed land as a result of mining increases the soil erosion leading to increased sediment deposition in streams. This can kill the

bottom-dwelling organisms. These are some examples to show how human activities affect the organisms through environmental pollution.

Human activities have **direct impact on biota** too. Disturbance of land by mining disrupts and pollutes underground water. Much of the mining activity is being carried out in forested regions causing deforestation and erosion. Underground mining also significantly denudes forests, because timber is used for supporting the roofs of mine galleries. In Goa alone, mining leases are spread over 43% of the forest area.

Underground mines may collapse during or after mining causing loss of human life. Despite improved working conditions, underground coal mining has the highest rate of injury of all major occupations. Underground coal mining also causes **black lung disease** or **pneumoconiosis,** a debilitating disease caused by breathing coal dust and other particulates. Victims cannot breathe enough oxygen as the alveoli or the tiny **air sacs** in the lungs get injured (see Fig. 19.8).



(a) (b)

Fig. 19.8 : (a) cross section of a normal lung, (b) cross section of a lung from a retired coal miner

Increase in coal mining results in demographic changes, i.e. changes in populations in nearby towns. Regions once sparsely populated are encroached on by miners and their families bringing along with them many undesirable effects, such as heavy strain on infrastructure of housing, sewage and water supply systems, hospitals, schools, recreational facilities and increase in health, economic and social problems.

The foregoing review of the impact of human activities related to coal-mining indicates the price society pays for overexploitation of resources. So, this should make the society aware of the problems and help plan ways to minimise them. Thus, impact analysis model is helpful while studying the effects of a particular technology in resource development such as coal, oil or nuclear energy

SAQ 2

a) Name the three conceptual models to understand the complex environmental problems and briefly discuss any one in the space provided below.

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b) Fill in the blanks with appropriate words:

i) Acquisition and use of resources ..... various environmental components.

ii) In economics ..... is the cost to control pollutions as a result of production.

iii) Animals and plants show ..... sensitivity to the pollutants.

iv) Human activities have ..... and indirect impact on ..... of our biosphere.

19.2.2 Poverty, Development and Environment

Environmental stress has often been a result of the growing demands on natural resources and pollution generated by rising living standard of the relatively rich people. But poverty itself pollutes the environment. The poor and hungry are often forced to destroy their immediate environment for their survival. They cut down forests, their livestock overgraze grasslands; they overuse marginal lands. As their number increases they crowd into congested cities. The cumulative effect of these changes are so far-reaching, as to make poverty itself a major global problem.

Developed countries are considered to be those in which technology is well advanced and the standard of living is generally high. Less developed countries are the poor nations that have not yet properly benefited from the technological advancement of the twentieth century. Developing countries are the ones that have made significant start towards modernisation but have not yet achieved full success. Developing and less developed countries are also referred to as the Third World countries.

At the beginning of twentieth century progress in medicine, agriculture and industrial techniques seemed to promise everyone a long life, decent food, adequate housing and satisfying employment. However, by 1987, when there were about 5 billion people on the earth, a quarter of them lived in greater luxury in wealthy **developed countries** and the remaining three quarters of the people lived in the poor regions of the world. The poorest of these are called **less developed countries,** whereas regions between these two extremes are called **developing countries.** Within the developing and less developed countries, many people have just enough to meet the necessities of life so as to keep themselves healthy, whereas millions of others live even below poverty level. According to a study by World Bank, at least 800 million people, i.e. one person in six in the world have such a limited diet that they do not have enough energy to perform normal physical activities. According to World Health Organisation 70 to 80 per cent children in some poorer countries in Africa, Latin America and Asia have suffered such extreme damage from malnutrition that they will never be able to realise their full genetic potential (see Fig. 19.9).

Fig. 19.9 : A starving child

One fourth of the world's population living in developed nations uses almost 80 per cent of the resources consumed by mankind in one year. The remaining three fourths of the population survives on 20 per cent. People of the United States alone, who are only 5 per cent of the world population, consume about 35 per cent of raw materials. The gap between the 'haves' and the 'have nots' is growing wider. Table 19.2 shows the inequalities in quality of life of people of various countries.

Table 19.2 Inequalities in the quality of life of the people belonging to developed, developing and less developed countries

Countries	Average Per capita GNP (Rs)	Infant Mortality Rate	Life Expectancy (years)	Population with access to safe water (%)	Adult Literacy Rate (%)	Per capita public expense in health (Rs)
Less Developed Countries	3400	110	45	31	28	34
Developing Countries	10500	94	60	41	55	130
Developed Countries	124600	17	72	100	98	4880

These inequalities not only represent the differences in the quality of life today, but also in the capacity of these societies to improve their quality of life in future. Most of the poor countries depend for export earnings on their native resources that are vulnerable to fluctuating or declining terms of trade. Unless there are more equitable trade relations one can only fear a continual resource deletion and irreparable damage to the environment in these countries.

Poverty within the countries has been increasing due to unequal distribution of land and other assets. Rapid increase in population has also contributed to the inability to raise living standards. The growing demand for the commercial use of agricultural land to grow crops for export have pushed many subsistence farmers into less fertile land.

Further as you know widespread deforestation, overcultivation, use of land for residential and commercial purposes have caused disasters like droughts and floods. Majority of the victims of such disasters are the impoverished ones in poor nations, and the impoverishment of the environment makes their survival even more difficult and uncertain. Their economically vulnerable governments are ill-equipped because of lack of necessary amenities and monetary reserves to cope with such disasters. Also with increase in population and rise in per capita income, consumption of energy and materials goes up. Thus, we see that environmental challenges arise from lack of development and also from developmental processes. The search for a more viable future can only be meaningful in the context of more vigorous effort to renounce and eliminate the development of means of annihilation.

SAQ 3

Discuss very briefly how poverty adds to the environmental problems, in the space given below.

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Till now you have read bout the environmental stress caused by developmental processes and you have also been introduced to a few models to understand the symptoms and causes of complex problems of our threatened future. In the following section, we will discuss the concept of sustainable development, i.e. development that meets the needs of the present without compromising the ability of future generations to meet their needs.

19.3 TOWARDS SUSTAINABLE DEVELOPMENT

Environment and development are inexorably inter-linked. Development cannot subsist upon deteriorating environmental resources and environment, in turn, cannot be protected if development does not take into account the environmental problems. Failure to manage the environment and to sustain development threaten the very basis of our existence. Thus, the issue of environment versus development has led to

the **concept of sustainable development** about which we will discuss in the following sub-section.

19.3.1 Concept of Sustainable Development

Sustainable development is the concept of needs and limitations imposed by technology and society on the environment's ability to meet the present and future needs. World Commission on Environment and Development (WCED) has defined sustainable development as "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations". Thus, the concept of sustainable development provides a framework for the integration of environmental policies and development strategies having implications at international, national, regional and local levels. Development should not endanger the natural systems that support life on earth. Many people in the industrial world today operate with the **frontier mentality,** which is a **human-centred** view based on the three erroneous basic ideas:

- the world has an unlimited supply of resources for human use;
- humans are apart from nature, and
- nature is something to overcome.

With this attitude towards nature, technological advances increase our ability to use earth's resources and thus, increase the damage. However, the realisation is growing fast that we are in a world of limits, and ever-increasing growth of material consumption can only damage, the life-giving physical components of the environment.

Hence, the concept of **sustainable development** leads us to new resource consumption strategies which are:

- conservation or reduction of excessive resource use,
- recycling and reuse of materials and
- more use of renewable resources like solar energy rather than non-renewable resources such as oil and coal.

Sustainable development also requires meeting the basic needs of all deprived people in this world and extending to all, the opportunities to satisfy their aspirations for a better life. Otherwise the world, in which poverty and inequity are endemic, will always be prone to ecological and other crisis. In Gandhiji's words, "Earth provides enough to satisfy every man's need but not any man's greed." The views of frontier society and the concept of sustainable society are compared in Table 19.3.

Table 19.3
Comparison between frontier and sustainable societies

	Frontier Society	Sustainable Society
1.	The earth has unlimited stock of resources	The earth has a limited supply of resources
2.	After the supply runs out at one place move elsewhere	Recycling and the use of renewable resources will prevent depletion
3.	Continued addition to our material wealth will make life better	Life's value does not depend on our material wealth
4.	The cost of any project is determined by the cost of materials, energy and labour	The cost of a project must include external costs such as damage to health and environment along with the costs of energy, labour and material
5.	Nature is something to overcome	We must understand nature and develop a symbiotic relationship
6.	Environmental problems can be solved through new technologies and new laws	We must all create awareness at personal level and also act to solve pressing problems
7.	We are above nature and superior to it	We are a part of nature and should abide by its rules
8.	Some waste is to be expected in all human activity	Waste should be minimised by recycling as far as possible

19.3.2 Equity and the Common Interest

Ecological interactions do not respect the boundaries of individual ownership and political jurisdictions. For example, the irrigation practices, pesticides, and fertilisers

used on one farm affect the productivity of the neighbouring ones, especially among small farms.

The interdependence of various components of the earth was recognised to some extent by traditional social systems which enforced practices such as community control over agriculture or traditional rights relating to water, forests and land. But with the surge of technological progress the responsibilities of decision-making are being taken away from traditional communities.

Interdependence is not simply a local phenomenon. Rapid growth in production has extended it to the international plane with both physical and economic manifestations. There are growing global and regional environmental hazards such as overconsumption of fossil fuels leading to global warming or excessive use of chloroflourocarbons leading to depletion of ozone layer.

Inequalities sharpen when a system approaches ecological limits. For example, when urban air quality deteriorates, the poor, living in vulnerable areas suffer more health damage than the rich, who live in cleaner neighbourhood and also have the means to find a remedy. Or when mineral resources become depleted, late-comers to the industrialisation process lose the benefits of cheap raw materials. Globally, wealthy nations are better placed financially and technologically to cope with the effects of resource depletion and environmental degradation.

We can say that our inability to promote common interest in sustainable development is often a product of the neglect of economic and social justice within and amongst the nations. However, the search for common interests would be less difficult if all developmental and environmental problems are tackled in totality for the betterment of whole mankind. Also our growing knowledge of the global interconnection would create a more thoughtful approach to development.

SAQ 4

Match the items in column I with those in column II. Write the answers in box provided.

	Column I		Column II
i)	Frontier mentality	☐	a) Conservation, recycling and reuse of earth's resources
ii)	Sustainable Society	☐	b) There is need for economic and social justice within and amongst nations.
iii)	Promotion of common interests	☐	c) Humans are supreme and apart from nature
iv)	Traditional social system	☐	d) Community control over agricultural practices

19.3.3 Strategic Imperatives

As you have read above, shift to a sustainable society will require policy changes at global level and basic changes in the way people interact with the environment. We will now discuss some of these aspects.

Technology

We are aware that high technology has played a major role in environmental deterioration and destruction throughout the world. Although a boon to society, technology has exacted its own price. The challenge, then, before mankind is to redirect its use to make it more energy efficient, less risky, cleaner and more humane. As you have read earlier, the new resource consumption strategies in sustainable development are conservation, recycling and reuse ot waste material and use of renewable resources, wherever possible.

The emerging technology is called **appropriate technology** which relies basically on the use of smaller, repairable machines with production methods that use optimum energy and materials and cause less pollution. It benefits people, communities and nations helping them become more self-reliant by using raw materials that are available locally. Table 19.4 gives an account of the characteristics of appropriate technology.

Table 19.4 : Characteristic Features of Appropriate Technology

1. Small to medium-sized machines are used which maximise human output.
2. Technology is simple and easy to understand.
3. Employees do a variety of tasks resulting in increased output.
4. It is less capital intensive and maintenance is easy.
5. Local resources are used, products are mainly created for local use leading to self-sufficiency.
6. Decentralised production and control and small-scale efficiency.
7. It emphasises the use of natural biodegradable materials.
8. Small amounts of energy and material input and small amount of pollution.
9. The use of renewable energy resources is emphasised.
10. Compatible with local culture and the environment.
11. It encourages local talents and handicrafts and the products are durable.

Appropriate technology is advantageous as it increases employment and requires less investment. It is also efficient on small scale and is compatible with environment because of low energy requirement and minimal pollution. Appropriate technology is especially useful in developing countries that have neither the capital nor the energy resources for high technologies. Countries like India, who have an abundance of manpower should look for labour-intensive rather than capital-intensive technology. High technology often puts people out of work, although it increases the production. In addition the maintenance cost and high energy requirement of these technologies are sometimes too much for developing countries.

Economics

In all countries, rich or poor, the process of economic growth to achieve sustainable society must be based upon the realities of existing renewable and non-renewable resources. However, most of the times it is not so. For example, income from forestry operations and mining is generally measured in terms of value of timber and other products extracted minus the cost of extraction. Whereas the cost of regenerating the forests or reclamation of land after mining is not taken into account. Similar incomplete accounting occurs in the exploitation of other natural resources.

Population

The sustainability of development is intimately linked to the dynamics of population growth. Overall rate of population growth in developed countries is under 1%. However, levels of material and energy use are much higher in these countries. Greater part of global population increase takes place in developing countries and is much faster than the capacity to cope with. Therefore, sustainable development can be persued more easily if population size is stabilised at a level consistent with productive capacity of the ecosystem.

Conservation

As you have read earlier, to meet our needs on a sustainable basis, earth's natural resources must be conserved and enhanced. The shift to appropriate technology and increased use of renewable resources such as solar energy, wind energy etc. can help us conserve our natural reserves. Recycling and reuse of the wastes such as, conversion of organic wastes into biogas, can help us minimise the use of our natural resources. Apart from meeting the developmental goals conservation of nature is also a part of our moral obligation to other living beings and the future generations.

Today, however, there is a general awareness of environmental impact in both rich and poor nations. Worldwide, many organisations are involved in the studies of critical issues of energy, population, resources and environment. Many people in developed countries are simplifying their life-style. The number of governmental environmental protection agencies in poorer nations have increased ten-folds between 1972 and 1984. All these indicate the beginning of a new society. Still we are a long way from becoming a truly sustainable society which means changes at global level so as to maintain the ecological balance and equitable distribution of profits among all the people to satisfy their needs and aspirations.

SAQ 5

Tick mark (√) the correct statements and (×) the wrong statements in the space provided.

i) Poverty increases peoples' capacity to use resources in sustainable manner. ( )

ii) Appropriate technology relies on the use of smaller, simpler and repairable machines. ( )

iii) Sustainable development is linked to the policy changes at global level. ( )

iv) Economic and ecological consideration need not be interlinked for sustainable development. ( )

19.4 ROLE OF INTERNATIONAL ECONOMY

Economics is a science concerned with the production, distribution and consumption of resources, goods and services. Economic growth depends on increasing consumption, due to larger population and higher per capita consumption. Therefore, challenges for many people are not to control population growth but to increase production to meet increasing demands. However, the present state of our environment has forced us to do some rethinking. In the following sub-section we will ' ss the links between international economy, environment and development.

19.4.1 International Economy, Environment and Development

To attain a sustainable economic system it is necessary that international economic exchanges become beneficial for all involved. This is possible only if two conditions are satisfied. One is that the sustainability of ecosystem, must be ensured. Secondly, the basis of economic exchange is equitable. Unfortunately, however, these conditions are not met for most of the interactions between developing and developed countries.

Developing countries face problems in managing their environments, since their economics depend largely on the export of their natural resources like export of iron by India or timber by Brazil. The adverse price trends in exports and fluctuations in the costs of imports faced by most of these countries make it impossible for them to manage their natural resources for sustained production. To sustain their economics they are forced to borrow from international agencies. The rising burden of debt and decline in further capital inflow lead to resource depletion and environmental deterioration. For example, one of the factors contributing to tropical deforestation is the trade in tropical timber. Need for foreign exchange encourages many developing countries to cut timber faster than forests can be regenerated. As you know this overcutting not only depletes the resources but also causes the loss of forest based livelihood, increases soil erosion and downstream flooding, and accelerates the loss of species and genetic resources. International trade patterns can also add to the unsustainable development policies and practices.

In recent years, agricultural land in India has been diverted to the growth of cash crops as well as wheat and rice much to the detriment of the production of oil seeds and pulses. This has resulted in acute shortage of edible oil and pulses in the country and expenditure of precious foreign exchange for their import. This shows that cash crops are getting too much attention as compared to the staple food crops, for external capital inflow. However, a mere increase in capital inflow to developing countries is not enough to implement all the developmental programmes. Domestic efforts in proper planning and formulation of policies for utilisation of resources, control of population and reduction of poverty, are of utmost importance for environmentally sound development. Since, financing of major capital investment by external sources, is generally on their own terms and conditions, the policies and plans are not under the control of the recipient country. Therefore, every country, especially the developing ones, have to choose their own environmental standards, adapted to their needs and resources and follow a path towards sustainable development and thus, sustainable economy. We will discuss about this in the following subsections but first try the following SAQ.

SAQ 6

Fill in the blanks with appropriate words.

i) For sustainable economic growth international economic ..... must be on ..... basis.

ii) External ..... is a must for the economic growth of many developing countries.

iii) ..... rather than staple food crops are important for external capital inflow.

iv) Environmental standards in the developing countries should be adapted to their ..... and .....

19.4.2 Enabling Sustainable World Economy

Developing countries for many years, have sought fundamental changes in international economic arrangements, so as to make them more equitable particularly with respect to financial flows, trade, transnational investment and technology transfer. Such changes in the long term will enhance economic growth at global level by making consumption and production patterns sustainable.

Enhancing Aid to Developing Countries

The idea that developing countries would do better to live within their limited means is an illusion. Global poverty cannot be reduced by the governments of poor countries acting alone. At the same time, aid and other forms of financial assistance, while necessary are not sufficient. Therefore, better projects and programmes of aid to developing countries must be designed for sustainable development at the global level which would mean that we all develop together and not at the cost of each other.

In the recipient countries a substantial portion of development assistance should be utilised to enhance the environment and productivity of resource sectors such as reforestation, soil conservation, irrigation projects, low cost sanitation measures, agriculture and recycling.

Linking Trade, Environment and Development

A commodity is something that is sold for money such as fishes, food, clothings, forest yields, cash crops like coffee, banana, etc.

As we have said earlier developing countries are facing the dilemma of exporting natural resource materials and commodities in order to obtain foreign exchange while trying to minimise damage to the environmental resources.

The substitution of raw materials by synthetics, with the help of technological developments also leads to a fall in their demand in the international market. For example, synthetic indigo and textile industry of Lancashire completely ruined the indigenous indigo manufacture and the much talked about textiles like muslin cloth made in India. The substitution of natural rubber by synthetic rubber is another case in point.

As you know, petroleum is one of the major energy sources today. Increased price of oil affects the international economy especially of developing countries as prices of all other items, dependent in some way or the other on oil use are increased.

The recent Gulf crisis has affected the import cost of petroleum products and crude oil. In India, increase in import prices resulted in the curtailment of fuel consumption by reducing the number of air flights, rail services and other means of transport, using petrol or diesel. To tide over the energy crisis we have to go for alternate sources of energy. One way could be the promotion of use of natural gas in place of liquid fuel for transport purposes. Another fuel saving technique has been devised by Coal India Limited, which has developed a smokeless, cost effective and pollution free fuel by using lower grade of slack coal, coal dust, paddy husk and mollases. This serves as a substitute for domestic fuels like wood, kerosene oil and LPG.

Eighty to ninety per cent of trade in coffee, cocoa, cotton, forest products, tobacco, jute, copper, iron ore, and bauxite is controlled in the case of each commodity by three to six largest transnational corporations.

The main international response to tackle such problems has been the development of **international commodity agreements** to stabilise and raise earnings of developing countries from the exports. However, the real progress has been very limited.

Over-production from Bombay High has resulted in about 90 wells going out of commission.

Individual governments on their own can decide to use renewable resources such as forests and fisheries and ensure that finances are available to regenerate these resources. Also they can deal with all linked environmental effects. This will help them to stay within their limits of sustainable production. In case of non-renewable

resource like minerals, governments should ensure that the ratio of production vis-a-vis resources of the country reserve remains below a certain pre-specified limits.

Protectionism, a policy of a country helping its own industry is another link between trade and sustainable development. Protectionism in industrial countries suppresses export growth of the developing countries and prevents diversification from traditional exports such as of cotton fabrics and tea. Recently, trade barriers set up by USA have adversely affected the garment export industry of India.

Protectionism is the policy a country has of helping its own industries by putting a tax on imported goods.

In case of exports from industrial countries the external costs are included in production cost and thus paid by consumers of importing countries including Third World nations. But in the case of exports from developing countries, such costs continue to be borne entirely domestically. Taxpayers and private citizens in these countries bear the brunt of industrial pollution.

Exchange and **transfer of technologies** from one country to the other is another link in the international trade. Sustainable development requires an organised effort at global level to develop and extend new technologies worldwide, for various purposes such as agricultural production, renewable energy systems and pollution control. The United Nations Organisation has already passed a resolution called the "New International Economic Order" to work in this direction.

New International Economic Order is based on equitable sharing of resources and knowledge amongst the developed and developing countries. NIEO aims at bringing about sustained improvement in unsatisfactory terms of trade and the expansion of world economy.

19.4.3 New Global Economic System

Some economists suggest that a new economic system at global level is necessary for long-term survival of the human race. The present economic system is characterised by maximum flow of money, maximum production, maximum consumption, maximum resource use and maximum profit. This **frontier economy** as it is called now, should be replaced by **spaceship economy** which says that earth, like a spaceship is a closed system. A spaceship economy or a sustainable economy promotes recycling, conservation, use of renewable resources, product durability and a clean and healthy environment. People live within the limits imposed by earth. Future patterns of developments should be made much less material — intensive. Broken goods should be repaired rather than replaced. Harmful and non-degradable wastes would be eliminated as much as possible. Some of the major goals that developed and developing nations need to set to achieve a sustainable society based on sustainable economy are listed in Table 19.5.

Table 19.5 : Some of the Major Goals Leading to Sustainable Economy at Global Level

Developed Nations
1. Population reduction is achieved.
2. Reduction in resource consumption.
3. Increase in self-sufficiency.
4. Recycling and conservation are increased.
5. Knowledge is shared with the developing nations.
6. Peace and stability is achieved.
7. Reduction in arms sale.
8. Cooperation at global level.
9. Sustainable ethics becomes reality.
Developing Nations
1. Population growth rate is stabilised and population reduced.
2. Sustainable agricultural system.
3. Resources meet the basic needs of the country.
4. Restrain in adoption of western agriculture and technology.
5. Promotion of universal literacy.
6. Maximum self-reliance is achieved.

Sustainable economy can be achieved and succeed only with new policies, new political directions, education and awareness. The most fundamental changes would

have to be an ethical shift promoted by parents, teachers and government agencies. Government can help by framing new laws that are conducive to the attainment of sustainable society. Therefore, overall shift to a sustainable society with sustainable economy can come from a combination of personal and governmental efforts (see Table 19.6).

Table 19.6 Ways to Achieve Sustainable Economy

Education
New social ethics should be inculcated amongst the children both in school and at home, emphasising concern for environment, personal growth and peaceful coexistence. Economic growth should mean equitable and sustainable growth.
Population Control
Rate of population growth should be controlled through education and awareness.
Resources
Resources must be conserved through judicious use and recycled whenever possible, renewable resources should replace non-renewable resources.

SAQ 7

a) Name three links between trade and development which affect our environment.

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b) Tick mark (√) the correct words in the following statements:

i) Increase in protectionism in industrial nations suppresses/enhances export growth in developing nations.

ii) Industrial countries include/do not include the external costs in the export product price.

iii) Technology transfer is/is not a link in international trade.

iv) Conservation of our resources and our environment can be promoted by frontier/spaceship economy.

19.5 SUMMARY

In this unit you have studied that:

- development of human societies from hunting and gathering societies of past to advanced industrial societies of present day has led to the overuse of earth's resources causing disruption of natural interaction of physical and biological processes of our environment,
- to deal with environmental stress and strain, current environmental problems in our biosphere can be understood by different conceptual models; population, resource and pollution model, multiple cause and effect model and impact analysis model and help people to come up with solutions,
- poverty and starvation are the major burning problems of developing and less developed nations. The increasing population growth and unequal trade are some of the factors which contribute to widening the gap between 'haves' and 'have nots',
- to save our planet from further environmental disasters it is necessary that we shift from frontier mentality to sustainable mentality by adopting the simpler appropriate technologies which are more suitable for local needs and are mainly based on low energy input, renewable resources and produce little or no pollution,
- international economics has an important role in achieving our goal of sustainable society with sustainable world economy which is possibly achieved only if international economic exchanges are equitable and beneficial to all involved. Sustainable economy or a spaceship economy will help create a clean and healthy

environment by promoting recycling and use of renewable resources, product durability which can be done at personal, educational and governmental level.

19.6 TERMINAL QUESTIONS

1) Explain briefly, how human activities affect biota in the biosphere.

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2) Outline the characteristic features of appropriate technology.

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3) 'Protectionism in developed countries often damages ecological and economic conditions in developing countries.' Justify the statement.

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4) Discuss briefly the concept of new global economic system.

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19.7 ANSWERS

Self Assessment Questions

1) i) ploughs,
   ii) capital and energy intensive
   iii) non-degradable synthetics
   iv) limited

2) a) i) Population, Resource and Pollution model
   ii) Multiple Cause and Effect model
   iii) Impact Analysis model

   The Population, Resource and Pollution model illustrates that all organisms acquire and use resources from environment which create pollution. Resource acquisition and use affect both population and pollution.

   Multiple cause and effect model illustrates that factors, like population, per capita consumption, politics and public policy, psychology and culture, biology, economics and technology, play a longer role in environmental problems.

   Impact Analysis model illustrates the effects of human activities on environment and biota.

   (Any one of the above can be discussed.)

   b) i) pollute, ii) external cost, iii) varying, iv) direct, biota.

3) Poverty degrades the environment. Poor and hungry destroy their immediate environment in order to survive by different ways. Some of these are deforestation for fuel, overgrazing of grassland by their livestock, overuse of marginal lands, rise to slums.

4) i) c, ii) a, iii) b, iv) d

5) i) ×, ii) √, iii) √, iv) ×

6) i) exchanges, equitable
   ii) capital inflow
   iii) Cash crops
   iv) needs, resources

7) a) The three links between trade and development are use of non-renewable resources, protectionism, and technology transfer.

   b) i) suppresses
   ii) include
   iii) is
   iv) spaceship

Terminal Questions

1) Human activities have direct and indirect impact on biota. All forms of pollutions caused by human interactions with the environment affect the life forms such as destruction of lake ecosystems by acid precipitations. Human activities affect biota directly resulting in demographic changes and destruction of habitat.

2) Appropriate technology : use of smaller and repairable machines, use of optimum energy and materials and produce less pollution, based on locally available materials and for local needs.

3) Protectionism in developed nations is ecologically and economically damaging to developing nations. Export growth and diversification from traditional exports of tea, garments etc., are suppressed by the protectionism in developed countries.

   (Student can give examples from other sources also.)

4) The concept of new global economic system is sustainable economy which says that earth is closed system like a spaceship. And for a healthy and clean global environment the world economy should promote recycling, conservation, use of renewable resources, product durability and less material intensive patterns of development at global level.