# 13

# BIOSPHERE

## 13.1 INTRODUCTION

Earth is the home of mankind. Life of human beings depends not only upon its land where we build our houses and grow our food but also upon its other natural components such as air, water and living organisms. The air we breathe and the water we drink, forms a major component of our bodies. Plants and animals also play an important role in our lives. Some of them provide us food and clothing while the others help in agriculture and transportation.

The earth and its surroundings which affect our lives are together called the environment. The environment is made up of non-living or abiotic and living or biotic components. The physical or the abiotic environment is the sum total of the non-living matter like land, water and air. It provides conditions favourable for plant and animal life. The plants and the animals together constitute the biotic environment. In the previous lessons, you have studied some of the important processes bringing about changes in the physical environment. In this lesson we are going to study how interaction between the abiotic and the biotic environmental components bring about changes on the face of the earth.

## 13.2 OBJECTIVES

After studying this lesson you will be able to :

- identify the major components of the environment and their inter-relationships;
- distinguish between the biotic and the abiotic environment;
- explain the term biosphere and describe its limits;
- identify the sources of energy in the biosphere;

- explain relationships between various categories of living organisms in the biosphere;
- explain the concept of ecosystem;
- explain the process of energy flow and food chains in an ecosystem;
- show diagrammatically the flow of energy in an ecosystem;
- explain the mechanism of maintenance of ecological balance; and
- explain the need for maintenance of ecological balance and suggest measures for its maintenance.

## 13.3 THE ENVIRONMENT

The Earth is our home and the land, water, air and all living organisms together make our environment. Thus land, water, air and living organisms are the four major components of the environment. They interact to bring about various changes and create different patterns of life on the earth's surface. Each of these components plays its part in the various processes and phenomena active on the earth. Land provides support to most of the organisms. It serves as the play-field for various events and processes in the environment. Water absorbs heat and evaporates. The water vapour condenses to cause precipitation. As the water again reaches the seas or the rivers, it completes the hydrological cycle. Similarly, the air also gets heated up by absorbing insolation and terrestrial radiation. This causes natural phenomena like winds. As water and air play important roles in the natural processes, so do the living beings. All phenomena and processes, ranging from climatic conditions and soil types to human occupations are the result of the interactions between these components of environment.

The components of the environment can be grouped into the categories of abiotic (physical) and biotic (biological). Land, water and air together form the abiotic environment. All changes in the abiotic environment are powered by solar energy. Thus, the sun also becomes a part of the abiotic environment. All living organisms (plant and animal kingdoms) together form the biotic environment. All plants and animals depend upon the abiotic environment for their food. All plants obtain their food directly from abiotic environment, i. e. land, water, air and the sun. All animals get their food directly from the plants or animals, and thus indirectly from the abiotic environment. The organisms in their turn affect the abiotic environment in a number of ways. Plants for example, affect the development and nature of soils. Likewise, the animals also affect their abiotic environment. One example of such effects can be taken from the activities of human beings. Human beings as farmers break the rocks of the earth's surface and change the courses of streams for irrigation facilities. Similarly, during the course of mining activities, human beings take the minerals out from below the surface of the earth. Industrial activities have a great impact upon the air and water which are both components of the abiotic environment.

Interactions between the abiotic and biotic components of the environment are responsible for all variations in the soil and vegetation and the distribution of species of plants and animals. Patterns of human activity are also the result of these interactions. That is why the areas of fertile soils, flat topography and abundant precipitation are used for agriculture. In the same way, the main occupation of the people of coastal regions is fishing while it is forestry in the forested areas.

- The sum total of the conditions within which an organism lives is called the environment.
- The four major components of the environment are land, water, air and living organisms.
- Land, water, air and the sun are the abiotic components and plant and animal organisms form the biotic components of the environment.
- The biotic and the abiotic components of the environment interact with each other to bring about changes on the earth's surface.

## 13.4 BIOSPHERE

We know that various organisms live on the surface of the earth. Some of them live in the air slightly above the earth's surface. Others live in water and inside earth upto a small depth. The environmental conditions limit the zone in which organisms can live. This rather narrow zone in which living organisms are found forms the ***biosphere***. It lies at the interfaces between the three abiotic realms of the earth i. e. lithosphere, atmosphere and hydrosphere.

Biosphere is called the life zone, as outside its limits, no life is possible. It is this zone which makes the earth beautiful with a variety of flora and fauna. This zone which distinguishes earth are marked by the abiotic environmental conditions which support life. Too much above or below the surface of the earth, lack of air or water or any other component of the abiotic environment may prohibit life. This sets limits to the biosphere. The abiotic components of the biosphere are the upper part of lithosphere, the lower part of the atmosphere and the shallow parts of the hydrosphere. The biotic component is made up of the plant and animal kingdoms. There are millions of species in plant and animal kingdoms.

All organisms in the biosphere are dependent on the abiotic environment and upon each other. The relations of the organisms among themselves and with their environment are studied by the science called ecology.

- The relatively narrow zone in which organisms are found is called the biosphere.
- Ecology is the science which studies the interrelations of the organisms among themselves and with their environment.

Biosphere is of great importance to man. We depend for all our requirements on the biosphere. Everything ranging from food, clothing and shelter to the complex industrial goods is supplied by the biosphere either directly or indirectly.

## INTEXT QUESTION 13.1

1. Give one word for each of the following.
   (a) The sum total of the conditions in which an organism lives._____
   (b) The non-living component of the environment. _____
   (c) The living component of the environment. _____
   (d) The narrow zone in which life exists. _____
   (e) The science which studies the relationship of the organisms with their environment and among themselves. _____
   (f) The environment of which man forms a part. _____
2. Fill in the blanks :
   (a) The four major components of the environment are (i)_____(ii)_____(iii)_____and (iv) living organisms.
   (b Most of the plants get their food directly from the _____ environment.
   (c) Most of the animals get their food _____ from the abiotic environment.
   (d) The biotic component of the biosphere is made up of _____ and _____ kingdoms.

## 13.5 SOURCES OF ENERGY IN THE BIOSPHERE

When you do any work for a long time you feel tired. Even studying for a long time tires you. Do you know why? When you work, your body consumes some energy and as the energy available in the body declines, you feel tired. When you have rested for some time, your body again recovers and you can start working again. This happens because while resting, your body has gained some energy. The energy in the body comes from the food we eat. If we do not eat anything for a number of days, the energy available in the body will finish and we will not be able to do any work. Thus the energy can be defined as the ability or capacity possessed by an organism for doing work.

All changes taking place in the environment involve use of energy. The energy has a number of forms. It may be, for example, in the form of light or heat energy or the energy contained by the running water or wind. The

forms of energy are interchangeable. The sunlight, for example, is converted into heat energy by the earth and into food energy by the plants. The only continuous source of energy in the biosphere is the sun. This energy is received in the form of sunlight and is converted into different forms by various components of the biosphere. A part of this energy is intercepted by the plants. Food is synthesized with the help of this energy through photosynthesis. The solar energy is thus converted into vegetal matter. A part of the synthesized food is consumed by the herbivourous animals. The herbivorous animals in their turn are eaten by the carnivorous animals. The energy synthesized by the plants thus passes on to the animals. A part of the energy synthesized by the plants and consumed by the animals is stored by them in the form of tissues and bones, etc. The animals may be consumed by other animals and the stored energy may thus pass from one animal to the other.

Sources of energy in the biosphere can be classified as primary and secondary sources of energy. The sources which provide energy from their own body and do not borrow it from other sources are the primary sources. Sun is the only primary source of energy for the biosphere. All other sources obtain energy directly or indirectly from the sun and then pass it on in various forms. They are all secondary sources of energy. Wood, coal, oil, flowing water and tides are all secondary sources of energy.

* Energy is the capacity or ability to work.
* Solar energy is converted into food energy by the plants through photosynthesis and it is passed on to the animals.
* Sun is the only primary source of energy for the biosphere. All other sources of energy in the biosphere are secondary sources.

## 13.6 PRODUCERS AND CONSUMERS

The biotic components of the biosphere can be classified as producers and consumers. All organisms capable of producing their own food directly from the abiotic environment are called producers or ***autotrophs***. Almost all plants are autotrophic in character as they make their food themselves.

The organism unable to produce their own food directly from the abiotic environment are called consumers or ***heterotrophs***. Such organisms have to depend on other organisms, plants or animals, for their food. Almost all animals are heterotrophic in nature.

Almost all animals are consumers. There are a number of groups in which they can be categorized. They can be herbivorous or plant eating. For example, a rabbit is a herbivorous. Some of them are carnivorous or animal eating only. Lion is an example of carnivorous animals. The third group is made

up of omnivorous i.e. animals eating plants and animals both. Human beings are omnivorous. Decomposers or detritus feeders are those organisms which feed on the dead bodies of the plants or animals. Bacteria and fungi are examples of such organisms. Another category of animals is predators and scavengers. Predators are the preying animals like tigers and eagles. The scavengers are the ones eating the dead animals, like the hyenas and jackals. In contrast to the predators and scavengers, the detritus feeders are the micro-organisms like bacteria which decompose the organic matter, thus converting it into inorganic. The consumers are also classified as primary and secondary consumers. The primary consumers are the organisms obtaining their food directly from plants. The Secondary consumers get their food from some other animals and thus indirectly from the plants. There is a possibility of some of the organisms also performing the function of a tertiary consumer. When a secondary consumer get their food from another secondary consumes, is known as tertiary consumers. An eagle eating a carnivorous snake performs this function.

Producers and consumers are inter-linked through food chains. In case of a typical food chain, small herbivorous animals eat the plants. They are in their turn eaten by the carnivorous animals. The carnivorous animals may become food for larger carnivores or the detritus feeders and scavengers. Energy in the biosphere is transferred in the form of food through the mechanism of food chain.

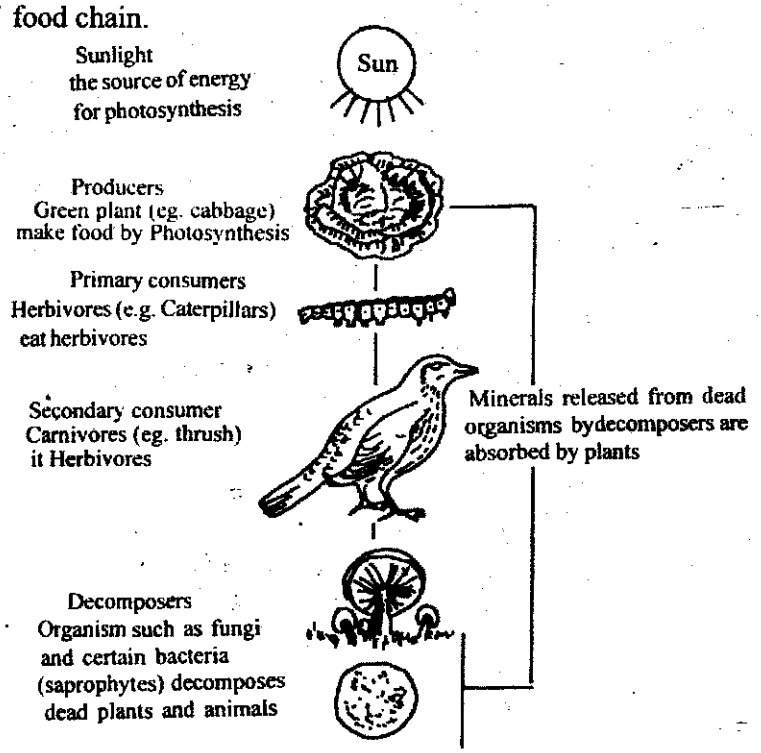


*Fig.13.1 : A simple food chain*

In a given food chain, a number of organisms obtain their food from the same link. This link or level in the chain is called a trophic level. All animals obtaining their food from one trophic level form the trophic community. All herbivores, for example, are at one trophic level. Likewise all carnivores feeding on the herbivores are at another trophic level. Rabbits, rats, grasshoppers and goats all feed directly on the plants and thus are at the same trophic level. The number of species in one trophic level may be numerous.

Energy is transferred in the biosphere through other means too. One example of such a transfer of energy is the use of animal power in agriculture. The total energy in the biosphere may be transferred through any number of food chains. The number of food chain operating in an area depends upon the variety of plant and animal life in that area. The food chain and thus the energy transfer may take a simple as well as a complex form. The number of trophic levels in each chain varies. Two examples of food chains are given here. One of the chains is a simple food chains (Fig.13.1) and the other is a complex one. (Fig.13.2).

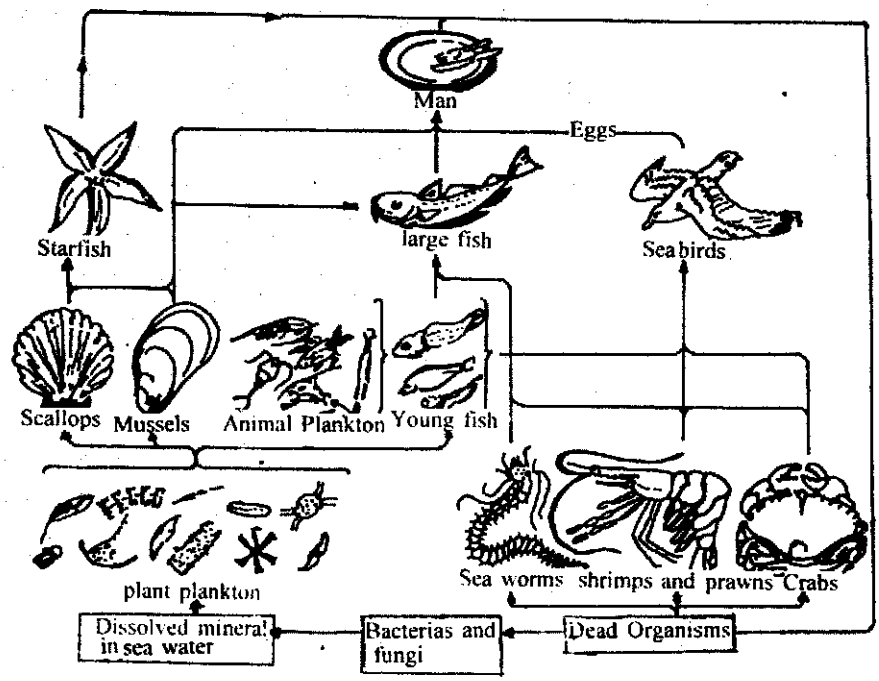


*Fig. 13.2 Food Web found in the Sea*

The complex food chains with a number of cross links between various trophic levels and a number of related chains are called food webs. The food chain shown in the fig 13.2 above is a food web. Identify the producers; primary, secondary and tertiary consumers; scavengers; and decomposers in fig. 13.2

* Organisms capable of producing their own food directly from the abiotic environment are called producers or autotrophs and those incapable of making their own food directly from the abiotic environment are called consumers or heterotrophs.
* Primary consumers take their food directly from plants while the secondary consumers get their food from some other animals and thus indirectly from plants.
* The sequence of energy transfer in the form of food from one organism to the other is called food chain. Complex food chains with many cross links are called foodwebs.
* All organisms which obtain their food from a common link in the food chain, belong to one trophic level.

## INTEXT QUESTIONS 13.2

1. Answer in one or two words :

   (a) What is the term used to denote the capacity to work? _____ .

   (b) What is the term used to denote all organisms obtaining their food from one link in a food chain?_____ .

   (c) What is the primary source of energy in the biosphere? _____ .

   (d) What is the name given to the organisms which can synthesize their food directly from the abiotic environment? _____ .

   (e) What is the name given to the organisms which can not produce their own food?_____ .

2. Fill in the blanks with the most appropriate words from those given in the bracket :

   (a) The_____ are the organisms that eat only plants. (herbivores, carnivores)

   (b) The_____ are the animals which eat plants and animals both.(carnivores, omnivores)

   (c) The process of energy transfer in the biosphere is carried on through the mechanism of _____ (food chain, energy flow)

   (d) Another term used to denote the producers is _____ (autotrophs, heterotrophs).

(e) Consumers are also known as_____. (autotrophs, heterotrophs)

(f) The microscopic organisms feeding on the dead bodies of plants and animals are called _____. (omnivores, decomposers)

## 13.7 ECOSYSTEM

An ecosystem or ecological system is a functioning system in which the organisms interact among themselves and with their environment. These interactions result in food chains and energy flows so that life is sustained within the system.

Every ecosystem is composed of abiotic environment and biotic communities living therein. One ecosystem represents at least one complete food chain. Some of the ecosystems, which are large enough, have more than one food chain. Presence of a large variety of biotic communities also result in more than one food chain in an ecosystem. Ecosystems can be of a number of types. Some of the common examples can be an agricultural ecosystem, a forest ecosystem and a pond ecosystem. A field in which the plants are producing food through photosynthesis and this food is being used by human being directly or through cattle, represents an agricultural ecosystem. One of the food chains in this ecosystem may run as : plants - man and domestic animals - detritus feeders; while another may run as : plants - birds - predators-detritus feeders. Still another food chain may be : plants-insects-predators-detritus feeders. There are grazing food chains including the larger animals like cattle and other domestic animals. The other may be a detritus food chain in which most of the energy passes on to the detritus feeders directly from the plants.

All energy synthesized in an ecosystem does not pass on to the consumers at various trophic levels. The consumers at the first trophic level do not pass on the entire amount of energy to the consumers at the second trophic level. The amount of energy available to each higher trophic level from the immediately lower trophic level keeps declining. This is because of two factors. Firstly, there are the losses of energy in the processes of energy transfer. This is a well known fact that no transfer of energy is 100 percent efficient. A part of the energy is consumed in the process of transfer itself. Secondly, a large proportion of the energy consumed by any consumer is used for the body-building process and respiration etc. This energy is not available to be transferred to the next higher trophic level. In addition to these losses, there are the losses concerned with non-acceptability of food. All food available at a given trophic level may not be eatable by the organisms at the next trophic level. Most of the animals do not eat skins, hair and bones and the vegetative materials like woody stems. There are losses in assimilation also. All of that an animal eats is not assimilated and a trophic

level determines the population of organisms at that level.

Suppose the plants in a given area synthesizing 1,000 calories of energy from the sun. Part of this energy, say 100 calories, is used by the plants in their growth process. Thus only 900 calories will be available in the form of all vegetal matter that can be consumed by the herbivores. The herbivores may eat only 700 calories as all parts of the plant bodies may not be eatable. Out of this they might assimilate only 500 calories. They will also utilize some energy in growth related processes, say 300 calories. Thus the amount of energy available to the carnivores will be only 200 calories. They will again consume only a part of it. The carnivores will use some of it in respiration and thus only 40 to 50 calories will be available to be passed on to the next trophic level. In actual situations the proportion of the energy fixed by the plants available at different trophic levels varies from one ecosystem to the other. This depends upon the nature of the species of organisms in the food chain.

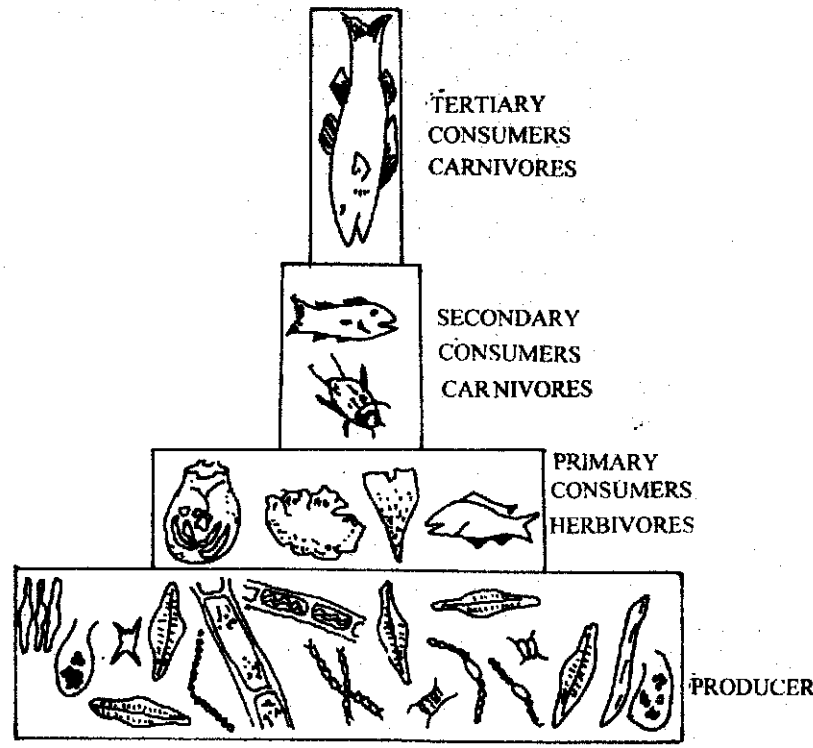


*Fig. 13.3 An ecological pyramid*

With the reduction of available energy at higher levels of the food chain, the number of consumers also decline. As less food or energy is available at successively higher trophic levels, the number of organisms that can survive on this amount of food or energy also declines successively. If the amount of energy or food available at different trophic levels in the food chain is represented graphically, it takes the shape of a pyramid with a

broad base and narrow apex. Such a pyramid is called a food pyramid or energy pyramid. The broader base here represents the larger amount of food or energy available at the lower trophic levels and a smaller amount at the higher trophic levels. Similarly number of organisms at various trophic levels in the food chain can also be shown graphically and this also attains a pyramidal shape with a broad base and a narrow apex. The broad base of this phyramid indicates a large number of the producers, a smaller number of primary consumers and a still smaller number of tertiary consumers. Such a pyramid showing the number of organisms at various trophic levels is called a pyramid of numbers. All such pyramids are called ecological pyramids.

* An ecosystem or ecological system is a functioning system in which organisms interact among themselves and with their environment.
* Each ecosystem has at least one completed food chain. The amount of energy and the population of organisms at each higher trophic level in the food chain keeps declining.
* Pyramids showing the declining amount of food energy or number of organisms at successively higher trophic levels are called ecological pyramids.

The relationship between organisms at various levels in the food chain indicates that there is a limit to the total population that can be sustained at a particular level. Man occupies the apex of the pyramid and thus gets only a small proportion of the total energy available in the biosphere. A lower position of human beings in the pyramid will mean a larger amount of food available to us and also a larger population can be supported by the resources of the given area. secondly, larger the number of links in the food chain, smaller would be the population that can be fed at the end of the chain. Therefore, the production systems should be such as to involve a fewer number of links in the food chain. For example if the plant food is used for rearing animals and then we use the products of the animals, the total amount of energy or food available will be smaller. On the other hand consuming the plant food directly by human beings would mean that a larger amount of food will be available and a larger population can be fed by the production of the biosphere.

Besides the above conclusions, there is another way to increase the supply of food for human beings. So far most of the production which we consume comes from the continents only which occupy only about 30 per cent of the total surface area of the earth. The remaining nearly 70 per cent of the earth's surface is occupied by water bodies such as oceans and seas. The food resources of the marine ecosystems have been used only to a limited extent. If the marine ecosystems are also used with equal intensity, the food supply for human beings can be increased to a great extent.

## INTEXT QUESTIONS 13.3

1. Answer in one or two words :

   (a) What is the term applied to denote a functioning system including the organisms and their environment?_____ .

   (b) What is the name given to the diagram showing the relationship between population of organisms at different trophic levels in a food chain ? _____ .

   (c) In what form is energy transferred through the ecosystem? _____ .

2. Fill in the blanks with appropriate words form those given in the bracket: (large, decreasing, small, one)

   (a) An ecosystem represents at least _____ complete food chain/chains.

   (b) The amount of energy available at each higher trophic level in a food chain keeps _____ .

   (c) The base of an ecological pyramid represents a _____ number of consumers.

## 13.8 ECOLOGICAL BALANCE

Under natural conditions there is a state of perfect equilibrium between the amount of energy production and consumption in an ecosystem. This state of equilibrium is called ecological balance. This means whatever energy is produced by the producers in the system, it is consumed by the consumers and there are no surpluses or deficits of energy. This is true for all undisturbed ecosystems in the long run.

In a typical grassland ecosystem this balance is maintained by a fixed number of herbivores and a fixed number of carnivores. Thus, whatever grass grows is enough to sustain a certain population of herbivores. In their turn the herbivores sustain a fixed population of carnivores. In the state of ecological balance, the population at all trophic levels is stable. If the amount of grass growing there increases or decreases, the population of herbivores and carnivores would change to attain the state of balance afresh. In case more grass is available, the population of herbivores will increase thereby increasing the food availability for carnivores. Therefore, the number of carnivores will also increase. On the other hand, if the amount of grass growing there decreases, the population of both herbivores and carnivores will decrease because of food scarcity. Thus, any change in the ecosystem results in a series of changes and new state of balance is established.

Due to the changes in population at various trophic levels sometimes there

may be temporary, surpluses and deficits of food and energy. During the period of energy surplus, the entire food produced in the ecosystem is not consumed. This may happen, for example, in an area where the plants are synthesizing the energy but there are no animals to consume it or the population of the consumers is too small and they are unable to consume the total energy or the food available in the ecosystem. Thus, the ecosystem will have a surplus production of food and this surplus food will be deposited in the physical component of the ecosystem. This may happen sometimes due to some natural accidents also. For example, the plant matter produced before the Carboniferous Period could not be consumed by the animals and it was buried below the sediments and was turned into coal. Thus, the coal and oil which we are using today have been produced by deposition of surplus energy during the periods of energy surplus. The modern period when all our energy requirements can not be met through utilization of the energy being produced in the ecosystems today, can be considered as a period of energy deficit. The shortage in the energy production today is being met through utilization of the energy produced and deposited in the ancient periods of earth's history.

The maintenance of ecological balance is of utmost importance to us. Only balanced ecosystems are stable and can ensure our continued survival and development. Most activities of human beings today, for example agriculture, mining and industry are responsible for creation of man-made ecosystems. Due to the increasing pressure of human population, the natural ecosystems are coming under an increasing stress. The area under forests is decreasing and number of animal species are becoming extinct. Some of the activities of human beings are responsible for environmental pollution. As a result of pollution, the quality of environment is being made unsuitable for many species of organisms. Use of insecticides in agricultural ecosystems is responsible for declining bird population in many parts of world. All organisms perform important functions in circulation of nutrients and energy. Elimination of any one of them may result in ecological disturbances. It may result in increase in the population of some species which serve as the food for the species being eliminated. Similarly, introduction of rabbit in Australia and water hyacinth in India are examples of such new introductions. Both these species have multiplied rapidly in the new areas as there are no local predators to check the population growth of these species.

Disturbances to the abiotic environment are also equally serious. Cultivation on steep slopes results in rapid soil erosion and more silt in stream waters. This causes floods in may parts of the world. Cutting of forests also leads to a number of environmental hazards. Over-use of soils results in reduced fertility and finally in lower crop yields. Thus, any seemingly unimportant alteration in the environment may lead to a whole series of changes.

The question that arises here is what should be done to maintain the ecological balance? Should we stop all development in view of the problem of disturbances to the ecosystem? The answer to the first question is very simple - leave nature least disturbed, and undisturbed if possible. The answer to the second question is rather difficult. There is no doubt that development cannot be stopped. What is required is that we must ensure that development strategies are not harmful to the ecological conditions. They should aim at maintaining the delicate balance in nature. Here we can take the example of the big dams which have been built to utilize the water resources. Many of these projects are situated in the hilly regions where forests have been cleared from large areas for the construction of these dams. This has increased the rate of soil erosion and frequency of floods in may cases. Excessive use of irrigation in some regions has resulted in increased soil alkalinity also. These harmful effects of the big dams could be prevented by a more careful approach aiming at maintenance of ecological balance. Another fact, that must be understood clearly is that if the ecological balance is to be maintained, we cannot let the population grow indefinitely. Population growth has to be checked to reduce the burden on the natural resources. The pressure on some of the resources can be reduced by their more efficient utilization including recycling. These steps will certainly help in maintaining the ecological balance where it has not been disturbed already. In areas where it has been already disturbed we should try to restore it. Here we can take the help of nature.

Nature has in-built mechanisms of maintaining this balance and recover it if the disturbance is not too serious. We should adopt the strategy of helping the nature in regaining the lost balance. For example, if there is depletion of natural vegetation leading to increased soil erosion in an area, activities such as felling of trees and grazing of animals should be stopped. The natural vegetation will grow there and this will automatically reduce the rate of soil erosion and lead to formation of new soil. Some of the useful steps which can be successful, include preservation of forests and wild life and afforestation. A number of sanctuaries have been created in India for the preservation and propagation of wildlife. As a result of it, a number of wild life species have been saved from extinction. All these steps can be helpful in maintaining the ecological balance. Finally, before planning anything new in terms of development programmes, its possible effect on the ecological equilibrium in the concerned area should be evaluated. Conservation of natural resources is perhaps the most important strategy for conservation of the natural environment.

* Ecological balance is the state in which there is an equilibrium in energy production and consumption in an ecosystem.
* Energy is deposited during the periods of temporary energy surplus. The deposited energy can be used during the periods of energy deficit.
* An elimination or introduction of any species of plants or animals may result in ecological disturbances.
* Human activities like agriculture, mining and industry are responsible for replacement of the natural ecosystems with man-made ones.

## INTEXT QUESTION 13.4

1. Answer in one or two words :

   (a) What is the state of an ecosystem called when there is no surplus or deficit of energy ? _____ .

   (b) What type of ecosystem is an agricultural ecosystem ?

   _____ .

   (c) What type of ecosystem is an undisturbed forest ecosystem ?

   _____ .

2. Fill in the blanks selecting the most appropriate word from those given in the bracket : (surplus, larger, coal, higher)

   (a) Cultivation on steep slopes leads to _____ rates of soil erosion.

   (b) Increased rate of soil erosion leads to _____ amount of silt in streams.

   (c) Deposits of energy take place during the periods of energy _____ in the ecosystem.

   (d) _____ is an example of energy deposited during a period of energy surplus.

## WHAT YOU HAVE LEARNT

Environment is the sum total of the physical and biological conditions within which an organism lives. Our environment is made up of four major components : land, water, air and living organisms. That part of the overall environment which can support life is called biosphere. The limits of the biosphere extend only upto a little above the earth's surface and inside earth up to a small depth. All organisms interact among themselves and with their

environment to produce various changes on the surface of the earth. Each of the processes and changes in the biosphere is powered by some energy. The only regular source of energy to the biosphere is the sun. Solar energy is converted by plants into food energy, which is consumed by all animals either directly or indirectly. The inter-relationships between the organisms and their environment are studied by the science of ecology. Ecosystem is a functioning system in the biosphere and energy is transferred in the form of food through various components of the ecosystem. All organisms feeding at a common level in the food-chain form the community in that trophic level. Because the amount of energy available at each higher trophic levels in a food chain keeps declining, the population of organisms keeps declining at successively higher trophic levels. Under normal conditions each ecosystem is in a state of balance or equilibrium and some activities of human beings may disturb this balance. Maintenance of ecological balance is very important for us. There are a number of methods which can be applied to maintain the ecological balance. The most important among these methods is the approach of leaving nature least disturbed.

## TERMINAL QUESTIONS

1. What is meant by the term environment and what are the major components of the environment ?
2. What is the role played by the abiotic and the biotic components of the environment ?
3. Define the term ecosystem. Draw a diagram showing the interaction of various components of the ecosystem.
4. What is a food chain ? How is energy transferred from one component of the biosphere to the other ?
5. What is the relationship between the producers and the consumers in the biosphere? Also show the relationship between population at various trophic levels in a food chain.
6. What is meant by the term ecological balance ? How does it get disturbed? What can be the consequences of such disturbances ?
7. How can ecological balance be restored if it has been disturbed ?
8. Represent diagrammatically a food chain and a food web.

## CHECK YOUR ANSWERS

## INTEXT QUESTIONS

**13.1**

1. (a) environment (b) abiotic environment (c) biotic environment (d) biosphere (e) ecology (f) biotic environment
2. (a) (i) land (ii) water (iii) air. (b) abiotic (c) indirectly (d) plant, animal

**13.2**

1. (a) energy (b) trophic level or trophic community (c) sun (d) producers (e) consumers
2. (a) herbivores (b) omnivores (c) food chain (d) autotrophs (e) heterotrophs (f) decomposers.

**13.3**

1. (a) ecosystem (b) population pyramid (c) food
2. (a) one (b) decreasing (c) large (d) small

**13.4**

1. (a) ecological balance (b) man-made (c) natural
2. (a) higher (b) larger (c) surplus (d) coal

## TERMINAL QUESTIONS

1. The sum total of the conditions within which an organism lives is called the environment. Land, water, air and living organism are the four major components of the environments.
2. Refer to section 13.3
3. Refer to section 13.7 Fig. 13.2 or Fig. 13.3
4. Refer to section 13.6 and draw the diagram of a simple food chain and show how and why consumers decline at each trophic level. Refer to section 13.6 and 13.7 figure 13.3

5. Explain how producers and consumers are inter linked through food chain and show how and why consumers decline at each trophic level. Refer to section 13.6 and 13.7 and figure 13.3.
6. Refer to section 13.8
7. Refer to section on ecological balance (Section 13.8)
8. Refer to Fig. 13.1 and 13.2 or make a food chain and a food web like producer-primary consumer-secondary consumer-tertiary consumer-scavengers-decomposers.