CHAPTER

5

Biosphere

The Earth is a unique planet, in that it has life thriving on it. It is inhabited by countless forms of life from microscopic bacteria to great banyan trees and animals like elephants, tigers and blue whales and of course human beings. The fact that the earth has a combination of land, air and water, and a moderate temperature due to a moderate distance from the Sun, has made life possible on it. We saw in an earlier lesson that life thrives only in the intersection of the three spheres – lithosphere, atmosphere and hydrosphere. According to many geographers, life itself constitutes a separate sphere called 'biosphere'.

All forms of life have an integral connection with the land, air, water and sunshine around them. They draw their sustenance from them and in turn affect them in significant ways.

Various forms of life are not only related to the three spheres around them, but also to each other. They are part of a complex 'food chain' – that is one kind of life becomes the food for another kind. Many of the life forms also are symbiotic, that is they live by exchanging essential substances with each other. Let us consider some examples:

- Can you say how plants are dependent upon air and water and how they affect the two in return?
- In what ways are insects like mosquitoes and butterflies dependent upon rocks or soil and upon water? How do they affect them in return?

The primary food producers are the plants which produce food with the help of sunlight. The plants themselves draw their vital nutrients from the soil, especially from organic compounds formed due to decay of other plants and animals. They also depend upon nitrogen stored in the soil by bacteria. The food produced by the plants are eaten by animals, usually called 'herbivores' or plant eating animals like deer, cattle, goats, elephants etc. Living beings like dogs, cats, fishes, birds, tigers etc. eat the flesh of herbivorous animals and in this way are indirectly dependent upon plants. Bacteria and fungi help in decomposition of dead trees and animals and breaking them down into organic compounds which the plants draw upon for their growth. Thus the cycle of life goes on.

Any disturbance in this cycle can create what is called an 'ecological crisis'. For example if a particular species which feeds upon a particular kind of plant is

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exterminated, it would result in unchecked growth of that plant. It may grow so much that it may intrude into the area of other plants and stop them from growing.

Another example of disturbance is mixing of some poisonous substances in air or water or soil. Many industries use chemicals and metals which they allow to flow into the streams and rivers. This leads to a large increase in the levels of such chemicals in the water. These metals like mercury are consumed by microorganisms in water and in turn become the food of a large number of fishes. When human beings consume these fishes they too absorb quantities of mercury that are detrimental to their health.

Let us look at another example. Vultures feed upon dead animals like cattle. Vultures eating dead carcass used to be a common sight in villages and towns some twenty years ago. However, people started noticing that vultures have virtually disappeared and are sighted very rarely. Investigations suggest that farmers use a particular chemical called Diclofenac to treat cattle. When the cattle die their flesh retains this chemical. When their flesh is consumed by vultures, diclofenac leads to kidney failure in them and they die within a week or so. In this way vultures have come very close to extinction.

Since all living and non-living things on the earth are in one way or the other connected to each other, changes affecting one, in due time affects all others too.

Natural Vegetation

Natural vegetation is generally classified into three broad categories: forests in areas of sufficient rainfall and sunshine; grasslands in regions of moderate rains; and shrubs in dry regions. In very cold regions we have tundra vegetation consisting of small shrubs, moss and lichens. Let us study some of these in greater detail.

As you may remember, there are different kinds of forests, depending upon climate of the place.

Tropical Evergreen Forests

These forests are also called tropical rainforests. These thick forests occur in the regions near the equator and close to the tropics. These regions are hot and receive heavy rainfall throughout the year. As there is no particular dry season, the trees do not shed their leaves altogether. This is the reason they are called evergreen. The thick canopies of the closely spaced trees do not allow the sunlight to penetrate inside the forest even in the day time. Hard wood trees like rosewood, ebony, mahogany are common here.

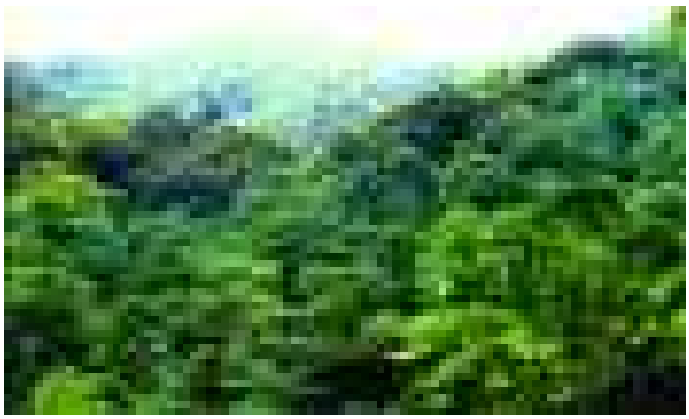

Fig. 5.1: Tropical Evergreen Forests

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Fig. 5.2: Tropical Deciduous Forests

Tropical Deciduous Forests

Tropical deciduous are the monsoon forests found in the large parts of India, northern Australia and in central America (Fig. 5.2).These regions experience seasonal changes. Trees shed their leaves in the dry season to conserve water. The hard wood trees found in these forests are sal, teak, neem and shisham. Hard wood trees are extremely useful for making furniture, transport and constructional materials. Tigers, lions, elephants, langoors and monkeys are the common animals of these regions.

Temperate Evergreen Forests

The temperate evergreen forests are located in the mid latitudinal coastal region (Fig. 5.3). They are commonly found along the eastern margin of the continents, for example in South East USA, South China and in South East Brazil. They comprise both hard and soft wood trees like oak, pine, eucalyptus etc.

Fig. 5.3: Temperate Evergreen Forests

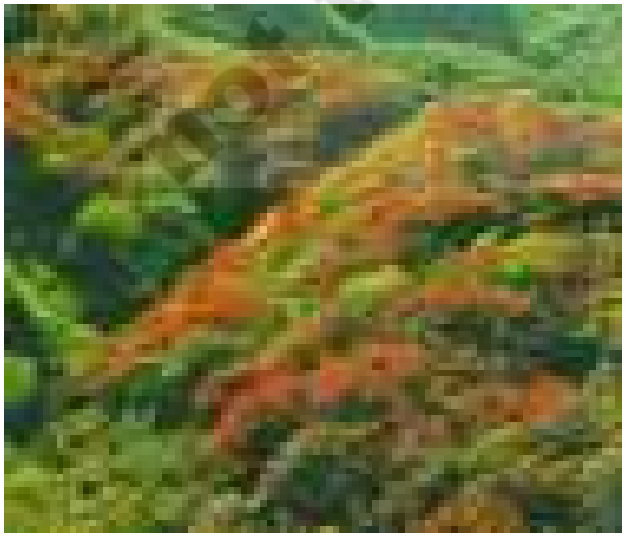

Fig. 5.4: Temperate deciduous forests

Temperate Deciduous Forests

As we go towards higher latitudes, there are more temperate deciduous forests (Fig. 5.4). These are found in the North Eastern part of USA, China, New Zealand, Chile and also in the coastal regions of Western Europe. They shed their leaves in the dry season. The common trees are oak, ash, beech, birch etc. Deer, foxes, wolves are the animals commonly found. Birds like pheasants, monals are also found here.

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Mediterranean Vegetation

Fig. 5.5: Mediterranean vegetation

You have learnt that most of the east and north east margins of the continents are covered by temperate evergreen and deciduous trees. The west and south west margins of the continents are different. They have Mediterranean vegetation. Mediterranean trees adapt themselves to dry summers with the help of their thick barks and wax coated leaves which help them reduce transpiration. This is mostly found in the areas around the Mediterranean sea in Europe, Africa and Asia, hence the name. This kind of vegetation is also found outside the actual Mediterranean region in California in the USA, south west Africa, south western and South America and South west Australia. These regions are marked for hot dry summers and mild rainy winters. Citrus fruits such as oranges, figs, olives and grapes are commonly cultivated here because people have removed the natural vegetation in order to take up agriculture. There isn't much wildlife here.

Coniferous Forests

Fig. 5.6: Coniferous forests

In the higher latitudes (50° – 70°) of Northern hemisphere the spectacular Coniferous forests are found (Fig.5.6). These are also called as Taiga. These forests are also seen in the higher altitudes. These trees are found in the Himalayas in abundance. They are tall, softwood, evergreen trees. These woods are very useful for making pulp, which is used for manufacturing paper and newsprint. Match boxes and packing boxes are also made from softwood. Chir, pine, cedar are the important trees in these forests. Silver fox, mink, polar bear are the common animals found here.

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- Look around in your surroundings and find out the articles made of hard wood and soft wood.
- Find out and learn few names of trees of your locality.

Fig. 5.7: Tropical grasslands

Fig. 5.8: Temperate grasslands

- Identify the desert regions in the world map.

Grasslands

Tropical grasslands: These grow on either side of the equator and extend till the tropics (Fig. 5.7). This vegetation grows in the areas of moderate to low amount of rainfall. The grasses grow very tall, about 3 to 4 metres in height. Savannah grasslands of Africa are of this type. Elephants, zebras, giraffes, deer, leopards are common in tropical grasslands.

Temperate grasslands: These are found in the mid-latitudinal zones and in the interior part of the continents (Fig. 5.8). Usually, grass here is short and nutritious. Wild buffaloes, bisons, antilopes are common in the temperate region. These ar known as Steppes.

Thorny bushes: These are found in the dry desert like regions. Tropical deserts are located in the western margins of the continents. The vegetation cover is scarce here because of scanty rain and scorching heat.

Tundra Vegetation: If you reach the polar region you will find the place extremely cold. The growth of natural vegetation is very limited here. Only mosses, lichens and very small shrubs are found here. These grow during the very short summer. This is called Tundra type of vegetation. This vegetation is found in the polar areas of Europe, Asia and North America. The animals have thick fur and thick skin to protect themselves from the cold climatic conditions. Seal, walruses, musk-oxen, Arctic owl, Polar bear and snow foxes are some of the animals found here.

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Human Society and Environment

Down the ages, human societies have been interacting with the environment and in this process changing it. Hunters and gatherers used stone tools and tools made of wood etc. to hunt animals and gather tubers and fruits. They learnt to use fire – by lighting sticks and grass – the first sources of energy to be used. Thus began the tale of human endeavour to alter the environment to satisfy their needs. Human beings also began investigating into the nature of the environment around them in order to be able to change and use them for their purposes. Thus the building of knowledge of the environment is an essential part of human beings interaction with the natural world.

When human beings began to practise agriculture and animal husbandry, they began to change their environment even more. The building of cities and the use of metals like bronze and iron further changed human interaction with the environment.

Before long, people began building tanks to store water, canals to divert water to fields, and even dams across streams and rivers.

People also built roads connecting distant places and sailed in ships and boats across seas and oceans. In this way human societies established themselves not only on every continent (except the Antarctic) but over the seas and oceans too.

Gradually human population grew so much so that human beings became the dominant species on the earth. It is estimated that during BC 10,000 i.e., the time when cultivation started, the total population of human beings worldwide was about 40 lakhs. It reached to 50 crores in 1750;100 crores in 1800; 250 crores during 1950 and to 700 crores during 2010. It is estimated to reach 1000 crores by 2100. This increase in population creates great pressure on earth as well as its resources. This means that almost the entire earth would be reshaped to suit the needs of humans.

This process of reshaping the surface of the earth received a great push with the industrial revolution and process of colonisation. Industrial production needs raw materials on an unprecedented scale and industrial countries began to search for diverse kinds of raw materials and sources of energy all over the globe. They 'explored' the world and made inventories of all possible resources. They dug deep

- Can you discuss how human beings would have impacted the land, water, plants and animals around them when they began agriculture and animal herding?
- What sources of energy would they have used and how would they have obtained them?
- Can you say what kinds of changes will building of cities have on the land and water around them?
- In what way do you think this would have affected the land scape and water cycle?

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wells and tried to find out what lay underneath and also explored high above in the atmosphere. Soon systematic mining, cutting of forests, building of factories and fields and roads took place all over the earth. Nations began to wage wars with each other to gain control over these resources.

Such intense human industrial activity has profound impact on the air, water and the land around us. Let us try to think of some of these.

Industries – Pollutants and Effluents

Modern industries and transport systems use immense amount of energy which is derived basically from coal and petroleum (which are called fossil fuels as they are remains of forests of lakhs of years ago buried underground). The burning of fossil fuels release large quantities of carbon dioxide and other chemicals like nitrogen oxides, sulfur dioxide, volatile organic compounds and heavy metals. They also cause the release of sulfuric, carbonic, and nitric acids, which cause what are called 'acid rains'. Acid rains are caused by the mingling of acidic particles of atmosphere with rain increasing the acid content of rain water.

In addition to burning of fossil fuels, modern industries release enormous amounts of waste materials in the form of solid, liquid and gaseous waste contaminating air, water (both surface water like rivers and underground water of wells) and soil.

The cumulative impact of such pollution is gradually poisoning of our environment. One important impact is the change in worldwide climate also called 'global warming'. Let us read about this in greater detail in Class IX biological science at Chapter X.

KYOTO PROTOCOL

A conference was held in the city of Kyoto in Japan under United Nations Organisation in December 1997 to protect mother earth from global warming. The countries that attended realised the effect of Green House Gases and signed a declaration called Kyoto Protocol. The main aim of this is to bring down the release of Green House Gases to less than 5.2%. According to this declaration, this aim should be achieved between 2008-2012.

Depletion of Resources

Industrialisation, rapid population growth and urbanisation all have meant unprecedented exploitation of natural resources like minerals, forests, soil, water, air etc. besides sources of energy (coal, petroleum etc.) stored in the earth for billions of years. This has resulted in rapid deforestation and decline of reserves of minerals, oil and groundwater. Many scientists have argued that the present way of life is not 'sustainable' for if we use so much natural resources, nothing will be left for our children and grand children.

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All the living beings on the earth depend on the environment and have to live according to the environment. But, for their enjoyment and development human beings are destroying nature. The commercial activities carried on by human beings are affecting every life and every matter on the earth. If this continues like this it is dangerous not only to animals but also to human beings themselves.

Do You Know?

1. Approximately 13-15 tonnes of effluents, sewage water reach Kolleru lake daily from its nearby towns and villages.
2. One study found taht the radiation released by cell phone towers affects the life of honey bees. This leads not only to scarcity of honey but also affects pollination and bio diversity and here agricultural products.

Key words

1. Food chain
2. Hard wood trees
3. Acid rains
4. Ecological crises
5. Tundra

Improve your learning

1. Life itself constitutes a seperate sphere called 'Biosphere'. Explain.
2. Why is ecological crisis created in modern times? What are its effects?
3. Natural vegetation depends upon the climate of the place. Write different kinds of forests and climatic conditions of their existence?
4. How can we protect natural resources?

Project

Visit any nearby industrial establishment and observe what kinds of smoke, liquid and solid wastes come out of the compound. Find out from the nearby residents about their impact on plants and animals. Based on the information collected, prepare a report and present in the class.

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