CHAPTER-02

ENVIRONMENT AND ENVIRONMENTAL PROBLEMS

KEY POINTS

- Meaning of Environment
- Environmental Problems
- Major Environmental Problems– Pollution, Desertification, Global warming.

2.0. Introduction:

The environment as a theme has drawn utmost attention of the people during the contemporary period. Although the term 'environment' has been in use for a long time, it has now acquired special importance. Presently, almost in all kinds of academic, administrative, commercial and political discussions, the issues relating to environment are commonly referred.

That the environmental problems have disturbed people in almost all parts of the world have been currently in media. Now-a-days, all kinds of media are seen putting more emphasis on the environmental issues. That we should keep the environment healthy has become goal and objective for all of us. Necessary importance for environmental education has also been given in the school and college curricula.

2.01. The Meaning of Environment:

In a broad sense, environment denotes the condition around an orgnism or a community of organisms. Such a condition includes all

necessary elements for survival. These elements are both biotic and abiotic. The biotic elements include all sorts of plants and animals ranging from microbes to large mammals. On the other hand, land, water, air and all other lifeless elements fall under the abiotic category. These biotic and abiotic elements through their interaction create necessary condition or environment for life. In other words, each and every organism or community of organisms depend upon the conditions around. Thus organisms are also constituents of their environment. Human beings are also an organism and they also depend on the environment around.

The meaning of environment is very wide and complex from geographical point of view. Four major spheres of the earth determine its environment. These are - (A) Lithosphere, (B) Hydrosphere, (C) Atmosphere and (D) Biosphere. These spheres are interconnected. The condition created by the interaction among them may broadly be called environment. The famous geographer Peter Haggett says that the environment is an outcome of the interaction among land, water, air and life. In this sense, the earth's environment is a vast and complicated system. Within such a vast system, the local and regional environments have been functioning. It means that the environments of all the localities are the constituents of the vast global environmental system.

Fig. 2.1 : Global Eco-system

In order to understand the earth's environment, it is necessary to have brief ideas on the above mentioned spheres and their interactions.

(A) Lithosphere :

The land component of the earth composed of rocks, soils, minerals, etc forms the lithosphere. The lithosphere covers all the continents where we find the mountains, hills, plateaus, plains, valleys and coasts. The characteristics of the lithosphere and its change in course of time depends on the other three components (hydrosphere, atmosphere and biosphere) of the earth's environmental system.

(B) Hydrosphere :

The seas and oceans have formed the earth's hydrosphere. The hydrosphere covers about 71% of the earth's surface. The rivers, lakes and other waterbodies distributed in the continents are also parts of the hydrosphere. The status and change in the hydrosphere depend on the status of the lithosphere, atmosphere and biosphere.

(C) Atmosphere :

From the earth's surface upward extends a gaseous layer. Composed of Oxygen, Nitrogen, Hydrogen, Carbon-di-Oxide, Argon, etc. this gaseous layer is called the atmosphere. The atmosphere extends broadly to a height of about 10000 km from the surface of the earth. The characteristics and change of the atmosphere depend on the other three components of the environmental system.

(D) Biosphere :

The biosphere covers those parts of the earth's environment where life forms occur. These include the earth's surface, down to a few meters from the earth's surface, the seas and oceans and the lower stratum of the atmosphere where birds and insects fly. So far 1.75 million species of plants and animals have been identified in the biosphere. Of these, human beings (Homo sapiens) constitute only a single species.

It has been mentioned already that the four major spheres of the earth's environment are interdependent. The interactions among them have given rise to what we call environment. The innumerable elements of these spheres through a complicated network of relationships have determined the earth's present environment. The environment is changing both in terms of space and time.

Fig. 2.2 : Coastal environment

Each of the geographical regions of the world has its own characteristics, although they are interrelated. The quality of the natural elements varies from region to region. There are regional variations with respect to land, water, climate, natural vegetation and wildlife. The natural environment of the places close to the equator is significantly different from that of the polar areas. The environment of the desert areas is again different. The environment of the river valleys (Fig. 2.3) differs from that of the coastal areas at least to a certain extent (Fig 2.2). Thus the different geographical conditions create various types of environment. Changes occur within the same environment in course of time. Hundred years back from now the environment of the Brahmaputra and the Barak Valleys was notably different, for instance.

Factors like population growth, industrialization, urbanization, expansion of transport and communication are responsible for the rapid change of the earth's environment. The shrinkage in forest cover, wetlands, etc has its negative impact on the biosphere and also on the

atmosphere. With the spread of population and human activities to the mountainous and the desert areas as well, such areas have experienced rapid environmental changes. Under such circumstances, the study and proper conservation of environment have acquired added importance.

Fig. 2.3 : River valley environment

2.02. Environmental Problems:

No environmental problem occurs, if the quality of the environmental elements and the mutual relations among them remain normal. At the beginning of the human civilization, there was no problem of pollution like to-day. Natural phenomena like earthquake, volcanic eruption, cyclones created some problem, but never took lives like today. People coexisted with all these. It is important to note that no major problem occurs so long a balance is maintained among the natural and man-made elements. Environmental problems did not disturb people badly so long the relations among the elements of lithosphere, hydrosphere, atmosphere and biosphere were in balance. But during the last three hundred years or so world population and demand for resources increased so much that the relation among the environmental elements could not remain normal. All the spheres of the earth's environment were put under the growing pressure of human activities. The forest cover declined on the one hand and the presence of Carbon-di-Oxide in the atmosphere started increasing on the other. As a result, new problems began to appear. As these problems are basically linked with the environment, they are referred to as environmental problems.

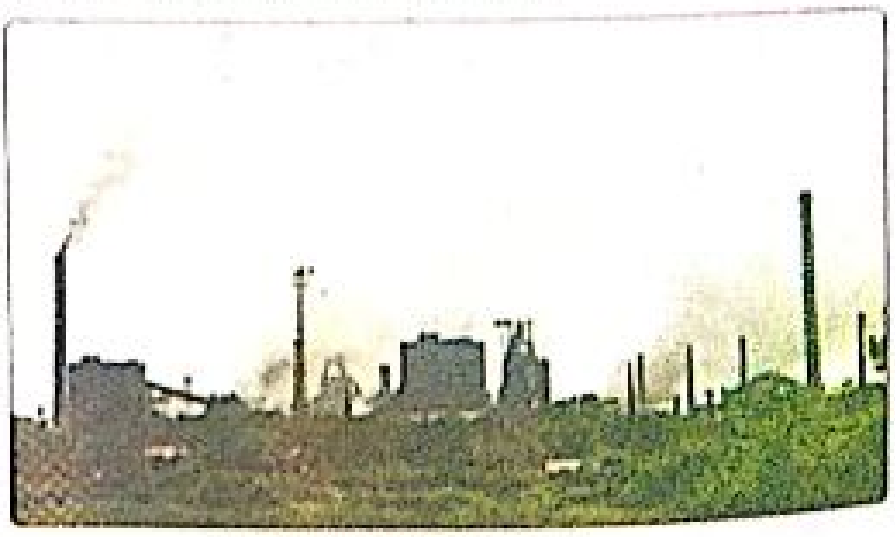

Fig. 2.4 : Industrial pollution

We know that in normal condition the Carbon-di-Oxide (CO_2) content in the atmosphere

is 0.035%. This gas absorbs the solar energy reflected from the earth's surface and thus helps in maintaining a favourable temperature condition for lives both in the atmosphere and the earth's surface. But, if the content of this gas increases in the atmosphere due to certain reasons, then there will be some change in the normal temperature of the atmosphere and the surface of the earth. In the contemporary period, because of the increasing trend of use of fossil fuel in the industries and transport vehicles, the Carbon-di-Oxide content in the atmosphere has increased. This has created serious problems like global warming (Fig. 2.4). Similarly, the processes like deforestation has accelerated the problem of soil erosion. Thus, the growing anti-natural human activities have led to rise of environmental problems in the world.

It should be mentioned here that the environmental problems can be geographically divided into three different groups– (A) Local problem, (B) Regional problem and (C) Global problem. The local problems may remain confined to small areas, so far as their genesis and spread are concerned. The instances of such problem may be the land pollution created by a small-scale industry, water scarcity in winter due to shallowing of a wetland, bank erosion problem created by a river in a locality and so on. On the other hand, some problems may be regional in occurrence. The flood problem of the Brahmaputra or the Barak Valley, problem of water pollution in a vast industrial region, problem of underground water shortage in an urban area, problem of soil erosion in a river basin are some examples of such regional environmental problem. Sometimes a regional problem may cover more than one country.

Some of the environmental problems on the other hand, cover the entire world. Such problems do not have any geographical boundary. For instance, we can refer to the problem of global warming. As this problem is linked with the atmosphere, it is limitless in terms of coverage. Its impact is felt in the lithosphere, hydrosphere and biosphere, in addition to the atmosphere. The management of such problem needs international efforts.

2.03. Major Environmental Problems:

Currently our earth including its people has confronted with various types of environmental problems. The root cause of all these problems is the overgrowing human activities. Factors like spread of human settlements, expansion of agricultural land, growth of industries and urban centres, expansion of transport and communication have

together disturbed the interrelationship among the environmental elements. This has created severe problems in the environmental system. The problems that have caused great loss to human beings and the Biological world include different types of pollution, desertification, landslide, soil erosion, global warming, artificial flood, rise of sea level, etc. (Fig. 2.3). Here, some of the major environmental problems have been discussed.

Fig. 2.3 : Problems of soil erosion

2.3.1 Pollution :

The process of contamination of the environment by harmful substances is simply called pollution. Many of the man-made substances, if added largly to the environment, it may cause harm to the biotic world. Such substances are generally called pollutants. Lime, Sulpher di-Oxide, Carbon-monoxide, etc. are some of the environmental pollutants. The major elements of environment-land, water and air-being polluted for various reasons may cause harm to human beings and other life forms. Presently, the pollution of these three elements has led to serious problems in different parts of the world.

Land Pollution : Land is an important element of nature. It is an indispensible resource for human being. The development of human civilization has been possible mainly based on this resource. It is, however, regretable that the land is getting polluted due to basically human factors. Land looses its natural properties and fertility, when it comes into contact with certain chemicals, poisonous metals, industrial wastes, radioactive substances, acid rain and so on. In such a situation, land is considered to be polluted.

Generally, modern farming practice, expanding industries and increasing deforestation are held mainly responsible for land pollution. The modernization of agriculture encouraged the application of chemical fertilizer, irrigation, insecticides, etc., in the crop land. The application of chemical fertilizers causes change in the soil composition and properties. Similarly, the use of underground water in the fields affects the natural property of soil. Moreover, the insecticides and weedicides applied in the fields destory the helpful microbes and other life forms in addition to the targetted insects and weeds. All these pollute the land by changing its natural properties. The industrial wastes and chemical substances also pollute land, if they get mixed with the soils.

The remains of coal and petroleum also pollute land when these are extracted from below the surface without proper care. Thus land pollution has become a widespread problem in most parts of the world.

Air Pollution : The atmosphere is mainly composed of gaseous substances. Some liquid and solid substances are also present in the atmosphere in different states. Among the gaseous substances, Nitrogen (78.08%), Oxygen (20.94%), Argon (0.93%) and Carbon di-Oxide (0.035%) are important. By maintaining a definite proportion, these substances keep the atmosphere in a balance. Surely various problems will occur, if this balance is somehow disturbed. The natural state of the atmosphere may be changed, if certain solid, liquid or gaseous substances are added to the atmosphere by some natural or human processes. If such a change causes some harm to the biotic and abiotic elements, then the atmosphere is said to be polluted.

Among the natural factors that contribute towards polluting the atmosphere, the important one is the volcanic eruption. The smoke, ashes and gases that come out from the earth's interior during eruption pollute the air. The example of the eruption of Mount Pinatubo in Phillippines may be cited as example in this connection. During this eruption as high as 15-20 million tonnes of sulphur di-oxide (SO_2) gas was emited to the atmosphere and the prevailing winds spread the pollutants to cover a huge part of the earth's atmosphere. Moreover, in certain parts of the earth, forest fire also pollutes the atmosphere.

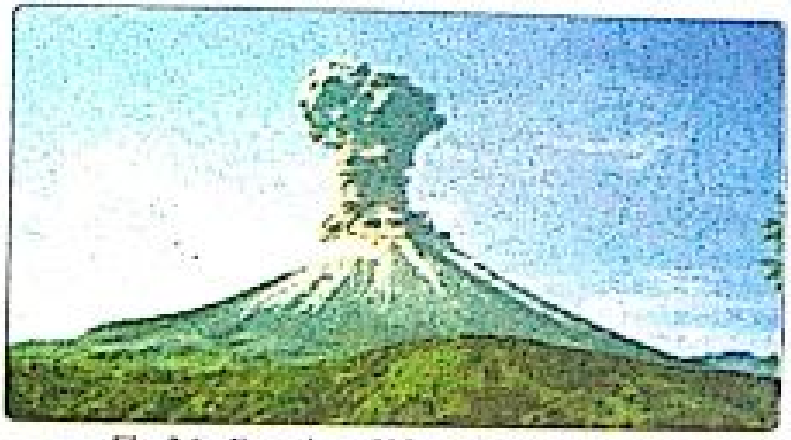

Fig. 2.6 : Eruption of Mount Pinatuba, 1991

Primarily the human activities are responsible for polluting the atmosphere. The growth of industries, urbanization, growth of vehicular traffic and nuclear explosions are some of the major man-made factors that cause air pollutions. Actually, the atmosphere started getting polluted after the beginning of industrial revolution in Europe. The increasing use of fossil fuel has added harmful gases like Carbon-monoxide (CO), Nitrogen Oxide (NO_2), Hydrocarbon (HC), Sulphur-dioxide (SO_2), etc. to the atmosphere. These gases pollute the atmosphere.

One of the important consequences of atmospheric pollution is the occurence of acid rain. It has been seen that during the last few decades

some of the industrially advanced areas have faced problems arising out of acid raining. Such problems have taken serious turn in the industrial areas of West Europe, United States of America and Eastern Canada. Generally, acid rain occurs when there is maximum concentration of Sulphur di-oxide and Nitrogen dioxide in the atmosphere. Such rains destroy forests and pollute water of the wetlands.

Water Pollution : Just like the atmosphere, the hydrosphere is also more or less polluted. The natural state or quality of water gets changed when certain chemical substances, particles, microbes, radiations are added to or passed through it. The process of such change in water is called pollution. In simple words, pollution means the process of making water unusuable due to mixing of some pollutants. Generally the water is polluted if there are human settlements, industries, agriculture, etc. in the water sources, where from wastes get mixed with water. Polluted water harms the plants and animals present there (Fig. 2.7). Such water is not usable for human beings.

Fig. 2.7 : Polluted water wastes

Generally, the industrial and urban wastes pollute the water of the rivers flowing through or by the side of the towns. The example of the Ganga flowing through north India may be cited in this connection (Fig 2.8). The wastes generated in the towns and cities and industries located on the banks of this river have been drained to the river for a long time and as a result the water of the river, which was considered to be sacred, is now badly polluted. Similarly, from a survey carried out in the United States of America it is evident that 55% of the total length of the rivers of the country is polluted by agriculture related factors. The remaining 16% is polluted by the cities, while 13% by mining activities and another 13% by housing development activities. In the same way, the twenty two towns along with more than 300 industries therein have polluted the water of the Yangtze river in China. We all know how the water of the Bharalu river flowing through the Guwahati

Fig. 2.8 : Pollution in Ganga river

city is being polluted by the urban and industrial wastes (Fig. 2.9). Cleaning these rivers and to make them pollution free has paused great challenge before the coutries concerned.

The water of the rivers and wetlands located close to the big industrial regions is polluted by the increasing proportion of acid in the water. The Sulphur di-oxide and Nitrogen oxide present in the atmosphere may come down in the form of acid rain and pollute the waterbodies. Many of the aquatic plant and animal species may be extinct, if the acid content in the water increases. On the other hand, due to various causes the ocean water is also getting polluted now. Becuse of the dumping of industrial wastes and accidents of the oil ships, the ocean water may be polluted. Thus, the water pollution caused by various factors has adversely affected human health and fertility of soil in the continents.

Fig. 2.9 : Water pollution in Guwahati

2.3.2 : Desertification

The deserts are naturally located in certain specific areas of the world. In the deserts, rainfall is scarce, but evaporation is more. Therefore, the desert environment is dry. Natural vegetation is scarce in the deserts. About 20% of the world's land surface is covered by the deserts. The snow-covered areas of the polar regions are called cold desert. Here, only the matters relating to the tropical hot deserts are discussed.

Desert and desertification do not mean the same thing. Desertification is such a process which renders the productive areas of the tropical region a desert-like situation. The term desertification, however, denotes the spread of the deserts to their peripheral areas (Fig. 2.10). It is worth mentioning in this connection that the environment of the Sahara desert in Africa became so dry in the early 1970s that many animals had to die. People were also badly affected. Under such circumstances, a meeting was held at Nairobi in 1977 under the patronage of the United Nations. Concerned with the problem of desertification, the meeting defined desertification as– "the

Fig. 2.10 : Desertification

diminution or destruction of the biological potential of the land leading ultimately to desert-like conditions." The process of desertification reduces the productivity of land and causes expansion of desert to the neighbouring and even the distant lands. This means that this process contributes towards the spread of the deserts and conversion of fertile areas into deserts. At present, around 35% of the world's land surface is affected by the process of desertification.

Generally, a number of natural and human factors favour the process of desertification. Among the natural factors, drought and global warming are important. The drought condition affects the land productivity and the growth of natural vegetation. This accelerates the desertification process. But the scientists are of the opinion that the global warming, which has made presently everybody worried about, would be a dangerous factor for increasing desertification. There is no doubt that the increasing temperature will make the desert environment more dry.

Many have held human activities responsible for desertification. Such activities include overgrazing, expansion of agriculture and deforestation. During the contemporary period, the rapid population growth has increased pressure in the desert and semi-desert regions. This pressure has helped greatly in the expansion of the deserts. At present, the dry areas of about 100 countries of the world have faced the problem of desertification. The proportion of area severely affected by desertification is very high in the continent of North America. As high as 27% of the total dry areas of the continent has been affected by desertification. The next position is occupied by South America with 22%, followed by Asia, Africa and Australia respectively with 20%, 18% and 8%. The low rainfall areas of the north-western India have been under the impact of desertification.

Fig. 2.11 : Measure to resist desertification

The solution of the problems of desertification is now a challenging task before the people of the world. Without international co-operation, it will not be possible to resolve this issue. As it is linked with the process like global warming, desertification has gradually acquired a very complicated dimension. The problem will be more intensified, if human activities are directed against nature. It is, therefore important to take steps for reducing desertification (Fig. 2.11).

2.3.3 Global Warming :

The earth has experienced a variety of changes during its 4,600 million years long history. The causes of these changes were basically natural. But lately the changes experienced by the earth are mostly man-made. Although the change in climate was caused by natural factors earlier, the present change in atmosphere as well as earth's surface temperature is ascribed to the human activities by the scientists. Termed as global warming, this particular problem has now badly threatened the people of the world (Fig. 2.12).

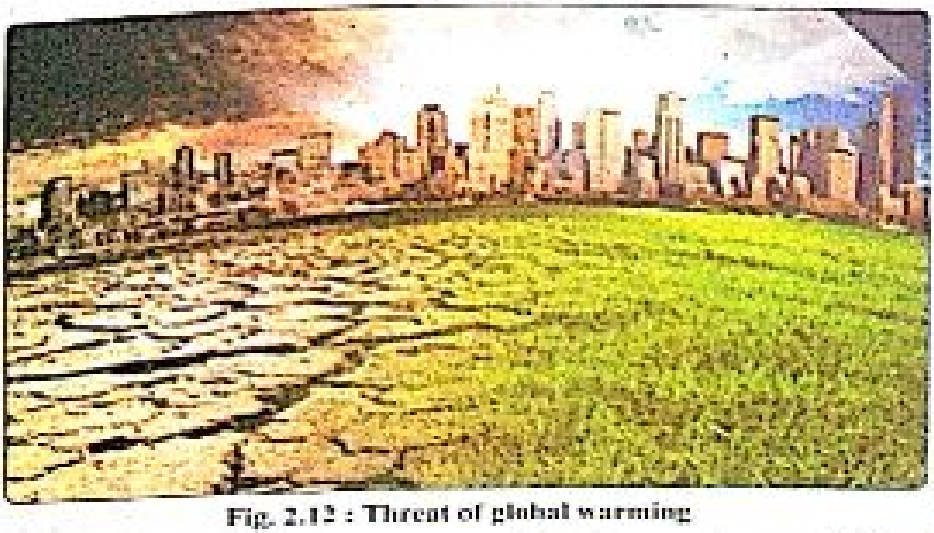

Fig. 2.12 : Threat of global warming

The source of temperature for the earth's surface and atmosphere is the solar energy. Out of the total incoming solar energy, 30% is reflected back by the cloud and the surface of the earth. The atmosphere absorbs 19% of the solar energy and the remaining 51% is released by the earth to the atmosphere as latent heat. Thus the atmosphere and the earth maintain a balance with respect to temperature. Maintaining such a balance of temperature has been made possible by the gases present in the atmosphere in specific proportion.

It should be remembered in this connection that certain gases can trap the energy reflected back by the earth's surface. These gases include Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), water vapour, etc. These gases help in increasing the atmospheric temperature by traping the energy reflected back by the earth and therefore these are called greenhouse gases. These gases constitute only 0.1% of the total volume of gases in the atmosphere. These gases naturally help in maintaining a balance in the temperature on the earth's surface and the atmosphere. But, if some how some variation occurs in the proportion of these gases in the atmosphere, the natural state of temperature will change. Atmospheric temperature generally increases with the increase of greenhouse gases in the atmosphere.

Among all the environmental problems that have greatly disturbed the people of the world, the problem of rise of temperature in the

atmosphere and the earth's surface as well, is the most important one. This has now become a global problem and the question of survival of the entire living world is connected with this. Therefore, the issue of global warming has become a common subject matter in all kinds of academic, administrative, political and economic discussions.

The role of Carbon-di-oxide, among all the greenhouse gases, in global warming is the most significant. We all know that the use of fossil fuel started increasing gradually after the industrial revolution and just to meet the demands of certain industries cutting of trees also increased. As a result, the proportion of Carbon-di-oxide gas in the atmosphere started rising. In addition to human activities, volcanic eruption also caused increase of greenhouse gases in the atmosphere. Thus during the 150 years or so there has been an increase of Carbon-di-oxide alone in the atmosphere by 30%. Moreover, there has also been increase in the proportion of gases like Methane, Nitrous oxide, Chlorofluorocarbons (CFC_s), etc. All these gases have caused increase in the atmospheric and earth's surface temperature by traping more and more solar energy.

It has already been established that the average surface temperature of the earth has increased by about 0.76°C from the pre-industrial revolution level. At the same time it has been estimated that the average temperature of the earth's surface will increase by about 5.8°C. This type of temperature increase will greatly change the earth's environment and threaten the very existence of lives in the world. In view of this, most of the countries of the world are ready to take up necessary programmes to control temperature rise. The United Nations has come forward to provide necessary guidance to the people of the world.

Fig. 2.13 : Future result of global warming

A variety of problems will be there due to the rise of atmospheric temperature. Among them, however, melting of snow in the polar areas, rise of sea level, change in the

growth and distribution of plants and animals, fall of crop output, desertification, etc. are important. It has been estimated that a rise of atmospheric temperature by 2-3°C will cause melting of snow on the north and south polar regions and rising of sea level (Fig. 2.13). Thus, if the sea level rises by one meter from the present level, about 5 million sq.km of coastal area will get submerged. At the same time many populated islands, deltas, and coral islands will get submerged. Fortunately the people of the world are aware of these problems and the countries have agreed to take up necessary plan unitedly to curb the problem of global warming.

SUMMARY

- In a broad sense, environment denotes the condition around an orgnism or a community of organisms. Such a condition includes all necessary elements for survival.
- Four major shperes of the earth determine its environment. These are – (A) Lithosphere, (B) Hydrosphere, (C) Atmosphere and (D) Biosphere.
- The environmental problem can be considered geographical in three different ways– (A) Local problem, (B) Regional problem and (C) Global problem.
- The problems that have caused great loss to human beings and the biological world include different types of pollution, desertification, landslide, soil erosion, global warming, artificial flood, rise of sea level, etc.
- The growth of industries, urbanization, growth of vehicular traffic and nuclear explosions are some of the major man-made factors that cause air pollutions.
- At present, around 35% of the land surface is affected by the process of desertification.
- During the 150 years or so there has been an increase of Carbon-di-oxide alone in the atmosphere by 30%. Moreover, there has also been increase in the proportion of gases like Methane, Nitrous oxide, Chlorofluorocarbons (CFC), etc. All these gases have caused increase in the atmospheric and earth's surface temperature by traping more and more solar energy.
- A variety of problems will be there due to the rise of atmospheric temperature. Among them, melting of snow in the polar areas, rise of sea level, change in the growth and distribution of plants and animals, fall of crop output, desertification, etc. are main.

EXERCISE

1. Write in your own words the meaning of environment.
2. Mention some of the biotic and abiotic elements of environment.
3. Write the meaning of lithosphere.
4. What are the features included in the hydrosphere?
5. Write about the composition of the atmosphere.
6. Give an outline of the extent of the biosphere.
7. Discuss briefly the relation among the four major components of environment.
8. Mention the major causes of environmental change.
9. Explain the meaning of environmental problem.
10. Write geographical divisions of the environmental problems.
11. What is a local environmental problem? Give examples.
12. Give two examples of regional environmental problem.
13. Which problems are considered as global environmental problem?
14. Mention the major environmental problems of the world.
15. Give the meaning of the term pollution.
16. What is water pollution? How does it occur?
17. Write a short note on land pollution.
18. Write how air is polluted.
19. What is a desert? Give the definition of desertification.
20. Mention the causes of desertification.
21. Is it possible to control desertification?
22. What is global warming? Mention its causes.
23. What are the probable consequences of global warming?
24. Write how to control global warming.
25. Is there any environmental problem in your own locality? If yes, then explain their causes and indicate some measures for their solution.