CHAPTER-2
Environmental Geography

2.01 Meaning of Environment :

The manifestation of different problems pertaining to the globe has brought out serious thinking about environment. Now, what is environment and what are the global problems– these are some of the pertinent questions that arise in the minds of the people. Presently, most of the academic discussions involve a good deal of environmental issues. The environmental study has now been incorporated in the science discipline like Geography, Biology, Environmental Science, Anthropology, Agricultural Science etc.

Broadly, the word 'environment' relates to the surrounding of the living beings. Our earth is the home of humankind. We, the humankind, live with other plants and animals. We have to depend on other animals and plants for our food and other necessities of life. Land, water and air are indispensable for human living. So, humankind is living on earth with plants, animals, water and air. All the natural surroundings like land, water and air together with all the living organisms including man, make the **environment.** Land, water, air and all the living organisms are known as the components of environment. Here humankind, plants, animals and other living organisms together make the **Biotic**

extensive environment, there exists a separate and distinctive environment for each and every living being. Human being is also a kind of living being and thus it needs an environment and therefore, we cannot discuss man without discussing the environment.

It has already been mentioned that the meaning and scope of environment is quite wide. In the global context, the environment itself is a system and this system is being operated by the combined actions of all the biotic and abiotic components. Neither of the biotic components can live in complete isolation. They must live within the abiotic environment. Thus the Physical or Natural Environment comprising all the living organisms within it has been known as the **Ecosystem.** It is a field of interaction between the biotic and the abiotic components of the environment.

The components of the global environment are within four specific zones. All these zones do have distinctive characteristics of their own, but they are naturally interelated with one another. The Zones are :

(1) Lithosphere (2) Hydrosphere (3) Biosphere and (4) Atmosphere.

(1) Lithosphere : The surface of the earth consists of different rocks and minerals. Sand particles and soils are the fragmented parts of rocks. The thin layer formed of the rocks, minerals, sands and soils has been known as the crust or the Lithosphere. All the continents of the earth are situated on the lithosphere. It covers about 29 % of the earth's surface and all the mountains, hills, plains, plateaus etc are situated on this lithosphere.

(2) Hydrosphere : Hydrosphere consists of all the water

(3) Biosphere : The layer of the earth that bears life is known as the Biosphere. Plants, animals and all other living beings live in the biosphere. Different organisms live in different heights and depths from the earth's surface. Human beings live on the earth's surface itself while the birds live in the air slightly above the surface. Although most of the plants live on the earth's surface, there are certain plants that thrive under the sea water. The aquatic animal like the whales lives under deep ocean waters. Therefore, the limit of the biosphere ranges from the abyssal plain of the ocean to that part of the atmospheric height upto which organisms live. This extensive biosphere contains some millions species of organisms of which only about 1.75 million species have so far been identified. The humankind, known as the Homo sapiens, is one such species of living organisms.

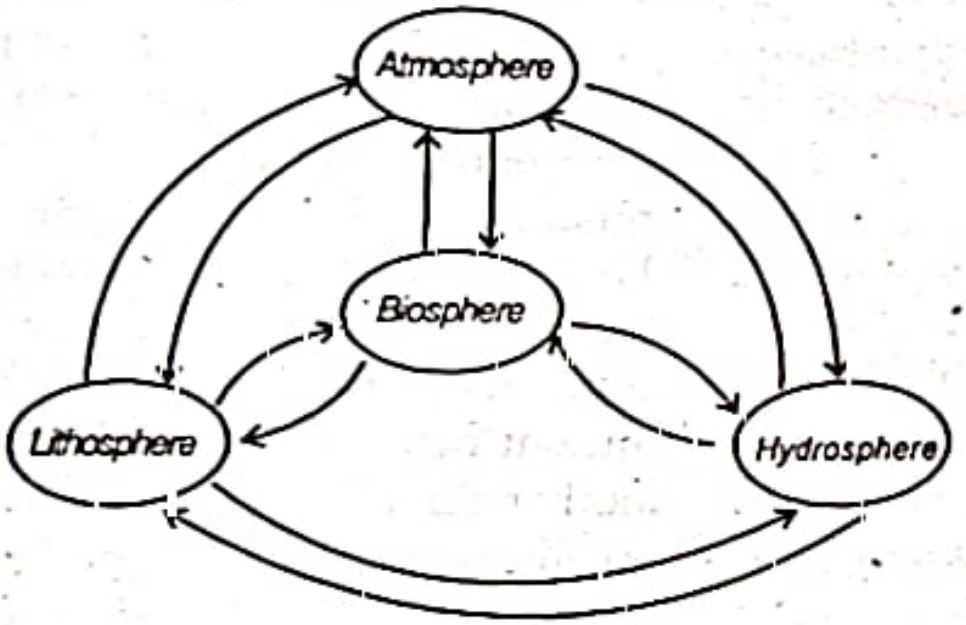

Fig.- 2.01: The global environment is the outcome of the interaction among the Lithosphere, Hydrosphere, Atmosphere and Biosphere (Peter Haggett, 1983)

(4) Atmosphere : The thick gaseous layer that surrounds the earth is known as the atmosphere. It consists of different gases like Nitrogen, Oxygen, Carbon-di-oxide, Hydrogen etc. The atmosphere is extended upto a height of about 480 km.

The four zones, already mentioned above are interdependent to one another. Different cycles like Hydrological cycle, Carbon cycle etc are to be found within these zones. The actions and reactions of these cycles give rise to the formation of suitable and useful environment for the organisms living on the earth. It has already been mentioned that the biotic and abiotic components are interrelated to each other and we get this present state of the environment through the complex network of this relationship [Fig-2.01]. The environment has been changing through time and in fact, this change is the outcome of the everchanging nature of the components of the environment. The role of human being is worth mentioning in this regard.

Regional Variation of Environment :

The environment itself is so vast and extensive that it is really a difficult task to identify it on a regional basis. Within the global system, the environment of a particular region does influence the environment of another region. This has fairly been observed that no place on earth is self-dependent, that is, it has to depend on the different environmental conditions prevailed over that particular place. This is being clearly evidenced from the varying characteristics of ocean current, circulated wind and the running water. In fact, the environment has got no specific geographical boundary, The environment of a particular place is closely interrelated to that of another place. Example may be cited that the smoke and ashes that came out during the eruption of krakatoa volcano in 1883 AD covered quite a large part of global atmosphere causing tremendous hazards to the living organisms.

On the other hand, we see that although the environment of different regions are closely interrelated, but the environment of a specific geographic region bears clear and distinctive

features of the high mountainous regions are quite different from those of the coastal regions. We observe these regional variations amidst the global environment.

It is worth mentioning that the natural environment of a place or a region is being determined by a number of factors. These factors may be location, physiography, distance from the water bodies, altitude, climate, flora & fauna etc. These factors are found to vary from place to place, region to region and thereby we see different types of environment over the global surface. In fact, the basis of the identification of the different Natural Regions over the earth's surface is the varying environmental conditions that prevail over those regions. Every Natural Region has some specific characteristics of its own. This can be more clearly observed from the characteristics of the natural vegetation of that region. The tall and broadleafed equatorial rainforest, the thorny bushes of the desert and semi-desert areas, the grasslands and conifers of the temperate region, the Mangrove of the coastal areas and the mosses and lichens of the Tundra region are all different from one another due to different environmental conditions. But we have to remember one thing that within one particular Natural Region, we may observe the local variation. For example, our country India falls within Monsoon Region. But the Noth Eastern region or the Thar Desert region in north-west or the Western Ghat region or the Deccan Plateau as a whole bears different environmental characteristics although located in the same country. Similarly, in our Brahmaphutra Valley, the flood plain areas are different from the relatively elevated areas under tea cultivation in Upper Assam.

2.02 Environmental Geography :

Literary speaking the word 'geography' means the description of the earth. The Greek geographer Eratosthenes coined the word for the first time. In fact, the study of

geography includes all the elements, both physical (natural) and social, that are present on the different regions over the earth's surface. The primary objective of the geographic study is the changing or evolutionary relationship between man and environment that prevailed over the globe. Geography wants to highlight the areal differentiation in respect of man and environment on one hand and the interdependence of the different regions as such, on the other hand. So, the matters relating to environment occupy an important place in the study of geography since inception. If this is so, the pertinent question as to the necessity of a separate branch like Environmental Geography within geography often comes in the people's mind.

Now, it is evident that our planet has been facing with different environmental problems. The rapid growth of population, the high pace of urbanization and industrialisation together with the growing development of the peoples' way of life have given a thrust on the global environment. At the same time, the unprecedented expansion of transport and communication, the unending tendency for acquiring resource from all available sources, modernisation of agricultural practices, market growth, indiscriminate use of mineral fuel in industries and vehicles and many socio-economic developmental processes are closely associated with this thrust. In fact, these processes lead to the different environmental problems like deforestation, contraction of biodiversity, global warming, desertification, land, water and air pollution and many others. The discipline Geography, along with other scientific disciplines, presently tries to find out the solutions of these problems by systematic analyses. It has now been felt by persons engaged in the study of environmental science that the traditional ideas, tools and techniques might not be very much working to tackle such complex problems and as such the geographers presently got

inclined to carry out scientific studies through new ideas and more developed technology. Keeping this objective in mind, a separate branch called **Environmental Geography** has been instituted within the study of geography. So, the **Environmental Geography** studies the nature of global environment, its spatio-temporal changes and tries to find out the probable solutions of the environmental problems.

This branch of geography is quite new and in practice, it is yet to attain a developed status, more precisely, in our country. But at the same time, it is seen that Environmental Geography is gaining popularity and relevance due to ever increasing environmental problems throughout the globe. The subject Environmental science also deals with environmental problems and includes the basic and Social Sciences like Physics, Chemistry, Biology, Geology, Geography and Climatology etc. Although these two subjects, **Environmental Science** and **Environmental Geography** bear almost the similar aims and objectives, however, they tend to differ in certain aspects.

Environmental Geography studies the nature of environment and areal differntiation of the changes of environmental conditions on the basis of man and his works. Deforestation, flood, erosion, landslide, pollution and their probable causes are some of the important aspects incorporated under the study of Environmental Geography. It also studies the environment friendly use of mineral resources and the topic like sustainable development. The development of any region must be directed in respect of environment, society and its economy. The temporal development of environmental characteristics, population growth and its relation to environment, natural disaster and its management, society- its economy and culture are a few pertinent aspects that are undertaken within the study of Environmental Geography. The environmental geographers are often seen to use developed

techniques and tools like Remote Sensing, computer aided skills in order to study environment related problems.

2.03 Elements of Environment :

It has already been mentioned that the meaning and scope of environment is extensive. It covers all the elements of Lithosphere, Hydrosphere, Atmosphere and Biosphere of the earth. The elements of environment can be categorised into two types : **(a) Biotic element** and **(b) Abiotic element.** The Biotic elements are within the Biosphere. It covers from the tiny microbes to the vast animals and all the plants. On the other hand, all the non living elements of Lithosphere, Hydrosphere, Atmosphere and Biosphere can be grouped under Abiotic elements. But we should remember that both of these elements- biotic and abiotic, are interdependent.

The characteristics of these elements are not similar in all the environments. A few examples will clarify the above statement.

(i) The **Equatorial Region** experiences high temperature and high rainfall almost all throughout the year and, therefore, we see the luxuriant growth of plants in the region. The natural

Fig- 2.02 : Three layers of trees found in Equatorial Evergreen Forests.

vegetation of the equatorial region has been known as Equatorial Evergreen Forest) Three different layers of trees are seen in these forests. The height of the first layer of trees is found to be within 10 metres. Other two layers of trees have more heights.

In the Evergreen Forests, the number of species is sometimes found to be as high as 3000 per km^2.

As compared to this, it is quite low in case of the natural vegetation of the **Tundra Region.** So also, in the case of the Xerophytic plants that grow in the **Arid or semi-arid Regions.** Similarly, the type of natural vegetation is found to vary with the increasing altitude of the mountains and the highly elevated parts of the mountains are almost devoid of any vegetation.

Like plants, animals are also found to be different under different environmental conditions. The Equatorial Forests cover only 6% of the total land surface of the earth but about 75% of the living organisms (plants and animals) identified so far, has been living within these forests. These rainforests are the ideal abode for different animal species like elephant, monkeys, birds, reptiles, amphibians and different insects. On the other hand, in arid and semi-arid regions, we see only those animals like camel and some other species that can thrive in the very dry areas. White reindeer, polar bear and penguins are the common animals living in the polar regions. So, it can be said that there are different types of plants and animals under different environments that prevail over different parts of the global surface.

Like the biotic elements, the abiotic elements also tend to differ from region to region. The soil, water and even the air have been found to differ in different regions. First, let us take the example of soil. The formation and characteristics of soil normally depend on the geological structure, slope of land, amount of precipitation, plant cover etc of a certain area. The soil of a river valley is normally alluvial. This type of soil has been formed from the materials carried down by a river during its course from mountains to plains. On the other hand, the soil of the temperate

grassland region is primarily chernozem. The colour of this soil is slightly blackish due to high organic contents and is mostly found in the semi-desert region. The soil of the high latitude areas having coniferous type of vegetation is normally podzol. This soil is highly acidic. This type of soil requires application of the chemical fertilisers like nitrogen and phosphate in order to make it suitable for agriculture.

Similarly, regional variation has been observed in case of air and water also. The climate of a particular region depends on the various climatic elements like temperature, atmospheric pressure, humidity, wind, precipitation etc. In fact, this is the difference in climate that makes the places different. So is also with the case of water. Almost three-fourth of the total surface area of the earth has been covered by water. We see that waters of seas and oceans are saline due to salt contents in it while the running water is found to be fresh. There is underground water and this is formed below the earth's surface due to percolation of rainwater through the porous rockbeds. The water found in the polar areas is in the form of ice and snow due to very low temperature over those regions.

2.04 Environmental Problems :

The way of life of the people depends on the environmental conditions that surround them. In other words, it can be said that environment has the sole control over man's life. This is also known as the environmental determinism.

At present, the entire global environment has been facing certain problems, so also its inhabitants. Now, it has gone to such an extent that almost all the living organisms are facing some threat to life. It is seen not only in the urban areas but in the rural areas too. It has really been a difficult task to find out a rational solution to such problems. Now, for all of us the need of the hour is to understand the environment properly, to become more eco-friendly and to safeguard the environment with better justice.

Causes for the ongoing environmental problems : Since the early history of mankind, peoples, no doubt, used to stay with some kind of natural disasters like earthquake, volcano, flood, cyclone, tsunamis etc. These problems are purely natural. But now, the nature of the environmental problems is quite different. At present, the problems are mostly man-made. Some of the main problems that we are facing now are rapid population growth, especially in the third world countries, indiscriminate extraction of resource, extensive application of technology in production sector, rapid growth of vehicles on road, expansion of towns and cities etc.

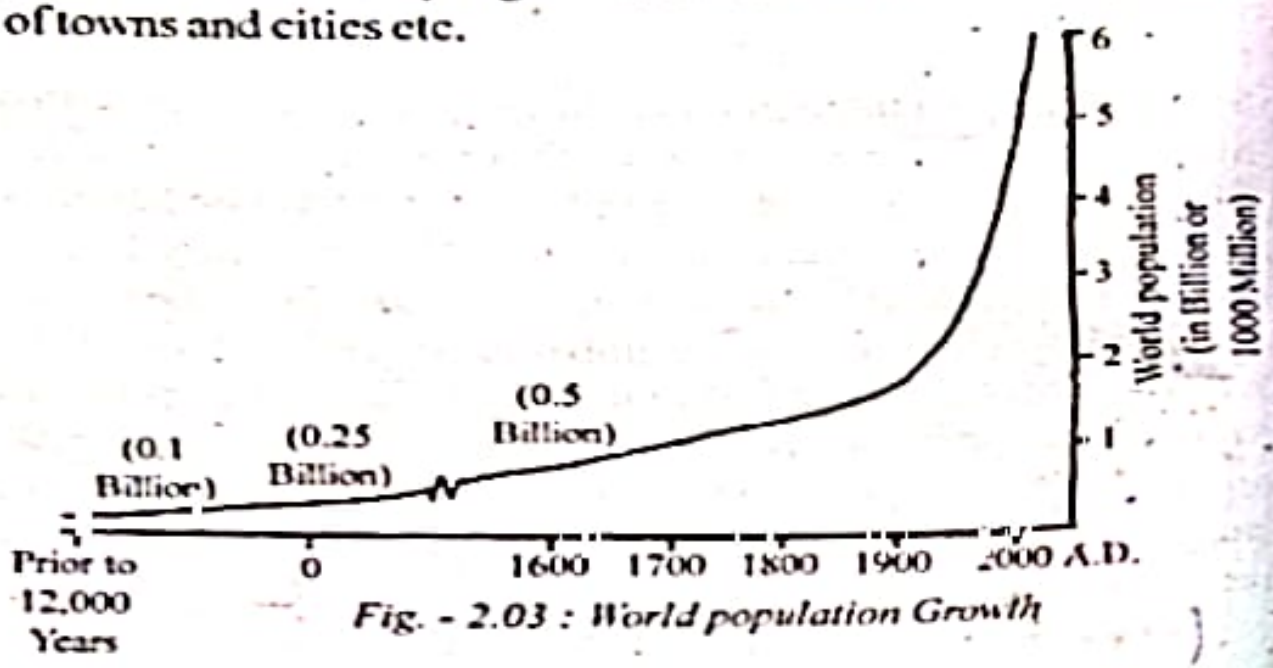

Fig. - 2.03 : World population Growth

If we look into the history, we will see that the environmental problems have been expanding with the beginning of the industrial revolution in Europe during the 18th century. The environmental equilibrium has been at stake to meet the ever increasing demand of the exploding population. Resource has been badly utilised- its extraction becomes irrational and rapid. The global population has increased from 1000 million to 6000 million during the last two hundred years from 1800 to 2000 AD (Fig.- 2.03). Now this number stands at about 7000 million. Obviously, the thrust of such poplution pressure falls on the environment.

Rapid urbanisation is another important factor for environment set-back. The percentage of urban population to the total population of the world in 1800 AD was just 2 (two). To-day it is about 50%. Increase in the number of towns and cities and also the urban population leads to different environmental problems because the urban people use more resource as compared to the rural people. Concentration of population in the urban centres leads to high density of population and this factor plays an important role in bringing about different environmental problems in those areas.

The unpreecedented development in the industrial sector, mostly in the post industrial revolution period has accelerated the use of different resources and thereby, pollutants are also being increased manifold. The industrial production has been found to increase for about 100 times in the last century. It is the same problem with the use of water resource also. The annual consumption of water resource globally has been increased from 100 cubic km to 3600 cubic km in the last two centuries that is, from 1800 to 2000 AD. All these factors throw a strong impact on the natural environment leading to some catastrophe. Some such major environmental problems have been outlined in the next few pages.

(1) Deforestation :

Deforestation can be said to be one of the most significant environmental problems that our planet has ever faced. Destruction of forests is known as deforestation. Deforestation is the cause of many problems and the result of many developmental processes. Now, much has been said about global warming and we know, it is caused due to increase in the quantity of carbon-di-oxide and other green house gases in the atmosphere. The industrial development and rapid upliftment in the standard of living of the people can be said to be one of the major causes of deforestation and this leads to the loss of green cover over the earth's surface and thereby causing global

warming. In other words, we gain wealth by losing the forest resource and we are destroying the ecological balance in the environment.

It is known that the vegetation cover of an area is the basis of maintaining the ecological balance of that area. If it is lost, the balance is disturbed. So, to maintain the ecological balance, 33% vegetation cover is a must. It should be further higher, at least 60%, in case of the hilly and mountainous regions. Otherwise, these areas would be more prone to the natural calamities like land erosion, landslide and dearth of water.

If we look into the early history of man's civilisation, there were dense vegetation cover on the earth. But with the gradual development of science and technology, the mortality rate of the people has been declined, thereby causing high birth rate, more specifically in the developing countries. Development in the industrial sector, transport and communication sector has been accelerated. People are in more need of forest resources for development of railways, paper pulp industries, chemical industires etc. High population growth also leads to high population density. People need more space to live in. This is another important factor for deforestation. So, with the ongoing processes of forest cover destruction, now we get only about 15% forest on the earth's surface.

It is not that deforestation is found only in the areas of high population density and developed industrialisation. It has also been found in the marginal semi-arid areas, hill slopes and in the areas of low population density of the equatorial forests. Even the islands in the ocean are also affected. The Easter island at a distance of about 3500 km off the coast of Chile is a good example of such activities. The act of deforestation leads to desertification, more landslides in the hills and mountains and contraction of the Equatorial Evergreen vegetation cover. It is alarming that this evergreen vegatation cover is reduced to almost 50% during last 100 years. The last few decades stand

as the worst time for the destruction of equatorial rainforest at the rate of about 2 lakh km^2 per annum. There was minor destruction in the evergreen forests of the Amazon Basin near Brazil till 1970. But after 1975, there were unprecedented destructions. If it continues at this alarming rate, the environmentalists believe that evergreen forests might be lost forever from the earth's surface by 2020. Similarly the Mangrove forests off along the coastal areas are also badly affected. These forests, grown along the coastal areas, play an important role in maintaining the coastal natural ecology. The Managrove forests in the coasts of Thailand, Indonesia and in the Sundarban delta region are gradually losing its sizes. It may be mentioned that the Mangrove forests can protect the coastal environment and human properties during the time of Tsunami.

At present, the deforestation is a global phenomenon and as such, India is also not an exception. The Himalayan mountainous region, the Northeastern region, the Western ghat region and the Ganga Brahraputra deltaic region are now facing the problem of deforestation although these areas were rich in forest resources till that day. It has been revealed from the report published in 1999 by the Ministry of Forest Resources, Govt of India, that India had only 19.39% forest cover of the total land area and out of that the percentage of dense forest is only 11.48.

Fortunately, of late, it has been observed that the people are becoming aware of such dreaded problem and coming forward to do something for afforestation. Different measures are also being taken up by the United Nations. We see Chipko and Silent valley movements in India for afforestation. Besides, people are attracted to protect the forests through the programmes of plantation during Van Mahotsav, World Environment Day etc. If something is done seriously against deforestation, we may again see lush green vegetation cover over our planet earth.

(2) Global Warming :

Since its inception, the earth has undergone different changes. The changes in the atmosphere have been one of the important changes that influence the natural environment and also man's activities. The biosphere has a close relationship with the atmosphere.

It is observed that some significant changes took place in the atmosphere during the last Geological Age on the earth. During Pleistocene age, the temperature in the atmosphere was decreased to such an extent that a major portion of the earth's surface was covered by thick layers of ice and snow. This is also known as the Ice Age. During the Ice Age, glaciers became more active on most of the areas. Even the aquatic animals were affected due to lowering of temperature in the seas and oceans. But with the beginnig of the Holocene Age that continues since last 10,000 years, the temperature in the atmosphere gradually started rising. Due to this temperature rise most of the areas which were ice-covered became ice-free except the ice cover on the high mountains and the poles. The melting of ice leads to the rise in sea level to a considerable height. This phenomenon bears a great impact on lithosphere, hydrosphere and biosphere of the earth.

We know that there is a gradual increase of temperature from the surface towards the centre of the earth. The rate of increase is 3°c per 100 meters of descent. The temperature at the centre of the earth is estimated to be 4500°c.

The solar energy is the principal source of heating of the atmosphere and the terrestrial surface. There is a balance of heat in the atmosphere and the earth's surface caused by a balanced system of absorption and radiation of solar energy. 30% of the total energy coming from the sun has been radiated back to the atmosphere from the earth's surface. 19% has been absorbed by the atmosphere and the rest 51% has been absorbed by the earth's surface. This 51% heat is being released to the atmosphere

as the latent heat through evaporation. The energy required by 1gram of water to be transformed into gaseous state is 580 calorie. Again to transform into the liquid state (water) through condensation, 580 calorie of energy has been released to atmosphere. Thus, a heat balance is maintained on the earth and its atmosphere through absorption and radiation of solar energy. The structure of the atmosphere, different gaseous matters within it, structure of the earth's surface, distribution of water bodies, the vegetation cover are some of the important factors responsible for the maintenance of such heat balance.

There are certain gases in the atmosphere which can absorb and retain the solar energy radiated from the earth's surface. Such major gases are Carbon-di-oxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Chloro Fluoro-Carbons (CFC_s), water vapour etc. Heating effect in the atmosphere is accelerated due to the absorption and retention of the radiated energy by these gases. These gases are known as **Greenhouse gas** and their effect has been termed as **Greenhouse effect.** It is interesting to note that these gases constitute only 0.1% of the total gas content in the atmosphere. These gases are in a fixed proportion and maintain a balanced state of temperature on the earth's surface. However, if this proportion is disturbed due to certain reasons, then the heat balance on the earth's surface is also disturbed.

Among the environmental problems that we are facing today, the global warming has been the most. It is serious because the very existence of the living organisms on earth is associated with such problem.

Out of the greenhouse gases, Carbon-di-Oxide plays the most important role in the act of temperature increase in the atmosphere. The industrial revolution, started in Europe, succeedingly gained importance in almost all the countries of the world and this happens to be one of the major causes for escalation in the use of fossil fuel leading to destruction of

vegetation cover. The atmosphere becomes enriched with high proportion of CO_2 due to indiseriminate use of fossil fuel by the vehicles and the different industrial units. So, the problem of high proportion of CO_2 contents in the atmosphere attains such a state that there is no alternative but to think seriously about the probable remedies.

The other source of increase of the greenhouse gases in the atmosphere is the volcanic activity. All these factors are seen to be responsible for about 30% increase of CO_2 in the atmosphere during the last 150 years. If it continues with this rate, the CO_2 contents may be doubled in every 50 years. Along with CO_2, the other green house gases are also on the increase due to different activities of human population, resulting in increase of global temperature.

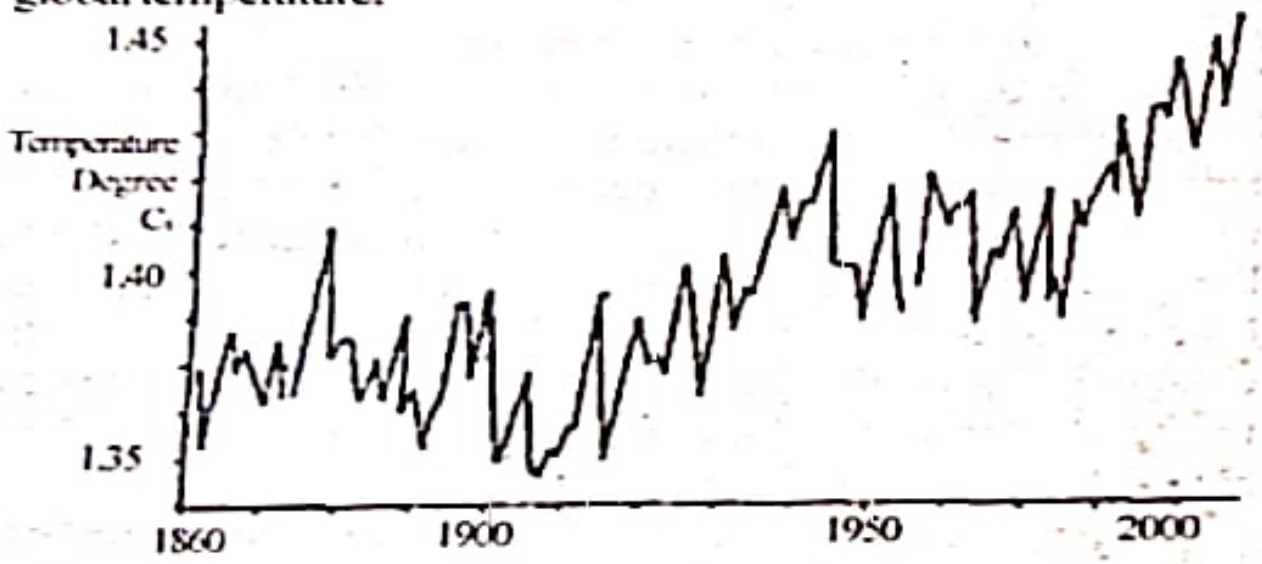

Fig. 2.04 : Average increase of World temperature.

Presently, the environmental scientists have become concerned with the information regarding the increase of global temperature. The USA experienced with the highest record of temperature in June, 1998 since last 100 years. India also experienced a temprature as high as 46.5°C in the national capital in May, 1998 and it is considered to be the highest recorded temperature in New Delhi since last 50 years. Now, after rigorous

investigation and scientific analysis, the scientists have come to the opinion that the global increase of temprature is presently estimated to be 0.6°C since last 100 years. If it goes like this, it may be raised to even 5.8°C to the end of this century. This increase of temperature over the entire earth's surface due to different factors, has been termed as the **Global Warming.**

The effect of global warming would be multi dimensional as stated by the scientists. It would bring drastic changes into the very nature of the climate and the impact would, obviously, fall on man, their activities and on all the living organisms on earth. The first and foremost effect would be the melting action of thick layers of ice stored for millions of years in the two poles. It is estimated that the increase of global temperature even upto 2°–3°C would result in large scale ice melting in the poles causing rise in the sea level. The rise in the sea level upto a height of even 1 metre would cause submerging of 5 million km^2 landmass of the coastal areas under sea water. Many oceanic islands; deltas and coral islands would be mostly affected. For example, the South Pacific coral islands of Tuvalu, Maldives in Indian ocean, Marshall islands in the Pacific, Sundarban delta along the coast of Bay of Bengal are already being affected by the rise in sea level. The height of some of these islands is not more than 1 metre from the sea surface.

Another significant impact of global warming would be on the agriculture sector. Drastic changes in the agricultural practices, decline in the agricultural production and famine would be the immediate outcome of this problem. If the increase of global temperature goes on with this rate, there would be a decline of 70% export of agricultural crop from USA to other contries in the coming 25-30 years. This has been stated by the scientist Martin Parry. He also stated that the conditions of semi-desert regions would be more alarming and the famine affected population would have to migrate to other places.

The increase of temperature in the atmosphere would throw direct impact on the plant kingdom also. The nature of the distribution of natural vegetation would be greatly affected. The xerophytic plants along the semi arid regions are likely to vanish, most of the present forests are likely to be converted into grasslands, the glaciated areas on the mountains would be shrunk and so on.

2.05 Environmental Pollution :

Air Pollution : The atmosphere of the earth has got certain properties and characteristics of its own. It is composed of different gases. In addition to these gases it has some liquid and solid matters also in different forms. The principal gases that constitute the earth's atmosphere are Nitrogen (78.08%), Oxygen (20.94%), Argon (0.93%) and Carbon-di-Oxide (0.035%). These gases are proportionately so balanced that it creates a congenial condition for survival of the living beings on earth. Any disturbance in this balance would lead to chaotic conditions not favourable for living and in fact, this becomes the pertinent problem of the day for all terrestrial organisms.

When pure air is mixed with some foreign matters, it loses some of its own properties and behaves differently. This phenomenon may be termed as the **Air Pollution.** The pollutants thus make the air impure and unhealthy for inhalation. Air may be polluted in two ways– naturally polluted and artificially polluted. That is, the pollutants may be natural or man-made. The major pollutants in natural air pollution are the smoke, ashes, debris, the molten lavas that are coming out from the interior of the earth during a volcanic eruption. These matters make a thick layer and cover on extensive area surrounding the volcanic cone and make the air most polluted. Example may be cited to the great volcanic eruption of Mount Pinatubo in Philippines that erupted in 1991. During this volcanic activity, as many as 15–20 tonnes of Sulphur-di-oxide were mixed with the air over the country and around and made it most polluted.

Such air pollution makes the surrounding airmass so poisonous that the inhabitants– mostly animals, had to suffer from various diseases, mainly skin diseases. Large scale destruction of plants is also a common scene in such areas. Forest fire is also another such factor for air pollution. The second type is the artificial air pollution, that is, the pollutants are man-made. Man and man's activities are no less responsible to make their surrounding air polluted. Rapid expansion of industrial activities, urbanisation, large scale use of different modes of transport, application of atomic energy, deforestation etc are some of the significant man-made activities through which the air has been polluted to a large extent.

In respect of the geographical area coverage, the air pollution may be categorised into three classes– (i) **Local**, (ii) **Regional** and (iii) **Global**. Formerly, the air pollution was found to occur only in the big cities and along large industrial units. So, that type of air pollution was purely **local** in nature. But with rapid industrialisation and increase in the numbers of towns and cities, the air pollution takes a **regional** shape. During the last part of the 20th century, the earth's atmosphere has been so polluted with enormous quantity of poisonous pollutants that it can now be classified as **global**.

It has already been mentioned that the indiscriminate use of fossil fuel has been one of the major causes for high rate of air pollution. The contents of the gases like Carbon-di-oxide (CO_2), Nitrogen-di-oxide (NO_2), Hydrocarbon (HC), Ozone (O_3), Sulphur-di-oxide (SO_2) are being increased so unproportionately that it may pose a danger to human living and also living for other plants and animals.

Another environmental problem that highly attracts the scientists is the acid rain occurrence mainly in the developed countries of the world. Western Europe, Eastern Canada and the industrially developed regions of the USA are the most affected areas by acid rain. This is mainly caused due to addition of SO_2

and NO_2 much more in quantity than what it was required. Acid rain is a major factor for water pollution.

Water Pollution : We know that 71% of the earth's surface has been covered by large and small waterbodies. It is the hydrosphere. We just cannot imagine a natural world without thinking of the rivers, lakes, marshes, swamps, seas and oceans over the earth's surface. Also, there seems to be an isostatic balance between the landmass and the waterbodies. But it is unfortunate that like air pollution water is also being polluted. When the fresh water becomes unfit for consumption due to admixture of some foreign ingredients, the phenomenon may be termed as the **water pollution.** Presently, it has been observed that the waters of rivers, lakes and even the saline water of seas and oceans are being polluted.

There are different factors for water pollution. Some of the major factors are industrial waste, agricultural fields using chemical fertiliser and pesticides, extraction of mineral resources, disposal of waste products etc. Mixing and spread of fossil fuel like petroleum also makes the sea water polluted. This may be occured due to certain accidents in the oil carrying vessels. Sometimes the radioactive substances are also found to mix with sea water causing pollution. The oceanographers like to say that at least 3–6 million metric tonnes of mineral oil is being mixed with the sea water annually.

The chemical substances and the disposable waste from the industrial units and other waste products of the towns and cities make the waters of the adjoining rivers, beels, ponds polluted. This is a common practice observed in the developing countries. Our Ganga, one of the large rivers in the world falls badly in the clutches of water pollution. The Ganga has been polluted due to disposal of waste products into the river from the towns, cities and the industrial units located on its banks. According to reports, it is one of the most polluted rivers in the world. Serious attempts have been

made by the Government of India to make the Ganga, pollution-free through 'Ganga Action Plan' but the result has been seen to be far from satisfactory. The population of the entire Ganga Valley has been directly or indirectly affected by the pollution in this great river.

From a scientific study undertaken in the USA, it has been observed that about 55% of the total river lengths in the country has been polluted due to agricultural reasons. 16% from towns and cities, 13% from extraction of mineral wealth, 13% due to expansion of residential areas and the rest 3% due to other reasons. Similarly, the Yangtze river in China has been polluted by about 300 industrial units of 22 major cities along its banks. The Bharalu river flowing through our city Guwahati is very badly polluted by the disposal of waste products into it and the waters of the Brahmaputra are also partly polluted due to mixing of Bharalu waters with the waters of this river.

The fresh waters of wells, tanks, ponds are also sometimes polluted due to addition of acidic matters into the water from the adjoining industrial units. There is water pollution due to acid rain that carries SO_2 from the atmosphere causing much damage to the aquatic flora and fauna. So, water pollution caused by different factors is a significant environmental problem. It may reduce the soil productivity and may be a prominent factor for water borne diseases.

Questions

1. What is meant by environment? Why is environment considered to be a system?
2. State with examples the relationship amongst lithosphere, atmosphere, hydrosphere and biosphere.
3. Write in brief as to why the environments of all the regions of the world are not same.
4. Define Environmental Geography.
5. Discuss the importance of Environmental Geography as a branch of Geography.

6. Give an account on the objective and scope of Environmental Geography.
7. What do you mean by elements of environment? Write down the meanings of biotic and abiotic elements.
8. Complete the given list by making a division of biotic and abiotic from the following elements : sand, mineral, bacteria, phytoplankton, grass, rainfall, humidity, soil, water, forest, insects, virus, coal, mineral oil, mangrove solar evergy.

Biotic elements	Abiotic elements

9. What is meant by environmental problem?
10. Mention the causes which are responsible for the growing environmental problems in the world.
11. What do you mean by the balance state of environment?
12. "Deforestation is the cause of many problems and the result of many developmental processes" – analyse the statement with arguments.
13. What is global warming? Discuss its main causes.
14. Give an account of the problems that may occur as a result of global warming.
15. Write briefly about the duties of the general people in controlling increased global warming.
16. What do you mean by air pollution? What are the causes of air-pollution?
17. Write the names of some Green House gases.
18. What kinds of problems may be created by air-pollution?
19. How is water polluted? How can it harm?
20. What kinds of steps may be taken by the people for the solution of environmental problems?

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