Indira Gandhi National Open University
School of Sciences

BGGCT-135

ENVIRONMENTAL GEOGRAPHY

BLOCK

5

ENVIRONMENTAL ISSUES, PROGRAMMES AND POLICIES

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BGGCT- 135
ENVIRONMENTAL GEOGRAPHY

BLOCK 5: ENVIRONMENTAL ISSUES, PROGRAMMES AND POLICIES

Changing climates, global warming, ozone layer depletion, pollution, acid rains, forest fires, etc. are being created pressure on environment and these environmental issues are directly or indirectly increasing the risk of human health as well as other life forms of the globe. These problems may not be limited to one particular area, it can be global, regional and local. United Nations and its member countries of the world have been initiated several programmes for the sustainable development of our planet Earth's environment since long. For example, United Nations Framework Convention on Climate Change and Convention on Biological Diversity working under United Nations play a significant role in formulating rules and regulations towards environmental management at global level. Environmental programmes and policies may differ from one country to another. In India, the environmental policies and regulations have been monitored often since independence. Several laws enacted to protect the air, water, soil, forest and other resources of environment in the Nation.

This block introduces you to the environmental issues, programmes and policies dealing with the climate change, global warming, pollution and health, United Nation's programmes, and Indian Laws on environment in three units.

Unit 15: Environmental Issues

This unit introduces the environmental problems that are affecting the planet earth due to various factors of over population, urbanization and industrialization. Every individual, community and society has to take responsibility to address the several environmental issues. The increased levels of greenhouse gases resulting in the rise of temperature, melting glaciers and sea level rise, frequent cyclones, tornadoes, floods, ozone layer depletion and ultimately impact the food and livelihood, etc. The several important issues are explained in this unit.

Unit 16: United Nations and the Environment

We have explained the important conventions on climate change and biological diversity of United Nations in this unit. The role of UN is to formulate the regulations and monitor problems and issues of various countries towards the sustainable development of the Earth's environment. Under these regulations, the UN formulated the forest principles and initiated discussion on the North and the South Debate with related to environment. These important programmes are discussed in this unit.

Unit 17: Environmental Policies with Special Reference to India

To understand environmental programmes and policies at global level, we have explained environmental development programmes of United Nations in general and environmental policies of India in particular in this unit. The Indian government judicial Acts, environmental policies, and other initiatives, for example, environmental research programme, forestry research, wildlife research, environmental education awareness and training, etc., to protect the environment have been discussed.

We hope after studying this block, you will better understand the environmental issues, programmes, and policies at global and national level.

Our best wishes are with you in this endeavour.

UNIT 15

ENVIRONMENTAL ISSUES

Structure

15.1 INTRODUCTION

Till now you have read about various environmental issues in previous blocks namely pollution, desertification, acid rain, global warming etc. Before discussing about environmental issues, we should know the meaning of environmental issues. In simpler terms it can be expressed as problems emerged in the planet's bio-geo-chemical system due to human activities.

If you read in more detail about these environmental issues you would find these issues can be grouped into various scales on the basis of extent of area affected by a particular type. These environmental issues are grouped as global, regional and local. But if we compare environmental issues with other issues, you would find many of these issues are unique. Do you know why it is so? This is because most of these problems namely global warming, climate change, acid rain etc. are not restricted by political and geographical boundaries. This has been observed that the countries which are not responsible for causing environmental problems have become the worst sufferers. Environmental problems have differential impacts and poor people across the countries are worst affected. Therefore, these environmental issues need to be addressed by all the nations of the world in a united manner.

In this unit, we will discuss about the nature of environmental problems and their causative factors in section 15.2 and 15.3. In the next four sections i.e. 154.4, 15.5, 15.6 and 15.7 we shall explain four major environmental issues namely global

warming, ozone layer depletion, climate change, pollution related health problem. In each environmental issue we will discuss about their causative factors, their consequences and remedial measures to mitigate such environmental problems

Expected Learning Outcomes

After completing the study of this unit, you should be able to:

- describe the nature of environmental issues;
- explain various causative factors associated with different types of environmental issues;
- analyse the relationship between greenhouse effect and global warming;
- describe ozone layer depletion and measures taken for improving it
- explain climate change and its associated environmental issues; and
- analyse the relationship between environmental pollution and associated health issues.

15.2 NATURE OF ENVIRONMENTAL PROBLEMS

Man-environment relationship is complex. We have not yet understood these complexities. However, if we have to understand the current environmental problems, then there is a need to understand the complexities of man-environment relationship. Some of the basic characteristics of these problems are as follow;

(i) Anthropogenic in Nature: If we analyse the root cause behind all the major environmental issues emerging as a challenge, many a time threats are anthropogenic. In other words, economic activities particularly industrialisation and consumerist life style that increases our carbon foot print and ecological footprint have affected our life support system provided by the nature. Do you know about these two terms? In simpler term carbon foot print and ecological foot print measures the load which humans place on the global ecosystem.

(ii) Adverse impact on bio-geo-chemical cycles of environment: You have already read in the Block 1 of this course that within the environment there are dynamic interrelationships between the biotic and abiotic components .These relationships can be expressed through various natural cycles which provide a continuous circulation of the essential constituents necessary for life. Examples are hydrological cycle, sedimentary cycle, gaseous cycle to name a few amongst abiotic or non-living organism and food chain or food web amongst living organism. The complex interactions among living and non-living organisms can be understood by analysing different types of ecosystem. These cycles mainly operate in a balanced state in an undisturbed natural environment. In other words, we can say that the balanced operations of these natural cycles are a fundamental condition to the continued existence and development of life on the Earth. Human beings should therefore maintain this balance with nature and act according to the law of nature. But, today the entire human society has been suffering due to excessive interference in the natural cycles of the environment that alters the balance in nature.

(iii) Trans-boundary in nature: Most of the environmental problems are trans-boundary in nature. In other words, it is not restricted within the geographical boundaries of a particular country or region and rather it affects many neighbouring countries. Air and water pollution, acid rains are some of the examples of trans-boundary environmental problems. The irony is that a large section of population in the world suffers without being responsible for its genesis. Many a times it has been observed that the impact of such environmental problem is more on those people who were not responsible for these environmental problems. Can you explain why it is so?

Therefore, we can conclude that most of the major environmental problems have already emerged as either regional or global Looking at the magnitude we can say that every individual, community and society has a responsibility to act consciously to address these environmental issues. This is essential because it affects human well-being in general and socio-economic development in specific.

SAQ 1

What is trans-boundary environmental problem? Give any one example of trans-boundary environmental problem.

15.3 CAUSATIVE FACTORS OF ENVIRONMENTAL PROBLERMS

Till now you might have realized that environmental problems emerged out of complex and dynamic interplay of socio-economic, technological and institutional factors. The discussion on nature of environmental issues in the previous section has also provided ample ideas about the causative factors of environmental issues. Can you name some of these factors? If we analyze all the major environmental problems confronted by human society, then major causative factors are rapid industrialization, urbanization, population growth intensification of agriculture, rising use of fossil fuel based energy and transportation to name a few. There are certain underlying factors like poverty, inequity and inequality.

(i) Industrialisation: Industrialization is being considered as one of the major causative factors responsible for today's majority of the environmental issues. If we compare the situation after the renaissance, mechanization and industrialization were considered as a panacea or boon for the upliftment of human progress. However, it was not visualized that this industrialization can act detrimentally to human life as well as the sustainability of the Earth. The release of green house gases and solid and liquid wastes from the industries lead to various environmental issues like pollution, global warming, acid rain, depletion of ozone layers to name a few.

(ii) Increasing use of fossil fuel based energy and Transport: Today fossil fuel use is a necessary evil. Can you explain why do we consider it as necessary evil? This is because we are not able to minimize the use

of fossil fuel. This has been extensively used in various sectors namely agriculture, industry, transport, household etc. Apart from all types of pollution, it has also altered the atmospheric composition particularly in lower atmosphere. This alteration leads to environmental problems like global warming, acid rain and ozone layer depletion.

(iii) Growth of Population: Population environment relationship is complex. It is not only the number of population that affects the environment but also quality of life that includes living standard, consumption patterns, technological access etc. When we are discussing different aspects of quality of life and their adverse impact on environment, it does not mean that we should not enhance the quality of life but we should not do it at the cost of environment. It becomes problematic today because our exploitative nature of use of environmental resources exceeded the threshold limits of the support systems. Therefore there is a need for maintaining a balance amongst growing population, increasing consumerist and over mechanized lifestyle and life support system provided by the nature. Therefore today we are talking about sustainable development as the development paradigm which provides a framework to maintain a balance amongst ecology, economy and society.

This is all the more important for highly populous countries like China and India. As you know India accounts 17 percent of the world population but we have only 2.4 percent of world's land area. It has been projected that by 2030 India would be the most populous country in the world. Therefore there is an urgent need to review our developmental activities to make it more eco-friendly and sustainable.

(iv) Urbanization: Another major development associated with industrialization is urbanization. Generally, urbanization is considered as a positive indicator of development. However, urbanization has posed a major challenge to environment. Urbanization is also associated with industrialization and mechanization. Therefore, urban areas are the major source of Green House Gas (GHG) emission, air, water and noise pollution and waste generation.

In developing countries lack of economic opportunities in terms of gainful employment forced masses to migrate from such rural areas to bigger cities. Such large scale migration leads haphazard growth and unplanned expansion of cities. This led to degradation of urban environment due to excessive pressure on available resources and infrastructural services. These services include housing, transport, water supply, sewerage, energy etc. to name a few and led to depletion of natural resource base. As a result of which there has been a growing trend in deterioration of air and water quality, generation of wastes, proliferation of slums and undesirable land use changes.

(v) Consumption Pattern and materialistic Lifestyle: This is also another major factor that has been responsible for environmental problems. You have already studied the IPAT theory given by Ehrlich and Ehrlich in the

course on Human Geography under the unit on “Population and Resources”. In this equation affluence represents average consumption of each individual in a population. Today the consumption pattern is highly unequal. There is a huge disparity between developed and developing countries as well as between rich and poor within countries irrespective of developed and developing countries. As a result majority of population in the world have been deprived of right to have a decent living i.e. safe drinking water, clean air to breathe and balanced diet to eat. Therefore, there is a need for equitable distribution of resources as far as possible in order to ensure every one’s right to having a decent standard of living.

SAQ 2

Name any four causative factors responsible for major environmental problems.

15.4 GREENHOUSE EFFECTS AND GLOBAL WARMING

You have been reading about global warming from school days. I am sure you might be reading, hearing and viewing discussions and debates related to the causes, effects and remedial measures related to global warming. In this section we will discuss all the above mentioned aspects related to global warming.

Let us begin the discussion by explaining the meaning and trend of global warming. Global warming refers to rise of atmospheric temperature and consequent changes in the radiation balance mainly due to human action. According to recent estimate, it has been found that the surface air temperature over the past 100 years has increased by about 0.5^0C to 0.7^0C. Do you know why it is so? This is because of green house effect. Do you know what is greenhouse and greenhouse effect is? Let us discuss about these two concepts briefly.

In temperate region people construct greenhouse in which they grow different types of flowers and vegetables. Greenhouse generally allows the sun’s rays to enter but do not allow it to exit and in the process keeps the greenhouse warm. Similarly in the context of the Earth, greenhouse effect is the process of warming the earth surface particularly lower atmosphere by absorbing the sun’s rays and do not allow it to exit from the lower atmosphere. Do you know how it is happening? There are certain gases which act like the glass panels of a green house. This is happening due to deforestation and industrialization. These gases are carbon dioxide (CO2), methane (CH4) nitrous oxides (NOx) and chlorofluorocarbon (CFC) and hence known as greenhouse gases. Out of these four gases, carbon dioxide contributes about 55%, chlorofluorocarbon contributes about 24%, methane (about 15%) and nitrous oxide (about 6%) towards heating of the atmosphere.

The next question which comes to our mind is that what are the various sources of these gases? Major Green House Gases and their important sources are given below in the table15.1.

Table 15.1: Major Green House Gases and their Sources

Green House Gases	Major Sources
Carbon Dioxides (CO_2)	Burning of fossil fuels and fire woods, automobiles and factories
Methane (CH_4)	Growing paddy fields, livestock, waste dumps and coal mining
Aerosols	Coolants in refrigerators and air conditioning devices
Nitrous Oxide (NO_2)	Emission from chemical industries, deforestation and certain agricultural practices.
Halocarbon (e.g., CFC-11 and CFC-12)	Refrigeration agents and industrial processes

Major Consequences: I am sure you might have read about the on sequences of greenhouse effect. Some of the major consequences are listed below:

1. **Rise of Temperature**: It is estimated that if the present rate of increase in CO_2 level continues, it will result in rise of atmospheric temperature by 2^0C to 3^0C by the end of 21st century.

2. **Melting of Glaciers and Rise in Sea-level**: This will result in receding of many glaciers; melting of icecaps in the Polar and mountainous regions and disappearance of deposits of ice on the other parts of world in large scale. According to an estimate, if all the ice on the earth would melt, about 60M of water would be added to surface of all oceans and low lying coastal areas. A rise in sea-level of only 50-100 cm caused by global warming would flood low lying areas of the world such as Bangladesh, coastal areas of India as well as densely populated coastal cities from Shanghai to San-Francisco.

3. **Increase in Magnitude and Intensity of Cyclones and Tornadoes:** Increased concentration of CO_2 and warmer tropical oceans often leads to the occurrence of more cyclones and hurricanes. Early snow melt in mountains will cause more floods during monsoon. According to United Nations Environment Programme (UNEP), within about three decades, rising levels of seas will be able to flood coastal cities like Bombay, Boston, Chittagong and Manila.

4. **Impact on Food Production:** A slight increase in global temperature can adversely affect the world food production. Thus the wheat production zones in the northern latitudes will beshifted to north of temperate latitudes. Biological productivity of the oceans would also decrease due to warming of the surface layer, which in turn reduces the transport of nutrients from deeper layers to the surface by vertical circulation.

Remedial Measures: After knowing the probable consequences can you think about some of the remedial measures? Some of the remedial measures are discussed below.

1. **Drastic Reduction in Emission of Carbon Dioxide and other Green House Gases**: CO2 concentration can be reduced by drastic cut in the consumption of fossil fuels in the developed and industrialized countries like USA, Japan, China and India. There should be a restriction on the emission of dangerous CO2, CFCs, and NO2 from the factories and automobiles.

2. **Development of Alternative Efficient Fuels**: Scientific efforts should be made to develop alternative efficient fuels. Methane may be a substitute of petroleum. Development of hydro-electricity and power from non conventional sources are considered better alternatives. In tropical and sub-tropical countries, the solar energy may be developed as an alternative to the fossil fuels. Biogas plants should be used which is another source of conventional energy for domestic use.

3. **Encouraging environmental sustainable Practices**: Limiting the driving days in megacities can be another option. Cities like Singapore and Mexico are following the practice.

4. **Enhancing afforestation**: This would certainly reduce the CO2 level and thereby decreasing the green house effect. Extensive urban forestry is another good practice.

SAQ 3

What is global warming? Name the Green House Gases that are responsible for global warming.

15.5 OZONE LAYER DEPLETION

This is another global environmental problem like global warming. Before discussing about the problem of ozone layer depletion, we should know about ozone and the ozone layer. You might have read about this in science and social science books at school level as well as in newspapers and magazines. Not only is the ozone layer thinning, in some places it has temporarily disappeared. A hole in the layer has developed over Antarctic since 1979 and that hole has persisted for a longer time. In 1988, an ozone hole was found over the Arctic for the first time and it too has lasted longer and longer each year since then. Let us recapitulate it.

What is Ozone and Ozone Layer? In simpler terms, Ozone is a form of oxygen that has three atoms (O_3) rather than the more common two atoms (O_2). It is formed in the upper atmosphere by the action of solar radiation on oxygen molecules. Do you know where it is found most? Yes, about 90% of all atmospheric ozone is found in the stratosphere between 15 to 48 kilometres above the Earth's surface (See Fig. 15.1). Ozone constitutes only less than 0.002 percentage of the volume of the atmosphere. However, its role is very

critical as far as live on the Earth are concerned. Do you know the role played by this thin ozone layer present in the atmosphere? It strongly absorbs ultraviolet radiation from the sun.

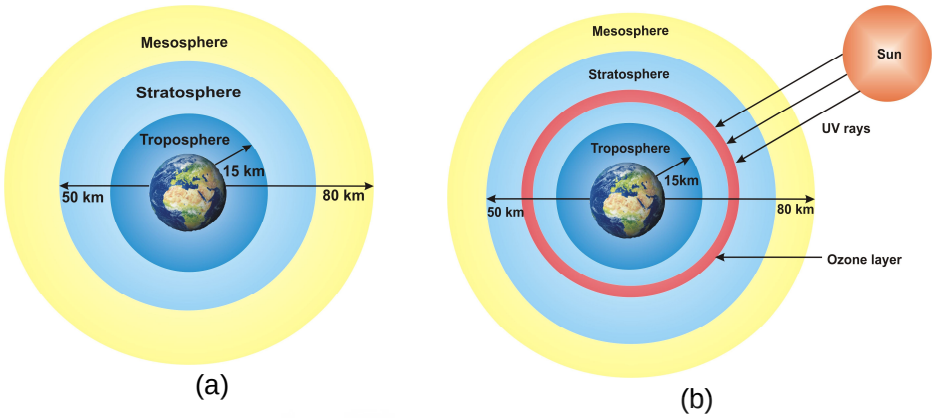

Fig.15.1: (a) Various atmospheric zones and (b) location of the Ozone layer

Major Sources Responsible for Ozone Depletion: You might be thinking that why is it happening? This is because of certain human activities which have infused certain chemicals in the stratosphere that consume ozone and reduce its concentration. Depletion is mainly caused by the following gases:

- Chlorofluorocarbons (CFCs)
- Halons
- Methyl chloroform
- Nitrogen Oxides
- Carbon tetrachloride.

These chemical substances are mainly compounds of either chlorine or bromine which can reach the stratosphere and catalytically break down ozone into oxygen. CFCs are odourless, non-flammable, non-corrosive and nontoxic. This is the reason for which scientist originally believed CFCs could not possibly have any effect on the environment. That is why it is widely used in refrigeration and air conditioning, in foam and plastic manufacturing and in aerosol sprays. Apart from this Nitrogen Oxides released by supersonic jets which fly at the height of 18 – 22 kilometers also depletes ozone. **Harmful Effects of Ozone Layer Depletion:** Major effects of ozone layer depletion can be grouped under four categories. They are as follows:

(i) **Effect on Human and Animal Health**: Exposure to Uitra Violet rays can cause cataract and skin cancer in humans. It also affects the immune system thereby increasing the risk of infectious diseases.

(ii) **Effect on Terrestrial Plants**: The UV radiation also affects the physiological and development processes in plants. Photosynthesis in plants may be impaired leading to decrease in size, the productivity and the quality in many species. It can also cause mutations in plants. Hence, the biodiversity would be affected.

(iii) Effect on Aquatic Ecosystems: As the phytoplanktons are the starting point in the food chain, reduction in phytoplankton on exposure to UV radiation would affect the fish productivity. In addition, the UV radiation can also damage the early development stages of many aquatic animals.

(iv) Effect on Materials: UV radiation also increases the rate of degradation of polymers.

Remedial Measures: Can we prevent this disaster? It needs certain actions both at individual as well as governmental level. Since the last two decades, certain actions have been initiated at the global level. Among these Montreal Protocol of 1987 is important. On September 16, 1987, the United Nations and 45 other countries signed the Montreal Protocol, on substances that deplete the Ozone layer. The purpose of the Montreal Protocol is to protect the Ozone layer by reducing the production of substances that are supposed to be responsible for Ozone layer depletion. India is also one of the signatories of Montreal Protocol. Therefore, all over the world research efforts are continuing for development of substitutes of CFC as coolants for refrigerators and air conditioners.

However, due to concerted and sincere efforts at all level, we have some good news related to this problem. According to United Nations Report in November, 2018 the ozone layer is healing above both the spheres. The ozone layer above the northern hemisphere should be completely healed by 2030s and over the southern hemisphere, it should be healed by 2050s.

SAQ 4

Name the major sources responsible for the depletion of ozone layer.

15.6 CLIMATE CHANGE AND ASSOCIATED ENVIRONMENTAL ISSUES

Climate change is one of the major environmental problems of 21st century. This problem has affected life and livelihoods of millions of people across the globe. But, before going to discuss the impacts of climate change, let us know what climate change means?

In simpler terms, climate change may be expressed as any substantial change in the Earth's climate that lasts for an extended period of time. Normally, minimum thirty to thirty five years' time period are being considered for analysing or predicting any climatic condition of a place. Two major elements of climate are temperature and precipitation. Let us know one of the formal and widely accepted definitions of climate change. According to the Inter-Governmental Panel on Climate Change (IPCC), climate change refers to

"any change in climate over time, whether due to natural variability or as a result of human activity" (IPCC, 2001a).

Climate Change due to Anthropogenic Activities: Do you know climate change had happened many a times on the Earth's history since its origin? Then, you must be thinking that why we are making so much hue and cry about this. This is because climate change in today's context is mainly due to human activities. Evidences suggest that earlier climate change occurred due to natural processes. Therefore, in this section we will discuss about climate change due to anthropogenic activities that have been taking place in recent times.

You might know that the Earth would have not been inhabitable without the presence of some naturally occurring greenhouse gases (GHG). This is because without these gases, no heat would be trapped in the atmosphere, so the Earth would have been extremely cold. It is estimated that the average temperature of the Earth would have been about -17^0C without greenhouse effect which is not at all a suitable condition for the growth of biota. Naturally occurring greenhouse gases are good in naturally occurring amounts. Greenhouse gases become a problem when people start contributing excessive amounts of these gases due to anthropogenic activities particularly after industrial revolution in the 17^{th} century.

Evidences about Climate Change: Climate scientists have been constantly engaged in gathering information on key parameters of climate change. These evidences are gathered from various sources for last hundred years as well as in extensive details for the last three to four decades. Do you know the sources through which we gather such data? Various sources used for gathering such data are innumerable weather stations across the globe, satellite, ships, aircrafts, weather balloons and buoys. These evidences are collated and trend analysis has been undertaken by numerous scientists engaged at national and international level.

At the international level, these data and findings are compiled and global trends have been reported by the Intergovernmental Panel on Climate Change (IPCC) in the form of Assessment Reports. Till now IPCC has published five assessment reports. For details about IPCC and its reports you can refer its website http://www.ipcc.ch. As mentioned above, there are certain parameters that provide indication of warming of climate. Some of these indicators are as follows:

(i) Increasing temperatures over land and ocean surfaces;

(ii) Melting glacial ice and sea ice;

(iii) Rising sea level; and

(iv) Increasing humidity.

Let us have a detail discussion on these indicators of climate change in the following section.

(i) Increasing Temperatures over Land and Ocean Surfaces: Meteorologists have been analysing temperature data available since 1880. It has been observed that the years with the warmest land-surface

temperatures were 2005 and 2010 in the Northern Hemisphere and 2009 in the Southern Hemisphere. It has also been observed that the period from 2000 to 2010 was the warmest decade since 1880. The data from long-term climate reconstructions of temperature point to the present time as the warmest in the last 120,000 years. These reconstructions also suggest that the increase in temperature during the twentieth century is extremely likely (within a confidence interval of greater than 95%–100 %) the largest to occur in any century over the past 1000 years.

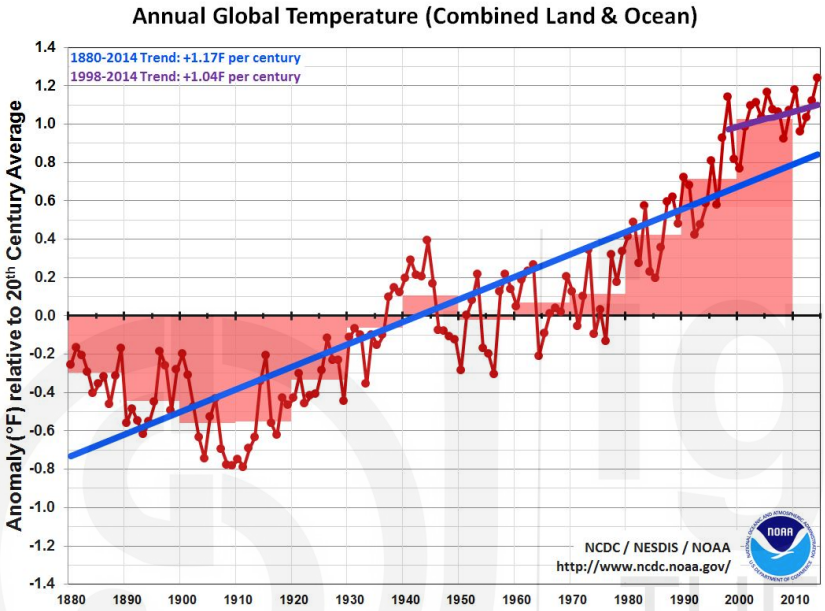

Figure 15.2: Global Temperature Change 1880-2004
(Source:https://www.ncdc.noaa.gov/monitoring-content/sotc/global/2014/ann/timeseries/trend-since-1998.png)

According to National Oceanic Administration of America (NOAA) ocean temperatures have also been rising. According to NOAA sea surface temperatures increased at an average rate of 0.07 C° (0.13 F°) per year from 1901 to 2012 as oceans absorbed atmospheric heat. This rise is reflected in measurements of upper-ocean heat content, which includes the upper 700 m (2296 ft.) of ocean.

(ii) Melting of Glacial and Sea Ice: You might have read in the newspapers, magazines or heard from TV, Radio etc. that glaciers in Greenland and Antarctica had been receding due to fast rate of melting. Is this a fact? If yes, what are the reasons responsible for such situation? As discussed in the previous paragraph that there has been increase in surface temperature both at land and sea. This rise in temperature has a direct relationship with the melting of glacial and sea ice.

As temperatures rise in Earth's atmosphere, glaciers are losing ice mass, shrinking in size. This process is known as glacial retreat. Earth's two largest ice sheets, in Greenland and Antarctica, are also losing ice mass. This is evident from the satellite records. Analysis of satellite data of July 2012

revealed that 97% of the ice sheet's surface was melting. This was the greatest extent in the 30-year record of satellite measurements. Another analysis related to summer melt of the Greenland ice sheet increased 30% from 1979 to 2006. On the basis of these evidences, scientists now estimate that between one- and two-thirds of Arctic permafrost will thaw over the next 200 years. As you know, these permafrost reserves took thousands of years to form.

Similar kind of observation has also been noticed in relation to sea ice. Maximum sea ice cover in the world is found in the Arctic Sea. The extent of Arctic Sea ice varies over the course of a year. Every summer, some amount of sea ice thaws whereas in winter, the ice refreezes. It has been observed with the help of satellite data that the minimum extent of summer sea-ice occurs in September whereas maximum extent of winter sea-ice occurs in the months of February or early March. However analysis of satellite data revealed that this has declined since 1979. September sea ice is declining at a rate of 11% per decade in comparison to the 1979– 2000 average and reached its lowest extent in 2012. The accelerating decline of summer sea ice, in association with record losses of sea ice in 2007 and 2012, suggests that summer sea ice may disappear sooner than predicted by most models. Some scientists have also estimated an ice-free summer Arctic Ocean within the next few decades.

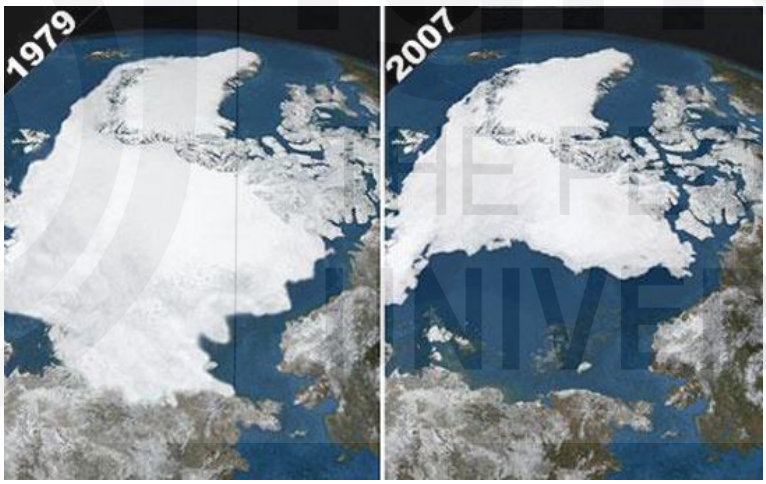

Figure 15.3: Shrinking of Glacial and Sea Ice 1984-2012 Source:https://scitechdaily.com/images/arctic-sea-ice-comparison.jpg

(iii) Rising sea-level: This is another important indicator of climate change. It has been observed that sea level is rising more quickly than the prediction simulated by most of the climate models. During the last century, sea level rose 17–21 cm (6.7–8.3 in.). However, this rise is not uniform across the globe. A greater rise has been observed in some areas like Atlantic coast of U.S. than at any time during the past 2000 years. You might be thinking that how did the scientists arrive at such conclusion? Do you have any idea about the tools used for assessing the rise in sea level? Generally we use tidal gauges and satellites to generate such kind of data. Tidal gauge records from 1901 to 2010 show that sea level rose at a rate of 1.7 mm (0.07 in.) per year.

Satellite data for the period 1993 - 2013 show that sea level rose 3.16 mm (0.12 in.) per year. This rise is primary due to two major factors that are presently contributing to sea-level rise. About two-thirds of the rise comes from the melting of glaciers and ice sheets whereas the rest one third comes from the thermal expansion of seawater due to absorption of atmospheric heat and expansion in volume of sea water.

(iv) Increasing humidity and extreme events: This is also another indicator of climate change. It has been observed that global average specific humidity has increased by about 0.1 g of water vapour per kilogram of air per decade since 1973. This change is consistent with rising air temperatures. As a science student you know that warm air has a greater capacity to absorb water vapour. A greater amount of water vapour in the atmosphere affects weather in a number of ways and can lead to “extreme” events involving temperature, precipitation, and storm intensity. According to the World Meteorological Organization, the decade from 2001 to 2010 showed evidence of a worldwide increase in extreme events, notably heat waves, increased precipitation, and floods. However, to establish a strong linkage between trends related to extreme weather and climate change requires data for a longer timeframe than what is now available.

These above mentioned change have differential impacts in terms of geographical locations, sectors of economy and socio-economic groups. Therefore, some of the major impacts/ consequences of climate change are mentioned for two levels. One is at macro scale i.e. at global level and the other at micro-level i.e. at national level.

Observation about Climate Change at Global Level: Some of the major observations of Fifth Assessment Report (2013) by IPCC are given below:

- Each of the last three decades has been successively warmer on the Earth’s surface than any preceding decade since 1850.
- Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010. Further uptake of carbon by the ocean will increase ocean acidification.
- Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink and arctic sea ice and northern Hemisphere spring snow cover have continued to decrease in extent.
- The rate of sea-level rise since the mid-nineteenth century has been larger than the mean rate during the previous two millennia. Over the period 1901–2010, global mean sea level rose by 0.19 m (0.6 ft).
- The atmospheric concentrations of carbon dioxide (CO_2), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years, primarily from fossil-fuel emissions and secondarily from

net land-use-change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.

- Total radiative forcing is positive and has led to an uptake of energy by the climate system. The largest contribution to total radiative forcing is caused by the increase in the atmospheric concentration of CO2 since 1750.
- Warming of the climate system is unequivocal. Many of the temperature changes observed since the 1950s are unprecedented over decades to millennia. It is extremely likely (95%–99%) that human influence has been the dominant cause of the observed warming since the mid-twentieth century.
- Continued emissions of greenhouse gases will cause further warming and changes in all the components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.
- Changes in the global water cycle will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase.
- Global mean sea level will continue to rise. The rate of sea-level rise will exceed that observed during 1971–2010, due to increased ocean warming and increased loss of ice from glaciers and ice sheets.

SAQ 5

Fill in the blanks with appropriate words:

a) According to NOAA sea surface temperatures increased at an average rate of _____ per year from 1901 to 2012.

b) Scientists now estimate that between _____, arctic permafrost will thaw over the next _____ years.

c) The rise in sea level is primarily due to the _____ and the _____.

15.7 ENVIRONMENTAL POLLUTION AND HEALTH

Till now you might have been convinced that most of these environmental problems are due to human actions of the past hundreds of years. Similar factors are also responsible for different types of health issues emerging due to pollution. You have already read about pollution in details in Block - 3. Some of the health issues occurring due to pollution have also been discussed briefly in that block. You have studied about the definition of pollution in general and air pollution, water pollution, soil pollution etc. in specific. But can you define environmental pollution? In simple term this can be expressed as ***abnormal changes in physical, chemical and biological characteristics of components present in the ecosystem namely air, water and soil that can***

have harmful effects on various life forms including human beings. In this section, we will discuss health problems occurring due to air and water pollution.

Today environmental pollution is a major concern. Why it is so? This is because of rapid industrialization, urbanization and carbon centric economic development. This led to green house gas emission, acid deposition and waste generation to name a few. We have already discussed this in previous sections in detail. About 50 to 60 years back, most of these problems were limited to some specific localities. In other words, we can say these problems were mostly at local scale. But today with increasing magnitude and extent, these health issues have been occurring at regional and global scale. One of the major consequences of environmental pollution is adverse impact on human health. Therefore, today we are confronted with so many health problems created by environmental pollution. These increasing health problems need to be controlled. Before that, we should know the agents responsible for contamination, their sources and emerging health risks. Some of the major health risks emerged out of environmental pollution are listed in the table given below (Refer Table 15.2).

Table 15.2: Major Environmental Pollutants and Associated Health Risks

Sr. No.	Agents of Contamination	Sources	Examples of Health Risks
1.	Bacteria, protozoa, and parasites	Human excreta	Diarrhoea, dysentery, cholera, typhoid fever, ascariasis, schistosomiasis, polio
2.	Viruses	Medical wastes containing body fluids from patients	HIV/AIDS infections Hepatitis
3.	Heavy/toxic metals	Industrial wastes Plastics	Continued and long-term ingestion of heavy metals can cause cancer and toxic effects
3.	Smoke (very small airborne solid particles)	Vehicle emissions Domestic fires Industrial emissions	Respiratory infections, pneumonia, lung cancer (in severe cases)
4.	Carbon monoxide	Vehicle emissions	Acute respiratory problems and death

Do you know that we are losing millions of lives each year due to diseases and associated health problems emerging out of environmental pollution? Majority of the cases are from the developing countries in Africa, Asia and South America. Let us understand the negative consequences of environmental pollution by analyzing loss of human lives due to environmental pollution.

Loss of Human Lives due to Environmental Pollution: Global Scenario: According to World Health Organization (WHO) website article titled "Environment and Health in developing countries" estimated global deaths

from the most significant environmentally-related causes or conditions, and from certain diseases with a strong environmental component are as follows:

1. Unsafe water, poor sanitation and hygiene kill an estimated 1.7 million people annually, particularly as a result of diarrheal disease.

2. Malaria kills over 1.2 million people annually, mostly African children under the age of five. Poorly designed irrigation and water systems, inadequate housing, poor waste disposal and water storage, deforestation and loss of biodiversity, all may be contributing factors to the most common vector-borne diseases including malaria, dengue and leishmaniasis.

3. Indoor smoke from solid fuels kills an estimated 1.6 million people annually due to respiratory disease. Urban air pollution generated by vehicles, industries and energy production also kills approximately 800 000 people annually.

4. Lead exposure kills more than 230 000 people per year and causes cognitive effects in one third of all children globally; more than 97% of those affected live in the developing world.

5. Unintentional poisonings kill 355 000 people globally each year. In developing countries, two-thirds of these deaths occur. Such poisonings are associated strongly with excessive exposure to, and inappropriate use of toxic chemicals and pesticides present in occupational and/or domestic environments (Cited from https://www.who.int/heli/risks/ehindevcoun/en/).

Therefore, there is an urgent need to address the above said problems by using multi-pronged approach which includes certain preventive as well as curative measures. We have to reorient our development paradigm to eliminate the root cause of environmental pollution.

SAQ 6

Match the following:

Agents of Contamination	**Health Risks**
a. Heavy/toxic metals	i. Respiratory problems
b. Smoke (very small airborne solid particles)	ii. Cholera
c. Bacteria	iii. Hepatitis
d. Viruses	iv. Cancer

15.8 SUMMARY

- Environmental problem emerges out of the complex human environment interaction. Most of the environmental problems are trans-boundary in nature.

- Major causative factors responsible for today's environmental problems are industrialization, urbanization, explosive population growth, intensification of agriculture, rising use of fossil fuel based energy and transportation to name a few.
- Global warming refers to rise of atmospheric temperature and consequent changes in the radiation balance mainly due to human action.
- Ozone layer depletion is happening due to certain recent human activities which have injected certain chemicals in the stratosphere which consume ozone and reduce its concentration. Depletion is mainly caused by chlorofluorocarbons (CFCs), halons, methyl chloroform and carbon tetra chlorides.
- Climate change in today's context is mainly due to human activities. There are certain parameters that provide indication of warming of climate. Some of these indicators are (i) increasing temperatures over land and ocean surfaces; (ii) melting glacial ice and sea ice; (iii) rising sea level; and (iv) Increasing humidity.
- Environmental pollution can be expressed as abnormal changes in physical, chemical and biological characteristics of components present in the ecosystem namely air, water and soil that can have harmful effects on various life forms including human beings.

15.9 TERMINAL QUESTIONS

1. Describe the nature of environmental problems with suitable examples.
2. Explain major causative factors responsible for environmental problems.
3. Explain the relationship between greenhouse effect and global warming. Suggest measures to control greenhouse effect.
4. What is Ozone layer depletion? What are the ill effects of Ozone layer depletion on human beings?
5. Analyse the relationship between environmental pollution and health with appropriate examples.

15.10 ANSWERS

Self Assessment Questions (SAQ)

1. Trans-boundaries problems are those problems which are not restricted within the geographical boundaries of a particular country and rather it affects many neighbouring countries. Air and water pollution, acid rains are some of the examples of trans-boundary environmental problem.
2. Major causative factors are industrialization, urbanization, population growth, intensification of agriculture, rising use of fossil fuel based energy and transportation.

3. These greenhouse gases are carbon dioxide (CO2), methane (CH4), nitrous oxides (NOx) and chlorofluorocarbon (CFC).

4. Depletion is mainly caused by chlorofluorocarbons (CFCs), halons, methyl chloroform and carbon tetrachloride.

5. a. 0.07 C° (0.13 F°)

   b. one- and two-thirds, 200

   c. melting of glaciers and ice sheets and thermal expansion of seawater

6. a-iv; b-I; c-ii; d-iii

Terminal Questions

1. Refer to Section 15.2
2. Refer to Section 15.3
3. Refer to Section 15.4
4. Refer to Section 15.5
5. Refer to Section 15.6
6. Refer to Section 15.7

15.11 REFERENCES/SUGGESTED FURTHER READINGS

- Christopherson, R. W. and Birkeland, G. H. (2015). 'Chapter 11 *Climate Change" in Geosystems An Introduction to Physical Geography.* Harlow, England: Pearson Education Ltd.
- IPCC, 2013: Summary for Policymakers. In: Climate Change (2013). *The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Saxena, H. M. (2013). *Environmental Geography.* New Delhi: Rawat Publications.
- Singh, S. (2001). *Environmental Geography.* Prayag Pustak Bhawan: Allahabad.
- Strahler, A.N. and Strahler, A.H. (1974). *Introduction to Environmental Science.*California: Hamilton Publication Company.

UNIT 16

UNITED NATIONS AND THE ENVIRONMENT

Structure

16.1 INTRODUCTION

In the previous unit, you have studied the factors leading to environmental problems, pollution and health, climate change and environmental issues. Now, this unit will explain you about the role and functions of Convention on Climate Change and Biological Diversity, forest principles and the North-South debate on the environmental issues. United Nations is an international organization which plays an important role in environmental management at global level formulating rules and regulations.

The United Nations Framework Convention on Climate Change (UNFCCC) was opened for signature of the participating State Parties at the United Nations Conference on Environment and Development (the Rio “Earth Summit”) held at Rio de Janeiro of Brazil on 5th June 1992. This was the phenomenal step taken by the countries towards reducing greenhouse gas emissions. We have explained the Convention’s objectives and principles as well as important measures related to climate change in Section 16.2.

Another important Convention on Biological Diversity (CBD) was also agreed in the same Earth Summit and came into force on 29 December 1993. Section 16.3 explains the main objectives and principles of this convention and the themes of biological diversity which are periodically conducted for sustainable development of environment.

Section 16.4 and Section 16.5 explains you about Forest Principles and the North-South debate in brief. The North South debate is related with various environmental policy and programmes of developed and developing countries. You will study more about environmental policies and laws of India in the next Unit 17.

Expected Learning Outcomes

After completing the study of this unit, you should be able to:

- understand the importance of the United Nations Framework Convention on Climate Change (UNFCCC);
- explain the roles and responsibilities of United Nations Convention on Biological Diversity (UNCBD);
- describe Forest Principles; and
- illustrate the environmental constraints of North South debate.

16.2 UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

The United Nations is an international organization founded with 51 membership countries in 1945 having headquarters at New York, USA, now increased to 193 Member States. UN is playing a key role in international environmental issues and climate change. We know that the changes in Earth's climate is a fallout of global warming which has happened due to a few natural causes in general but anthropogenic activities in particular. Release of toxic green house gases to the atmosphere from industrial and vehicular emissions and aeroslos could trap the out going heat and raise air temperatures near the ground leading to global warming.

The Intergovernmental Panel on Climate Change (IPCC) of UN has warned that the increasing levels of global warming is mostly due to human activities of the past five decades. World is now experiencing the effects of global warming in the form of rising sea levels, decrease in snow cover, moving ice sheets, changing rainfall pattern, and occurrence of extreme weather events in many areas across the globe.

The UN opines that the GHG emissions must be reduced to prevent global warming and arrest the climate change impact on the environment. However, reducing emissions of GHGs depend on the actions of various countries of the world but it is not in the hands of a particular region or country. The World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP) and the International Council of Scientific Unions (ICSU) had started World Climate Programme to tackle climate change problems

during 1979. This was slowly led to the formation of IPCC in 1988 to assess the magnitude and timing of changes, estimate their impacts and evaluate management strategies. You will understand how the United Nations Framework Convention on Climate Change (UNFCCC) came into existence and playing a significant role in addressing the above problems.

16.2.1 The Objective and Principles of UNFCCC

A total of 154 States Members of the world met in 1992, at the UN Earth Summit in Rio de Janeiro of Brazil, and signed this Convention. The countries ratified the Convention and agreed upon reducing their greenhouse gas emissions.

The main **objective of Convention** is to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system. Keeping in consideration of the food production and economic development in a sustainable manner, such a level should be achieved within a time-line. The ecosystems must be allowed to adapt naturally to climate change. It may be essential to think of the bearable limits of emissions by the atmosphere. This framework convention is a legally binding treaty aimed at lowering the emissions of carbon dioxide (CO_2) and other greenhouse gases. You will be astonished to know that once CO_2 is emitted, it stays nearly 100 years and more time in the climate system.

The treaty was expected to come into operation immediately. The developed countries should lead, and the developing counties should be compensated for costs incurred for taking necessary measures for controlling climatic change. Governments should submit reports on their activities and meet regularly to review progress.

There are some **important principles of the Convention** made to protect the climate system for the benefit of present and future generations of mankind (UNFCCC Handbook, 2006).

a) The principles of equity and of common but differentiated responsibilities and respective capabilities. It stresses the developed countries to take the lead in combating climate change and the adverse effects thereof.

b) The full consideration must be given for the specific needs and special circumstances of developing countries, especially those that are particularly vulnerable to the adverse effects of climate change

c) The precautionary measures are utmost priority for reducing climate change and its adverse effects through cost-effective interventions.

d) The Parties should, promote sustainable development policies and measures to protect the climate system integrating with the national development programmes.

e) It upholds the principle of free trade, calling on the Parties to promote a “supportive and open international economic system that would lead to sustainable economic growth and sustainable development thus enabling them better to address the problems of climate change”.

16.2.2 Administrative Setup of UNFCCC

The Convention has established several institutions to work within the framework. These are the Conference of the Parties to the Convention (**COP**), the subsidiary bodies (**SBs**), the **Bureau** and the **Secretariat**.

Conference of the Parties to the Convention-COP is the "supreme body" of the Convention and is responsible for reviewing and making decisions necessary to promote the effective implementation of the Convention.

Subsidiary bodies-SBs, namely the Subsidiary Body for Scientific and Technological Advice (SBSTA), and the Subsidiary Body for Implementation (SBI), are designated as advisory bodies to the COP. Each have a Bureau which consist of a Chair, a Vice-Chair and a Rapporteur. These SBs conduct the sessions on climate change process and recommend draft decisions to the COP for taking final decisions.

We now discuss some of the important conventions held after Rio Earth Summit to know the initiatives taken to address the issues of climate change. Table 16.1 explains broadly about the details of Convention.

Table 16.1: The Conference of the Parties to the Convention held at various places of countries and its significant outcome.

Convention Session	Location of Meeting	Discussion/outcome
COP 1	Berlin, Germany/1995	"Berlin Mandate" talks on additional commitments of industrialized countries.
COP 2	Geneva, Switzerland/ 1996	Cost-effective steps, consistent with sustainable development and designed to provide "no regrets" safeguards against food security, social justice and the wealth of nations.
COP 3	Kyoto, Japan/ 1997	"Kyoto Protocol" sets individual, legally binding targets for industrialized countries prepared to take positive steps to curb emissions of carbon dioxide and other GHGs from sources within their remit.
COP 4	Buenos Aires, Argentina/ 1998	Buenos Aires Plan of Action (BAPA)-a set of practical rules agreed.
COP 5	Bonn, Germany / 1999	The agenda of BAPA discussed. The draft guidelines for the technical review process related to greenhouse gas inventories.
COP 6	Bonn, Germany/ 2001	"Bonn Agreements"- on emissions trading system; Clean Development Mechanism (CDM) rules for accounting for emissions reductions from carbon "sinks" and compliance regime. Financial and technological support to help developing countries, etc.
COP 7	Marrakesh, Morocco / 2001	"Marrakesh Accords"- Adopted decisions on COP 6.
COP 8	New Delhi, India/ 2002	"Delhi Ministerial Declaration" on Climate Change and Sustainable Development as

		well as the New Delhi Work Programme on Education, Training and Public Awareness. It is related to implementation of the Marrakesh Accords and to Convention issues.
COP 9	Milan, Italy/2003	Decisions on afforestation and reforestation activities under the Clean Development Mechanism (CDM)
COP 10	Buenos Aires, Argentina/2004	Work on adaptation and response measures.
COP 11 (or COP 11/CMP 1)	Montreal, Canada /2005	The first Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP 1). The Kyoto Protocol came into force. It is an important political break-through being the decision by Parties to start a dialogue on strategic long-term cooperative action.
COP 12/CMP 2	Nairobi, Kenya/2006	Plan of work to support climate change adaptation by developing countries support for developing countries and clean development mechanism.
COP 13/CMP 3	Bali, Indonesia/2007	The adoption of the Bali Action Plan: Post-2012 framework due to the end of the first commitment period of the Kyoto Protocol.
COP 14/CMP 4	Poznan, Poland/2008	Principles for the financing of a fund to help the poorest nations and mechanism to incorporate forest protection into the efforts of the international community to combat climate change.
COP 15/CMP 5	Copenhagen, Denmark/2009	Discussed on long-term options on climate financing.
COP 16/CMP 6	Cancun, Mexico/2010	Agreement adopted for creation of US$100 billion per year to "Green Climate Fund (GCF)", and a "Climate Technology Centre" and network. The goal of a maximum 2°C global warming and all parties should take urgent action to meet this goal.
COP 17/CMP 7	Durban, South Africa/2011	Progress on Green Climate Fund (GCF) to help poor countries adapt to climate impacts.
COP 18/CMP 8	Doha, Qatar/2012	The Doha Climate Gateway: The Doha Amendment to the Kyoto Protocol. Second commitment (2012-2020) limited in scope to 15% of the global carbon dioxide emissions due to the lack of commitments of Japan, Russia, Belarus, Ukraine, New Zealand (USA and Canada were not Parties to the Protocol) and due to the fact that developing countries like China (the world's largest emitter), India and Brazil are not subject to emissions reductions under the Kyoto Protocol.
COP 19/CMP 9	Warsaw, Poland/2013	Decides to continue the Nairobi work programme on impacts, vulnerability and adaptation to climate change by considering ecosystems; human settlements; water resources; and health. General guidelines for domestic measurement, reporting and verification of domestically supported nationally appropriate mitigation actions by developing country Parties which are purely

		voluntary, pragmatic, non-prescriptive and nonintrusive, and promote a cost-effective approach.
COP 20/CMP 10	Lima, Peru/2014	'Lima Call For Climate Action': the foundations for a new global climate deal. Lima work programme on gender and its gender action plan, which promotes gender equality and women's empowerment in the UNFCCC process, and encourages Parties to advance its implementation.
COP 21/CMP 11	Paris, France/2015	The Paris Agreement: governing climate change reduction measures from 2020.
COP 22/CMP 12/CMA 1	Marrakech, Morocco/2016	Water scarcity, water cleanliness, and water-related sustainability are recognized as major problems in the developing world and many African nations. Discussed the need of reducing greenhouse gas emissions and utilization of low-carbon energy sources.
COP 23/CMP 13/CMA 2	Bonn, Germany/2017	Total of 197 Parties achieved important progress on implementing the Paris Agreement.
COP 24/CMP 14/CMA 3	Katowice, Poland/2018	Scale up the mobilization of climate finance, including through greater engagement of the private sector, to increase finance for adaptation, and to align financial flows with the objectives of the Paris Agreement and the United Nations Sustainable Development Goals; Established Local Communities and Indigenous Peoples Platform Facilitative Working Group.
COP 25/CMP 15/CMA 4	Madrid, Spain/2019	Started process of collecting greenhouse gases information from all Parties. Enhanced the time period for Lima work programme on gender and its gender action plan to achieve and sustain the full, equal and meaningful participation of women in the UNFCCC process.

(Source: https://unfccc.int/documents, 2020)

16.2.3 The Kyoto Protocol

Under the Kyoto Protocol, the Parties are legally bounded by specific commitments on GHG reduction. In December 1997, COP 3 held at Kyoto, Japan, adopted the Kyoto Protocol unanimously and came in to force on 16 February 2005. The industrialized countries agreed to reduce greenhouse gas emissions to an average of 5.2 per cent below the base year 1990 levels between the five year commitment periods from 2008 to 2012. There are some important issues under the Kyoto Protocol also discussed as follows:

- Identification of acceptable means of solutions for greenhouse gas reductions.
- Agreement on an accounting system which gives nations credit for their reductions.
- Agreement on penalties for lack of full compliance with agreed upon reductions.

The Protocol also provides for a comprehensive inclusion of GHGs and sources. Table 16.2 gives a basket of four important gases and two groups of gases addressed by the Kyoto Protocol. It has not provided the reduction or limitation values for individual gases. Further, Protocol suggested that Parties may form a group whose emissions are counted together rather than individually for each Party, like the European Union approach. It also introduced flexibility mechanisms with regard to landuse change and forest activities for example afforestation, reforestation and deforestation, allowing countries to achieve a proportion of their commitments by earning credits for GHG emissions avoided or GHG removals achieved in other countries.

Table 16.2: GHGs under the Kyoto Protocol.

Gases	**Groups of gases**
Carbon dioxide (CO2)	Hydrofluorocarbons (HFCs)
Methane (CH4)	Perfluorocarbons (PFCs)
Nitrous oxide (N2O)	
Sulphur hexafluoride (SF6)	

16.2.4 The Progress and Implications of Kyoto Protocol

The Kyoto protocol of 1997 was the beginning of the development of international policy and concerted action on global warming. Its purpose was to firm up the commitments made by virtually all the countries in 1992 at the United Nations (UN) Earth Summit which pledged to stabilize GHGs' at a level that would prevent dangerous anthropogenic interference with the climate system. There were two major problems with the Kyoto Protocol. The first is that it was only a very small beginning: the goal was for industrialized nations, to cut their annual GHG emissions by 2012 to 5.2% below their 1990 level.

The second problem is the continued resistance from many countries for doing anything about global warming. The Protocol required ratification by enough industrialized countries to represent 55 per cent of the CO_2 emissions of the developed world and it took a full seven years after the signing of the Protocol for it to be enacted (Kyoto Protocol Status of Ratification, 2006). Australia ratified it in 2008 and Kazakhstan in 2009. Up to recent times, the least enthusiastic country and the biggest stumbling block to the full implementation of the Kyoto Protocol was the United States of America, which has not ratified Kyoto Protocol. It is noted that it has less than 5 per cent of the world's population, the US is responsible for about 25 per cent of total global warming.

The progress in controlling CO_2 emission is not satisfactory. Not a single country in the world is decreasing its CO_2 emission to meet the target to reduce it to pre-industrial levels; every country in the world is going to overshoot. Nevertheless, some countries, particularly Sweden and Germany, and to a lesser extent the United Kingdom are making some progress. Sweden has an effective carbon tax with a significant bite, so much so that when it was introduced, income tax was cut by half to compensate. Between 1990 and 2005 its economy grew by 44 per cent but its GHG emissions went

down by 9 per cent. Germany lead the world in micro-generation of energy from renewable source: it has 'feed-in-tariffs' where householders and small businesses get paid for generating their own energy and imputing it to the national grid. The price is highly subsidized and fixed for 20 years so Germany is far ahead of any other country in micro generation.

Developing countries are caught in a dilemma in relation to global warming. It is clear that they are the countries which will suffer the most from the impacts of global warming but they are also being warned that any attempt on their part to join the club of developed nations by expanding their economies must be constrained in order to minimize carbon emissions. The UN Climate Summit held in Copenhagen in December 2009 was anticipated to produce a step change in how countries would address environmental concerns. The accord, drafted by the US, China, Brazil, India and South Africa, speaks only of reducing gas emission in order to reduce additional temperature rise up to 2^{o} C above pre-industrial levels. There was no agreement on measures to achieve these limits in concrete terms.

You will understand by studying some of the following inferences which are drawn from the various proceedings on global warming:

- The threat posed by global climate change to human and natural systems is unparallel in recorded history
- Technological and policy decisions made by nations in the relatively near term will affect substantially the timing and severity of any global warming that occurs.
- The technologies needed to prevent, reduce, or mitigate human impacts on the atmospheric concentrations of the gases contributing to global warming exist, or are likely to exist soon, although they are not disseminated widely.

SAQ 1

a) Define the main objective of UNFCCC.

b) What are GHGs?

16.3 UNITED NATIONS CONVENTION ON BIOLOGICAL DIVERSITY (UNCBD)

You might have understood that the impact of climate change is not only limited to the human development but also seriously effects plant and animal species, and deterioration of dry lands across the globe. It can lead to the shifting of habitats, hence, species can experience changes in life cycles and sometimes in extreme cases, die-off reaching to extinctions. The climate change increases the alteration of drylands into desertification due to rising temperatures, low rainfall. The Rio Conventions – the United Nations

Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Convention on Biological Diversity (UNCBD) are working together on climate change adaptation, combating desertification, biodiversity conservation and sustainable development.

In 1987, the foundation of the Convention on Biological Diversity started by the United Nations Environment Programme (UNEP) to elaborate an internationally binding instrument on biological diversity. On 5th June 1992, the The United Nations Conventionon Biological Diversity (UNCBD) was opened for signature at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro and came into force on 29 December 1993. At present, it has a membership of 188 countries.

16.3.1 The Objective and Principles of UNCBD

CBD as a legally binding treaty aimed at achieving three main objectives;

a) Conservation of biological diversity;
b) Sustainable use of its components; and
c) Equitable sharing of benefits arising out of the utilization of genetic resources.

The principle of CBD is that *"States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction*" (CBD Handbook, 2005).It explains that States have sovereign rights over their biological resources but fair and equitable sharing should take place. The parties should design, implement, and report activities in support of climate change adaptation based on their national and local circumstances and priorities.

16.3.2 Administrative Setup of UNCBD

There are three institutions namely the Conference of the Parties (COP), the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and the Secretariat are established to look into the measures for the conservation of biological diversity, both *in situ* and *ex situ*; incentives for the conservation and sustainable use of biological diversity; research and training; public awareness and education; assessing the impacts of projects upon biological diversity; regulating access to genetic resources; access to and transfer of technology; and the provision of financial resources. The Conference of the Parties (COP) is the governing body of the convention to review and steer its development.

SBSTTA works on providing the advice and recommendations on scientific, technical and technological aspects of the implementation of the Convention to the COP. The Secretariat provides administrative support to the COP, SBSTTA and other convention bodies. It plays a significant role in coordinating the work carried out under the convention with that of other relevant

institutions and conventions. UNEP hosts the Secretariat which is located in Montreal, Canada. The COP and SBSTTA conduct periodical reviews on the state of implementation of the programmes under CBD. There are two important Protocols which are adopted by CBD as below.

16.3.3 The Cartagena Protocol

The Cartagena Protocol on Biosafety to the Convention on Biological Diversity was adopted on 29 January 2000 in Montreal, Canada. It is an international treaty governing the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another. The objective of this Protocol is "to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking into account risks to human health, and specifically focusing on trans-boundary movements" (CBD Handbook, 2005).

16.3.4 The Nagoya Protocol

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their utilization was adopted on 29th October 2010 in Nagoya, Japan. This Protocol is the third objective of the convention providing a strong basis for greater legal certainty and transparency for both providers and users of genetic resources. Some of the important benefits of this Protocol are given below (Nagoya Protocol, CBD 2011):

- Collaboration, cooperation and contribution in scientific research and development programmes, particularly biotechnological research activities;
- Strengthening institutional capacity-building and technology transfer;
- Training related to genetic resources with the full participation of countries providing genetic resources, and where possible, in such countries;
- Access to scientific information relevant to conservation and sustainable use of biological diversity, including biological inventories and taxonomic studies;
- Research on health and food security, taking into account domestic uses of genetic resources of the State;
- Contributions to the local economy, and food and livelihood security benefits; and so on.

SAQ 2

What is the role of SBSTTA?

You have understood the structure and importance of CBD and also the two legal treaties with regard to the sustainable development and use of biological diversity. Let us now discuss the main themes of CBD programmes.

16.3.5 Themes of CBD Programme

Agro-Biodiversity

Food and Agriculture Organization (FAO) and the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources contributed a lot on agro-biodiversity under the Convention. FAO defines agro-biodiversity as "The variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agro-ecosystems". According to the FAO, we are getting today 90% of our food, energy and protein from only 15 plants and 8 animal species, and wheat, rice and maize alone provide more than 50% of the global plant-based energy intake.

- Agricultural biodiversity includes all components of biological diversity of relevance to food and agriculture, agro-ecosystem and its structure and processes.
- It deals with the positive effects of plant and animal genetic resources comprising crops, trees, pasture, rangeland species, and domesticated animals, wild animals, fish and other aquatic organisms for food and agriculture.
- It also involves in mitigating the negative impacts of agricultural practices on biological diversity in agro-ecosystems and their interface with other ecosystems.
- Microbial and fungal genetic resources, pest, pollination, nutrient cycling, sedimentation and erosion, water and climatic conditions, etc. are involved in agricultural biodiversity.
- Socio-economic and cultural factors are also associated in agricultural biodiversity as a number of people work in agricultural fields for their livelihood.
- Agricultural biodiversity is the outcome of the interactions among genetic resources, the environment and the management systems and practices used by the farmers.
- Over growing human population demanding food and changing pattern of production-consumption resulting intensive agriculture. Although, modern agriculture contributes towards food security and reduction of poverty but at the same time it is also damaging the biodiversity through land-use

conversion, climate change, over grazing, overexploitation of water, unwarranted fertilizers and pesticides use, intensification of agricultural production systems, and introduction of alien species.

- Biodiversity and agriculture are both interrelated. Biodiversity includes all species of crops and domesticated livestock which are essential to sustain agriculture. These are the result of many thousands of years of human intervention.

- Agricultural biodiversity is essential to satisfy basic human needs for food and livelihood security through raw materials such as cotton, wood, fuel, plants and roots, etc. Hence, it is essential to identify causes for changing agricultural practices, adaptive management techniques, national policies, and to increase awareness and suggest strategies for the conservation and sustainable use of agro-biodiversity

Biodiversity of the Dry and Sub-Humid Land

The bio-diversity of dry and sub-humid lands is a joint work programme of the Convention on Biological Diversity and the Convention to Combat Desertification. Global Land Degradation Assessment of Drylands (GLADA) has a mandate to integrate the information on the status and trends of dry and sub-humid lands biodiversity in their program..

Dry and sub-humid lands include arid and semi-arid regions, grasslands, savannahs, and Mediterranean landscapes. The biodiversity of these lands is unique and well adapted to the harsh conditions. For example, the Gemsbok of the Kalahari desert can survive for weeks without drinking water and the sociable weaver of southern Africa builds communal nests weigh up to 1,000 kg in order to maximize insulation from extreme temperatures. Many species of desert toads burrow into the sand and lie dormant for months until the return of the rains. Wheat, barley and olives are originated in these lands and are considered very important to livelihood support and poverty alleviation.

The UN announced the International Year for Deserts and Desertification for the Year 2006 in recognition of “the exacerbation of desertification, particularly in Africa, and its far-reaching implications for the implementation of the Millennium Development Goals, in particular on poverty eradication”. Infant mortality in dry and sub-humid lands is about 54 children per 1,000 live births - twice as high as that of temperate areas. This biodiversity supports livelihood of majority of the developing countries and large proportion of the world's food production.

The conservation and sustainable use of dry and sub-humid lands biodiversity is utmost important today because 2,311 known species of the dry and sub-humid lands are endangered and are threatened for extinction. Some of the problems of biodiversity of the dry and sub-humid lands are as follows:

- Transformation of these lands into crop-lands lead to environment degradation. Conversion dry and subhumid land for transport, tourism and industrial infrastructure is also effecting the biodiversity.

- Overgrazing, trampling and removal of biomass by wildlife and livestock is extensively creating pressure on dry and sub-humid lands biodiversity.
- Wetlands in dry lands, remnant grasslands, prairies, Mediterranean forests, and desert margins are effected by climate change impacts like changing temperature and rainfall patterns affecting biodiversity.
- Invasive alien plant and animal species, introduction of exotic grasses, legumes in pastures and rangelands, and introduction of improved crop varieties adversely affect indigenous biodiversity. Introducing of feral animals, such as rabbits, can contribute to overgrazing.
- Limited availability of water for excessive use in irrigation, and the increased frequency or intensity of fires are changing the species composition and finally affects the biodiversity in these regions.
- These lands are prone to soil erosion. Excessive harvesting of plants, collection of fuel wood, and hunting wild-life are also affecting the biodiversity of the dry and sub-humid lands.

Biodiversity of the Forests

Forest bio diversity include all life forms and their interactive ecological roles within forested areas. It contains not only trees, but a range of varied plants, animals and micro-organisms that inhabit forest areas and their associated genetic diversity. *"Forest biological diversity results from evolutionary processes over thousands and even millions of years which, in themselves, are driven by ecological forces such as climate, fire, competition and disturbances. Furthermore, the diversity of forest ecosystems (in both physical and biological features) results in high levels of adaptation, a feature of forest ecosystems which is an integral component of their biological diversity. Within specific forest ecosystems, the maintenance of ecological processes is dependent upon the maintenance of their biological diversity."*FAO estimated that each year we are losing nearly 13 million hectares of the world's forests due to deforestation, fragmentation and degradation. Some significant features of biodiversity of the forests are given below.

- Forests are one of the most biologically rich terrestrial systems. The anthropogenic activities are degrading the forest biological diversity through shifting/Jhoom cultivation, conversion of forest lands to agricultural lands, overgrazing and mismanagement, introduction of invasive alien plant and animal species, infrastructure development, mining and oil exploitation, forest fires, pollution, and climate change, etc.
- The tropical, temperate and boreal types of forests provide livelihoods for people worldwide and play important economic, social, and cultural roles in the lives of many indigenous communities.
- Forests harbour diverse sets of habitats for plants, animals and micro-organisms, and further provide timber and non-timber forest resources to mitigate climate change and genetic resources.

- It is important to assess the climate change effects on forests because forests act as a carbon sink.

Biodiversity of the Inland Water Bodies

The biodiversity associated with inland waters include lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as bogs, marshes and swamps. “Inland waters” may be fresh, saline or a mix of the two (brackish water) and are aquatic-influenced environments located within land boundaries. These are traditionally grouped as inland wetlands.The Ramsar Convention defined wetland as "Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salty, including areas of marine water the depth of which at low tide does not exceed six meters."

- The inland water biodiversity (e.g. fish) not only provides food security for poor but also helps in climate regulation, flood mitigation, nutrient recycling, water purification and waste treatment, etc.
- The groundwater recharge through wetlands and a large scale population dependency on surface water are created necessity for human beings for functioning of freshwater ecosystems.
- Due to climate change, the rising sea levels cause the erosion of shores and habitat, increased salinity of estuaries and freshwater aquifers, in turn, increases the vulnerability of some inland water bodies of the coastal areas
- To overcome the adverse effects of climate change, humans must reduce the pressure on wetlands, such as mangroves and river floodplains, which play a very significant role in mitigating the impacts of extreme weather events like flood and cyclones and natural catastrophes like Tsunamis as well.

Island Biodiversity

As we all know that an island is a portion of land surrounded by water. The **Millennium Ecosystem Assessment** defines islands as “lands isolated by surrounding water and with a high proportion of coast to hinterland”.

Island’s size vary between 0.15 square kilometres to 2.2 million square kilometres (the size of Greenland)’ these are isolated areas located some distance from other large landmasses. Island biodiversity is truly unique assemblage of life and also fragile and vulnerable. The isolation develops highly specialized species with typical characteristics of genetic diversity and unusual adaptations, such as gigantism, dwarfism, flightlessness, and loss of dispersability and defence mechanisms. Islands are repositories of genetic information whose present-day biodiversity stands as a record of millions of years of evolution. Some of their characteristics are as follows;

- Islands are inhabiting one-tenth of the world's population. They follow unique customs and cultures and their economic, environmental and

cultural well-being directly or indirectly depends on their local environment.

- Island species have become rare and threatened and are now vulnerable to near extinction. Of the 724 recorded animal extinctions in the last 400 years, about half were of island species.

- The Barbados Programme of Action for the Sustainable Development of Small Island Developing States (BPoA) referred to the biological diversity of island ecosystems as “among the most threatened in the world”, due to their small size, isolation and fragility. The causes may be of invasive alien species, expansion of tourism, climate change and natural disasters, overexploitation, pollution and waste disposal, etc.

Marine and Coastal Biodiversity

The large portion of Earth’s surface is occupied by oceans which harbour 95% of the biosphere. Marine and coastal biodiversity include coral reefs, mangroves, seagrass meadows, estuaries, and seamounts, soft and rocky bottoms etc. Millions of people depend on marine fish and invertebrates for their source of food.

We are still finding new oceanic species and hardly carried out research on oceans. There is an estimate that world’s oceans host somewhere between 500,000 and 10 million marine species. People are interested in knowing oceanic potential not only for genetic resources but also for other valuable resources of commercial uses. The major problems currently identified to marine and coastal ecosystems are overfishing, land-based pollution and eutrophication, illegal and unregulated fishing, alteration of mangroves and wetlands, climate change effects on physical habitats, etc. You may refer to Block 2 for more information on coastal areas.

Mountain Biodiversity

The UNEP-World Conservation Monitoring Centre and UNEP’s Mountain Programme provide a systematic assessment of mountain ecosystems with the help of geographic information system (GIS) based analysis of global data.

You might be knowing that nearly 27% of world’s land surface is occupied by mountains and are providing fresh water to a large number of species including humans. Mountain biodiversity at high altitudes are particularly facing risk from environmental effects of climate change. You may refer to Block 2 for more information on mountain ecosystem.

- Population pressure on mountain biodiversity are caused by human interventions in land use, deforestation, tourism and infrastructure development, over-exploitation of natural resources, grazing, fragmentation of habitats, and climate change.

- People live in mountain areas have adapted climatic conditions for getting livelihood by adopting thousands of plant varieties and animal breeds since long.

- We have to consider great cultural significance of mountains as they are considered sacred by local and indigenous people. It is essential to identify socio-economic, cultural and environmental costs and benefits of various options in mountain biodiversity studies.
- We have to understand the existing traditional ecological knowledge of local communities for successful ecosystem management of mountain areas.

SAQ 3

Differentiate between island biodiversity and marine biodiversity.

16.4 FOREST PRINCIPLES

At the Rio Earth Summit, State Members of the world negotiated to announce the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests. These principles are popularly known as “Forest Principles”. The main purpose of this statement of principles is to strengthen political commitment and action at national and international levels to implement effectively for sustainable management of all types of forests.

The important features of the principles are mentioned below. However, you can learn more about forestry by going through the website http://www.fao.org/forestry/en/ and also links given at the references section.

a) States should participate voluntarily and is responsible for the sustainable management of its forests and for the enforcement of its forest-related laws;

b) Indigenous people and local communities, forest owners and other relevant stake holders should contribute towards achieving sustainable forest management in a transparent and participatory way in forest decision-making processes as per national legislation;

c) International cooperation, including financial support, technology transfer, capacity-building and education, plays a crucial role in supporting the efforts of all countries to achieve sustainable forest management.

The Convention also set some of global objectives to reach these goals.

These are;

- Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation;
- Enhance forest-based economic, social and environmental benefits and improving the livelihoods of forest-dependent people;

- Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products;

- Reverse the decline in official development assistance for sustainable forest management and mobilize significantly increased, new and additional financial resources from all sources for the implementation of sustainable forest management.

According to United Nations, these principles and objectives will certainly help to maintain and enhance the economic, social and environmental values of all types of forests, for getting utmost benefit of present and future generations.

16.5 THE NORTH-SOUTH DEBATE

In the Rio Earth Summit, several State Parties raised a veritable North-South confrontation on several environmental issues including emission of greenhouse gases global warming and ozone depletion. Serious rifts grew between the developed and the developing countries over the question of who is to be held primarily responsible for damaging the earth and environment, and who shall pay for the repair.

UNFCCC notified developed nations also referred to as 'North' are primarily responsible for producing nearly 70 per cent of total GHGs, hence they must take lead to reduce GHGs as per developing nations of ‘South’ argument. In the list of global North, Australia and New Zealand are added and China is included in the global South.

As we know increasing emissions levels of GHGs like ccarbon dioxide, nitrogen oxide, methane and chlorofluorocarbons, etc.into the atmosphere has caused global warming which in turn has lead to climatic changes resulting sea level rise and extreme weather events like floods, cyclones, habitat loss, etc.The European community and Japan went further and promised to limit their CO_2 emission at 1990 level by the year 2000. Most nations wanted a 20% cut, but Germany declared 25-30% reduction by 2005.

The South nations were reluctant to any cut in their own CO_2 emission as it would hinder their economic development. The climate convention generated the need for recognition of equal rights of all individuals on earth to the use of the atmosphere and responsibilities of the North for the environmental debt in terms of the damage that has already been done. To face this challenge we should think about strategies which can help present and future generations.

- The research and development on global warming and its likely impacts must be carried out in large scale to get authenticated results.

- The energy consumption and usage of fossil fuels are essentially need to be estimated at North and South in particular and at global level in general.

- Innovative technologies for optimum utilization of renewable resources particularly solar, and wind for reducing fossil fuels must be explored towards consumption of energy.
- Explore investment opportunities in the South through technological advancements in a sustainable manner and also attempts be made to create binding of compensation mechanisms through pollution-pay principle.
- Should be taken care of sharing of technologies, collection of carbon tax, helping financial assistance to vulnerable countries, joint implementation for carbon reduction projects, etc.

SAQ 4

What is the main concern of developing countries in the North South debate.

16.6 SUMMARY

In this unit, you have studied so far:

- The role and responsibilities of UNFCCC and UNCBD.
- Importance of biodiversity and need of conservation towards various biodiversity which are occupied on both terrestrial and water.
- Despite of the presence of staunch environmental policies formulated by United Nations and other international organizations, it has been observed that some developed countries does not abide by environmental treaties like Kyoto Protocol.
- It can be understood that the attitude of noncompliance by some developed nations set an example of discouragement for other developing countries. Therefore, the decisions taken regarding environmental treaties should be strictly binding on all the countries.
- United Nations should also promote environmental behavioral practices among global citizens in order to increase the environmental education and awareness at micro level like observing Earth Hour, etc.

16.7 TERMINAL QUESTIONS

1. Define UNFCCC and elaborate its major objectives and principles.
2. Explain in detail about the Convention on Biological Diversity.
3. Describe agricultural and forest biodiversity.
4. Explain about forest principles.

16.8 ANSWERS

Self Assessment Questions (SAQs)

1. a) The objectives of convention is to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system.

   b) The Greenhouse Gases (GHGs) are carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, etc.

2. Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) works on providing the advice and recommendations on scientific, technical and technological aspects of the implementation of the convention to the COP.

3. The biodiversity exist in isolated lands which is surrounded by water referred to as island biodiversity. Marine biodiversity includes coral reefs, mangroves, estuaries, and seamounts, soft and rocky bottoms etc.

4. The South nations are worried for their economic development since GHGs released to atmosphere during industrial and developmental activities. North should bear the cost of environmental damage.

Terminal Questions

1. Refer to Section 16.2.
2. Refer to Section 16.3.
3. Refer to Sub-Sections 16.4.1 and 16.4.3.
4. Refer to Section 16.5.

16.9 REFERENCES/SUGGESTED FURTHER READING

- Casper, J.K. (2010). *Changing Ecosystems: Effects of Global Warming*, Infobase Publication, New York.
- Christopherson, R. W. and Birkeland, G. H. (2015). *Geosystems An Introduction to Physical Geography.* Harlow, England: Pearson Education Ltd.
- Heywood, V.H. (ed) (1995) *Global Biodiversity Assessment*, Cambridge, UK: Cambridge University Press.
- Rajagopalan, R. (2016) *Environment and Ecology: A Complete Guide*, Gurugram: LexisNexis.
- Saxena, H.M. (2013). *Environmental Geography*, Rawat Publications, New Delhi.

- Smith, W. H. (1989). *Air Pollution and Forests*. New York: Springer.
- Strahler, A.N. and Strahler, A.H. (1974). *Introduction to Environmental Science*, Hamilton Publication Company, California.
- The Secretariat of the Convention on Biological Diversity (2011). *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity*: text and annex / Secretariat of the Convention on Biological Diversity www.cbd.int.
- The Secretariat of the Convention on Biological Diversity (2000). *Cartagena Protocol on Biosafety to the Convention on Biological Diversity*: text and annexes. Montreal: Secretariat of the Convention on Biological Diversity. www.cbd.int
- Secretariat of the Convention on Biological Diversity (2005). *Handbook of the Convention on Biological Diversity Including its Cartagena Protocol on Biosafety*, 3rd edition, (Montreal, Canada).
- UNFCCC Handbook (2006). *United Nations Framework Convention on Climate Change: Handbook. Bonn*, Germany: Climate Change Secretariat. unfccc.int
- IPCC, 2013: Summary for Policymakers. In: Climate Change (2013). *The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- https://www.cbd.int/doc/handbook/cbd-hb-all-en.pdf
- http://www.fao.org/forestry/14717-03d86aa8c1a7426cf69bf9e2f5023bb12.pdf
- https://www.cbd.int/
- https://unfccc.int/
- http://www.fao.org/
- https://www.iucn.org/theme/global-policy/our-work/united-nations-framework-Convention-climate-change-unfccc

UNIT 17

ENVIRONMENTAL POLICIES WITH SPECIAL REFERENCE TO INDIA

Structure

17.1 INTRODUCTION

You have studied some of the important initiatives of United Nations (UN) towards the development of the Earth's environment from previous units. Section 17.2 explains you about the important environmental programmes and policies of the UN. Environmental programs and policies differ from one country to another. You will study the environmental policies which are framed for Indian territories to monitor environment cautiously by its judicial law and order. In India, several environmental policies and regulations have been adopted after independence from time to time. In Sections 17.3 &

17.4, we have introduced various environment policies adopted early by various countries in general and laws enacted for better environment of India in particular.

For the first time, comprehensive environmental policy adopted in India and is further modified as an introduction of new environmental policy. There is no significant difference between environmental policies of developed and developing countries. Apart from these environmental policies, there are several government initiatives like environmental research programme, forestry research, wildlife research, environmental education awareness and training, etc., to protect the environment. You will learn more about all of these initiatives by Government of India from Sections 17.5 & 17.6.

Expected Learning Outcomes

After completing the study of this unit, you should be able to:

- describe the United Nations world environmental programmes for the protection of environment;
- explain environmental of policies of various countries and polices of India in particular;
- illustrate the salient features of New Environmental Policy of India; and
- describe government initiatives towards protecting environment and promoting environmental awareness.

17.2 UNITED NATIONS WORLD ENVIRONMENTAL PROGRAMMES

There are mainly two important enivironmental programes such as the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) working for the sustainable human and environmental development at global level. We will discuss these two important programmes.

17.2.1 The United Nations Development Programme (UNDP)

The UNDP is an international development agency devoted to the notion of "Sustainable Human Development". It was founded in 1965 with its headquarters at New York in the United States of America. UNDP coordinates the development work of United Nations and receives funds entirely by voluntary contributions from UN member States. The organisation works in over 177 countries and territories to achieve Sustainable Development Goals (SDGs) by focusing on multiple issues including in the area of poverty eradication and sustainable livelihoods for the poor. UNDP organizes and administers most of the technical assistance provided by UN system to individual countries for their social and economic development. At the same time, it also has concern about environmental degradation. Planning and implementation of development projects necessarily requires environmental consideration, which is carried out within the UNDP. Under the present system, each project proposal should be reviewed for possible negative impacts on the environment. The UNDP is also involved in building country level capacity for sustainable development as formulated in Agenda 21: information gathering,

environmental concerns and development programmes are taken into account in all United Nations Development Programmes to the maximum extent possible.

The UNDP programmes for specific countries are planned on the basis of five-year units. At the end of each five-year period, a new series of programmes are designed for each specific country, which are now called Country Cooperative Frameworks (CCF). It has been recommended that the basic geographic conditions and environmental signatures of a country are considered and incorporated within the Programme when a new country's programme is set up. This is the environmental overview programme (EOP) for the country whose objective is to highlight the critical environmental conditions so that any development project or programme may utilize the existing strengths such as technical facilities, and at the same time, avoid accelerating possible major environmental degradation, such as soil erosion. An EOP will include the following:

- A brief description of the natural environment of the country;
- Identification of the main environmental issues; an assessment of the relationship between economic development and the environment;
- An evaluation of the ability of the country to achieve appropriate environmental management and sustainable developments;
- The identification of likely environmental impacts associated with the implementation of the UNDP country programme; and
- A comparison of the alternatives to the proposed country programme.

In September 2015, world leaders adopted the 2030 Agenda for Sustainable Development to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. It is working to strengthen new frameworks for development, disaster risk reduction and climate change. Accroding to the Agenda of UNDP, the following Signature Solutions are identified:

- Keeping people out of POVERTY
- GOVERNANCE for peaceful, just, and inclusive societies
- Crisis prevention and increased RESILIENCE
- ENVIRONMENT: nature-based solutions for development
- Clean, affordable ENERGY
- Women's empowerment and GENDER equality.

UNDP set a goal to encourage the protection of human rights and the empowerment of women, minorities and the poorest and most vulnerable (www.undp.org).

17.2.2 The United Nations Environment Programme (UNEP)

The United Nations Conference on the Human Environment held at Stockholm, Sweden, in 1972 established the United Nations Environment Programme (UNEP)

to encourage economic growth compatible with the protection of the environment. The Stockholm Conference on the Human Environment, with its slogan 'Only One Earth', the first of many large international conferences, that added the environment as a huge global policy problem to the UN agenda and set the scene for the signing of a series of key international treaties.

UNEP headquarters is located in Nirobi, Kenya. It is the leading global environmental authority which promotes environmental awareness and implementation of the environmental dimension of sustainable development in the world. UNEP has the global environmental agenda which serves as an authoritative advocate for the global environment. UNEP mission is "to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations" (www.unep.org).

The Brundtland Commission report on 'Our Common Future' recognized that the twin concept of environment and development need to be addressed together. It found the solution to the apparent contradiction between them in the concept of 'Sustainable Development'. It defines as 'development that meets the needs of the present without compromising the ability of future generation to meet their own needs'. Sustainable development does not use non-renewable resources faster than substitutes can be found, or renewable resources faster than they can be replaced, nor does it emit pollutants faster than natural processes can render them harmless. This element of UNEP's role was considerably enhanced at the UN Conference on Environment and Development (The Earth Summit) held at Rio de Janeiro in 1992 as global environmental agenda. The work of UNEP is structured around seven broad thematic areas: climate change, disasters and conflicts, ecosystem management, environmental governance, chemicals and waste, resource efficiency, and environment under review.

You have studied in the previous unit about United Nations conference on climate change and convention of biological diversity, these are the important outcomes of Rio Earth Summit . However, a number of international agreements have come into force in the twenty years between Stockholm Conference (1972) and Rio Conference (1992). The significant treaties and conventions were made in protection of envrionment in the world including Convention for Prevention of Pollution of the Sea by Oil (1954), the Antarctic Treaty (1959), the Space Treaty (1967), the Ramsar Convention (1971), Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES) (1973), the Law of the Sea (1982), the Vienna Convention for the Protection of the Ozone Layer (1985), The Montreal Protocol on Substances that Deplete the Ozone Layer (1987), and the Basel Convention (1989). Let us now study the environmental policies formed in different countries of the world.

SAQ 1

a) What is the main contribution of UNDP?

b) Write the objective of UNEP.

17.3 ENVIRONMENTAL POLICIES IN DIFFERENT COUNTRIES

Most of developing countries enacted laws depending on their environmental conditions and the requirements, and also various institutions have been established to address the environmental problems. Few of them have been successful in dealing with it to some extent. Global financial institutions such as World Bank is promoting economic incentives and other market based strategies as a key to protect environment. But, they rarely enquire about the success of the policies developed to deal with environmental problems before allowing its effective implementation in developing countries which have limited resources and little experience with market based policies of any kind.

During 1980s, United States Environmental Protection Agency (EPA) had observed pollution conditions in the environment to implement Clean Air Act for limiting discharge permits. It was allowed firms to trade those permits internally and externally, so that expensive-to-control sources could emit more and cheap-to-control sources would be encouraged to cut back. This led to enacting the Law in United States to create successful market-based instrument. For example, Title IV of the 1990 Amendments to the Clean Air Act established to control Acid Rain that provides tradable emission allowances for SO_2 (Sulfur Dioxide).

Similar to United States, many developed countries in the Europe such as Germany, France and Netherland had implemented economic instruments such as taxes on fertilizer, gasoline, and other polluting inputs in the form of effluent charge systems. The incentives in the form of tax, forced the people to abide the pollution laws. You know very well if fines for the offence is low then people take advantage for overrule the law. It happens everywhere. The tax or charge levels were set very less hence, that people felt comfortable in paying the tax levied rather than abiding by the pollution control laws. Thus, in many countries, these low economic penalties have acted as a fairly regular income stream rather a law to deal with the environmental problems.

Though, the key elements discussed above are good to deal with the environmental problems, its accurate monitoring, transparency, a working legal system, and a realistic incentive to trade are at least as scarce in the developing and transitioning world. Problems with the functioning of government machineries with poor environmental enforcement are the features countering the effective policy implementation to deal with the environmental crises. Apart from inheriting the initiatives from developed countries, the developing nations should have their own policies in particularly the environmental conditions and problems associated within their regions. It is also essential to develop expertise for the regulatory authorities and people making them mentally, socially, economically and psychologically efficient to deal with the problems of the environment.

17.4 ENVIRONMENTAL POLICIES IN INDIA

Let us study India's policies towards the sustainable development and management of the environment. India has a long history of environmental regulations and there were various enactments to tackle environmental problems

in colonial period. These are namely, The Indian Penal Code 1860, The Criminal Procedure Code, The Bengal Smoke Nuisance Act 1905, The Merchant Shipping Act 1958, The Indian Ports Act 1908, The Indian Motor Vehicle Act, The Indian Forests Act 1927, The Factories Act 1948, The Industries (Development and Regulation) Act, The Mines and Minerals (Regulation and Development Act) 1952 etc. In the post-independence India, some of these provisions are still in office. According to The Indian Penal Code 1860, polluting air and water is an offence. Creating public nuisance is also punishable. Due to rapid changes and non-effective implementation, these provisions are ineffective in checking environmental degradation.

17.4.1 Indian Constitutional Provisions Towards the Environment

India is one of the country amended its Constitution endorsing environmental protection and improvement. The 42nd Amendment to the Constitution was adopted in 1976 and came in to effect in January, 1977. It arranges two provisions to the Directive Principles of State Policy, these are Article 48 A and Article 51 A (g). Article 48A was inserted to enjoin the state to make efforts for protection and improvement of the environment and for safeguarding the forest and wildlife in the country. While, Article 51A (g) stipulates that it shall be the fundamental duty of every citizen to protect and improve the natural environment including forest, lakes, rivers and wildlife, and to have compassion for all the living creatures.

You should aware of laws with regard to protecting environment in India. Article 253 of the Constitution empowers Parliament to make laws and harmonize national legislation relating to international agreements and conventions agreements. However, the Constitution has no provision empowering the central government to enact domestic laws pertaining to environmental issues applied uniformly to all the states. Some of the items pertaining to environment are in the state list and the central government has to approach the states for it. For example, 'water' is on the state list and Article 252 mentions that at least two or more state legislatures should pass resolutions empowering the parliament to pass water related laws. The Ministry of Health introduced the Prevention of Water Pollution Bill in 1969 after a lot of deliberations. The modified version for the Water (Prevention and Control of Pollution) was passed in 1974. Thereafter, the Air (Prevention and Control of Pollution) Act was enacted in 1981. The task of implementation of this legislation was entrusted to the same regulatory agency created under the Water (Prevention and Control) Act, 1974.

The Stockholm Conference on Human Environment, 1972 emphasized a need to adopt comprehensive legislation for environmental problems endangering health and safety of people, flora and fauna. Keeping this in view, a National Committee on Environmental Planning and Coordination (NCEPC) was set up with an objective to deal with the issues like, appraisal of development projects, human settlement planning, and survey of different eco-systems and spread of environmental education.

In 1980, Government of India appointed Tiwari Committee on environmental issues. On its recommendation, Department of Environment (DOE) was

established on November 1, 1980 as a nodal agency for environmental protection and conservation. It took measures like environmental appraisals of developmental projects, pollution monitoring and regulations, monitoring of air and water quality and coordination between local, state and central governments. However, it served as an advisory body without enforcement powers.

In 1985, with an objective to overcome shortcomings of environmental protection created Ministry of Environment and Forests (MoEF) comprising of 18 divisions and two independent units holding prime importance i.e. Ganga Project Directorate, and National Mission on Wasteland Developments. It furthered the works originally with the Department of Environment (DOE), viz., monitoring and enforcement, conducting environmental assessments and surveys, undertaking promotional works etc.

In 1986, the Parliament enacted a comprehensive legislation on Environment, the Environment (Protection) Act, 1986. The task to administer the new legislation was entrusted to the central and state pollution control boards. Then, laws addressing specific environmental problems were passed like, The Wildlife Protection Act, The Atomic Energy Act etc. MoEF completed its Environmental Action Plan in 1993 to integrate environmental considerations in development planning. It employed a number of strategies like, implementation of 'Polluter Pays' principle, water cess, water consumption charges with additional charge for excessive water use, technical assistance to promote central effluent treatment plants etc. and pursued pollution abatement and prevention policy.

You are pretty aware of present day environmental problems for which human beings are playing key role. Eco-friendly measures with related to sustenance of plants, animals, humans, and other organisms must be regulated through administration. It is known fact that the survival of life is largely depend on the sustainable development of environment. In recognition of protection of environment, various regulatory and promotional measures have been taken legally in the country. Let us discuss briefly about these Constitutional Provisions.

17.4.2 The Wildlife Protection Act, 1972

The increase in population results in undue pressure on land and therefore forests are being cleared for human habitation. It ultimately results in shrinking of wildlife habitats. The ever-increasing consumerism leading to increased demand for luxury and vanity products that impacted the wildlife adversely. The onerous task to protect the wildlife has to be handled not only by the Government but by individuals as well. As per the Constitution, it is our duty to protect natural environment, including forests, lakes, rivers and the wildlife. Ministry of Environment and Forest became the lead agency for administration and enforcement in the development and management of environment in the country.

The Wildlife Protection Act, 1972 emphasized on protection of wildlife within a broad ecological perspective. The Act describes that "wildlife includes any animal, bees, butterflies, crustacean, fish and moths; and aquatic or land vegetation that forms a part of any habitat". It is also directed to state governments for the protection of forests and wildlife, and banned the hunting of certain rare species animals. This Act prohibited picking, uprooting, damaging or collecting willfully any specified plants under Schedule VI from any forest or any area specified by a

notification of the central government.As per the amendment, certain areas were declared as Sanctuaries or National Parks for protecting and conserving wildlife. The State Government may, if it considers an area of adequate ecological, floral, natural or zoological significance for the purpose of protecting or developing wildlife may declare an area other than a reserved forest to be a Sanctuary with restricted entry. In case of Zoo, there is a Central Zoo Authority to specify minimum standards of housing, upkeep and veterinary care of animals and functions of Zoos. The wildlife is property of the government and if a person has possession of such animal or article and reported, has to surrender it. Trading in wild animals and animal articles like, ivory, taxidermy, dealing with trophy, captive animals of their meat etc. is prohibited by law. The officials are authorized under suspicion, to search premises, land vehicles, vessel, open baggages or other possessions for any prohibited and illegal possession.

17.4.3 The Water (Prevention and Control of Pollution) Act, 1974

We all know that the water is an essential element for life. Sustainable management of water resources must be given importance in the protection of environment and ecosystem. There are standard practices for water management, these should be followed by the industries and households in the country. However, daily discharge of waste water can contaminate natural water bodies like ponds, lakes, rivers, estuaries, and sea water. The Act states that "pollution" means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms". This Act provides a fairly comprehensive matters pertaining to water pollution. Sewage effluents are effluents from sewerage waste, sewage disposal works or open drain. Industrial effluent includes any liquid, gaseous or solid substance discharged from any premises carrying on any trade or industry, other than domestic sewage.

The Legislation empowered the establishment of Central and State Pollution Control Boards at the central and the state levels to carry out the purposes of the Act. The Boards are provided with judicial powers and failure to comply is punishable offence. The functions of the Central Board is to:

- Coordinate State Boards and settle their disputes.
- Provide technical assistance and guidance.
- Set standards for streams and wells.
- Advise central government especially on preventing water pollution.
- Create environmental awareness and state boards for the union territories.
- Promote research and investigate water pollution problems.

The State Board has the following functions:

- Prevention, control or abatement of pollution in streams and wells.
- Inspecting sewage or industrial effluent, including municipal plants for the treatment of sewage or trade effluent.
- Setting standards for the discharge of sewage and industrial effluent.

The Water Act says that no industry or operator process or any treatment and disposal system can be established without the consent of the State Board and no industry or process can discharge sewage or trade effluent into a stream or well or sewer or land in excess of the standards & without the consent of the Board. The Board can issue directions for closure of industry and disconnection of electricity in case of persistent defiance by any polluting industry. It is also given provision to appeal against the orders of the Board.

17.4.4 The Water (Prevention and Control of Pollution) Cess Act, 1977

Subsqunet to the Water Act 1974, the Water Cess Act, 1977 was passed to help to meet the expenses of the Central and State Pollution Control Boards. It is aimed to levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities. A rebate of 25 per cent can avail in case of the eastablishment of sewage or trade effluent plant by any person or local authorities. However, the Act is limited to streams and wells and not covered critical sources of water pollution, such as the ground water pollution. All the governmental bodies and local authorities like Municipalities responsible for treatment of residential waste remained free from liabilities. The penaty structure created by the Act was unrealistic for the cost defiance for polluting industries. No individual could sue any polluting agency under the act. It is for the board to bring action against the polluter.

17.4.5 The Air (Prevention and Control of Pollution) Act,1981

In 1981, the Government enacted the Air (Prevention and Control of Pollution) Act to provide for the prevention, control and abatement of air pollution in country. This legislation defines "air pollutant" means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. Any unwanted substance presence in the atmosphere may be called as air pollution. Emission is defined as any solid, liquid or gaseous substances that are coming out from any chimney, and dust from any other outlet. The companies should follow all the rules and regulations to contain emission to the specied level.

prosecution guidelines and makes provision for Central and State Boards to Industries must take permission as per the standards of State Pollution Control Boards. The ambient air quality standards are differnet in various places and are prescribed based on their locations. Noize levels also vary based on its zonations like industrial, commercial, resedential and silient. The Air Act also specifies

penalties and prevent and control of air pollution. The main functions of the boards are:

- Advice Central government on issues of air pollution.
- Set standards for air quality.
- Planning and execution of plans for prevention, control and abatement of air pollution.
- Planning and coordination of all activities of state boards, to resolve disputes, provide technical assistance and research on pollution.
- To organize awareness programmes on environmental issues.

The State Boards were further given responsibilities to plan, execute, advise, and disseminate information regarding the improvement of air qaulity. It assess the pollutant levels at reasonable time and set standards for the emission of the air pollutants. The Act stipulates that without prior consent of the State Board, no one can set up any industry in the areas like mining and ore processing, iron, steel and non-ferrous metal foundries, petroleum, petrochemical, power and boiler, etc. The State government has the right to designate air pollution control areas and authorities can enter and inspect premises to ensure compliance with the Act. Penalties and punishment for offences have been enhanced after amendment of 1987.

17.4.6 The Forest (Conservation) Act, 1980

The Forest (Conservation) Act of 1980 was enacted with an objective to stop diversion of forests areas for other purposes. The broad objectives of the act are to regulate indiscriminate diversion of forest lands for non-forestry purposes and maintain logical balance between developmental needs and conservation of natural heritage. Under the provisions of the Act, prior approval of the central government is required for diversion of forests lands to non-forestry purposes including development and transportation projects, cash crops like, tea, coffee, spices, rubber, medicinal plants and horticultural plants, etc. However, the Act is not included any work relating or ancillary to conservation and management of forests and wildlife, namely, establishment of check-posts, fire lines, wireless communications and construction of fencing, bridges and culverts, dam's water holes, trench marks, boundary marks, pipelines or other purposes.

The Act places liability on authorities and in the event of negligence therfore they may also be imprisoned. There is diversion of forestland to meet the developmental needs for drinking water, irrigation, railway lines, roads, mining, power and transmission projects, etc. The Government make efforts to mitigate adverse effects of such projects by various efforts like, compensatory afforestation, rehabilitation, wildlife improvement plan, catchment area treatment plan, etc. Compensatory Afforestation Management and Planning Authority (CAMPA) was constituted at the national level to monitor effective implementation of the compensatory afforestation. Ministry of Environment and Forests established a monitoring cell to monitor proposals and ensure compliance by the user agencies stipulated in the forests clearances.

India has diverse ecosystems. There are mainly four categories of forests such as tropical, subtropical, temperate and alpine identified. The over exploitation of forest increases vulnerability for the surrounding land, which lead to floods and droughts. The role of maintaining ecological balance, quality of environment, preventing soil erosion and floods, conserving water, maintaining balance between oxygen and carbon dioxide is very crucial to save forest and human life. The National Forest Policy, 1952 recommended to increase forest cover up to 33% of the total areas of the country. The National Forest Policy of 1988 revised the policy mainly with following objectives:

- Maintain environmental stability and conserve country's natural heritage;
- Halt soil erosion and check movement of sand dunes;
- Increase the amount of forest cover through social forestry;
- Meet the rural people's needs for firewood, fodder and timber;
- Increase productivity of forests to meet the nation's increasing needs
- Make more efficient use of forest produce; and
- Create mass awareness.

17.4.7 Environmental Protection Act, 1986

Environment Protection Act (EPA) was enacted in 1986 under Article 253 of the Constitution, aftermath of the Bhopal Gas Tragedy (1984). This is an umbrella legislation designed to provide a framework for central government to coordinate the activities of various central and state authorities established under previous laws, such as the Water Act and the Air Act. According to EPA, environment includes water, air, land and their relationship with human beings, other living creatures, plants and microorganisms. The Act notified relating to various aspects of management of hazardous chemicals, waste, microorganisms, etc. The main features of the Act are:

- The Act empowers the Central Government to take measures, as it deems necessary for protecting and improving the quality of the environment and preventing, controlling and abetting environmental pollution.
- The Central Government may also put restrictions on an area in which any industry, operation or process or class of industries or operations shall not be carried out. They may be permitted with certain safeguards only.
- The Act authorizes the Central Government to issue direction for the closure, prohibition or regulation of any industry, operation or process. It can stop or regulate the supply of electricity or water or any other service directly without obtaining judicial order.
- Emissions and effluent standards in respect of 61 categories of industries have been evolved and notified so far.
- The government has been given powers to collect samples of air, water, soil or other substances as evidence of offences under the Act.

- A special procedure can be prescribed for handling hazardous substances.
- The standards in respect of pollutants are to be achieved within the period of one year from the date of their notification, especially those industries that are identified as highly polluting.
- A private citizen may file a complaint, after giving notice of at least 60 days to the concerned authority.

The Department of Environment, and Forests and Wildlife under MoEF are designated for administration and enforcement. It provides guidelines for location of industries and mining areas, for permitting or forbidding industries in the environmentally sensitive areas, coastal zone regulations and environment impact assessments of developmental projects. Even private citizens are given the right to file case against non-complying factories. The board can prevent new industrial activities or expansion of existing industries and restrain or prevent industries from violating the pollution laws. The industrial plants will have one year to comply with the emission or effluent standards according to the rules.

SAQ 2

a) What explains Article 48A and Article 51A (g) of Indian Constitution?

b) Which act prohibits the hunting of certain animals?

17.5 NEW ENVIRONMENTAL POLICY OF INDIA (2006)

We are facing numerous challenges in the economic, social, political, cultural, and environmental dimensions. Natural resources play a vital role in providing livelihood security, and securing life support ecosystem services. Every one of us need to understand that we should maintain the balance between sociocultural-economic values and the environment in the progress of development. As you understand from the previous sections, India is continuously thriving as a part of international initiatives with respect to the natural environment. The National Environment Policy (NEP) is also one of the India's commitment to clean environment for making a positive contribution to international efforts. Articles 48 A and 51 A (g) of the Constitution are strengthened by judicial interpretation of Article 21 recognized that maintaining a healthy environment is the every citizen's responsibility of the country. The new environmental policy of India was implemented in 2006.

This policy sets a group of Principles depending upon their relevance, feasibility in relation to costs, and technical and administrative aspects of their application. The Principles under this policy include sustainable development concerns, the right to development, environmental protection, the precautionary approach, economic efficiency, equity, legal liability, and setting up of the environmental standards, etc.

The main objectives of NEP (2006) are:

- To protect and conserve critical ecological systems and resources, and invaluable natural and human-made heritage, which are essential for life support, livelihoods, economic growth, and a broad conception of human well-being.
- To ensure equitable access to environmental resources and quality for all sections of society, and in particular, to ensure that poor communities, which are most dependent on environmental resources for their livelihoods, are assured secure access to these resources.
- To ensure judicious use of environmental resources to meet the needs and aspirations of the present and future generations.
- To integrate environmental concerns into policies, plans, programmes, and projects for economic and social development.
- To ensure efficient use of environmental resources in the sense of reduction in their use per unit of economic output, to minimize adverse environmental impacts.
- To apply the principles of good governance (transparency, rationality, accountability, reduction in time and costs, participation, and regulatory independence) to the management and regulation of use of environmental resources.

To ensure higher resource flows, comprising finance, technology, management skills, traditional knowledge, and social capital, for environmental conservation through mutually beneficial multi stake holder partnerships between local communities, public agencies, the academic and research community, investors, and multilateral and bilateral development partners.

SAQ 3

Write any two important decisions of NEP.

17.6 GOVERNMENT INITIATIVES

Till now, you have studied various government policies and its judicial initiatives for the benefit of population as well as whole environment. Let us study further government initiation towards sustainable development of natural environment.

17.6.1 Research and Development

The Ministry of Environment and Forests has been funding towards research in various ways. The grant-in-aid projects and other funds are allocated for many research institutions and organizations working in different fields of studies under the broad ambit of environment protection and management. It is aimed ‘to promote basic and applied research in various facets of ecology and environment’.

The main objectives of the research support are as follows:

- to generate information and knowledge required for developing strategies, techniques and methodologies for better environmental management;
- to find practical solutions to problems of environment protection and management (e.g. eco-regeneration of degraded areas, management of plastic wastes, bioremediation of contaminated sites, etc.);
- to build indigenous capacities and strengthen scientific manpower in multidisciplinary and emerging areas of environmental sciences;
- to promote development of infrastructure facilities, where necessary, for undertaking environmental research;
- to nurture trained scientific manpower and recognize established scientists through national fellowship programmes, chairs, national environmental sciences fellows Programme and Post-Doctoral Fellowship Programme; and
- to generate document and analyse information for taking policy decisions relating to environment and natural resources, including preparedness for international negotiations; to facilitate database management at one single point in the ministry.

17.6.2 Environmental Research Programme

It deals with the problems related to pollution and development of suitable cost-effective technologies for abatement of pollution. Emphasis is laid on development of eco-friendly biological and other interventions for prevention, abatement of pollution and development of strategies, technologies and instruments, etc. for control of pollution. Projects are also encouraged for development of biodegradable plastics, to carry out epidemiological studies, strategies to reduce impact of mining, chemical pollution of soils and hazardous substances including pesticides, heavy metals, etc. The works related to waste recycling and resource recovery form waste along with development of eco-friendly and cleaner technologies are also given priority. Projects supports in the identified thrust areas of environment research from time to time.

17.6.3 Ecosystem Research Programme

It is an interdisciplinary programme of research which emphasizes ecological approach for studying the relationship between human and environment. The programme deals with ‘green issues’ relating to ecology, conservation of natural resources, eastern and western rainforests, wetlands, mangroves and coral reefs, biosphere reserves, biodiversity and the study of inter-relationships between humans and environment. It also identifies the management solutions and generate scientific knowledge for sustainable use and development of natural resources. The programme is aimed to develop a basis within the field of natural and social sciences for rational use and conservation of resources for general improvement of the relationship between human and their environment.

17.6.4 Forestry and Wildlife Research

Indian Council of Forestry Research and Education (ICFRE), an apex body in the national forestry research system, has been undertaking the holistic development of forestry research by need based planning, promoting, conducting and coordinating research, education and extension covering all aspects of forestry. The council deals with solution based forestry research in tune with the emerging issues in the sector, including global concerns such as climate change, conservation of biological diversity, combating desertification, sustainable management and development of resources, etc. Topical research by the council enhances public confidence in the ability of forest managers and researchers to successfully handle challenges related to natural resource management. The Wildlife Division of the Ministry provides financial assistance as per the stipulated guidelines for research institutions, universities and NGOs for research and development in the field of wildlife.

17.6.5 Environmental Education, Awareness and Training

To understand the relationship between human beings and the environment, the Environmental Education, Awareness and Training programme was launched by the Ministry of Environment Forest And Climate Change (MoEF&CC) in 1983-84. It is also aimed at all levels of people in the country to develop capabilities and skills to improve and protect the environment. The basic objectives are to promote environmental awareness among all sections of the society; to spread environment education, especially in the non-formal system among different sections of the society; to facilitate development of education/training materials and aids in the formal education sector; to promote environment education through existing educational/scientific/research institutions; to ensure training and manpower development for environment education, awareness and training; to encourage non-governmental organization, mass media and other concerned organizations for promoting awareness about environmental issues among the people at all levels; to use different media including films, audio, visual and print, theatre, drama, advertisements, hoarding, posters, seminars, workshops competitions, meetings, etc. for spreading messages concerning environment and awareness; and to mobilize people's participation for preservation and conservation for environment (http://www.envis.nic.in/).

17.6.6 National Green Corps

As we all aware of fact that children are promoters in the ensemble of the environmental issues. Being future citizens, inculcation of environment friendly attitudes help to long term benefits in the protection of environment. Children can create wonders through awareness of environment not only at the local and community level but also global level. By recognizing this capability, the government has taken a major initiative of establishing National Green Corps (NGC) in 2001-02 for creating environmental awareness among children. The NGC has now more than 100,000 eco-clubs across the country. The unique partnership between the ministries, the State Government agencies along with the dedicated NGOs, working in the field of environmental education is being contributed to the success of the Programme.

17.6.7 National Museum of Natural History

National Museum of Natural History (NMNH) is located in New Delhi and is devoted institution working in environmental education. It was opened to the public on 5th June 1978, on the occasion of the World Environment Day. The museum undertakes environment education through exhibition programs and educational activities. Even though the primary target audiences of the museum are school students, it has developed programs for other categories of people as well. It has initiated several specialized programs to cater the needs of persons with disabilities. The museum also undertakes many outreach programs such as temporary exhibitions, mobile exhibitions and a large number of nature camps. It arranges many local and national level competitions and awards like Young Environmentalist of the Year Award (YEYA).

SAQ 4

What are government initiatives for the protection and development of environment?

17.6 SUMMARY

In this unit, you have studied so far:

- The United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) are providing significant contribution in managing enivironmental programes. These two prominent institutional programmes working mainly for the sustainable human and environmental development across the world.
- The initiation by developed countries towards their economic development making the awareness and creation of various policies in other counties of the world. This ultimately help to deal with the environment and protect them efficiently.
- In recognition of protection of environment, various regulatory and promotional measures have been taken legally in the country. The several Indian Government Acts for example, the Water Act, the Air Act, the Wild life Act, etc. formulated for improving the quality of environment.
- The various environmental programme and policies, which are formulated in India, are detailed and appropriate but implementation of these policies and programme somehow ineffective.
- The new environmental policy implemented in 2006 is very comprehensive and encompasses all the various aspects related to environmental protection and management.
- There is a need of environmental education and national environmental campaign to solve the various environmental issues in our country.

17.7 TERMINAL QUESTIONS

1. Explain roles of UNDP and UNEP in the environmental development.
2. Describe the Constitutional Provisions towards controlling the pollution in the environment.
3. Explain about new environment policy of Government of India.
4. Write government initiatives in the field of research to improve the quality of environment.

17.8 ANSWERS

Self Assessment Questions (SAQs)

1. a) The objective is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.

   b) UNDP coordinates the development work of United Nations towards poverty eradication and sustainable livelihoods for the poor.

2. a) Article 48A states that the state to make efforts for protection and improvement of the environment and for safeguarding the forest and wildlife in the country. Article 51A (g) stipulates that it shall be the fundamental duty of every citizen to protect and improve the natural environment including forest, lakes, rivers and wildlife, and to have compassion for all the living creatures.

   b) The Wildlife Protection Act, 1972

3. To protect critical ecological systems and resources, and to ensure efficient use of environmental resources.
4. The government initiatives are including research and development, environmental research programme, ecosystem research programme, forestry and wildlife research, environmental education, awareness and training, NGCs, NMNH, etc.

Terminal Questions

1. Refer to Section 17.3.
2. Refer to Sub.Sections 17.4.3 and 17.4.5
3. Refer to Section 17.5
4. Refer to Sub.Sections 17.6.1 to 17.6.4

17.9 REFERENCES/SUGGESTED FURTHER READING

- Batra, S.K., Kaur, H., Batra, K. and Pant, P. (2015). *Environmental Studies*. New Delhi: Taxman Publication Pvt. Ltd.
- Casper, J.K. (2010). *Changing Ecosystems: Effects of Global Warming*. New York: Infobase Publication.
- Heywood, V.H. (ed) (1995). *Global Biodiversity Assessment*, Cambridge, UK: Cambridge University Press.
- India (2017). Publication from Ministry of Information and Broadcasting, Government of India, New Delhi.
- New Environmental Policy (2006). Ministry of Environment and Forests, Govt. of India
- Rajagopalan, R. (2016) *Environment and Ecology: A Complete Guide*, Gurugram: LexisNexis.
- Saxena, H.M. (2013). Environmental Geography, Rawat Publications, New Delhi.
- Singh, S. (2001). Environmental Geography, Prayag Pustak Bhawan, Allahabad.
- Smith, W. H. (1989). *Air Pollution and Forests*. New York: Springer.
- http://cgwb.gov.in/
- http://moef.gov.in/en/
- http://www.envis.nic.in/
- http://www.fao.org/
- https://cpcb.nic.in/

GLOSSARY

Agricultural biodiversity : It includes the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries.

Air pollution : Any unwanted substance presence in the atmosphere is called air pollution.

Biogeochemical cycles : These cycles of environment explain the dynamic interrelationships between the biotic and abiotic components. These relationships provide a continuous circulation of the essential constituents necessary for life.

Cartagena protocol : It is an international treaty framed for biosafety in 2000 at Montreal, Canada.

Climate change : Any substantial change in the Earth's climate that lasts for an extended period of time is referred as climate change. The important climatic elements are temperature and precipitation.

Dry and sub-humid lands biodiversity : These are including arid and semi-arid regions, grasslands, savannahs, and mediterranean landscapes. The biodiversity of these lands is unique and well adapted to the harsh conditions.

Emission : It is defined as any solid, liquid or gaseous substances releasing into atmosphere from chimney or any other outlet.

Forest biodiversity : It is one of the most biologically rich terrestrial systems. Forest biodiversity contains trees, plants, animals and micro-organisms inhabit in forest areas and their associated genetic diversity.

Global warming : It can be referred as rising of atmospheric temperature and consequent changes in the radiation balance mainly due to human action.

Greenhouse gases : Carbon dioxide (CO_2), methane (CH_4) nitrous oxides (NOx) and chlorofluorocarbon (CFC) are known as greenhouse gases. These are mostly emitted into atmosphere due to deforestation and industrialization.

Inland waters : Lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as bogs, marshes and swamps are designated as inland waters. These can be fresh, saline or a mix of the two (brackish water) environments located within land boundaries.

Islands : The lands isolated by surrounding water and with a high proportion of coast to hinterland are called islands.

Kyoto protocol : It became effective from 16 February 2005. It included four important gases carbon dioxide, methane, nitrous oxide, sulphur hexafluoride and two groups of gases hydrofluorocarbons and perfluorocarbons under green house

gases emissions into atmosphere.

Marine and coastal biodiversity : These include coral reefs, mangroves, seagrass meadows, estuaries, seamounts, soft and rocky bottoms etc.

Nagoya protocol : It was adopted in UN conference held at Nagoya, Japan in 2010. It mainly stresses the access to genetic resources and the fair and equitable sharing of benefits arising from their utilization in the world.

National environment policy : National environment policy (NEP) is one of the India's commitment to clean environment for making a positive contribution to international efforts. It is dedicated to sustainable development concerns, the right to development, environmental protection, the precautionary approach, economic efficiency, equity, legal liability, and setting up of the environmental standards, etc.

North-south debate : It is a discussion between developed and the developing nations on several environmental issues particularly about emission of greenhouse gases, global warming and ozone depletion.

Ozone : It is a trioxygen with chemical formula O_3 formed in the upper atmosphere by the action of solar radiation on oxygen molecules. It is visible as pale blue gas with a distinctively pungent smell.

UNCBD : United Nations Convention on Biological Diversity which is a part of Rio Convention working on climate change adaptation, combating desertification, biodiversity conservation and sustainable development.

UNDP : United Nations Development Programmes is an international development agency established in 1965 for coordinating the development work of United Nations with its member countries.

UNEP : The United Nations Environment Programme was started in 1972 to encourage economic growth compatible with the protection of the environment in the world.

UNFCCC : United Nations Framework Convention on Climate Change held at the UN Earth Summit in Rio de Janeiro of Brazil (1992) with an objective of stabilizing greenhouse gas concentrations in the atmosphere.

Wildlife : It is including any animal, bees, butterflies, crustacean, fish and moths; and aquatic or land vegetation that forms a part of any habitat.