Study unit 9: The Global Environment and World Politics

9.0 Overview

There are two features of present environment politics that could indeed be causes of concern:

(i) The changing basis for legitimate decision making

(ii) The hidden link between science and politics

Hard decision making in global environmental problems requires a very high degree of trust in experts and our political leaders, yet at the same time this trust is continually undermined by scientific controversies and political indecisions. Politicians try to remain an image of being in control yet the fears and worries of citizens are likely to persist if no attempt is made to reconcile the technical perceptions of the problems with the social dimensions.

1972 is often taken as the starting point for the wave of environmental politics, the club of Rome's "Limits to Growth" report was published and the UN conference of the environment was held in Stockholm Sweden immediately after most Western countries created the environment as a semi independent field of attention for the first time. Ministries were setup though often attached to health departments. Characteristic of this early period was the predominantly legislative attempt to cover all aspects of the environment with at least a basic set of rules on proper conduct concerning the emission to substances.

Environment policy was a matter of aiming to control the quality of the separate resources (air, water, soils, minerals, vegetation) by imposing overall quality targets or regulating various industrial works through handing out political permits. Control/ prevention strategies under this regulatory regime were "end of pipe" technologies, e.g. filter on chimneys or drains, water treatment plants, this died out between 1972 and 1990.

The 1980's saw the emergence of ecological modernization which introduces concepts that make issues of environmental degradation calculable. Costs and benefits of pollution can then be taken into account:

- It produces better results

- It uses the language of business and conceptualizes environmental pollution as a matter of inefficiency, while operating with cost effectiveness and administrative efficiency and not imposing restrictions on industry to stop environmental pollution, yet Governments have a functional dependency relationship with business.
- It avoids addressing basic social contradictions introduced by earlier discussions, it is based on best efficiency, technological innovation and coordinated management. In itself it may write-off generations of production equipment and industrial works

Politically the world is composed of nations and states and international relations examine how states interact with one another. Ecosystems such as rain forests connect with each other from different nations example Ecosystems such as rain forests connect with each other from different nations example the Nile is shared by Uganda, Sudan and Egypt and it provides watershed for these states; on the other hand the destruction of ozone layer by USA and Europe affects other countries such as Chile in the Southern hemisphere, therefore, this dissociation between ecological and political systems makes addressing environmental issues at global level difficult and necessary since nations cannot address many environmental problems successfully on their own and t his causes international cooperation.

Global environment politics brings together a wide variety of traditions examining the way states and other actors interact internationally; therefore it is important to explore theoretical issues of:

(i) International environment cooperation

(ii) Relationship between environment and security

(iii)The issue of science, uncertainty and risk

(iv)The role of non state actors.

If we are to take climate change and ozone layer depletion, both issues of global concern and long term ecological process have met with varying levels of success in efforts to prevent global environmental damage. They share the similarity that their harm is truly global and not influenced by the location of damaging emissions but also they present different political problems. The science and economic structural industry related to ozone depletion is simpler

than the case in climate change, in particular the nations most concerned for ozone depletion are those most responsible for causing it and most capable of taking action to prevent it therefore ethics play an important role in addressing the global environment problems but there is no clear consensus on how /who deserves consideration or how to act on behalf of a non human entity. If we examine biodiversity loss especially in the context of the Amazonian rainforest, it suggests the true interconnected nature of environmental resources and their interactions with political structure. The damage/ harm to these forests come both locally by resource harvesting and subsistence farming and globally from pollution, therefore the loss of biodiversity and harm to the Amazonian ecosystems have both local and global effects/ impacts; such as global warming, climate change including some impacts that we are unlikely to realize until the damage is irreversible.

9.1 Global Warming and Climate Change

Before the Industrial Revolution, human activities released very few gases into the atmosphere and all climate changes happened naturally. After the Industrial Revolution, through fossil fuel combustion, changing agricultural practices and deforestation, the natural composition of gases in the atmosphere is getting affected and climate and environment began to alter significantly. Over the last 100 years, it was found out that the earth is getting warmer and warmer, unlike previous 8000 years when temperatures have been relatively constant. The present temperature is 0.3 - 0.6 ^{o}C warmer than it was 100 years ago.

The key greenhouse gases (GHG) causing global warming is carbon dioxide. CFC's, even though they exist in very small quantities, are significant contributors to global warming. Carbon dioxide, one of the most prevalent greenhouse gases in the atmosphere, has two major anthropogenic (human-caused) sources: the combustion of fossil fuels and changes in land use. Net releases of carbon dioxide from these two sources are believed to be contributing to the rapid rise in atmospheric concentrations since Industrial Revolution. Because estimates indicate that approximately 80 percent of all anthropogenic carbon dioxide emissions currently come from fossil fuel combustion, world energy use has emerged at the center of the climate change debate.

9.1.1 Sources of Greenhouse Gases

Some greenhouse gases occur naturally in the atmosphere, while others result from human activities. Naturally occurring greenhouse gases include water vapor, carbon dioxide; methane, nitrous oxide, and ozone. Certain human activities, however, add to the levels of most of these naturally occurring gases. Carbon dioxide is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned. Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from the decomposition of organic wastes in municipal solid waste landfills, and the raising of livestock. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels. Very powerful greenhouse gases that are not naturally occurring include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6),

which are generated in a variety of industrial processes. Often, estimates of greenhouse gas emissions are presented in units of millions of metric tons of carbon equivalents (MMTCE), which weights each gas by its Global Warming Potential or GWP value.

9.1.2 Global Warming Potentials

Although there are a number of ways of measuring the strength of different greenhouse gases in the atmosphere, the Global Warming Potential (GWP) is perhaps the most useful. GWPs measure the influence greenhouse gases have on the natural greenhouse effect, including the ability of greenhouse gas molecules to absorb or trap heat and the length of time, greenhouse gas molecules remain in the atmosphere before being removed or broken down. In this way, the contribution that each greenhouse gas has towards global warming can be assessed. Each greenhouse gas differs in its ability to absorb heat in the atmosphere. HFCs and PFCs are the most heat-absorbent. Methane traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 270 times more heat per molecule than carbon dioxide. Conventionally, the GWP of carbon dioxide, measured across all time horizons, is 1. The GWPs of other greenhouse gases are then measured relative to the GWP of carbon dioxide. Thus GWP of methane is 21 while GWP of nitrous oxide is 270. Other greenhouse gases have much higher GWPs than carbon dioxide, but because their concentration in the atmosphere is much lower, carbon dioxide is still the most important greenhouse gas, contributing about 60% to the enhancement of the greenhouse effect.

9.1.3 Global Warming (Climate Change) Implications

Rise in global temperature

Observations show that global temperatures have risen by about 0.6 °C over the 20th century. There is strong evidence now that most of the observed warming over the last 50 years is caused by human activities. Climate models predict that the global temperature will rise by about 6 °C by the year 2100.

Rise in sea level

In general, the faster the climate changes, the greater will be the risk of damage. The mean sea level is expected to rise 9 - 88 cm by the year 2100, causing flooding of low lying areas and other damages.

Food shortages and hunger

Water resources will be affected as precipitation and evaporation patterns change around the world. This will affect agricultural output. Food security is likely to be threatened and some regions are likely to experience food shortages and hunger.

India's risk

India could be more at risks than many other countries because "models predict an average increase in temperature in India of 2.3 to 4.8 ^{o}C for the benchmark doubling of Carbon-dioxide scenario. Temperature would rise more in Northern India than in Southern India. It is estimated that 7 million people would be displaced."

9.2 Greenhouse Effect

The Greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere (referred to as greenhouse gases), trap energy from the Sun. Without these gases, heat would escape back into space and living on Earth would be inhospitable with average temperature being about 6^{0}F lower. Because of the way they warm our world these gases are referred to as green house gases.

Some green house gases occur naturally, while others result from human activity. The various natural greenhouse gases are: water vapor, carbon dioxide, nitrous oxide, ozone and methane. Carbon dioxide, methane and nitrous oxide, levels in the atmosphere are added by human activities of industry, transport, agriculture, organic and solid waste combustion. Very powerful green house gases that are not naturally occurring include hydroflourocarbons (HFCs) perflourocarbons (PFCs) and sulphurhexafluroide (SF_6), which are generated in a variety of industrial processes.

9.2.1 Greenhouse effect around the Earth

Green house gases in the atmosphere behave much like the glass panes in a green house. Green houses are like small glass houses whose transparent glass roof and walls allow sunrays to pass through. It keeps the heat from escaping, thus allowing vegetables and flowers to grow even in cold weather. An effect similar to the one in glass chamber is

responsible for keeping the Earth's surface warmer than it would otherwise be. Green house gases in the atmosphere around the Earth act like a glass of the greenhouse chamber. Earth receives a large amount of energy from the Sun, which emits U.V. radiations, visible light and infra-red (IR) radiations. Some of the solar radiation is reflected away by the atmosphere and Earth, while some of the infrared radiation is absorbed and re-emitted in all directions by the green house gas molecules. The effect of this is to warm the Earth's surface.

A large part of the Sun's radiation pass through the Earth's atmosphere and Earth absorbs these IR radiations of short wavelength. This warms the Earth's surface and increases its temperature. It starts emitting infra-red radiations of longer wavelengths. The partially radiated infra-red radiations from the Earth are absorbed by CO_2 and green house gases. This restricts the outward flow of infrared radiation and effectively stores some of the heat in the atmosphere, producing a net warming of the surface. The heating of the atmosphere due to absorption of infra-red radiations by carbon dioxide and other gases is called greenhouse effect.

As more and more infra-red radiations are trapped, the atmosphere becomes hotter and therefore, temperature rises.

Note:

Each green house gas differs in its ability to absorb heat in the atmosphere. HFC's and PFC's are the maximum heat absorbent's. Methane traps over 21 times more heat per molecule than carbon dioxide. Nitrous oxide absorbs 270 times more heat per molecule than carbon dioxide. Further, only long-lived gases have the potential for affecting the global environment. This effect arises principally because the concentrations of long-lived gases are the result of many years of accumulated emissions. The mean atmospheric life time of CH_4 is about 8 years. The mean lifetime of N_2O in the atmosphere is about 150 years. CO_2 is chemically inert and is not destroyed by photochemical or chemical processes in the atmosphere. It is either lost by transfer into the ocean or biosphere, or it

builds up in the atmosphere.

9.2.2 Advantages of Greenhouse Effect

The presence of carbon dioxide and other gases in the atmosphere produces the greenhouse effect, which keeps the atmosphere warm. The warm atmosphere is very essential for the survival of life on Earth in the following ways:

- Precipitation of water, formation of clouds, rainfall etc. life in the biosphere depends on these resources.
- The warm atmosphere helps in the growth of vegetation and forest etc. These are sources of food, shelter etc.
- This effect helps in rapid bio-degradation of dead plants and animals.

9.3 Biodiversity Loss

Biodiversity refers to the variety of life on earth, and its biological diversity. The number of species of plants, animals, micro organisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as deserts, rainforests and coral reefs are all a part of a biologically diverse earth. Biodiversity actually boosts ecosystem productivity where each species, no matter how small, has an important role to play and that it is this combination that enables the ecosystem to possess the ability to prevent and recover from a variety of disasters.

It is now believed that human activity is changing biodiversity and causing massive extinctions. The World Resource Institute reports that there is a link between biodiversity and climate change. Rapid global warming can affect ecosystems' chances to adapt naturally. Over the past 150 years, deforestation has contributed an estimated 30 percent of the atmospheric build-up of CO_2. It is also a significant driving force behind the loss of genes, species, and critical ecosystem services.

9.3.1 Link between Biodiversity and Climate change

- Climate change is affecting species already threatened by multiple threats across the globe. Habitat fragmentation due to colonization, logging, agriculture and mining etc.

are all contributing to further destruction of terrestrial habitats.

- Individual species may not be able to adapt. Species most threatened by climate change have small ranges, low population densities, restricted habitat requirements and patchy distribution.
- Ecosystems will generally shift northward or upward in altitude, but in some cases they will run out of space – as 1^{0}C change in temperature correspond to a 100 Km change in latitude, hence, average shift in habitat conditions by the year 2100 will be in the order of 140 to 580 Km.
- Coral reef mortality may increase and erosion may be accelerated. Increased level of carbon dioxide adversely impacts the coral building process (calcification).
- Sea levels may rise, engulfing low-lying areas causing disappearance of many islands, and extinctions of endemic island species.
- Invasive species may be aided by climate change. Exotic species can out-compete native wildlife for space, food, water and other resources, and may also prey on native wildlife.
- Droughts and wildfires may increase. An increased risk of wildfires due to warming and drying out of vegetation is likely.
- Sustained climate change may change the competitive balance among species and might lead to forests destruction

Self-Review Questions (SRQ) For Study Session 9

1. Mention the two features of present environment politics that could indeed be causes of concern
2. What is the difference between climate change and global warming?
3. Explain the causes, effects and measures for dealing with climate change phenomena