PUC Ist year - Semester – II

Unit VII: Environmental issues: Causes,effects and control measures

Module No 39. Global Warming and Green house effects

The term "Green House Effect" was first coined by J.Fourier in 1827. The effect is also called as "Atmospheric Effect", Global warming or "Carbon dioxide problem".

The normal level of Co_2 in atmosphere is 0.03%. In normal concentration Co_2 is not a pollutant. But higher concentration of Co_2 in the atmosphere causes serious health problems to air breathing animals. Major amount of carbon dioxide is released in the atmosphere from burning of fossil fuels (Coal, Oil etc) for domestic cooking, heating, mobile combustion, industrial processing etc.

High concentration of Co_2 causes suffocation, nausea and vomiting. The high concentration of Co_2 content is increasing the global temperature due to the green house effect. When there is an increase in Co_2 concentration, the thick layer of this gas prevents the heat from being re-radiated out. This thick Co_2 layer thus functions like the glass panels of a green house, allowing the sunlight to filter through but preventing the heat from being re-radiated in outer space. This is the so called Green house effect.

The Green house effect may therefore be defined as **"The progressive warming up of the earth's surface due to blanketing effect of man made Co_2 in the atmosphere".**

The four major green house gases, which cause adverse effects are carbon dioxide (Co_2), Methane (CH_4), Nitrous oxide (N_2O) and Chloro fluro carbons (CFCs). Among these Co_2 is the most common and important green house gas. Here it

should also be noted that Ozone and So_2 also act as serious pollutants in causing global warming.

Sources of Green house gases:

1. Factories which burn Coal, Oil and Natural gases.
2. Power stations based on fossil fuels.
3. A large fleet of automobiles.
4. Burning of fire wood and deforestation.
5. Forest fire.
6. The reduction of forest cover due to industrial expansion and urbanization.

How the green house effect is produced:

Under normal concentrations of Co_2, the temperature of the earth's surface is maintained by the energy balance of the sun rays that strike the planet and the heat that is radiated back into the outer space. However, when concentration of Co_2 in the atmosphere increases, the thick envelop of this gas prevents the heat from being re-radiated out. Thus the thick Co_2 layer acts like the glass panels of a green house or the window glass of a closed car, allowing the sun rays to filter through but preventing the heat from being escaping in the outer space, there by warming the troposphere (lowest layer of the atmosphere) of the atmosphere.

Impact of Green house effect:

1. Due to the rise of temperature, the ice caps of the North and South Pole is melting. Melting ice is increasing the sea levels. Many islands and low lying areas are submerging under sea water.
2. Due to increase in temperature the land will become drier and this will affect the crop production.

3. Desert areas will increase and forest areas will decrease.
4. In temperate regions, the winter will be shorter and warmer and the summer will be longer and hotter.
5. The plants and animals will also be affected resulting in the disruption of the whole ecosystem.
6. Because of increased concentration of Co_2 and due to much warmer tropical oceans, there may occur more cyclones and hurricanes, and early snow melt in mountains will cause more floods during monsoon.

Control and Remedial measures of Green house effect:

1. Reducing the consumption of fossil fuels such as coal and petroleum. This can be achieved by depending more on non-conventional renewable sources of energy such as wind, solar, nuclear and bio-gas energies.
2. Disposal of the green house gases as they are formed elsewhere than in the atmosphere.
3. Recovering green house gases present already in the atmosphere and disposing off them elsewhere.
4. Learn to adapt and accept the changing climate.
5. International co-operation for attempting the reduction of green house gases.

Ozone (O_3)

It is universally accepted that the ozone layer in the stratosphere protect us from the harmful UV radiations from sun. The depletion of this **O_3** layer by human activities may have serious implications, on the other hand, ozone is also formed in the atmosphere through chemical reactions involving certain pollutants (so_2, No_2 , aldehydes) on absorption of UV radiations. The atmospheric ozone is now being regarded as potential danger to human health and crop growth.

The ozone layer has two important and interrelated effects. Firstly, it absorbs UV light and thus protects all life on earth from harmful effects of radiation. Second, by absorbing the UV radiation the ozone layer heats the stratosphere, causing temperature inversion. This temperature inversion limits the vertical mixing of pollutants. However, in spite of this slow vertical mixing, some pollutants enter the stratosphere and remain there for years until they react with ozone and converted to other products. These pollutants thus deplete ozone in the stratosphere. Major pollutants responsible for this depletion are chlorofluoro carbons (CFCs), nitrogen oxides (coming from fertilizers) and hydrocarbons. CFCs are widely used as coolants in air conditioners, refrigerators, cleaning solvents, aerosol propellants, foam insulation, fire extinguishing equipment. They escape as aerosol in the stratosphere. Depletion of ozone in stratosphere causes direct as well as indirect harmful effects. Since the temperature rise in stratosphere is due to heat absorption by ozone, the reduction in ozone would lead to temperature changes and rainfall failures on earth. When the O_3 layer becomes thinner or has holes, it causes cancers, especially relating to skin like melanoma. The other disorders are cataracts, destruction of aquatic life and vegetation and loss of immunity.

Apart from direct effects, there are also indirect effects. Under green house effect conditions, plant exposed to UV radiation showed a 20-50% reduction in growth, reduction in chlorophyll content, increase in harmful mutations and also impairs fish productivity

Check Points

- Green house effect is the phenomenon due to which the earth retains heat.
- Four major green house gases are Co_2, Methane, Nitrous oxide, and chloro fluoro carbons.
- Co_2 is the most common and important green house gas.
- Green house gases act like a blanket, trapping heat close to the surface of the earth leads to global warming.

- Burning of fossil fuels, cooking, heating, mobile combustion, industrial processing etc leads to rise in the levels of Co_2.
- Increase of global temperature leads to melting of polar ice caps. Flooding of low lying coastal areas as the level of water increases in seas and oceans.
- To overcome this effect it is required that global emissions are significantly lowered.
- Ozone layer in the stratosphere protect us from the harmful UV radiation from sun
- When ozone layer becomes thinner or has holes it causes cancers, cataracts, destruction of aquatic life, vegetation and loss of immunity.

Object Type Questions:

1. Green house effect is related to

   A. Global warming B. Co_2 Problem C. Atmospheric effect **D. All**
2. As a result of combustion

   A. O_2 concentration in atmosphere increases

   B. Co_2 concentration increases

   C. Co_2 concentration decreases D. None
3. Which among the following causes global warming

   A. Co_2 B. N_2O C. CH_4 **D. All**
4. The green house gas is

   A. Co_2 B. CH_4 C. N_2O **D. All**
5. Fossil fuel is

   A. Coal B. Petroleum **C. Both A & B** D. None

6. Green house effect causes

A. Rise in temperature of the earth

B. Continuous rain fall

C. Lowering in temperature of the earth

D. Continuous snowing on the earth

7. Which is not a green house gas

   A. CH_4 B. Chlorofluorocarbons C. Co_2 **D. Co**

8. Green house effect is increasing due to

   A. Increasing Co2 Conc.

   B. Increasing So2 Conc.

   C. Ozone hole

   D. Increasing CFCs concentration

9. Green house effect with respect to global climate refers to

   A. Cooling of earth

   B. Warming of earth

   C. Increased rainfall and greenery

   D. Desertification

Short Answer Questions:

1. What is Global warming?
2. How Green house effect is produced?
3. What are the control measures of Green house effect?

Long Answer Questions:

1. Explain the Green house effect?