LECTURE NOTES

ON

CURRENT ENVIRONMENTAL ISSUES

ENVIRONMENT & ECOLOGY

B.Tech 2nd year

By

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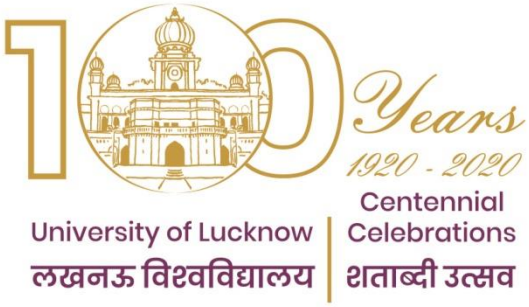

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CURRENT ENVIRONMENTAL ISSUES

Global warming & climate change

The greenhouse effect is natural process that helps in the heating of earth's surface and atmosphere. It result from the fact that certain atmospheric gases such as CO_2, H_2O vapour & CH_4 are capable to change the energy balance of the planet by absorbing long wave radiation reflected from the earth surface (short wave radiations of sunlight struck on the earth surface and converted into long wave radiations). Without the green house effect, it is not possible to maintain life on this planet.

The amount of heat energy added to the atmosphere by green house effect is controlled by the concentration of greenhouse gases like CO_2, CFCs, nitrous oxide, methane etc. in the earth's atmosphere. As a result of this higher concentration, the green house effect will be enhanced and the earth's climate will become warmer and this is referred to as global warming.

Effect of global warming:

a) Water resources: Quality & availability of water & aquatic life can affected by changes in precipitation and increased evaporation.
b) Seed growth: high temperature could be harmful for seed growth.
c) Ocean: as the temperature increase ocean become less able to absorb excess CO_2. Therefore CO_2 come in atmosphere and causes global warming.
d) Agriculture: CO_2 induce climate change could lead to lower rainfall, affecting agricultural productivity.
e) Health: global warming also affects life of all living things.

Control measures for global warming

a) Use energy efficient appliances.
b) To minimize greenhouse gases, replacing fossil fuels with renewable or alternative sources of energy.
c) Sustainable agriculture and forest management
d) Sustainable transportation to reduce CO_2 emission.
e) Reduce, reuse, and recycle waste materials.

Photochemical smog

Photochemical smog is produce when sunlight reacts with pollutants like nitrogen oxide, ozone, peroxy acetyl nitrates (PAN), unreacted hydrocarbon etc. The photochemical smog looks like brown haze due to presence of nitrogen dioxide.

Reaction in photochemical smog

In presence of sunlight atmospheric nitrogen gas oxidized to form NO

$$N_2 + O_2 \longrightarrow 2NO$$

$$2NO + O_2 \longrightarrow 2NO_2$$

NO_2 absorb sunlight & undergoes reduction

$$NO_2 \longrightarrow NO + O$$

In presence of Sunlight, oxygen atom react with oxygen gas & form ozone

$$O + O_2 \longrightarrow O_3$$

ozone react with NO to form NO_2 in presence of sunlight

$$O_3 + NO \rightleftharpoons NO_2 + O_2$$

Types of photochemical smog:

a) **London smog**: London type smog occurs in the region were emission of the sulphur containing compounds is high (due to burning of coal) and air contain higher water content. These acidic droplets and smoke inhibit the function of the lungs and causes death.

b) **Las Angeles smog**: this type of smog occurs in those areas where high emission gases from automobiles, high concentration of hydrocarbons and high level of UV radiation.

Effect of photochemical smog

i) It can damage plant, leading to the loss of crops.

ii) It can cause fabric and rubber to deteriorate.

iii) It can cause headaches, eye, throat irritation, affect the function of lungs.

Acid Rain

If the pH of rain water is less than 5.6, due to presence of pollutants gases like CO_2, SO_2, NO_X in atmosphere, known as acid rain. In acid rain primary pollutant like CO_2, SO_2, NO_X etc. react with moisture in the cloud to form secondary pollutants and fall as rain.

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

Carbonic acid

$$SO_2 + H_2O \longrightarrow H_2SO_4$$

Sulphuric acid

$$2NO_2 + H_2O \longrightarrow HNO_3 + HNO_2$$

Nitric acid Nitrous acid

Primary Pollutant Secondary Pollutant

Effect of acid rain

a) Acid rain cause eye and skin irritation etc.
b) Reduce the crop yield
c) Acid rain affect the aquatic animal, for example it retarded egg development, blood chemistry etc. in the fish.
d) It is also affect the historical monument.

$$CaCO_3 + H^+ \longrightarrow Ca^{2+} + H_2CO_3$$

Ozone Layer depletion

Ozone layer forms a protective layer around the earth, which protect us from the harmful UV radiation which causes skin cancer. Ozone layer formed in stratosphere by the combination of oxygen atom with molecular oxygen in presence of sunlight. Ozone layer deplete naturally by absorption of UV radiation.

$$O_2 + O \underset{\text{UV radiation}}{\overset{\text{sunlight}}{\rightleftharpoons}} O_3$$

The ozone layer thickness is measure in terms of Dobson unit. The normal thickness of ozone layer is 300 Dobson unit, if thickness below 200 Dobson unit then we say that ozone layer become deplete.

Cause of Ozone layer depletion

Ozone can be deplete by hydroxyl radical, nitric oxide radical, chlorine radical, hydroxide radical etc. The main component responsible for ozone layer depletion is CFCs, which is used as refrigerant and propellant in spray cans etc. The reaction of CFCs with ozone is as fallows;

$$CCl_2F_2 \xrightarrow{\text{sunlight}} {}^{\bullet}CClF_2 + Cl^{\bullet}$$

$$O_3 + Cl^{\bullet} \longrightarrow ClO^{\bullet} + O_2$$

$$ClO^{\bullet} + O_3 \longrightarrow Cl^{\bullet} + 2O_2$$

Effect of ozone layer depletion

a) If UV radiations increase in the troposphere causes skin cancer, immune system suppression & also causes gene mutation.
b) UV radiation effect productivity or yield of crops.
c) Disturbed the aquatic food chain and plankton.
d) Materials like plastic, wood, fabric, rubber are deteriorated by UV radiation.
e) It increases acid production as well as photochemical smog.

Solution to ozone layer depletion

a) Avoid the use of refrigeration and air conditioning.
b) Avoid halons (carbon containing bromine, fluorine) containing Fire extinguishers.
c) Ban nuclear explosion because during explosion lots of nitric oxide radical release with affect the ozone layer.

Solid waste management

The unwanted, discarded and useless materials resulting from day by day activities in the communities, is known as solid waste, and controlled generation, storage, collection, transfer, processing and disposal of solid waste, is known as solid waste management.

Source of solid waste

Medical store, food store, feeding centre, food distribution plant, slaughter areas, market, domestic areas etc. are the source of solid waste.

Types of solid waste

a) Combustible: paper, wood, leaves, etc.
b) Non-combustible: metal, tin cans, bottles, stones etc.
c) Organic waste: waste from preparation of food, dead animal and market places.
d) Bulky waste: trees branches, tires etc.
e) Hazardous waste: oil, battery waste, medical waste etc.

Management of solid waste