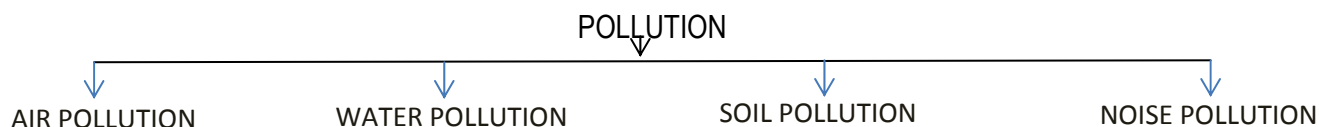


Chapter – 16: Environmental Issues

Pollution: Any undesirable change in physical, chemical or biological characteristics of air, land, water or soil which harms the human beings.



Pollutants: Agents that bring about pollution eg. smoke, dust, pollen, chemical pollutants, wastes from hospitals, E-wastes etc.

Biodegradable and non -biodegradable pollutants

Ways of removing particulate matter

1. Electrostatic Precipitator

Electrical device to remove 99% particulate matter. Electrode wires produce a corona that releases electrons. Negatively charged dust particles get attached with electrons & are collected in plates.

2. Scrubber

Used to remove gases from industrial exhaust by spraying water or lime. Gases get dissolved in water while lime reacts to form precipitation of substances.

3. Proper maintenance of Automobiles

Reference Fig 16.1 NCERT

Advantage of CNG over diesel

- CNG burns most efficiently.
- Cheaper cannot be siphoned.
- Cannot be adulterated.

Problems in use of CNG

- Difficulty in laying down pipelines. Non-assurance of uninterrupted supply

Steps taken in Delhi to reduce pollution.

- Phasing out old vehicles.
- Use of unleaded petrol.
- Use of low sulphur Petrol and Diesel.
- Use of catalytic converters in vehicles Application of stringent pollution level norms for vehicles.

Noise pollution

- It is undesirable high level of sound.

Harmful effects of noise pollution

- Psychological and Physiological disorders
- Damage of eardrums and hearing ability
- Cause sleeplessness, increased heartbeat altered breathing pattern, stress etc.

Steps to be taken to control noise pollution

- Use of sound absorbent materials or by muffling noise in industries
- Demarcation of horn free zones around hospitals and schools.
- Permissible sound levels of crackers,
- Timings after which Loudspeakers cannot be played

Water pollution

Deterioration in water quality due to physical, chemical or biological factor.

Sources of water pollution

a) Domestic sewage: Includes waste water from residential & public sewage system & contains suspended solids(sand, silt & clay), colloids(faecal matter, microbes, paper & cloth fibres), dissolved materials(Nitrates, Ammonium phosphate, sodium and calcium salts) & biodegradable organic wastes.

b) Industrial wastes

Includes heavy metals released along with waste water eg., Mercury, DDT which increases toxicity level of water affecting living bodies and results in biomagnification.

BOD

Biological Oxygen Demand (BOD) indicates the amount of dissolved oxygen utilised by the microorganisms for oxidising the organic matter present in the water body. Greater the organics, greater would be the pollution and lesser the dissolved oxygen.

Effects of BOD**Algal bloom**

- It is free floating (Planktonic) Algae.
- Imparts a distinct colour to water bodies
- Cause deterioration of water quality and fish mortality.
- Some blooms are toxic to humans and Animals.

Water hyacinth (*Eichornia crassipes*)

World's most problematic aquatic weed

Called as 'Bengal Terror' Grows faster than our ability to remove.

Bio magnification

Increase in concentration of the toxicant at successive trophic levels

Bio magnification of DDT in Aquatic food chain

Water	→	Zooplankton	→	Small Fish	→	Large Fish	→	Fish-eating Birds
0.0003 ppm		0.04 ppm		0.5 ppm		2 ppm		5 ppm

Eutrophication

Defined as Natural ageing of lake by biological enrichment of its water. Life supportive water in young lakes encourage growth of aquatic life & simultaneously deposition of organic remains at the bottom. Eventually floating plants grow in raised water temperature resulting in blockade of surface water that accelerates ageing called as eutrophication.

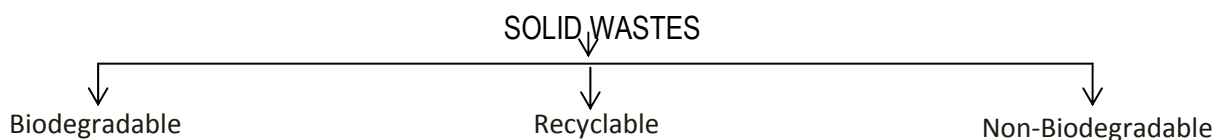
Cultural or accelerated eutrophication

Acceleration of ageing process of a lake by effluents from industries and homes.

Integrated waste water treatment in arcata

It consist of two steps

- Conventional sedimentation, filtering and chlorine treatment,
- Passing this water through marshes for neutralization absorption and assimilation of pollutants.
- Upkeep of this project by FOAM (Friends of Arcata Marsh).

**Ecological sanitation (Ecosan)**

A sustainable system for handling human excreta without using water but with composting method. **Advantages of ecosan**

- Wastage of water is reduced
- Practical and efficient
- Hygienic and cheap
- Excreta can be recycled and used as natural fertilizer.

Syringes, discarded medicines, Used gloves, Post-operative materials etc.
Should be treated before disposing off.

E-wastes

- Unused or damaged computers, calculators, mobile phones etc.
- Developed countries have plants for recycling e-wastes for recycling of metals.
- In developing countries e-wastes are buried in landfills or incinerated.

Agro chemicals

- Chemicals used in agricultural fields, Fertilizers, pesticides, weedicides etc.
- They are toxic to even non target organisms.
- Excess fertilizers cause Eutrophication.
- They cause soil pollution

Advantages of organic farming

- Economical Wastes do not get accumulated but recycled
- Does not cause Eutrophication

Radioactive wastes

- Emit radiations and damage biological organisms.
- Nuclear wastes are called potent pollutants, as they are lethal even in lower doses.

Disadvantages of nuclear plants

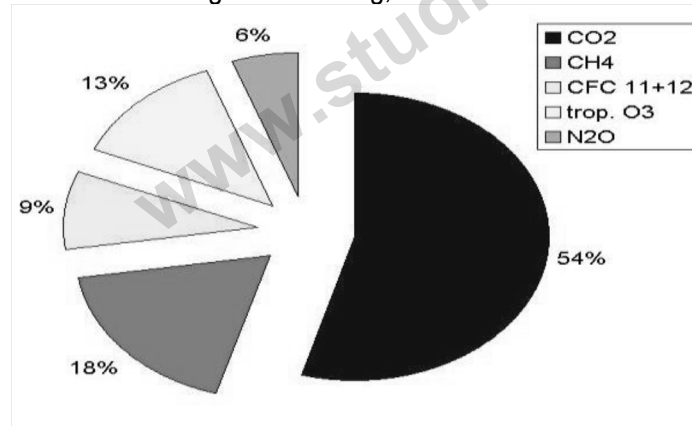
- Accidental leakages may happen
- Unsafe disposal of radioactive wastes
- Radiation emitted cause mutations in organisms
- Radiation causes genetic disorders

Greenhouse effect

Atmospheric cover around earth does not allow substantial amount of long wave radiation emitted by earth to escape in space. Infrared radiation is absorbed by greenhouse gases in atmosphere which is further returned as downward flux of radiation for keeping earth warm. Thus, greenhouse gases control of escape of heat from earth surface to outer space.

Green House Gases:- Carbon dioxide, methane, Chlorofluorocarbon (CFC), Perfluoromethane (CF₄), Nitrous oxide (N₂O) etc.

Harmful effect is global warming, increase in sea level etc.



Ozone depletion

Ozonosphere protects earth from harmful radiation. In stratosphere, photodissociation results in ozone formation that dissipates the energy of UV radiation. $O_3 \xrightleftharpoons{UV} O_2 + O$

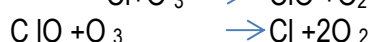
UV

CFC produces active chlorine in presence of UV radiation & depletes ozone layer

UV-C



UV-C



- Found in stratosphere of atmosphere.
- CFCs discharged from lower atmosphere move upward .
- UV rays act on these CFCs and release chlorine atoms.
- Chlorine degrades ozone and release molecular oxygen.
- This process is irreversible and thus ozone is depleted.

OZONE HOLE

Reference Fig 16.8 NCERT

Soil erosion

The removal of top fertile layer due to human activities

Reasons: -

- Over cultivation
- Over grazing
- Deforestation
- Improper irrigation practices

Waterlogging

- The crops may droop
- Leads to salinity of the soil.

Slash and burn agriculture/jhum cultivation

- Farmers cut down the trees of the forest and burn the plant remains.
- Ash is used as fertilizer and land is used for farming or cattle grazing
- Later, Land is left uncultivated for several years for replenishment of minerals

Effects of deforestation

- Leads to global warming due to excess carbon-dioxide
- Loss of biodiversity
- Damage to hydrological cycle
- Leads to soil erosion
- Desertification of land

Reforestation

- Restoring forest that was existing earlier
- E.g. Observing Van-Mahotsavas
- It also occurs naturally

Afforestation

- Developing a forest in a new area where no such forest existed in that area.

A case study of people's participation in forest conservation

A king of Jodhpur wanted to arrange wood for his new palace in 1731.

Few Bishnois hugged the trees and asked to cut them first rather than cutting trees.

365 persons lost their lives in this act

A small temple is now present there in remembrance of this act

Amrita Devi Bishnoi Wild Life Protection Award is instituted for individuals of rural areas who take keen interest in protecting wild life.

Chipko movement

It was started by local women of Garhwal, They hugged the trees to protect them from the axes of contractors.

Joint forest management (jfm)

- Strategy Government of India in 1980
- Local communities worked with the government to save the forest.
- Communities get forest products for encouragement.

Environmental issues

1. What is meant by algal blooms? What is its significance?

Ans. Excess growth of certain phytoplankton due to excess nutrients in water causes Deteriorates water quality, leads to fish mortality.

2. Define eutrophication.

Ans. Nutrient enrichment in water bodies leading to depletion of oxygen and loss of life supporting Environment.

3. What is bio magnification?

Ans. Increase in the concentration of certain toxic chemicals at successive trophic levels.

4. What is BOD?

Ans. Biological Oxygen Demand is the measure of organic matter in any water sample.

5. What is the effect of DDT in birds?

Ans. DDT disturbs calcium metabolism in birds, thinning of egg shell and premature breaking of Eggs lead to decline in bird population.

6. What do you understand by 'Ecosan'?

Ans. Ecosan are the toilets which use composting method for ecological sanitation.

7. Why are nuclear wastes called potent pollutants?

Ans. Are lethal even at lower doses and cause damaging disorders.

8. What is Jhum cultivation?

Ans. Farmers cut down the trees, burn, use cattle for grazing and then allow the land to recover.

9. Mention two problems that have arisen due to green revolution.

Ans. Water logging and soil salinity.

10. What is snow blindness?

Ans. Inflammation of cornea caused by a high dose of UV-B radiation.

11. Which is the world's most problematic weed, also known as 'terror of Bengal'?

Ans. *Eichornia crassipes* (Water hyacinth).

12. What is the effect of DDT in birds?

Ans. Disturbs Calcium metabolism Thinning of egg shells and premature breakage of eggs, Decline of bird population.

Short answer type questions (2 marks)

1. Mention the harm caused by fine particulate matter to human beings?

Ans. (i) Cause respiratory problems
(ii) Irritation of eyes
(iii) Inflammation of lungs
(iv) Premature death.

2. Differentiate between biodegradable and non-biodegradable wastes.

Biodegradable wastes	Non-Biodegradable wastes
*Can be broken down into harmless simple Compounds by the action of decomposers.	*Cannot be broken down by microbes and get accumulated in the biosphere
*Can be used as manure	*Enter the food chain
*Cause little pollution	*Cause bio magnifications

3. Describe Chipko Movement.

Ans. It was launched in Garhwal, Himalayas by Shri Sunder Lal Bahuguna in 1974.

Local women showed enormous bravery in protecting the trees from the axes of the contractors by hugging them.

4. What are the advantages of Organic farming?

Ans. Economical procedure as recycling takes place.

Waste not accumulated but recycled

Efficiency and utilization of resources increased

5. Write an account on Ecological sanitation (Ecosan).

Ans. A sustainable system for handling human excreta, using dry composting toilets. Practical, Hygienic, efficient and cost-effective solution to human waste disposal Human excreta can be Recycled into manure Used in Kerala and Sri Lanka.

6. How do radioactive wastes cause damage to living organism?

Ans. Cause mutations in living organisms at a very high rate. Lethal in high doses Causes cancer and other disorders. Reduces the vegetation cover.

7. What is ecological sanitation? What are its advantages?

Ans. It is sustainable system for handling human excreta without using water but by composting Method.

Advantages

Hygienic, practical and efficient, Conserves water can be recycled and, Acts as a natural fertilizer.

Short answer type questions (3 marks)

1. Mention harmful effects of noise pollution on human health.

Ans. Stress Altered breathing pattern

Increased heart beating and blood pressure

Sleeplessness and headache

Hearing impairment.

2. What measures should be taken to reduce global warming?

Ans. Reduce use of fossil fuel

Efficient use of energy.

Avoid deforestation

Reduce human population Control greenhouse gases.

3. How can we reduce automobile pollution?

Ans. Un-Leaded Petrol- Reduces lead pollution in air.

Low Sulphur Diesel- Reduces sulphur pollution in air

Four stroke engines to reduce emission of unburnt hydrocarbons.

Tube-Ups to increase air-fuel ratio and help in better combustion.

Catalytic Converters to reduce pollution.

CNG to reduce pollution and conserve fossil fuels.

4. Mention the adverse effects agrochemicals.

Ans. They are toxic to non-target organisms. They cause soil pollution Excess fertilizers cause eutrophication.

5. Write a short note on ozone depletion.

Ans. Ozone found in stratosphere. CFCs discharged from lower atmosphere move upward. In stratosphere UV rays act on these CFCs release chlorine atoms. Chlorine degrades ozone and release molecular oxygen (O_3O_2). In this reaction chlorine acts, as catalyst and loss ozone is irreversible.

6. Mention the Supreme Court directions to the Government to reduce pollution.

Ans. Switch over to CNG in public transport system

Enforcement of Euro II norms for vehicles.

Compulsory periodic check-up of pollution.

Use of unleaded petrol Low sulphur petrol and diesel

Catalytic converters in vehicles

Phasing out of old vehicles.

1. a) Explain the functioning of electrostatic precipitator with the help of a diagram.

b) Mention the consequence if the electrostatic precipitator does not work in a power plant.

Ans. Used for removing particulate air pollutants.

Removes about 99 of the particulate pollutants from the exhaust of thermal power plants.

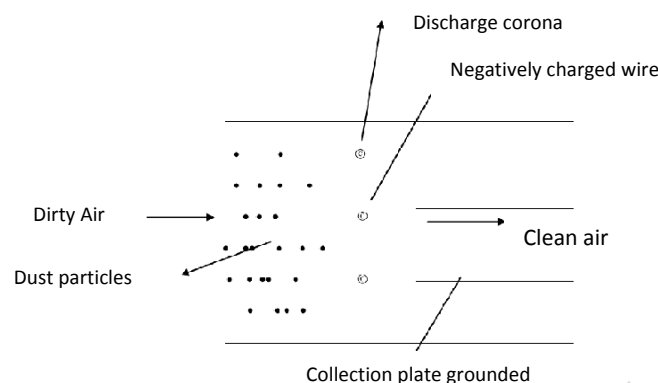
Electrode wires that are maintained at several thousand volts, which release electrons.

Electrons become attached to dust particles giving a net negative charge.

Collecting plates are grounded and attract the charged dust particles.

Velocity of air between the plates must be low enough to allow the dust particles to fall.

If electrostatic precipitator of a thermal plant stops working, all the particulate pollutants get released and pollute the air.



ELECTROSTATIC PRECIPITATOR

IMPORTANT LEGISLATIONS FOR ENVIRONMENTAL PROTECTION

Sl. No.	Environmental Act	Application
01.	The Environment Protection Act, 1986	Protect & control the quality of environment
02.	The Air (Prevention & control) Act, 1981	Protect & control of air pollution
03.	The Water (Prevention & control) Act, 1974	Protect & control of water pollution to safe guard water resources
04.	The Insecticide Act, 1968	Control & regulation of safe distribution & use of insecticides
05.	Montreal Protocol	Control on emission of ozone depleting substances
06.	National Forest Policy, 1988	Restriction of forest cover for plain land & hills
07.	Kyoto Protocol, 1977	Reducing overall greenhouse gas emission

- Secondary air pollutants are produced from primary pollutants by photochemical oxidation . eg., Olefins, aldehydes, Peroxyacetyl Nitrate(PAN)
- Photochemical Smogs are formed by following reactions:

$$\text{N}_2 + \text{O}_2 \longrightarrow 2\text{NO} \text{ (From vehicle exhaust)}$$

$$2\text{NO} + \text{O}_2 \xrightarrow{\text{UV}} 2\text{NO}_2$$

$$\text{NO}_2 \longrightarrow \text{NO} + \text{O}$$

$$\text{O} + \text{O}_2 \longrightarrow \text{O}_3$$

$$\text{NO} + \text{O}_3 \longrightarrow \text{NO}_2 + \text{O}_2$$

$$\text{HC} + \text{NO} + \text{O}_2 \longrightarrow \text{NO}_2 + \text{PAN (Peroxyacetyl nitrate)(SMOG)}$$

www.studiestoday.com