CHAPTER – 7

ENVIRONMENTAL ISSUES

Introduction

With increase in human population, demands for food, shelter, water, electricity, roads, and automobiles are increasing rapidly and exerting pressure on environment and altering the natural health of ecosystem. All across the world, people are facing a wealth of new and challenging.

AIR POLLUTION

Air is a complex, dynamic natural entity, which is essential for supporting life on earth. Air pollutant is a substance that causes harm to the humans and other living organisms.

Pollution is undesirable change in physical, chemical or biological properties of air, land, water or soil. The agents which cause undesirable change are called pollutants.

In order to control environmental pollution the Government of India has passed the Environment (Protection) Act. 1986 to protect and improve the quality of our environment (air, water and soil) .

Some of the common pollutants of air :

Nitrogen dioxide, Sulphur dioxide , Carbon monoxide and carbon dioxide , Volatile organic compounds ,Particulate matter .

AIR POLLUTION AND ITS CONTROL

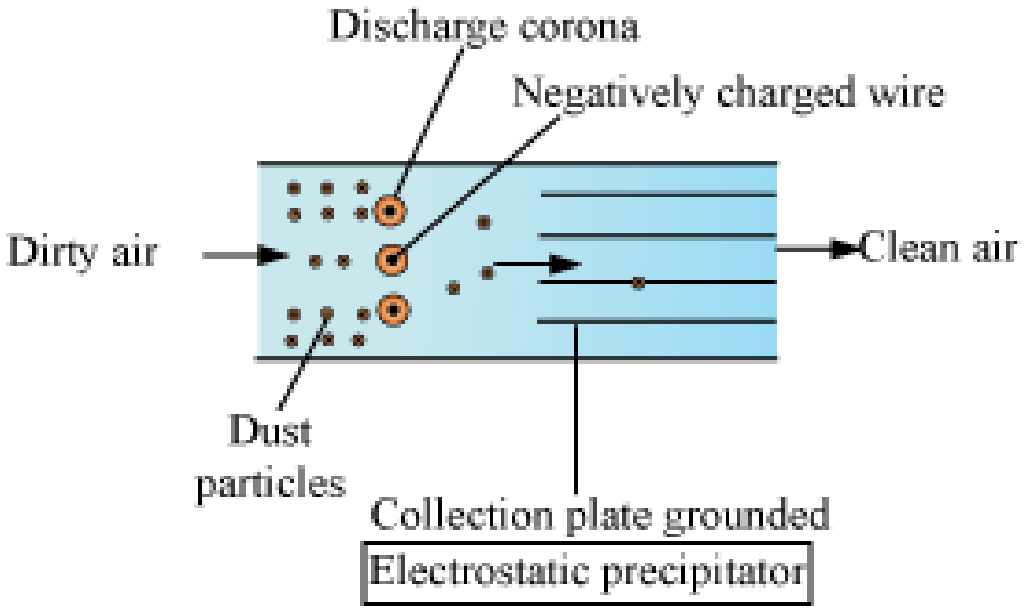
Air is essential for respiration in all living organisms. Pollutants reduce growth and production of crops as well as premature death of plants. The harmful effect of pollution on all the living organisms depends upon-

- Concentration of pollutants.
- Duration of exposure.
- Organisms involved.

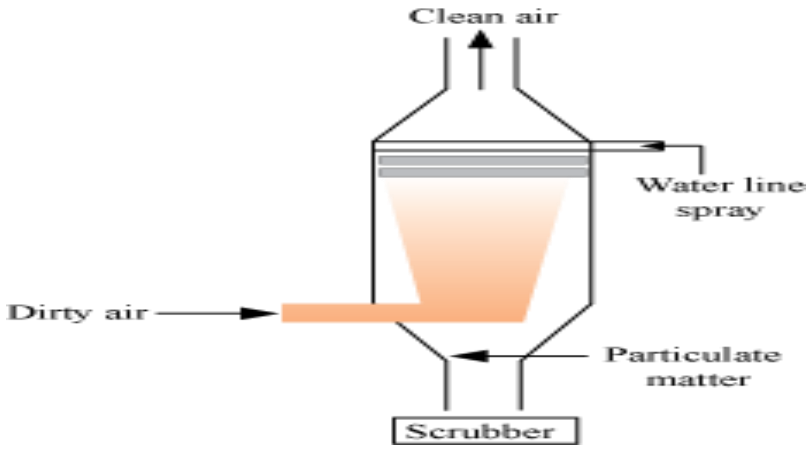
Thermal power plants, smelters and other industries release particulate and gaseous air pollutants along with harmless gases such as nitrogen, oxygen etc. These pollutants should be

filtered out before releasing the harmless gases into the atmosphere. There are many methods of removing particulate matter; the most widely used is the **electrostatic precipitator**.

ELECTROSTATIC PRECIPITATOR- can remove over 99% of particulate matter present in the exhaust from thermal power plant. Particulate matter can be removed by using an electrostatic precipitator. It contains electrode wires maintained at several thousand volts, which produce electrons. These electrons cling on to dust particles and give them a net negative charge and are attracted by collecting plates, which are grounded .The velocity of air passing through the plates should be low enough to allow the dust to fall.



SCRUBBER can remove gases like sulphur dioxide. The exhaust is passed through spray of water or lime.



According to CPCB (Central Pollution Control Board) particulate size less 2.5 micrometers or less in diameter (PM 2.5)cause greatest harm to human health.

The fine particles can be inhaled deep into the lungs and can cause breathing and respiratory symptoms, irritation, inflammations and damage to lungs and premature death.

Automobiles are main cause of atmospheric pollution in metro cities. Proper maintenance of automobiles along with use of lead-free petrol or diesel can reduce the pollutants they emit.

CATALYTIC CONVERTERS - contain platinum-palladium and rhodium as the catalyst, are fitted into automobiles for reducing emission of poisonous gases. As the exhaust passes through the catalytic converter, unburnt hydrocarbons are converted into carbon dioxide and water and carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas . The vehicles fitted with catalytic converter should use unleaded petrol because lead in the petrol inactivates the catalyst.

In Delhi, entire fleet of public transport was converted to **compressed natural gas (CNG)** mode to reduce the fast increasing pollution level of metro.

CNG- is better than diesel because it is cheaper than petrol and diesel, burn completely with leaving any residue and cannot be adulterated like petrol and diesel. But the main problem with switching over to CNG is the difficulty of laying down pipelines to deliver CNG through distribution points/pumps and ensuring uninterrupted supply.

AUTO FUEL POLICY : The Government of India has laid out a road map to cut down the vehicular air pollution in many cities of India. The goal of this policy is to reduce Sulphur to 50 ppm in petrol and diesel and reduce levels of aromatic hydrocarbons to 35% of the fuel. The Bharat Stage II will be applicable to all automobiles in all cities April, 1, 2005. The cities (like Delhi, Mumbai, Chennai, Kolkata etc.) will have to meet Euro III emission norms from April 1, 2005 and Euro IV Emission norms from April 1, 2010

In India, **the Air (Prevention and Control of Pollution) Act** came into force in 1981 and was amended in 1987 to include noise as an air pollutant.

NOISE POLLUTION:

Noise is undesired high level of sound. High sound level greater than 150 dB or more generated by takeoff or a jet plane or rocket may damage ear drums thus permanently impairing hearing ability.

Noise also causes sleeplessness, increased heart beating, altered breathing pattern, thus considerably stressing humans.

Reduction of noise in industries can be affected by use of sound absorbent materials or by muffling noise.

WATER POLLUTION AND IT CONTROL

Water bodies are lifeline of human beings as well as other animals. Due to disposal of all kinds of waste and other anthropogenic actions the ponds, lakes ,stream, river, estuaries and oceans are becoming polluted in several parts of world. The Government of India has passed the **Water (Prevention and Control of Pollution) Act, 1974** to protect the water resources.

DOMESTIC SEWAGE AND INDUSTRIAL EFFLUENTS-

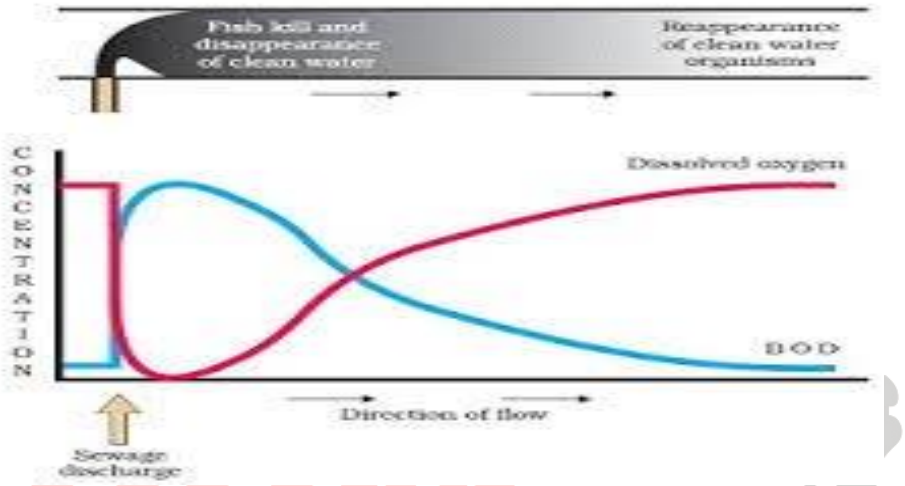
The sewage that comes out from house and office makes the domestic sewage. A mere 0.1% impurities make domestic sewage unfit for human use. Solid wastes are relatively easy to remove but dissolved salts as nitrates, phosphates and other nutrients and toxic metal ions and organic compounds present in domestic wastes are comparatively difficult to remove.

Domestic sewage mainly contains biodegradable organic matter, which can be easily decomposed by microbes like bacteria and fungi. They use organic wastes as nutrients.

BIOLOGICAL OXYGEN DEMAND (BOD)

The microbes that decompose organic wastes in water bodies consume a lot of oxygen that result into sharp decline in dissolved oxygen downstream from the point of sewage discharge. This causes mortality of fish and other aquatic creatures.

BOD refer to the amount of oxygen that would be consumed if all the organic matter is one litre of water were oxidized by bacteria. The BOD test measures the rate of uptake of oxygen by micro-organisms in a sample of water. Indirectly BOD is a measure of the organic matter present in the water. The greater the BOD of waste water, more is its polluting potential.



ALGAL BLOOM

Presence of large amount of organic nutrients in water causes excessive growth of planktonic or free floating algae called algal bloom. Due to this colour of water bodies get changed. This may cause deterioration of the water quality and fish mortality.

WATER HYACINTH (*Eichhornia crassipes*)

It is the world's most problematic aquatic weed. They are introduced into India for their beautiful flowers that have caused havoc by their excessive growth by causing blocks in our water bodies. This weed is commonly known as 'Terror of Bengal'.

BIOMAGNIFICATION OR BIOLOGICAL MAGNIFICATION

Toxic wastes present in industrial wastes and water from farmhouse containing pesticides and weedicides enters the food chain of aquatic organisms. The increase in concentration of toxicant at each successive trophic levels is called biological magnification. The substances can neither be accumulated nor metabolised by the organisms.

The most common toxicant that get accumulated at successive trophic levels includes DDT and Mercury. High concentrations of DDT disturb calcium metabolism in birds, which causes thinning of eggshell and their premature breaking, eventually causing decline in bird populations.

EUTROPHICATION

It is the natural aging of a lake by biological enrichment of its water. Due to addition of nutrients such as nitrogen and phosphorus that encourage the growth of aquatic organism the accumulation of organic remains in course of time leads to shall lowing of lake. Over the centuries the silt and organic debris piles up at the bottom of lake and encourage the growth of marsh plants in the shallow and begin to fill in the original lake basin. Eventually large masses of floating plants grows and finally converting into land.

The pollutants from man's activities such as effluents from the industries and homes radically accelerate the aging of lake. This phenomenon is called **Cultural or Accelerated Eutrophication.**

Main contaminants include nitrates, phosphates that act as plant nutrients. They increase the growth of algae, causing unsightly scum and unpleasant odours, and depleting the dissolved oxygen of water which is important for other aquatic life.

INTEGRATED WASTE WATER TREATMENT

Wastewater including sewage can be treated in an integrated way, by combining artificial and natural processes. An example of such an initiative is the town of Arcata, situated along the northern coast of California .The native people in collabaration with Humboldt State University created an integrated waste water treatment process within a natural system. The cleaning occurs in two stages –

(a) the conventional sedimentation, filtering and chlorine treatments are given.

(b) To combat with pollutants like dissolved heavy metals , the biologists developed a series of six connected marshes over 60 hectares of marshland where plants, algae, fungi and bacteria were seeded which neutralise, absorb and assimilate the pollutants.

As the water flows through the marshes, it gets purified naturally. The marshes also constitute a sanctuary, which is highly diverse in the form of fishes, animals and birds that now reside there.

A citizens group called **Friends of the Arcata Marsh (FOAM)** are responsible for the safety of this project.

ECOSAN' TOILETS :

Ecological sanitation is a sustainable system for managing human excreta, using dry composting toilets. This is a practical, hygienic, efficient and cost-effective solution to human waste disposal. The important part is that with this composting method, human excreta can be recycled into natural fertiliser. There are working **'EcoSan'** toilets in many areas of Kerala and Sri Lanka

SOLID WASTES:

Municipal solid wastes are wastes from home, offices, stores, schools, hospitals etc. that are collected and disposed by the municipality. It consists of paper, food wastes, plastics, glass, metals, rubber, leather, textile etc. Burning reduces the volume of the wastes but the waste generally not burnt to irts completion and open dumps often serve as the breeding ground for rodents and flies. **Sanitary landfills** were used as substitute for open burning dumps where wastes are dumped in a depression or trench after compaction and covered with dirt every day. There is a danger of seepage of chemicals from these landfills polluting the underground water resources.

MUNICIPAL WASTES: Bio-degradable wastes, Recyclable wastes, Non-biodegradable waste

The biodegradable materials can be put into deep pits in the ground and be left for natural breakdown.

Kabadiwallahs and rag-pickers do a great job of separation of materials for recycling of different kinds of wastes.

POLYBLEND - A plastic sack manufacturer in Bangalore has managed to find the ideal solution to the ever-increasing problem of accumulating plastic waste. Ahmed Khan. aged 57 years old. has been producing plastic sacks for 20 years. About 8) years ago. He realized that plastic waste was a real problem.

Polyblend is the best way to combat with ever-increasing problem of accumulating plastic waste .It is a fine powder of recycled modified plastic which is mixed with the bitumen. Polyblend and bitumen, when used to lay roads, enhanced the bitumen's water repellant properties, and helped to increase road life by a factor of three. The raw material for creating

Polyblend is any plastic film waste. So against the price of Rs. 0.40 per kg that rag pickers had been getting for plastic waste, Khan now offers Rs.6.00.

Using Khan's technique by the year 2002 more than 40 k.ms of road in Bangalore has already been laid.

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Hospitals generate hazardous wastes that contain disinfectants and other chemicals and alos pathogenic micro-organisms. Such wastes need careful treatment and disposal. Incinators are used for disposal of hospital wastes.

ELECTRONIC WASTES- Unrepairable computers and other electronic goods are known as electronic wastes (e-wastes). E-wastes are buried in landfills or incinerated. Over half of the e-wastes generated in the developed world are exported to developing countries, mainly to China, India and Pakistan, where metals like copper, iron, silicon, nickel and gold are recovered during recycling process. Recycling is the only solution for the treatment of e-wastes provided it is carried out in an environment-friendly manner

AGRO-CHEMICALS AND OTHER EFFECTS

Use of inorganic fertilizers and pesticides has been increased many fold due to green revolution for enhancing crop production. The pesticides and insecticides are toxic to non-target organisms that are important components of the soil ecosystem. They are biomagnified in the terrestrial ecosystem and also causes eutrophication in aquatic ecosystems .

ORGANIC FARMING

Integrated organic farming is a cyclic, zero-waste procedure in which waste products from one process are cycled in as nutrients for other processes to allow the maximum utilization of resource and increase the efficiency of production. It includes bee-keeping, dairy management, water harvesting, composting and agriculture in a chain of processes which support each other and allow an extremely economical and sustainable venture. No chemical fertilizer is used in this process.

RADIOACTIVE WASTES

Nuclear energy has two very serious problems-

- Accidental leakage

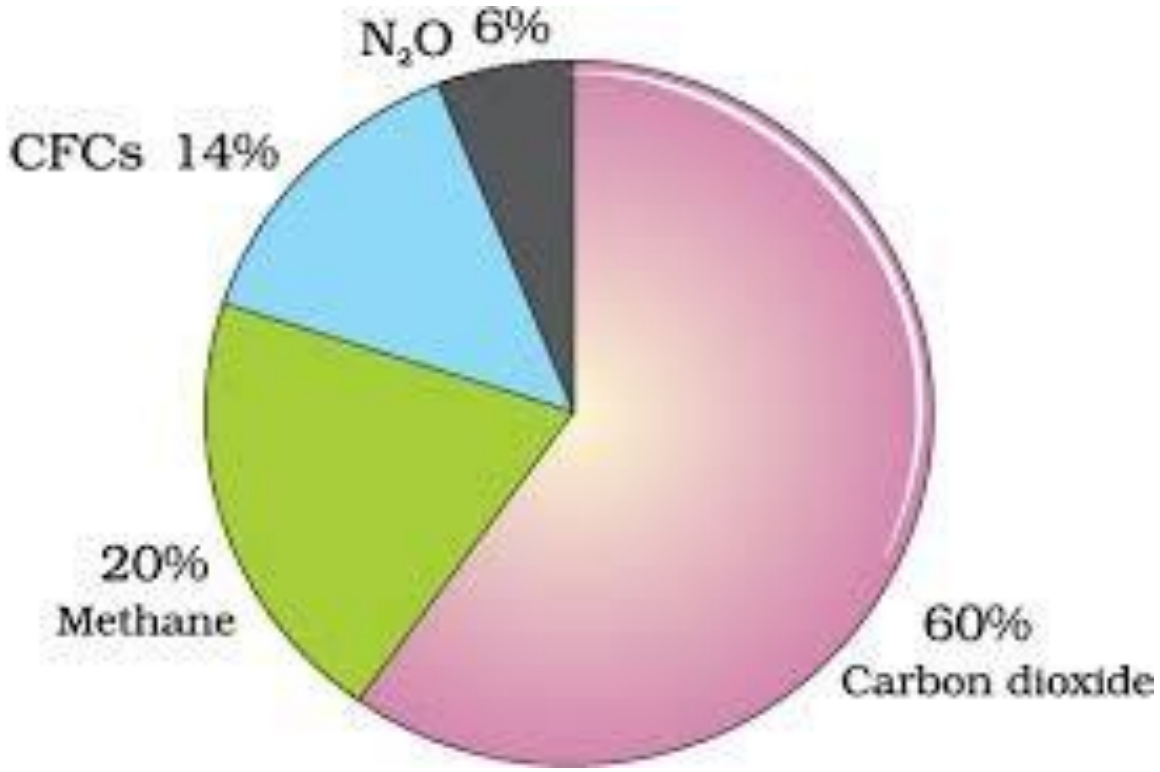
- Safe disposal of radioactive wastes

The radiation released from nuclear wastes is extremely damaging to biological organisms as it causes mutations to occur at very high rate. It has been recommended that storage of nuclear wastes after sufficient pre-treatment should be done in suitably shielded containers and buried within the rock about 500m deep below the earth surface.

GREEN HOUSE EFFECT AND GLOBAL WARMING

The greenhouse effect is a naturally occurring phenomenon that is responsible for heating of Earth's surface and atmosphere due to increase in concentration of carbon dioxide and methane gas. Clouds and gases reflect about one-fourth of the incoming solar radiation and absorb some of it but almost half of incoming solar radiation falls on Earth's surface heating it, while a small proportion is reflected back. The surface of earth re- emits heat in the form of infrared radiation but part of this does not reflected back due to greenhouse gases that leads to heating of earth atmosphere.

Global warming is caused due to greenhouse effect.



Scientists believe that this rise in temperature is leading to harmful changes in the environment and resulting in odd climatic changes (e.g. El Nino effect) , thus leading to increased melting of polar ice caps.

Global warming can be controlled by

- Cutting down use of fossil fuel
- Improving efficiency of energy usage
- Reducing deforestation
- Planting tree
- Slowing down the growth of human population.

OZONE DEPLETION IN THE STRATOSPHERE

Ozone found in the upper part of the atmosphere called stratosphere acts as a shield absorbing ultraviolet radiation form the sun. UV rays are highly injurious to living organisms.

The thickness of the ozone-layer in a column of air from the ground to the top of the atmosphere is measured in tems of **Dobson units (DU)**. Ozone layer absorbs the harmful UV-rays. It causes aging of skin, damage to skin cells and various types of skin cancers. In human eye, cornea absorbs UV-B radiation, and a high dose of UV-B causes inflammation of cornea, called snow-blindness cataract, etc. Such exposure may permanently damage the cornea.

Chlorofluro Carbons deplete the ozone layer. The part of atmosphere with lesser concentration of ozone is called ozone hole.

Steps leading to ozone depletion:

UV-rays split CFCs and release atomic chlorine (Cl). UV-rays also split ozone into oxygen.

Chlorine atoms trap oxygen atoms and ozone is not formed again from oxygen. This leads to depletion of ozone in the stratosphere. Ozone layer absorbs the harmful UV-rays. It causes aging of skin, damage to skin cells and various types of skin cancers.

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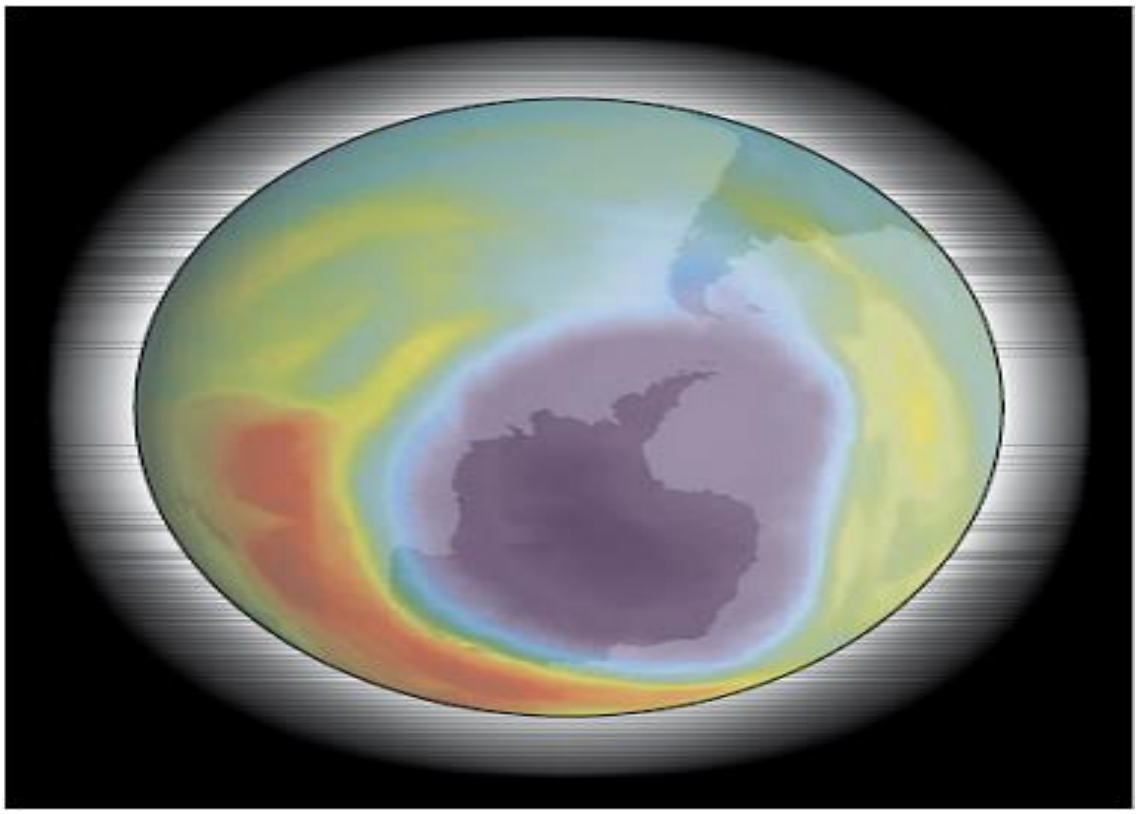
Although ozone depletion is occuring widely in the stratosphere , the depletion is particularly marked over the Antarctic region. This has resulted in formation of a large area of thinned ozone layer, commonly called as the Ozone hole .

Recognizing the deleterious affects of ozone depletion an international treaty known as the Montreal protocol was signed at Montreal(Canada) in 1987 to control the emission of ozone depleting substances.

Subsequently many more efforts have been made and protocols have laid down definite roadmaps, separately for developed and developing countries for reducing the emission of CFC and other ozone depleting chemicals.



Pollution is not only the cause of degradation of natural resources .Improper utilization practices can also lead to degradation of natural resources.Natural resources can get degraded by their improper use.There are two such misutilisation of resources mentioned below :

SOIL EROSION AND DESERTIFICATION:

Fertile top soil tale hundreds of years to develop. However faulty utilization practices can remove it within a few years. This can convert the area into an arid patch.

Over-cultivation, overgrazing, leaving tilted soils without shading and irrigation, deforestation, and poor irrigation techniques lead to soil erosion and desertification.

Soil without a vegetation cover is eroded by both wind and water and makes the soil infertile.

WATER LOGGING AND SOIL SALINITY:

Excessive irrigation, presence of impermeable underground soil pans and lack of proper drainage leads to water logging, which affects the crops and also leads to increase in the salinity of the soil. A waterlogged soil has poor aeration. As a result there is a poor plant growth.

Evaporation of water from surface draws salt to the surface. A crust of salt is formed over surface as well as upper layers of soil. Such soil become saline and unfit for plant growth.

DEFORESTATION

It is the unlimited cutting of trees and conversion of forests into cultivable land.

In the beginning of 20^{th} century, India had 30% of its area under forests, which was reduced to just 19.4% by the end of 20^{th} century, whereas the National Forest policy (1988) of India has recommended 33 percent forest cover for the plains and 67 percent for the hills.

Deforestation is a result of a number of human activities such as increased population and the demand for land.

Trees are cut for timber, fuel, and also for Slash and burn agriculture, also called Jhum cultivation. In this, trees are cut and plant remains in the forest are burned since the ash acts as a fertilizer

CAUSES OF DEFORESTATION:

Apart from jhuming , slash and burn cultivation other many causes for deforestation is there.

Forest fires : huge forest fires engulfing areas of 40,000km^3 have occured in Indonesia in 1983 and the forest fire in Australia in this current year became the major reason for deforestation.

Human establishment : there is an ever interesting demand for agricultural land in order to grow more food crops for feeding and growing human population . This is only possible through forest cleaning .

Mountain and forest roads : construction of road and railways in the hilly forested areas bring about a lot of deforestation..large sections are dynamited.

Canals: big irrigation projects damaged forests .

Overgrazing : India with million of livestock depends on forest for grazing ,which ultimately destroys forest

CONSEQUENCES OF DEFORESTATION :

One of the major effects is enhanced carbon dioxide concentration in the atmosphere because trees that could hold a lot of carbon in their biomass are lost with deforestation.

It results in loss of biodiversity due to habitat destruction, disturbs hydrologic cycle. causes soil erosion, may lead to desertification in extreme cases.

REFORESTATION: Process of restoring a forest that was removed at some point of time in the past.

The Government of India has recently started the **Amrita Devi Bishnoi Wildlife Protection Award** for individuals or communities from rural areas that have shown extraordinary courage and dedication in protecting wildlife.

CHIPKO MOVEMENT - In 1974, local women of Garhwal Himalayas showed tremendous courage in protecting trees from the axe of contractors by hugging them. People all over the world have appreciated the Chipko movement.

JFM : Realising the importance of participation by local communities, the Government of India in 1980s has introduced the concept of **Joint Forest Management (JFM)** so as to work closely with the local communities for protecting and managing forests.

IMPORTANT TERMS

Sl No.	Terms	Explanation
1	DU	Dobson unit
2	CPCB	Central pollution control board
3	BOD	Biological oxygen demand
4	CNG	Compressed natural gas
5	FOAM	Friends of Arcata Marsh
6	JFM	Joint forest management
7	PIL	Public interest litigation
8	Air prevention & control act	1981 protect & control of air(environment)
9	Water(prevention & control of pollution)act	1974 protect & control of water pollution to safe guard water resources.
10	Chipko movement	1974 protection of forest
11	Pollutants	Agents which cause pollution
12	Jhum cultivation	Cutting down trees and burn the plant remains for agriculture
13	Algal bloom	Excessive growth of algae due to presence of nutrients in water
14	Plankton	Free floating aquatic organisms
15	Biomagnifications	Increase in concentration of toxic substances at successive tropic levels
16	Eutruphication	Natural aging of lake by nutrient enrichment
17	Snowblindness	Inflammation of cornea due to high dose of UV-B radiation