ENVIROMENTAL ISSUES

Pollution: It is any undesirable change in the physical, chemical or biological characteristics of the environment.

Pollutants: They are the agents or substances that bring about undesirable change in the environment.

Environmental Act (1986): It was passed by the government of India to protect and improve the quality of the environment.

Air Pollution: It is the undesirable change in the physical, chemi9cal or biological nature of the air.

Causes for air pollution:

- Exhausts from industries, thermal power plants, and automobiles.
- Forest fires and volcanoes.
- Burning of wood and charcoal for domestic purposes.

Major pollutants: Include carbon dioxide, carbon monoxide, sulphur dioxide, oxides of nitrogen, suspended particulate matter (SPM), chlorofluro carbons (CFC).

Effects of air pollution:

- In plants, they reduce growth and yield of crops and cause premature death of plants.
- In animals the respiratory system gets affected.
- Global warming
- Ozone depletion
- SPM enters into the lungs and causes breathing and respiratory problems, irritation and inflammation and damage to the lungs and premature death.

Methods of control of air pollution:

Electrostatic precipitator:

- It helps in removing the suspended particulate matter, released from thermal power plants.
- It consists of electrode wires maintained at a high voltage of several thousands and collecting plates that are grounded.
- When such high voltage is maintained, the electrodes produce a corona of electrons.
- The electrons get attached to the dust particles, when dirty air is passed through them and gives them a net negative charge.
- As the charged particles move further, they are attracted to the positively charged collecting plates and get collected over them
- Pu8re air passes out of the electrostatic precipitator.
- The SPM are collected from the collecting plates and disposed.

Scrubber:

- It is a device used to remove gases like sulphur dioxide and SPM
- In a scrubber the exhausted is passed through a spray of water or lime water.
- Water dissolves the soluble matter and lime reacts with sulphur dioxide to produce a precipitate of calcium sulphate thus purifying the air.

Catalytic converter:

- It is a device fitted into automobiles, to eliminated unburnt hydrocarbons and reduces emissions of poisonous gases.
- It consists of expensive metals like platinum, palladium and rhodium as catalyst

- As the exhaust passes through the catalytic converter the unburnt hydrocarbons are converted into carbon dioxide and water, carbon monoxide and nitric oxide are changed to CO_2 and H_2O.
- Vehicles fitted with catalytic converters should use unleaded petrol as lead in the petrol inactivates the catalyst.

Noise pollution: It is the undesired high level of sound.

Effects:

- A brief exposure to extremely high sound level of 150 dB or more may damage ear drums and cause permanent impairing of hearing ability.
- Exposure to relatively low noise level for a long duration of time may permanently damage hearing abilities and also cause sleeplessness, increased heart beat, change in breathing pattern and increase stress.

Causes for noise pollution:

- Loud sounds from musical shows, jet planes.
- Sound and horns produced due to vehicular traffic
- Machinery sounds and sirens in industries
- Crackers burst during celebrations

Control measures:

- Hospitals and school zones must be delimited as horn free zones
- Industries should use sound absorbent material in the walls
- Use of loud speakers and amplifiers should be restricted
- People working loud noise areas should use ear plugs

Controlling Vehicular traffic – Case study of Delhi

Delhi has a very large vehicles' traffic. In 1990 it ranked 4th among the 40 most populated cities of the world. Public interest litigation was filed in the Supreme Court after the air pollution problems became serious. Under the guidance of supreme court, government of Delhi changed the entire public transport from diesel to compressed natural gas(CNG), phased out old vehicles, made it mandatory to use unleaded petrol, low sulphur petrol and catalytic converter.

Advantages of CNG:

- It burns most efficiently than petrol/diesel and hence very little of it is left unburnt.
- CNG is cheaper than petrol
- It cannot be adulterated.

Auto fuel policy:

Auto fuel policy was implemented to reduce vehicular pollution in inidan cities by reducing sulphur and aromatic hydrocarbons in diesel and petrol. According to Euro II norms, sulphur should be controlled at 350 parts per million in diesel and 150 ppm in petrol and aromatic hydrocarbons should be 42% in the fuel. According to the auto fuel policy sulphur is to be reduced to 50ppmin petrol and diesel and then bring down to 35%

Water Pollution: It is the undesirable change in the physical chemical and biological characteristics of water.

Sources of water pollution

Effluents from industries	Agrochemical waste
Domestic sewage	Discharge from Thermal and nuclear power plants

Water pollutants:

- Suspended solids – Sand, silt, clay
- Colloidal matter – Faeces, bacteria, cloth and paper fibres
- Dissolved matter – nutrients – phosphates, nitrates, ammonia from agriculture
- Minerals – Cu, Zn, Pb, Hg
- Chemicals – Fungicides, Insecticides, DDT

Domestic sewage: It is the organic waste released from house, hotel, commercial buildings and may contain human excreta, animal waste, food left overs, detergents, etc. It is easily decomposed by the bacteria and other microbes.

Industrial effluents: it is the waste water released from industries and contains toxic chemicals and heavy metals like Hg, Pb, Cd, Cu etc. Petroleum refining, paper, metal extraction and processing and chemical manufacturing industries are the major industries that produce the effluents.

Effects of water pollution:

- **Algal blooms:**
    - They are the excessive growth of planktonic (free floating) algae due to large amounts of nutrients in water.
    - They give a distinct colour to the water
    - Cause deterioration of the water quality
    - It decreases the oxygen content of the water and thus causes the death of aquatic organisms
    - Some algae that form blooms are extremely toxic to human beings.
- **Biochemical Oxygen Demand:**
    - It is the amount of O_2 used by the bacteria to oxidise (breakdown) all the organic matter present in 1 litre of water.
    - Higher the amount of oxygen used by the bacteria, the more polluted water is. Hence it is a measure of water pollution
    - When water gets mixed or polluted with sewage, the microbes decompose the organic waste by using up the O_2. This results in a sharp reduction in the O_2 content downstream from the point of discharge of sewage.
- **Bio-magnification:**
    - It is the increase in the concentration of toxic or non-biodegradable substances at successive trophic levels of food chain.
    - It occurs because the toxic substance released by an organism or by human activities cannot be metabolised or excreted and is thus passed on the next higher trophic level Eg. DDT & Mercury.
    - DDT an insecticide was used extensively to control insects. It is insoluble in water and non-biodegradable and hence accumulates in the soil and water bodies (through rain)
    - In the water body DDT moves through the food chain from zooplanktons to small fish to large fish and finally to the fish eating birds.
    - The concentration of DDT starts at 0.003 ppb (parts per billion) in water and ultimately reaches to 25 ppm in the fish eating birds through bio magnification.
    - High concentration of DDT disturbs calcium metabolism in birds and leads to thinning of egg shell and their premature breaking eventually causing a decrease in bird population.
- **Eutrophication:**
    - It is the natural ageing of water body (like lakes and ponds) by increase in the nutrient content of water.
    - It occurs by the natural increase in the nutrient content of the water and is called natural eutrophication.

    - Natural eutrophication is a slow process and may occur over thousands of years
    - Pollution of water due to man's activities like the effluents from industries and homes speed up the process of eutrophication considerably and is known as cultural or accelerated eutrophication.
    - **Accelerated eutrophication**: When water bodies are contaminated with sewage, industrial and agricultural wastes, the nitrate and phosphate content of the water increases. This increases the growth of algae and other aquatic organisms in the water. This decreases the oxygen content in the water bodies and further causes the death of the larger aquatic animals. The decomposing of the dead aquatic animals further depletes the oxygen in the water and with passage of time, the organic wastes get deposited at the bottom along with silt and organic debris and makes the lake shallower and warmer. This makes way for growth of marsh plants, floating plants and finally gets converted into land.
- **Thermal power plants:**
    - Electricity is generated in thermal power plants by heating water which is directly released into the water bodies
    - Hot water kills or reduces the organism sensitive to high temperature.
- **Pathogenecity:**
    - Addition of sewage to water bodies increases the number of diseases causing microbes in water and thus water becomes a source for spreading of diseases like dysentery, typhoid, jaundice, cholera etc.
- **Case study of integrated waste water treatment:**
    - Integrated waste water treatment is method of cleaning polluted water by using both artificial & natural process.
    - It was started in Arcata a small town in Northern California. The people of Arcata created an integrated waste water treatment process within a natural system, by taking help from biologists of Humboldt State University.
    - It involved cleaning water in 2 stages – In the first stage, the waste water is filtered, sedimented and chlorinated to remove all the solid wastes. The water still contains pollutants like heavy metals.
    - In the second stage the water is allowed to flow through a series of 6 connected marshy areas spread over60 hectares of marsh land.
    - The marsh lands having a large growth of bacteria, fungi, algae, plants etc., neutralise, absorb and assimilate the pollutants in water and purifies naturally.
    - This has helped in conserving the biodiversity of the marshland and has been guarded by a citizens group called "Friends of the Arcata Marsh".
- **Ecological Sanitation/Eco San:**
    - It is a sustainable system for disposing human excreta using dry composting toilets.
    - It helps in conserving lot water that was used to dispose the human excreta.
    - It is also an effective way of recycling human excreta as natural fertilizer.
- **Solid Wastes:**
    - Everything that is thrown into dustbin is known as solid wastes
    - Wastes from home, offices, stores, schools, hospitals that are collected and disposed by the municipality is known as municipal solid waste.
- Disposal of waste is not very easy:
    - Burning of wastes may lead to air pollution and the wastes may not be completely burnt out.
    - They cannot be used as landfills as the amount of wastes produced everyday in the metro cities is so high that the landfills are also overflowing.
    - Landfills also pose the threat of seepage of chemicals into the underground water resources
    - Waste management can be done easily by categorising the waste into different types and disposing accordingly

- **Biodegradable wastes**: These are the wastes which can be decomposed by micro organisms
- **Recyclable waste:** These are the wastes which can be reused or recycled like metals, card boxes
- **Non – biodegradable wastes:** These are the wastes which cannot be degraded by microorganism Eg: polythene bags, broken glass
- Disposal of solid wastes can be brought about by:
- Composting: The biodegradable materials can be put into deep pits in the ground and left to be broken down naturally by the microbes
- **Recycling**: it is the process of conversion of waste into another useful product. The paper products bottles are recycled for other uses
- **Incineration:** It is the process of burning of waste at high temperature using incinerator. It helps in destroying pathogenic microorganisms, disinfectants and chemical compounds produced as hospital wastes.

- **E – wastes (electronic wastes)**
  - Irreparable computer and other electronic goods are known as e – wastes
  - They are buried in landfills or incinerated or recycled
  - They contain metals like Cu, Fe, Si, Ni, Au etc., and can be recovered during recycling process.
  - Workers handling e wastes are exposed to toxic substances of e wastes.
- **Case study of Remedy for Plastic waste**
  - Ahmed Khan, a plastic sac manufacturer in Bangalore has given ideal solution to the over increasing problem of accumulating plastic wastes. He started to produce polyblend which is a mixture of fine powder of recycled modified plastic. This polyblend is mixed with bitumen and used to lay roads. The mixture of polyblend and bitumen makes the roads to repel water and increases their life span. Ahmed Khan proved this in Bangalore with the collaboration of R V college of engineering and Bangalore City Corporation. Using Khan's technique more than 40 kms of road in Bangalore has already been laid.
- **Agro chemicals and their effect:**
  - Agro chemicals are the inorganic fertilizers, pesticides, herbicides, fungicides etc., used to protect the crop and produce high yield.
  - These agro chemicals are used extensively. They are toxic to non-target organisms that are important components of the soil ecosystem and aquatic ecosystem.
  - It also leads to eutrophication and bio magnification.
- **Radioactive wastes:**
  - They are the by-products of nuclear technology or nuclear power generation
  - Radiation that is given off by nuclear waste is extremely damaging to organisms as it may lead to mutations
  - High doses of nuclear radiation is lethal, but low doses cause disorder and the most common effect of radioactive waste is cancer
  - Hence the nuclear wastes need to be displaced very carefully. Three mile island and Chernobyl incidents that occurred due to accidental leakage have resulted in large scale deaths and deadly effects on people for many generations
  - The nuclear waste is stored in shielded containers and buried inside the rock about 500m deep below the earth's surface
- **Green House Effect and global warming:**
  - A green house is a small glass house used for growing plants especially during winter. The glass panel of the green house lets the light in but does not allow the heat to escape. This helps in growing plants
  - The same effect of a green house is produced in the atmosphere, which is responsible for heating of earth's surface and atmosphere.

- Of all the sunlight reaching the earth's atmosphere about ¼th of it is absorbed and reflected by clouds and gases.
- Half of the incoming solar radiation reaches the earth's surface. A small portion of this light reaching the earth's surface is reflected back.
- Earth's surface re emits heat in the form of infra red radiation. Some of the infra red radiation are absorbed by the gases like CO_2 & CH_4 and radiate it back to earth making it warmer. This is also known as global warming
- Increase in the level of green house gases (CO_2 , CH_4, N_2O, CFC) has led to considerable heating of the earth and during the past century, the temperature of earth has increased by 0.6°c

- **Effects of global warming:**
  - Rise in temperature has resulted in climatic changes and has lead to increased melting polar ice caps
  - This will resulted in a rise in sea level and submerge many coastal areas
- **Control measures to reduce global warming:**
  - Cutting down use of fossil fuel
  - Improve efficiency of energy usage
  - Reduce deforestation and plant trees
  - Reduce the growth of human population
- **Ozone depletion in the stratosphere:**
  - Ozone is a gas present in the stratosphere and helps in absorbing UV rays in the sunlight.
  - UV rays are harmful to living organism as they break the bonds in the DNA molecules and lead to mutation.
  - Ozone gas is continuously formed by the action of UV rays on molecular O_2 and also degraded into molecular O_2 in the stratosphere

    $O_3 \rightarrow O_2+O$ $O_2+O \rightarrow O_3$
  - There should be a balance between the production and degradation of ozone. This balance is disrupted due to increase of CFC – chlorofluorocarbons
  - CFCs are discharged by refrigerants and they reach the stratosphere, where the UV rays act on them and release Cl atoms. Cl degrades ozone releasing molecular $_2$
  - The ozone depletion has occurred widely in the stratosphere and particularly over Antarctic region and is referred as ozone hole.
  - The UV B rays of the UV light are absorbed by the organisms, due to the ozone hole, causing damage to DNA, leads to aging of skin and various types of skin cancer.
  - Snow blindness: When the cornea absorbs the UV B radiations, it leads to inflammation, cataract and cause permanent blinding. This is also known as snow blindness because due to inflammation of the cornea the person cannot see properly or everything around him appears as bright white light.
  - Control measures: According to the 1987 Montreal protocol, reducing the use of CFC in refrigerants and controlling the emission of ozone depleting substances can reduce ozone depletion.

Degradation by Improper Resource Utilization and Maintenance: Natural resources are degraded not just because of pollution but due to improper use also.

- **Soil erosion:** Human activities like over cultivation, unrestricted grazing, deforestation and poor irrigation practice have led to reduction in soil fertility and formation of dry land. When patches of large barren land meet together it leads to formation of deserts.
- **Water logging and soil salinity**: Irrigation without proper drainage of water leads to water logging in the soil. Effects of water logging is that it affects the crop, draws salt to the surface of the soil. It accumulates at the roots of the plant and inhibits the growth.

- **Deforestation:** It is the conversion of forest areas to non-forest area or cutting down of trees in large scale. Deforestation occurs mainly due to agricultural practises, cutting down of trees for timber and fire wood, urbanisation and building dams and hydroprojects.
- **Slash and burn cultivation /Jhum cultivation:** It is a technique in agriculture where an area of forest is cleared by cutting and burning of trees and the land is used for farming. The ash that remains after burning is used as fertilizer. After cultivation for some time, the area is left unused for several years for recovery, after recovery the land is used again for agriculture. With increase in population and repeated cultivation, the recovery phase is done away with and results in deforestation
- **Effects of deforestation:** 1) Increase in carbon dioxide concentration and thus lead to global warming 2) soil erosion and may lead to desertification 3) loss of biodiversity
- **Reforestation:** it is the process of restoring a forest that once existed by planting trees.

Case Study of peoples' participation in conservation of forest

- Amrita Devi a bishnoi woman played a major role in wild life protection. In 1731, the king of Jodhpur asked his ministers to arrange for wood for constructing a new palace. When the workers went to a forest inhabited by the Bishnoi community to cut the trees, Amrita Devi protested against them by hugging the tree, but the king's men did but listen to her and thus she was killed along with her 3 daughters and several other people. In honour of her memory the government of India has instituted the Amrita Devi Bishnoi Wild life protection award for individuals from rural areas who show courage and dedication in wild life protection.
- **Chipko Movement:** it was started in1974, by local women of Garhwal Himalayas to protect trees. They showed a lot of bravery in protecting trees from the axe of contractors by hugging them.