Waste Management-II

Impact of Waste Accumulation

If wastes are allowed to accumulate and are not disposed carefully, then they will not only affect our environment but will also affect our health.

- When accumulated wastes are left opened and unattended, they begin to decompose. This results in the growth and multiplication of number of pathogenic bacteria, viruses and fungi which carry germs of various diseases to human settlements.
- Decomposition of wastes also produces various gases which pollute the air around us.
- During the rainy season, rainwater takes various decomposed wastes containing pathogens to water bodies causing water pollution.

Spoilage of Landscape

- Waste accumulation ruins the natural beauty of the landscape. Apart from this, it also becomes the thriving ground for rats and other disease-carrying germs.
- Burning of coal, fuel or wood produces sulphur and nitrogen which react with oxygen to form sulphur oxide and nitrogen oxide, respectively. When these gases react with water vapour, sulphuric acid and nitric acid are formed. Precipitation of water along with these acids forms acid rain.
- When monuments come into contact with acid rain, gypsum and calcium are washed away leading to their corrosion. Examples: The Parthenon of Athens, the Colosseum of Rome, the Taj Mahal of Agra

Pollution

- Pollution is caused by the introduction of harmful substance in the atmosphere. It is caused by the addition of waste toxic chemicals or gases into the atmosphere.
- Accumulation of waste leads to pollution. Industries, household activities, hospitals, restaurants and agricultural practices (such as the use of fertilisers) are the main sources of pollution.
- In open dumping, wastes are dumped in open spaces located far away from the limits of the city. This kind of waste disposal is not safe and has many limitations. The dumping of different types of wastes makes such dumping grounds the breeding ground of mosquitoes and flies. When these wastes are carried by rainwater to nearby lakes, rivers or ponds it results in water pollution.
- Industrial wastes contain harmful chemicals such as lead and mercury. These chemicals enter animal and human bodies by the food chain.

Eutrophication

It is a process in which oxygen begins to deplete from water bodies either naturally or because of human activities. Nutrients and chemicals are discharged into water bodies through sewage and effluents. Accumulation of these in water bodies results in the growth of phytoplankton and algae. This obstructs the penetration of oxygen and sunlight into water bodies which may result in the death of aquatic organisms.

Health Hazards

- Respiratory infections and irritation in the eyes, nose and throat. It causes headaches, nausea, dizziness and allergic reactions.
- Air pollution may also cause chronic respiratory diseases, lung cancer, cardiovascular diseases and even damages the nerves, kidneys and liver.

- Pathogens are disease-causing bacteria which are present in wastewater. When contaminated water is consumed, pathogens enter the human body. It may cause various water borne diseases such as typhoid, cholera, diarrhoea, dysentery and jaundice.
- Metals such as lead, mercury and cadmium dissolved in water may cause several diseases if they enter the human body. When water contaminated with cadmium was consumed by people in Japan, they were affected by a disease called Itai-Itai. Similarly, a disease known as Minamata affected the Japanese after they consumed fish which had large concentrations of mercury. Lead can affect the blood system and can lead to behavioural disorders.
- Radiations are extremely dangerous for human health as they produce harmful changes in the body cells and affect the genes.
- When people are exposed to radiations, their offspring may also be affected and gene mutations may be transmitted to future generations. This is known as genetic variations.
- When a person is exposed to radioactive pollution, damage may be caused to the body organs. It may result in lung cancer, brain cancer, thyroid cancer, sterility and reduced or defective eyesight.

Effects of Waste Accumulation on Terrestrial Life

Effects of waste accumulation on human health have already been discussed above.

Its effects on plants are

- Nitrogen dioxide leads to the premature falling of leaves. It also affects the growth of plants which result in low crop yields.
- Ozone enters the leaves of plants through stomata. It then dissolves with water within the plant and reacts with other chemicals damaging its leaves. Plants weakened by ozone may become more susceptible to various diseases, pests and droughts.
- Peroxyacetyl nitrate causes premature falling and discolouring of leafy vegetables.
- Sulphur dioxide has a bleaching effect on plants. It results in the loss of chlorophyll. Many leafy vegetables become yellow because of the effect of the gas.
- Radioactive pollution affects our environment. Radioactive wastes cannot be destroyed, and hence, they remain in our environment for a long period of time. They cause the discolouring of trees in the forests. After the Chernobyl nuclear accident, a pine forest cover near the power plant turned reddish brown.

Effects on Animals and Birds

- Animals may consume toxic materials or polythene bags from wastes. This results in the spread of diseases among them.
- The underground disposal of radioactive wastes may contaminate the drinking water which may be harmful for plants, animals and humans.
- Birds consuming agricultural wastes produce defective egg shells and show increased mortality.

Effects on Aquatic Life

When the quantities of harmful substances such as pesticides and insecticides increase in the food chain of marine and aquatic organisms who are then consumed by other living beings, it is known as the process of biomagnification. The phenomenon of concentrated toxic deposition at the higher trophic level in the food chain is known as **bioaccumulation**.

Minamata Tragedy

Minamata is a coastal town in Japan. It had a vinyl chloride factory which used to discharge effluents contaminated with methyl mercury into the sea. This was consumed by fish. When these fish were caught and consumed by the people, it caused Minamata disease. The disease affected the central nervous

system resulting in difficulty in walking and speaking among humans. Under extreme circumstances, the disease also resulted in death among people. Fishing in Minamata Bay was later banned by the Japanese authorities.

Safe Disposal of Wastes

It is important to safely dispose wastes. Wastes can be safely disposed in the following ways:

Segregation

This is a method in which wastes are segregated. Biodegradable and non-biodegradable wastes are segregated into different bins. Biodegradable wastes are then converted to useful products like biogas.

Open Dumping

In open dumping, wastes are dumped in open spaces located far away from the limits of the city. This kind of waste disposal is not safe and has many limitations. The dumping of different types of wastes makes such dumping grounds the breeding ground of mosquitoes and flies. Burning of these wastes also pollutes the air. The situation can become worse during the rains. Rainwater may carry these wastes to nearby lakes, rivers or ponds and pollute them.

Sanitary Landfills

In sanitary landfills, the wastes are disposed away from the city. The waste is first spread in layers and then is compacted tightly so that their volume is reduced. The waste is then covered by soil. The waste is then subjected to bacterial decomposition. Sanitary landfills are useful as the wastes are not attacked by rodents or insects. Sanitary landfills are planted with vegetation. It has to be taken care that the roots of plants which are grown should not penetrate more than 30 cm into the soil. Further, only those plants should be grown which have the ability to thrive on low nutrient soil.
One precaution which needs to be taken care is that landfills should not be located in areas which have high underground water level as it may get polluted.

Composting

In composting, household and municipal wastes are decomposed by the aerobic method. The wastes are decomposed by microorganisms.
This is a useful method of waste decomposition as wastes are decomposed by microorganisms into humus which adds fertility to the soil. Advantages of composting are

- Enhances soil nutrition and soil water retention capacity
- Checks soil erosion
- Increases the soil fertility by adding humus

Incineration

In the process of incineration, municipal wastes are burned at a very high temperature. Many materials like metal do not get completely burnt. These may be then recycled. This method however also pollutes the air with fly ash and sulphur dioxide.
It is also an expensive process as the installation of proper devices for controlling air pollution need to be installed. This method is useful because

- It kills pathogenic organisms and reduces the volume of wastes.
- It is useful for disposing petroleum and plastic wastes in chemical industries.

Management of Municipal Wastes

- Municipal authorities should collect solid wastes from each house.
- Horticultural and construction wastes should be collected separately and disposed of.
- Biomedical wastes and industrial wastes should not be mixed with municipal wastes.
- Municipal wastes should be carefully stored and segregated.

Drainage and Treatment of Effluents

Wastewater has to undergo three treatments during its purification. These are

Primary Treatment

- In the first stage of primary treatment, large particles such as rags and sticks are removed from water.
- To remove inorganic solids such as silt, egg shells along with bone chips and seeds, known as grit, the wastewater is made to enter a grit chamber where the speed of water is decreased. The grit then settles and is removed manually or mechanically from the grit chamber.
- Water then flows into a sedimentation tank. In the process of sedimentation, water is stored in large basins where sand particles, silt and other particles settle. The impurities or sludge are then removed.
- The process in which sedimented water is subjected to a chemical process is known as coagulation or flocculation.
- In the process of filtration, suspended impurities are removed by making water pass through a barrier of sand matrix.

Secondary Treatment of Water

- In this method, the organic matter which is present in water is biologically degraded by microorganisms. When water enters a tank, it comes into contact with microorganisms.
- Air is introduced into the tank through diffusers. Microorganisms in the presence of oxygen break the organic matter and the impurities then settle at the bottom of the tank which are later removed.
- Water is then treated with chlorine gas which then kills the rest of the harmful organisms.

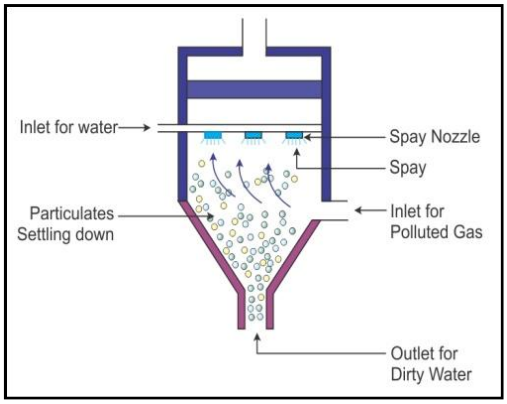
Tertiary Treatment

Tertiary treatment: In this method, nutrients such as nitrogen or phosphorus are removed. This water can be reused for industrial, agricultural and domestic purposes.

Pollution Control Devices and their Functioning

Scrubber

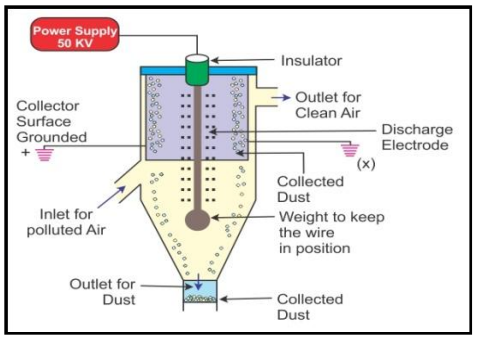
- Wet scrubber is a device which is used for trapping the emissions of water-soluble gases such as sulphur dioxide, nitrogen oxide and ammonia.
- In a wet scrubber, spray nozzles are fitted through which water is sprayed into the device in a way that it goes downwards.
- As polluted gases rise upwards, the particulate matter present in it collides with water drops. Because of the gravitational force, the water drops containing particulate matter settle at the bottom and the pollutants are segregated.



Scrubber

Electrostatic Precipitator

- This device is used for removing fly ash after combustion of coal or other materials. The process of its working is as follows:
- After combustion of coal and other materials, polluted gas or smoke enters the electrostatic precipitator.
- The devise is electronically charged. The polluted air and the impurities become negatively charged as they gain electrons on their surface.
- Negatively charged dust particles are then drawn towards the positive charged electrode plates and are deposited there.
- Impurities are then dislodged by mechanical rappers and get collected at the bottom of the unit in a hopper.
- An electrostatic precipitator is a very efficient device which removes more than 99% of impurities.
- The advantages of using this device are that they are economical to operate and have high efficiency. They also do not produce moisture plume.



Electronic Precipitator

Reduce, Reuse and Recycle

Wastes should be reduced, reused and recycled.

- Waste can be reduced by reducing the generation of waste from industries. Wastes should also be segregated.
- Wastes such as glass, rubber and metal pieces can be reused to produce new materials. Wastes such as fly ash produced by the paper industry can be used for making roads and filling up low-lying areas.
- Wastes can also be treated and recycled to make new products. Example: The paper industry uses recycled pieces of wood from the furniture industry. Paper can also be recycled.

Government Initiatives for Protecting the Environment

The Environment Protection Act (1986) empowers the central government to coordinate actions of the state governments and plan and execute a nationwide programme for the prevention, control and abatement of environmental pollution.

Environmental activists have been demanding that large and big dams should not be built, as construction of big dams submerges forested land, disrupts the ecosystem of rivers and destroys not only the aquatic life but also the terrestrial life around them. Building of large dams also displaces people in large numbers.

Social Initiatives

Many social initiatives are taken to protect the environment. Some of these are

- Air pollution can be minimised by using public transport by car pooling.
- People living in housing societies can initiate steps for waste management by making provisions for waste segregation and building compost pits.
- People should stress on making houses or residential buildings with solar panels and water recharging facilities.

Individual initiatives

- Use of plastic bags should be discarded, and bags made of jute or cloth should be encouraged
- Use eco-friendly objects
- Cut down on the use of chlorofluorocarbons (CFCs)
- Adopt and popularise renewable sources of energy
- Reuse and recycle wastes
- Use rechargeable batteries