

MODULE -

4

ENVIRONMENTAL POLLUTION

Environmental Pollution: Definition, Cause, effects and control measures of - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards, Solid waste Management, Disaster management Role of an individual in prevention of pollution, Pollution case studies.

Pollution is the impact of undesirable changes in our surroundings that affect plants, creatures and individuals. Pollution is the introduction of contaminants into a natural atmosphere that causes instability, disorder, harm or discomfort to the ecosystem. Pollution can appear as chemical substances or energy such as noise, heat or light.

During the last few decades we have contaminated our air, water and land on which life itself depends with a variety of waste products. Pollutants include solid, liquid or gaseous substances present in greater than natural abundance produced due to human activity, which have a detrimental effect on our environment. The nature and amount of a pollutant determines the severity of detrimental effects on human health. Even a small concentration of pollutants in the air becomes more significant in comparison to the similar levels present in food. Pollutants that enter water have the ability to spread to distant places especially in the marine ecosystem.

4.1 TYPES OF POLLUTION

- Air pollution
- Water pollution
- Soil Pollution

- Marine Pollution
- Thermal Pollution

4.2 AIR POLLUTION

Air pollution occurs due to the presence of undesirable solid or gaseous particles in the air in quantities that are harmful to human health and the environment. Air may get polluted by natural causes such as volcanoes, which release ash, dust, sulphur and other gases.

4.2.1 SOURCES OF AIR POLLUTION

Pollutants that are emitted directly from identifiable sources are produced both by natural events (for example, dust storms and volcanic eruptions) and human activities (emission from vehicles, industries, etc.). These are called **primary pollutants**. There are five primary pollutants that together contribute to a large extent to air pollution. These are carbon oxides (CO and CO₂), nitrogen oxides, sulphur oxides, volatile organic compounds (mostly hydrocarbons) and suspended particulate matter.

Pollutants that are produced in the atmosphere when certain chemical reactions take place among the primary pollutants are called **secondary pollutants**. These are sulfuric acid, nitric acid, carbonic acid.

Carbon monoxide is a colourless, odourless and toxic gas produced when organic materials such as natural gas, coal or wood are incompletely burnt. Vehicular exhausts are the single largest source of carbon monoxide.

Sulphur oxides are produced when sulphur containing fossil fuels are burnt.

Nitrogen oxides are found in vehicular exhausts. Nitrogen oxides are significant, as they are involved in the production of secondary air pollutants such as ozone.

Hydrocarbons are a group of compounds consisting of carbon and hydrogen atoms. They either evaporate from fuel supplies or are remnants of fuel that did not burn completely. Hydrocarbons are washed out of the air when it rains and run into surface water. They cause an oily film on the surface and react to form secondary pollutants.

Particulates are small solid materials (for example, smoke particles from fires, bits of asbestos, dust particles and ash from industries) dispersed into the atmosphere. The effects of particulates range from soot to the carcinogenic (cancer causing) effects of asbestos, dust particles and ash from industrial plants that are dispersed into the atmosphere. Repeated exposure to particulates can cause them to accumulate in the lungs and interfere with the ability of the lungs to exchange gases.

Lead is a major air pollutant that remains largely unmonitored and is emitted by vehicles.

4.2.2 EFFECTS OF AIR POLLUTION

Living Organisms: Prolonged exposure to air pollutants can breakdown natural defences of the body causing or contributing to diseases such as lung cancer, asthma, chronic bronchitis and emphysema. Chronic exposure causes a condition similar to bronchitis. Suspended particles aggravate bronchitis and asthma. Exposure to these particles over a long period of time damages lung tissue and contributes to the development of chronic respiratory disease and cancer.

Plants: When some gaseous pollutants enter leaf pores they damage the leaves of crop plants. Chronic exposure of the leaves to air pollutants can break down the waxy coating that helps prevent excessive water loss and leads to damage from diseases, pests, drought and frost.

Materials: Air pollutants break down exterior paint on cars and houses. All around the world air pollutants have discoloured irreplaceable monuments, historic buildings, marble statues, etc.

4.2.3 CONTROL MEASURES

Air pollution can be controlled by two fundamental approaches: preventive techniques and effluent control.

One of the effective means of controlling air pollution is to have proper equipment in place. This includes devices for removal of pollutants from the flue gases through **scrubbers, closed collection recovery systems** through which it is possible to collect the pollutants before they escape, **use of dry and wet collectors, filters, electrostatic precipitators**, etc. Providing a greater height to the stacks can help in facilitating the discharge of pollutants as far away from the ground as possible. Industries should be located in places so as to minimize the effects of pollution after considering the topography and the wind directions.

4.3 WATER POLLUTION

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater. Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

4.3.1 CAUSES OF WATER POLLUTION

There are several classes of common water pollutants. These are **disease-causing agents (pathogens)** which include bacteria, viruses, protozoa and parasitic worms that enter water from domestic sewage and untreated human and animal wastes. Human wastes contain bacteria. Large amounts of human waste in water, increases the number of these bacteria which cause gastrointestinal diseases.

The next category water pollutants are **oxygen depleting wastes**. These are organic wastes that can be decomposed by aerobic (oxygen requiring) bacteria. Large populations of bacteria use up the oxygen present in water to degrade these wastes. In the process this degrades water quality. The amount of oxygen required to break down a certain amount of organic matter is called the biological oxygen demand (BOD). The amount of BOD in the water is an indicator of the level of pollution.

The third category of pollutants are **inorganic plant nutrients**. These are water soluble nitrates and phosphates that cause excessive growth of algae and other aquatic plants. They may interfere with the use of the water by clogging water intake pipes, changing the taste and odour of water and cause a build-up of organic matters.

The fourth category are water **soluble inorganic chemicals** which are acids, salts and compounds of toxic metals such as mercury and lead. High levels of these chemicals can make the water unfit to drink, harm fish and other aquatic life, reduce crop yields and accelerate corrosion of equipment that use this water.

4.3.2 EFFECT OF WATER POLLUTION

The main problem caused by water pollution is that it kills organisms that depend on these water bodies. Pollution disrupts the natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and shellfish, and the food chain continues to be disrupted at all higher levels. Ecosystems can be severely changed or destroyed by water pollution. Groundwater contamination from pesticides causes damage within wildlife in ecosystems. Sewage, fertilizer, and agricultural run-off contain organic materials that when discharged into waters, increase the growth of algae, which causes the depletion of oxygen. The low oxygen levels are not able to support most indigenous organisms in the area and therefore upset the natural ecological balance in rivers and lakes. Drinking contaminated water causes skin rashes and health problems like cancer, typhoid fever and stomach sickness in humans. Water pollution causes flooding due to the accumulation of solid waste and soil erosion in streams and rivers. Oil spills in the water causes animal to die when they ingest it or encounter it. Oil does not dissolve in water so it causes suffocation in fish and birds.

4.3.3 CONTROL MEASURES OF WATER POLLUTION

The foremost necessity is prevention, setting up effluent treatment plants and treating waste through these can reduce the pollution load in the recipient water. The treated effluent can be

reused for either gardening or cooling purposes wherever possible. Use environment friendly household products, such as washing powder, household cleaning agents etc. Excessive use of pesticides and fertilizers should be avoided. Don't throw litter into rivers, lakes or oceans and dispose it at designated bins. Suspended, solid particles and inorganic material can be removed by the use of filters. Use of biological filters and processes can naturally degrade the organic waste material.

4.4 SOIL POLLUTION

Soil is a thin covering over the land consisting of a mixture of minerals, organic material, living organisms, air and water that together support the growth of plant life. Soils vary in their content of clay (very fine particles), silt (fine particles), sand (medium size particles) and gravel (coarse to very coarse particles). The relative amounts of the different sizes and types of mineral particles determine soil texture.

Soil erosion can be defined as the movement of surface litter and topsoil from one place to another. While erosion is a natural process often caused by wind and flowing water it is greatly accelerated by human activities such as farming, construction, overgrazing by livestock, burning of grass cover and deforestation.

4.4.1 CAUSES AND EFFECTS OF SOIL POLLUTION

Loss of the topsoil makes a soil less fertile and reduces its water holding capacity. The topsoil, which is washed away, also contributes to water pollution clogging lakes, increasing turbidity of the water and also leads to loss of aquatic life.

Industrial Activity: Industrial activity has been the biggest contributor to the problem. Most industries are dependent on extracting minerals from the Earth. Whether it is iron ore or coal, the by products are contaminated and they are not disposed of in a manner that can be considered safe and makes it unsuitable for use.

Agricultural Activities: Chemical utilization has gone up tremendously since technology provided us with modern pesticides and fertilizers. They contain chemicals that are not produced in nature and cannot be broken down by it. As a result, they seep into the ground after they mix with water and slowly reduce the fertility of the soil. Other chemicals damage the composition of the soil and make it easier to erode by water and air. Plants absorb many of these pesticides and when they decompose, they cause soil pollution since they become a part of the land.

Waste Disposal: While industrial waste is sure to cause contamination, there is another way in which we are adding to the pollution. Every human produces a certain amount of waste products by way of defecation. While much of it moves into the sewer system, there is also a large amount that is dumped directly into landfills. Even the sewer system ends at the landfill, where the biological waste pollutes the soil and water. This is because our bodies are full of toxins and chemicals which are now seeping into the land and causing pollution of soil.

Accidental Oil Spills: Oil leaks can happen during storage and transport of chemicals. This can be seen at most of the fuel stations. The chemicals present in the fuel deteriorates the quality of soil and make them unsuitable for cultivation. These chemicals can enter into the groundwater through soil and make the water unsafe for consumption.

Acid Rain: Acid rain is caused when pollutants present in the air mixes up with the rain and returns on the ground. The polluted water could dissolve away some of the important nutrients found in soil and change the structure of the soil.

4.4.2 CONTROL MEASURES OF SOIL POLLUTION

It is essential that proper soil conservation measures are used to minimize the loss of top soil. There are several techniques that can protect soil from erosion. The most commonly employed methods include the two types of treatment that are generally used.

- Area treatment which involves treating the land
- Drainage line treatment which involves treating the natural water courses

Continuous contour trenches can be used to enhance infiltration of water reduce the runoff and check soil erosion. It involves shallow trenches dug across the slope of the land and along the contour lines basically for the purpose of soil and water conservation. They are most effective on gentle slopes and in areas of low to medium rainfall.

Live check dams which barriers created by planting grass, shrubs and trees across the gullies can be used for this purpose.

A bund constructed out of stones across the stream can also be used for conserving soil and water.

4.5 MARINE POLLUTION

It is defined as the discharge of waste substances into the sea resulting in harm to living resources, hazards to human health, hindrance to fishery and impairment of quality for use of sea-water. Marine pollution is associated with the changes in physical, chemical and biological conditions of the sea water.

4.5.1 CAUSES OF MARINE POLLUTION

The most obvious inputs of waste are through pipes directly discharging wastes into the sea. municipal waste and sewage from residences and hotels in coastal towns are directly discharged into the sea.

Pesticides and fertilizers from agriculture which are washed off the land by rain, enter water courses and eventually reach the sea.

Petroleum and oils washed off from the roads enter the sewage system. When storm water overflows, these materials are carried into rivers and eventually into the seas.

Ship accidents and accidental spillages at sea can be very damaging to the marine environment. They may contain heavy metals and other contaminants are often dumped out to sea.

Offshore oil exploration and extraction also pollute the seawater to a large extent.

4.5.2 EFFECTS OF MARINE POLLUTION

Apart from causing eutrophication a large amount of organic wastes can also result in the development of red tides. Many important commercially important marine species are also killed due to clogging of gills or other structures. Oil slicks damage marine life to a large extent. Salt marshes, mangrove swamps are likely to trap oil and the plants, which form the basis for these ecosystems thus suffer.

4.5.3 CONTROL MEASURES OF MARINE POLLUTION

Reducing the pollution load on marine waters is through the introduction of sewage treatment plants. This will reduce the biological oxygen demand (BOD) of the final product before it is discharged to the receiving waters.

Primary treatment: These treatment plants use physical processes such as screening and sedimentation to remove pollutants that will settle, float or, that are too large to pass through simple screening devices. After screening the wastewater passes into a grit chamber. The detention time is chosen to be long enough to allow lighter, organic material to settle. From the grit chamber the sewage passes into a primary settling tank (also called as sedimentation tank) where the flow speed is reduced sufficiently to allow most of the suspended solids to settle out by gravity. If the waste is to undergo only primary treatment it is then chlorinated to destroy bacteria and control odours after which the effluent is released.

Secondary treatment: The main objective of secondary treatment is to remove most of the BOD. There are three commonly used approaches: trickling filters, activated sludge process and oxidation ponds.

A trickling filter consists of a rotating distribution arm that sprays liquid wastewater over a circular bed of 'fist size' rocks or other coarse materials. The spaces between the rocks allow air to circulate easily so that aerobic conditions can be maintained. The individual rocks in the bed are covered with a layer of slime, which consists of bacteria, fungi, algae, etc. which degrade the waste trickling through the bed.

In the activated sludge process, the sewage is pumped into a large tank and mixed for several hours with bacteria rich sludge and air bubbles to facilitate degradation by micro-organisms. The water then goes into a sedimentation tank where most of the microorganisms settle out as sludge.

Oxidation ponds are large shallow ponds approximately 1 to 2 metres deep where raw or partially treated sewage is decomposed by microorganisms.

4.6 NOISE POLLUTION

Noise is undesirable and unwanted sound. Noise may not seem as harmful as the contamination of air or water but it is a pollution problem that affects human health and can contribute to a general deterioration of environmental quality.

4.6.1 CAUSES OF NOISE POLLUTION

There are several sources of noise pollution that contribute to both indoor and outdoor noise pollution. Noise emanating from factories, vehicles, playing of loudspeakers during various festivals can contribute to outdoor noise pollution while loudly played radio or music systems, and other electronic gadgets can contribute to indoor noise pollution.

4.6.2 EFFECTS OF NOISE POLLUTION

Physical health: The most direct harmful effect of excessive noise is physical damage to the ear and the temporary or permanent hearing loss. Below a sound level of 80 dBA hearing loss does not occur at all. However temporary effects are noticed at sound levels

between 80 and 130 dBA. A sound level of 150 dBA or more can physically rupture the human eardrum. The degree of hearing loss depends on the duration as well as the intensity of the noise. In addition to hearing losses excessive sound levels can cause harmful effects on the circulatory system by raising blood pressure and altering pulse rates.

Mental health: Noise can also cause emotional or psychological effects such as irritability, anxiety and stress. Lack of concentration and mental fatigue are significant health effects of noise.

4.6.3 CONTROL MEASURES OF NOISE POLLUTION

There are four fundamental ways in which noise can be controlled: Reduce noise at the source, block the path of noise, increase the path length and protect the recipient. In general, the best control method is to reduce noise levels at the source.

Source reduction can be done by effectively muffling vehicles and machinery to reduce the noise. In industries noise reduction can be done by using rigid sealed enclosures around machinery lined with acoustic absorbing material. Another best method of noise source reduction is regular and thorough maintenance of operating machinery. Noise levels at construction sites can be controlled using proper construction planning and scheduling techniques.

4.7 THERMAL POLLUTION

Thermal pollution is the act of altering the temperature of a natural water body, which may be a river, lake or ocean environment.

Definition-The discharge of warm water into a river is usually called a thermal pollution.

4.7.1 CAUSES OF THERMAL POLLUTION

It occurs when an industry removes water from a source, uses the water for cooling purposes and then returns the heated water to its source. Power plants heat water to convert it into steam, to drive the turbines that generate electricity. the steam is condensed into water after it leaves the turbines. This condensation is done

by taking water from a water body to absorb the heat. This heated water is discharged back into the water body. This condition chiefly arises from the waste heat generated by an industrial process such as certain power generation plants. There can be significant environmental consequences of thermal pollution with respect to surface receiving waters such as rivers and lakes; in particular, decrease in biodiversity and creation of an environment hospitable to alien aquatic species may occur.

4.7.2 EFFECTS OF THERMAL POLLUTION

The warmer temperature decreases the solubility of oxygen and increases the metabolism of fish. This changes the ecological balance of the river. Sudden changes in temperature caused by periodic plant shutdowns both planned and unintentional can change result in death of these fish that are acclimatized to living in warmer waters. Due to decrease in Dissolved Oxygen levels there is suffocation of plants and animal species which creates anaerobic conditions. The sudden change in the temperature causes harm to the aquatic organisms. The heated water is used for irrigation purposes to extend plant growing seasons.

4.7.3 CONTROL MEASURES OF THERMAL POLLUTION

Thermal pollution can be controlled by passing the heated water through a cooling pond or a cooling tower after it leaves the condenser. The heat is dissipated into the air and the water can then be discharged into the river or pumped back to the plant for reuse as cooling water.

One method is to construct a large shallow pond. Hot water is pumped into one end of the pond and cooler water is removed from the other end. The heat gets dissipated from the pond into the atmosphere.

A second method is to use a cooling tower. Here warm waters coming from the condenser is sprayed downward over vertical sheets or baffles where the water flows in thin films. Cool air enters the tower through the water inlet that encircles the base of the tower and rises upwards causing evaporative cooling. The waste heat is

dissipated into the atmosphere about 100 m above the base of the tower. The cooled water is collected at the floor of the tower and recycled back to the power plant condensers.

4.8 SOLID WASTE MANAGEMENT

Waste, which is non-affective and comes from city, town or village as domestic and biomedical waste is termed as **solid waste**. The process of transportation, storage, collection and processing of solid waste in a protective and economic manner is termed as **Solid Waste Management(SWM)**.

4.8.1 NATURE OF THE PROBLEM

- SWM is a civic problem and it has to evolve optimally &continuously to serve the future generation.
- Solid wastes if unchecked can not only be a health hazard but will impart multidimensional threats.
- A complete and environmentally sound SWM requires effective contribution from all those who are involved in this problem.
- Everyone is involved in solid waste generation problem so everyone should be involved in the proper disposal of it.

4.8.2 SWM TECHNIQUES

An integrated waste management strategy includes three main components:

1. Source reduction
2. Recycling
3. Disposal

Source reduction is one of the fundamental ways to reduce waste. This can be done by using less material when making a product, reuse of products on site, designing products or packaging to reduce their quantity.

Recycling is reusing some components of the waste that may have some economic value. Recycling has readily visible benefits such as conservation of resources reduction in energy used during manufacture and reducing pollution levels.

Disposal of solid waste is done most commonly through a sanitary landfill or through incineration. A modern sanitary landfill is a depression in an impermeable soil layer that is lined with an impermeable membrane.

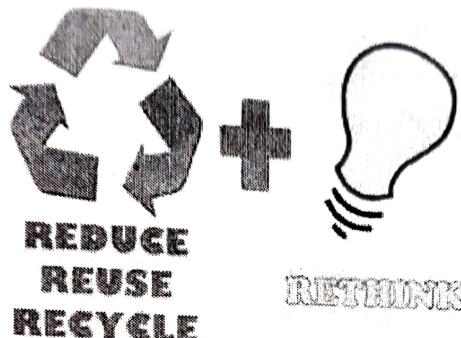


Fig 4.1 Strategy for Solid Waste Management

Even though landfilling is an economic alternative for solid waste disposal, it has become increasingly difficult to find suitable landfilling sites that are within economic hauling distance and very often citizens do not want landfills in their vicinity.

Methods include Incineration and Vermi composting

Incineration is the process of burning municipal solid waste in a properly designed furnace under suitable temperature and operating conditions. Incineration is a chemical process in which the combustible portion of the waste is combined with oxygen forming carbon dioxide and water, which are released into the atmosphere. However, extensive air pollution control equipment and high-level technical supervision and skilled employees for proper operation and maintenance is required.

Vermi Composting involves collection of all dead and dry leaves and twigs to decompose and are broken down by organisms such as worms and insects, and is finally broken down by bacteria and fungi, to form a dark rich soil-like material called compost. These organisms in the soil use the organic material as food, which provides them with nutrients for their growth and activities. These nutrients are returned to the soil to be used again by trees and other plants. This process recycles nutrients in nature. This soil can be used as a manure for farms and gardens.

4.9 ROLE OF INDIVIDUAL IN PREVENTION OF POLLUTION

Concepts that help individuals contribute towards a better quality of our environment and human life include

- Develop respect for all forms of life.
- Plant trees wherever you can and more importantly take care of them. They reduce air pollution.
- Reduce the use of wood and paper products wherever possible.
- Do not buy furniture, doors, window frames made from tropical hardwoods such as teak and mahogany. These are forest based.
- Reduce the use of fossil fuels by either walking up a short distance using a car pool, sharing a bike or using public transport. This reduces air pollution.
- Shut off the lights and fans when not needed.
- Don't use aerosol spray products and commercial room air fresheners. They damage the ozone layer.
- Use rechargeable batteries.
- Try to avoid asking for plastic carry bags when you buy groceries or vegetables or any other items. Use your own cloth bag instead.
- Use sponges and washable cloth napkins, dish towels and handkerchiefs instead of paper ones
- Don't use throwaway paper and plastic plates and cups when reusable versions are available.
- Recycle all newspaper, glass, aluminium and other items accepted for recycling in your area.
- Set up a compost bin in your garden or terrace and use it to produce manure for your plants to reduce use of fertilizers.
- Do not litter the roads and surroundings.

Take care to put into practice what you preach. *ENVIRONMENT PROTECTION BEGINS WITH YOU.*

4.10 POLLUTION CASE STUDIES

1. Bhopal gas tragedy
2. Love canal tragedy

- 3. Arsenic pollution in ground water
- 4. Chernobyl nuclear disaster

4.10.1 DONORA AIR POLLUTION DISASTER

- Donora (Pennsylvania, USA) is a mill town - Steel mill, Zinc smelter, Sulphuric Acid plant.
- Donora is in a valley on Monongahela river surrounded by steep hills on each side of the river.
- 25-31 October 1948 - fog due to accumulation of cold air due to inversion. Inversion is trapping of cold layer below the warm layer.
- Effect of inversion- Top fog layer reflected away the solar radiation during day time.
- Insufficient heat to break the inversion
- Pollutants of the mills got trapped in lower layer and remained for 4 days.
- 6000 of 14000 people living in Donora fell ill, 20 died.

4.10.2 BHOPAL GAS TRAGEDY

- 2-3rd December 1984 – Union Carbide Company, Bhopal – major disaster. UCC Manufactured Carbaryl pesticide using Methyl Isocyanite(MIC).
- Cause of accident - Accidental entry of water in processing tank -Overheating of mixture - Failure of cooling system- Safety Devices in not working condition - EXPLOSION.
- 40 tons of MIC leaked into atmosphere.
- Lungs, eye and skin damage in 40km² area. 5100 people died. 250000 people got exposed to MIC. 65000 people suffered from severe diseases. 1000 people became blind.
- \$570 million to clean up and settlement of damages all because of lack of safety measurements in proper working condition.

4.10.3 LOVE CANAL TRAGEDY

- Love Canal was built by William Love in suburb of Niagara falls, New York. It was later dug up and used to dump sealed steel drums of chemical wastes by Hooker chemicals corporation (1942-1953).

- In 1953 the site was covered with clay and top soil and sold to city board of education. Elementary school and houses were built.
- 1976- residents complain about foul smell. Children playing in canal area received chemical burns.
- Cause- steel containers got corroded- leaking of chemicals into storm sewers, basement of homes and school playgrounds.
- Remedy-
 1. Wastes were pumped to the new treatment plant
 2. Families were relocated.

4.10.4 ARSENIC POLLUTION IN GROUND WATER

- West Bengal and Bangladesh are severely infected by toxic heavy metal Arsenic(study report of 1978- west Bengal) (1993- Bangladesh)
- Residents have been taking low doses of Arsenic for 10-14 years through contaminated water.
- Result-white/black spots called Melanosis affecting the skin - Leprosy like skin lesions on palms and soles. Eventually rotting into ulcers. Long exposure results in cancer. Affected people are socially boycotted.
- 24-Parganas, Hooghly, Murshidabad districts are the most Arsenic risk zone.
- Cause- excess use of lead Arsenate, copper arsenate as pesticides in summer paddy and jute crops.
- Short term remedy-contaminated tube wells in the state are being painted red whereas safe water tube wells are painted green for the use of people.

4.10.5 CHERNOBYL NUCLEAR DISASTER

- Worst nuclear disaster-26 April 1986 in Chernobyl, Ukraine.
- The power plant designed to produce 1000MW electrical energy, was working continuously for 2 years. Shut down on 25th April for normal repair work.
- Due to faulty shutting down process - SEVERE EXPLOSION
- Severity- 1000 tonne steel concrete lid blew off - Fire started- Temperature rose to 2000°C - Fuel and Radioactive debris

spread out on volcanic cloud – neighbouring countries Poland, Sweden, Denmark and Norway were also affected.

- Damage-506000 people were affected - Risk of severe diseases like cancer and leukaemia- People also suffered from anaemia, loss of hair, damaged skin - 2000 people died – Flora and fauna destroyed -agriculture produces were damaged for years.
- Future precaution- nuclear energy is a cheap, non-polluting source of energy but lack of proper care and safety measures can create huge disasters.

LIST OF QUESTIONS

1. Discuss briefly the causes, effects and control measures of air pollution.
2. Enumerate the water pollution causes and its effects. Mention the control measures that can be initiated for mitigating the same.
3. Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution (iii) Thermal Pollution
4. Discuss Solid Waste Management techniques.
5. Enumerate the role of an individual in prevention of pollution.
6. Discuss any two case studies related to pollution of environment in detail.

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