

Chapter 4

Other Types of Pollution

There are a lot of ways other than air pollution and water pollution by which the environment gets polluted day by day. Out of which the major types are,

1. Soil Pollution.
2. Thermal Pollution.
3. Noise Pollution.
4. Radiation Pollution.

4.1 Soil Pollution

Soil pollution is the contamination of soil with harmful substances, when they cross their threshold levels, can adversely affect the quality of the soil and the health of those living on it. It usually results from different human activities like waste dumping, use of agrochemicals, mining operations and urbanisation.

4.1.1 Causes

1. Industrial Activity:- Industrial activity has been the biggest contributor to the problem in the last century, especially since the amount of mining and manufacturing has increased. 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 off in a manner that can be considered safe. As a result, the industrial waste lingers in the soil surface for a long time and makes it unsuitable for use.

Most of the industrial waste rejected contains materials like calcium carbonate, Magnesium, sulphides etc. This causes toxicity in the soil.

2. Agricultural Activities:- Chemical utilization has gone up tremendously since technology provided us with modern pesticides and fertilizers. They are full of 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.

Chemicals used in this field include pesticides, insecticides, fertilisers etc. Excessive use of these chemicals increases the salinity of the soil which in turn affects the micro organisms present in the soil causing soil to lose its fertility.

3. Waste Disposal:- Finally, a growing cause for concern is how we dispose of our waste. 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 personal waste products by way of urine and faeces.

While much of it moves into the sewer the system, there is also a large amount that is dumped directly into landfills in the form of diapers. 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.

Both domestic and commercial waste contain garbage and rubbish material like, paper, fibres, plastic, glasses, bottles, and dried sludge of sewage.

Other major wastes are from:

- (i). Radio active waste.
- (ii). Waste from mining.
- (iii). Solid wastes including domestic and commercial wastes.
- (iv). Electronic wastes(e-wastes).

4. 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 undrinkable.

5. Acid Rain:- Acid rain is caused when pollutants present in the air mixes up with the rain and fall back on the ground. The polluted water could dissolve away some of the important nutrients found in soil and change the structure of the soil. As a result soil loses its nutrient due to high solubility in acidic water.

6. Soil Erosion:- Soil erosion occurs when top soil moves from one place to another as a result of various natural and man made factors. It leads to decrease in the soils capacity to retain water. When the soil is eroded the crops grown are effected resulting in an indirect effect on environment.

Other minor causes of soil pollution are:

7. Salty water.
8. Leakage of toxins.
9. Intensive farming.
10. Overgrazing of animals.
11. Genetically modified plants.
12. Industrial accidents.
13. Disposal of coal ash.
14. Wars and explosives.

4.1.2 Effects of Soil Pollution

1. Effect on Health of Humans: Considering how soil is the reason we are able to sustain ourselves, the contamination of it has major consequences on our health. Crops and plants grown on polluted soil absorb much of the pollution and then pass these on to us. This could explain the sudden surge in small and terminal illnesses. Long term exposure to such soil can affect the genetic make-up of the body, causing congenital illnesses and chronic health problems that cannot be cured easily. In fact, it can sicken the livestock to a considerable extent and cause food poisoning over a long period of time. The soil pollution can even lead to widespread famines if the plants are unable to grow in it. Effects of public health can be consolidated as

- (i). Foul smell and release of poisonous gases.
- (ii). Pollution of drinking water sources.

- (iii). Poisoning effect by consuming polluted plants and plant products.
- (iv). Organ damage due to heavy metal accumulation.i.e. Liver , Kidney etc.
- (v). Irreversible developmental damage in children.
- (vi). Damage to developing brains of young children.
- (vii). Leads to neurological damage.
- (viii). Bio magnification
- (ix). Radio active wastes emits gamma radiations which causes health problems.

2. Effect on Growth of Plants: The ecological balance of any system gets affected due to the widespread contamination of the soil. Most plants are unable to adapt when the chemistry of the soil changes so radically in a short period of time. Fungi and bacteria found in the soil that bind it together begin to decline, which creates an additional problem of soil erosion. The fertility slowly diminishes, making land unsuitable for agriculture and any local vegetation to survive. The soil pollution causes large tracts of land to become hazardous to health. Unlike deserts, which are suitable for its native vegetation, such land cannot support most forms of life. Other effects are

- (i). Loss of a variety of micro organisms which is essential for plant life.
- (ii). Pollutants accumulate in plants by root absorption.
- (iii). Decrease photosynthesis.
- (iv). Reduce crop yield.

3. Decreased Soil Fertility: The toxic chemicals present in the soil can decrease soil fertility and therefore decrease in the soil yield. The contaminated soil is then used to produce fruits and vegetables which lacks quality nutrients and may contain some poisonous substance to cause serious health problems in people consuming them.

4. Toxic Dust: The emission of toxic and foul gases from landfills pollutes the environment and causes serious effects on health of some people. The unpleasant smell causes inconvenience to other people.

5. Changes in Soil Structure: The death of many soil organisms (e.g. earthworms) in the soil can lead to alteration in soil structure. Apart from that, it could also force other predators to move to other places in search of food.

Harmful effects on soil structure are:

- (i). Leads to soil infertility.
- (ii). Decrease soil yield.
- (iii). Loss of nutrients in the soil.
- (iv). Change soil texture, p^H etc.
- (v). Non biodegradable wastes in soil arrests the penetration of water into soil.
- (vi). Inorganic fertilisers and pesticide residues change chemical properties of the soil.
- (vii). Contamination of top soil.

4.1.3 Control of soil Pollution

The following steps have been suggested to control soil pollution. One thing that we can do for prevention of soil pollution is to prevent soil erosion. In general we would need less fertilizer and fewer pesticides if we could all adopt the three R's: Reduce, Reuse, and Recycle. This would give us less solid waste.

In short the control of soil pollution is multi faced. Important are:

1. Safe land use.
2. Planned urbanisation.
3. Controlled developmental activities.
4. Reduce use of pesticides, insecticides, and fungicides.
5. Manures and bio fertilisers like rhizobium can be used to increase the fertility of the soil.
6. Waste should be disposed off properly to avoid pollution
7. Acidic and alkaline waste should be neutralised before they are disposed off; so they don't contaminate soil.
8. Biodegradable waste should be broken down before disposing it off.
9. Bio augmentation is the practice of inoculating contaminated soil with large number of appropriate micro-organisms.
10. Cheaper pollution clean up methods are to employed.
11. Bio remediation.
12. Proper disposal of industrial waste.
13. Waste reduction techniques.
14. As far as possible adopt recycling methods i.e in the case of paper, plastics etc.
15. Reduce toxic wastes.
16. Proper waste disposal at home.
17. Use of chemicals preferable in optimal dose.
18. Afforestation.e. planting of more trees.
19. Weed control.
20. Incineration and pyrolysis of solid wastes especially biochemical wastes.
21. Municipal wastes transformed into manure by composting.

4.2 Types Waste

4.2.1 Biodegradable Waste

Materials or Objects capable of being broken down or decomposed to smaller products by the action of living things (such as animals or microorganisms). After being broken down they are easily absorbed into the soil to become nutrients or elements. It is generally of plant, animal or mineral origin. It can be easily disposed by the action of microorganisms or animals. It can be broken down to base elements and is easily absorbed by the environment without damaging it. Examples of biodegradable items are:

- Food Waste
- Animal And Human Excrement
- Manure
- Sewage
- Slaughterhouse waste
- Most paper products
- Egg shells
- Grass
- Flower/brush clippings

4.2.2 Non biodegradable Waste

Materials or Objects not capable of being broken down or decomposed to smaller products by the action of living things (such as animals or microorganisms). Since they cannot be broken down or decomposed they clutter the earth's surface and and natural resources and are termed as 'POLLUTANTS'. It is not of plant or animal origin or is of plant and animal origin but is processed and modified to change it's basic natural composition. And hence cannot be broken down or decomposed to smaller products by the action of living things (such as animals or microorganisms). Examples of non biodegradable items are:

- Plastic cups, bags, toys, etc.
- Styrofoams Cups and Plates
- Plastic bottles, furnitures, etc.

4.2.3 e-waste

Unwanted, obsolete or unusable electronic products such as computers, computer peripherals, televisions, VCRs, DVD Players, stereo equipment, hand cell phones are commonly referred to as 'electronic waste'. Management and disposal of e-waste has become a serious problem among states nationwide because of following reasons:

1. The problem of electronic waste (e-waste) is growing at an unsustainable rate.
2. E-waste is now the fastest growing, and most toxic, component of municipal garbage.
3. Local governments are facing huge costs to handle e-waste, and even greater costs if they do not capture this toxic stream and handle it in an appropriate manner.

The major problems caused by e-waste are:

1. The leaching of heavy material from e-waste may pose a potential long term human health and environmental impacts. Ground water especially is more likely to be polluted (note, more than half the country relies on ground water resources).
2. Lead is a toxic substance which may cause lead poisoning and can be especially harmful to young children.
3. A typical 17-inch computer monitor contains approximately 2.2 pounds of lead. The 500 million computers that will become obsolete between 1997 and 2007 will contain nearly 1.6 billion pounds of lead.
4. Much of the focus of managing e-waste revolves around Cathode Ray Tubes-which convert an electronic signal into a visual image. Computer monitors, televisions, camcorders and other electronic devices contain CRT. A typical CRT contains between 2 and 5 pounds of lead.
5. Uncontrolled burning and disposal are causing environmental problems.
6. The toxicity of some of the substances, e.g. mercury, cadmium may also pose an environmental and health challenge.

Control Measures

Due to increased public, regulatory and commercial scrutiny and also a commensurate entrepreneur interest, there has been a diversion from energy intensive down cycling processes to more mature processing systems. This has been largely achieved through reuse and refurbishing. Preventing waste in the first place is the preferred management option. This can be achieved through repairing, upgrading used electrical equipment. Example - adding memory to a computer, upgrading software. Make use of take back programs. Through recycling units are either reused or dismantled for recycling. The silver, gold, lead and other heavy metals are recyclable. The least preferred option is to landfill electronic waste. This should only come as a last option but care to consult with state regulations on disposal of any hazardous waste.

4.2.4 Bio Medical Waste

“Bio-medical waste is any type of waste generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining to the production of drugs in pharmaceutical companies, animal waste generated in the veterinary hospitals and also in the slaughter houses, etc.”. Need for BMW Management: If BMW is not segregated at source and allowed to be mixed with MSW, it may cause dreadful and infectious diseases like HIV, hepatitis B and C, tuberculosis and other skin and respiratory ailments.

Sources

Sources Generating Bio-Medical Waste are of two types:

- o Major sources :-
 - Govt. hospitals/private hospitals/nursing homes/ dispensaries.
 - Primary health centres Medical colleges and research centres/ paramedic services.
 - Veterinary colleges and animal research centres.
 - Blood banks/mortuaries/autopsy centres.
 - Biotechnology institutions Production units.
- o Minor sources :-
 - Physicians/ dentists clinics
 - Animal houses/slaughter houses

- Blood donation camps Vaccination centers
- Acupuncturists/psychiatric clinics/cosmetic piercing
- Funeral services.

Effects

- Unscientific technology like open burning for disposal of BMW may lead to dangerous levels of emission of gases like dioxins and furans in the environment, which contain cancer causing agents.
- Residual ash, if not disposed off in secured landfills, can also pollute the underground water and contaminate the soil.
- The liquid waste generated when let into sewers can also lead to surface water pollution if not treated properly.
- Injuries from sharps and exposure to harmful chemical waste and radioactive waste also cause health hazards to employees involved in collection and disposal of BMW.
- Plastic waste can choke animals, which scavenge on openly dumped waste.
- Radioactive waste and heavy metals in liquid form can come from chemical or biological research and may affect the reproductive system adversely.

Control Measures

Hospital Waste Management discusses how to effectively manage waste disposal in hospitals, healthcare facilities, medical facilities, infirmary, or any organizations or establishments that deals with medicines. As we all know, the waste materials from these establishments need to be disposed properly because it puts us at a great risk not only for our health but for the environment as well. The wastes from hospitals as we all know are mostly non-biodegradable which will really destroy our environment if not disposed of properly. Most also may have the possibility of containing transmittable diseases that may affect our health especially those waste that involves needle. Treatment and disposal of the biomedical waste shall be done by the following methods Incineration. Autoclaving. Shredding. Disposal option.

85% to 90% of the total BMW is treated by Incineration. Incineration systems uses high temperature combustion under controlled conditions to convert wastes containing infectious and pathological material to inert mineral residues and gases. Incineration is a process where the combustible waste is reduced to exhaust gaseous products and the incombustible waste is reduced to ash The key parameter in an incinerator are Temperature should be 900-1000°C . The waste be exposed for at least two seconds Incinerator should have the air pollution control equipment.

The autoclave process is technology for the treatment of microbiology laboratory waste, human blood any body fluid waste, waste sharps and anatomical waste. Autoclaving is a time-tested process of sterilization of medical waste using high temperature and high pressure steam. Typical operating conditions for an autoclave are a temperature of at least 121°C at a pressure of 105 kPa for a period of at least 1 hour. Effective sterilization results in the destruction of bacteria, virus, spores, fungi and other pathogenic micro organisms.

Shredders are used to destroy plastic and paper waste to prevent their reuse. After autoclaving the plastic waste is sent to the shredder. The shredded waste is sold out to authorized plastic moulding units. Only waste that is disinfected should be used in a shredder. This reduces the bulk of waste making transportation easy. Shredder have a set of revolving blades/shafts, which cut the waste into small pieces. Maintenance cost is high.

Incineration ash is disposed by Secured landfill. Treated solid waste is disposed by Municipal landfill Sharps, after disinfection (if encapsulated) - Municipal landfill. Treated waste water - Sewer/drain is send for recycling.

4.2.5 Plastic Pollution

Plastic is the general common term for a wide range of synthetic or semi synthetic organic solid materials suitable for the manufacture of industrial products. Plastics are typically polymers of high molecular weight and may contain other substances to improve performance and / or reduce costs. Plastic is one of the few new chemical materials which pose environmental problem. Polythene, polyvinyl chloride, polystyrene is largely used in the manufacture of plastics. Plastics are utilised in the form of Plastic bags, coatings, furniture, sheets, fittings, tanks, toys, buckets, sanitary wares, stationery, etc.

Effects

- Plastic pollute beaches and oceans :- Garbage has been discarded into the oceans for as long as humans have sailed the seven seas or lived on seashores or near water water ways flowing into the sea. Since the 1940s, use of plastic has increased dramatically, resulting in a huge quantity of nearly indestructible, lightweight material flowing into the sea, floating in the oceans and eventually deposited on beaches worldwide.
- Plastic bags litter the landscape :- Once they are used, most plastic bags go into landfill, or rubbish tips. Each year more and more plastic bags are ending up littering the environment. Once they become litter, plastic bags find their way into our waterways, parks, beaches, and streets. And, if they are burned, they infuse the air with toxic fumes.
- Plastic bags kill animals About 100,000 animals such as dolphins, turtles, whales, penguins are killed every year due to plastic bags. Many animals ingest plastic bags, mistaking them for food, and therefore die. And worse, the ingested plastic bag remains intact even after the death and decomposition of the animal. Thus, it lies around in the landscape where another victim may ingest it.
- Plastic bags are non-biodegradable and one of the worst environmental effects of plastic bags is that they are non-biodegradable. The decomposition of plastic bags takes about 1000 years.
- Plastic plays the villain right from the stage of its production. The major chemicals that go into the making of plastic are highly toxic and pose serious threat to living beings of all species on earth. Some of the constituents of plastic such as benzene are known to cause cancer. Plastic resins themselves are flammable and have contributed considerably to several accidents worldwide.
- Once plastic is produced, the harm is done once and for all. Plastic defies any kind of attempt at disposal be it through recycling, burning, or land filling When you recycle a hazard, you create a hazard. Recycling of plastic is associated with skin and respiratory problems, resulting from exposure to and inhalation of toxic fumes, especially hydrocarbons and residues released during the process.

Control Measures

- Single-use plastic bags have become such a ubiquitous way of life that it seems as if we simply cannot do without them. However, if we have the will, we can start reducing their use in small ways.
- A tote bag can make a good substitute for holding the shopping. You can keep the bag with the cashier, and then put your purchases into it instead of the usual plastic bag.
- Recycling the plastic bags you already have is another good idea. These can come into use for various purposes, like holding your garbage, instead of purchasing new ones.
- While governments may be working out ways to lessen the impact of plastic bags on the environment, however, each of us should shoulder some of the responsibility for this problem, which ultimately harms us.

4.2.6 Pesticide Pollution

Pesticides are chemical substances used to control weeds and pests. When pesticides are applied on a certain area, it has the ability to contaminate every part of the environment and can make a lot of effects to the environment. It can cause air pollution, water pollution, and soil pollution.

Effects

- Pesticide affects plants by affecting root nodule formation, reduced nitrogen fixation, hence we are forced to use synthetic nitrogen fertilizer, killing bees and decline the pollinators which decreases crop yield.
- Pesticide can eliminate some animal's essential food sources. Pesticides can travel up to food chain. They have harmful effects on growth and reproduction on earth worms. Also they can cause cancers, endocrine disruption, reproductive effects, neuro toxicity, kidney and liver damage, birth effects, and developmental changes in a wide range of species.
- Pesticides kill billions of birds each year, worldwide. DDT induced egg shell thinning has especially affected world's bird population. Even though some fungicides are slightly toxic to birds and mammals, they affect earthworm and can reduce the bird population. They also cause growth abnormalities in embryos and reduce the number of chicks that hatch successfully.
- Other special effects are:
 - Organochlorine pesticides like DDT, DDE, can cause
 - * Eggshell thinning
 - * Endocrine disruption
 - * Acute mortality due to acetyl choline esterase.
 - Organophosphate pesticides can cause:
 - * Thyroid disruption in rodents, amphibians and fish.
 - * Acute mortality due to acetyl choline esterase.
 - * Reduce metabolic activities like thermo regulation.
 - Carbamate pesticides
 - * Decreases immunity in vertebrates.
 - * Acute mortality due to acetyl choline esterase.
 - * Reduce metabolic activities like thermo regulation.
 - Parathyroid pesticides can cause
 - * Toxic to beneficial insects such as bees and dragonflies.
 - * Toxic to fish and other aquatic organisms.
- Biomagnification:-If any individual continuously eat contaminated food, it will accumulate in the body. Since all individuals are part of food chain, the toxins store in the fats and oils pass one trophic level to next trophic level. The higher up the food chain, more concentrate the pesticide called biomagnification. Humans are more affected by this effect, because they are in top of the food chain.
- resistance development:- When pests are exposed to pesticides for a longer time, they become resistant to the pesticide and hence they cannot be controlled. Farmers have to increase the concentration or change the pesticide and can cause more and more environmental effects.

Control Measures

- Cultural controls :-
 - Rotate crops to reduce the build up of weeds disease and insect pests.
 - Remove overwintering sites, such as cull piles, damaged and volunteer plants and alternate hosts, to minimise damage by insects.
 - Use techniques that expose pests to natural enemies or environmental stress or that make the crop less susceptible to insects or disease
 - adjust planting rimes to avoid periods of peak pest abundance
 - Plant disease free seed and transplants.
 - Promote vigorous crop growth with proper nutrition and weed removal to avoid stress that may weaken crops and make them more susceptible to attack by insects.
 - Manage irrigation schedules to avoid long periods of high relative humidity, to avoid development of disease pests.
 - Arrange fields for the best air drainage and circulation to promote low humidity.
 - Where crops are planted in rows use cultivation, where practical, in combination with banding of herbicides over the row for weed control. This could reduce herbicide costs while achieving good weed control.
- Biological control :- By conserving and releasing natural enemies(biological control agents) we can prevent the rise of certain pests.e.g. beneficial mites that feed on mite pests in orchards, milky spore disease that kills harmful soil grubs, the wasp *Encarsia formosa* parasites the greenhouse whitefly. The different methods include
 - Purchasing and releasing predators and parasites of pests.
 - Develop refuges for natural enemies of the pest by establishing areas of flowering plants and shrubs.
 - Choose and use pesticides wisely so you can conserve indigenous or released natural enemies of insect and mite pests.
- Chemical control :-
 - Use pesticides only when necessary.
 - elect pesticides according to efficacy, previous use patterns, the potential for and incidence of resistance, and the possible impact on the environment and natural enemies.
 - Be certain to achieve uniform spray coverage with your equipment, applying recommended spray rates with accurately calibrated equipment which targets the pest, or crop surfaces to be protected.
- Physical Barriers :- Physical Barriers such as netting over small fruits and screening in greenhouses can prevent insects that cause crop loss, and mulch can inhibit weed germination beneath desirable plants. Physical barriers are important in termite, house fly, and rodent control.
- Pheromones :- Pheromones (natural insect scents) can be used in pest management. Sometimes a manufactured “copy” of the pheromone that a female insect emits to attract mates can be used to confuse males and prevent mating. This technique is used in curbing damage from many different species pest species, such as the oriental fruit moth, codling moth, the grape berry moth pink bollworm, tomato pinworm.

- Structural modifications :- Structural Modifications, such as preventing support timbers from contacting soil, can help prevent damage from several different wood destroying pests.
- Pest resistant cultivars :- Planting disease resistant crops is one of the simplest methods of reducing disease management actions during the growing season. Use of resistant varieties often means that growers do not need to apply as many pesticides as with susceptible varieties.

4.3 Thermal Pollution

Thermal pollution results from addition of excessive undesirable amount of heat to water that it makes harmful to man, animal or aquatic life.

It is defined as the deterioration of water quality, as a result of any process that changes ambient water temperature.

4.3.1 Causes of Thermal Pollution

Discharge of heated water or hot waste materials into water bodies from

1. Nuclear power plants:- Nuclear power plants use water as a cooling agent. After using water it is put back into a water supply at 9 - 20⁰C. Also emissions from nuclear reactor increases the temperature of water bodies.
2. Industrial effluents.
3. Domestic sewage.
4. Hydro electric power projects.
5. Coal fired power plants.
6. Deforestation:- The decrease in vegetation increases the amount of light that hits the water, which increases the temperature of the water. It also increases erosion.
7. Soil erosion:- Erosion makes the water muddy, which increases the light absorbed.

4.3.2 Effects of Increased Water Temperature.

1. Physical Effects:
 - (a) As the temperature increases, sedimentation of suspended particles increases due to decrease in density and viscosity of water.
 - (b) As water becomes warm, its palatability decreases.
 - (c) Rate of evaporation increases.
 - (d) Warm water being of low density spreads over the surface of water bodies causing thermal stratification. This becomes a barrier for oxygen penetration into deeper layers. It also affects normal circulation patterns.
2. Chemical effects:
 - (a) Rate of chemical reactions highly dependent on temperature. i.e rate almost doubles for every 10⁰C rise in temperature.
 - (b) Dissolved oxygen in water decreases.
3. Biological effects:
 - (a) Thermal shock:- Aquatic life adapted to a certain water temperature can go into shock when the temperature is changed, even 1 or 2 degrees.
 - (b) Increases the rate of photosynthesis, which increases the amount of plant growth.

- (c) Increases the metabolic rate of fish, which increases their need for oxygen.
- (d) Redistribution of aquatic species in local community.
- (e) It also increases their susceptibility to disease, parasites, and toxic chemicals.
- (f) As all proteins and enzymes are heat labile, temperature changes bring several physiological problems in aquatic organisms.

4.3.3 Remedial Measures

1. Energy chips (Energy chip) :- Hafnium oxide, bismuth telluride chip that converts excess heat into electricity.
2. Desalination plants :- Desalination means any process that removes the excess salt and other minerals from water (industrial effluents) in order to obtain fresh water suitable for animal consumption or irrigation. If almost all of the salt is removed for human consumption. Desalinated water absorbs less energy.
3. Less nuclear power.
4. End shoreline deforestation.
5. Prevent soil erosion.
6. Provide use of cooling towers :- A tower like device in which atmospheric air circulates and cools warm water, generally by direct evaporation.

4.4 Noise Pollution

Noise is a pollutant which is harmful to all sorts of animals. With the development of technology, machinery and industry, noise has now become a global problem to human peace and tranquillity.

Noise can be classified into three categories.

1. Transport noise:- It is connected with various types of noise. It can be subdivided into three categories
 - (a) Road traffic noise
 - (b) Air craft noise.
 - (c) Rail traffic noise.
2. Occupational noise:- Produced by industrial machines and processes, and also from domestic gadgets like washing machines, vacuum cleaners.
3. Neighbourhood noise:- This implies a variety of sources of noise, which disturb and annoy the general public by interfering with their comfort and welfare. e.g., loud TV, radio set, loud speakers, etc.

4.4.1 Meaning of Noise Pollution

Noise pollution means pollution of the environment with unpleasant and undesirable sound, through human activities, thereby causing adverse effects in all recipients

4.4.2 Sources of Noise Pollution

Some of the man-made sources of noise pollution are as follows:

1. Industries, factories, and machinery.
2. Vehicles such as trains, buses, cars, scooters, etc, and hooting of horns.
3. Loud speakers and audio systems used in social gatherings, celebrations, etc.

4. Fireworks.
5. Domestic appliances such as grinders, mixies, vacuum cleaners, audio systems etc..
6. Various construction works.
7. Sirens from factories, etc..

4.4.3 Effects of Noise Pollution

Major effects of noise pollution are:

1. It induces hormonal imbalance.
2. It affects the hearing capacity and at higher levels damages, ear drum and inner ear mechanism causing deafness.
3. It may induce emotional disturbances, psychological disorders, nervous break down and even insanity.
4. It disturbs sleep and causes fatigue and frustration.
5. It increases heart beats and raise blood pressure.
6. It aggravates gastric disorders and stomach ulcers.
7. I t may adversely affect the functioning of brain, kidneys, and liver.
8. It disturbs human method of normal communication and telephonic conversation.
9. It causes head ache, nausea, and fatigue as well as poor work performance.
10. It induces abortions, and causes physical abnormalities, in young children.
11. At very high levels, it may even kill a person by inducing heart attack or cerebral haemorrhage.

4.4.4 Control of Noise Pollution

Noise pollution cannot be totally eliminated, we can reduce and minimise the ill effects of it by adopting some preventive and safety measures.

Some are given below

- (i). Ear protective aids such as ear plugs must be issued to workers in noisy factories.
- (ii). Walls and ceilings of factories must be insulated with sound absorbing materials.
- (iii). Old noisy factory machines should be replaced by new ones fitted with silencers.
- (iv). For houses and office buildings in the middle of cities, the doors and windows should be designed properly using adequate sound proofing techniques.
- (v). Noise creating operations should not be conducted in enclosed spaces but only in large open spaces.
- (vi). Vehicles creating loud rattling noises should not be allowed on the road.
- (vii). The use of air horns should be banned in cities and towns and near hospitals, schools etc..
- (viii). The use of blaring loud speakers in thickly populated areas should be prohibited.
- (ix). By growing trees around factories and places of gathering, the impact of noises can be reduced.
- (x). Busy bus stations, railway stations, aerodromes etc., should be away from heavily populated areas.

4.5 Radiation Pollution

The environmental pollution caused by extremely dangerous radiations from sources introduced into the environment by human activities is called radiation pollution.

4.5.1 Natural Sources

There are two major natural sources.

1. High energy radiation from sun and other cosmic bodies: Fortunately, there are a very few radiations coming out of cosmic bodies, because of the presence of Ozone layer in the upper atmosphere.
2. Mineral deposits containing radionuclides release ionising radiations which can cause radiation pollution naturally. For example, black sand (Monozite sand) present in the coastal regions of Kollam, Thiruvananthapuram districts of kerala produce beta and gamma radiations and causes skin cancers to many.

4.5.2 Anthropogenic Sources

Major man made sources are

1. Medical diagnosis using X-rays:- The use of X-rays for medical diagnosis constitutes an important source of radiation pollution as they are highly penetrating in nature.

2. Radiotherapy:- Radionuclides used in radiotherapy of diseases like cancer constitute a source of radiation pollution as they are often indiscriminately used and improperly handled.

3. Nuclear tests and radioactive fallout:- Nuclear explosion tests carried out by various countries pose a major radiation threat to all living organisms as they introduce a large quantity of long lived radio nuclides to the environment which gets distributed all over the globe.

The radio active dust that falls to the earth after a nuclear explosion is called radio active fallout. It gets suspended in air up to 7 to 8 kilometres heigh above earth's surface and are carried by air currents around the world. The dust contains radionuclides which usually settle down with rain and pollute soil and water. From the soil they enter into plants and thereby enter the food chain. Once they enter the body of a living organism, they radiate internally throughout its life span.

4. Nuclear reactors:- The leakage of nuclear radiation from nuclear reactors contributes considerably to radiation pollution.

5. Nuclear Power plants:- The nuclear power plants set up in various parts of the world for the purpose of producing power have become a major threat to to the whole world.

6. Radioactive waste:- The radio active waste form nuclear reactant and power plants contain a very large number of radionuclides. The storage, transportation and disposal of these wastes are major problems of the present nuclear industry. They cause wide spread radiation damage, from wherever they are deposited irrespective of whether it is deep under the earth's surface or in the deepest portion of the oceans.

7. Radioactive ore processing:- Radionuclides from the mining and processing units of radioactive ores pollute soil, water and air and cause extensive radiation pollution.

8. Industrial and medical research:- Researches in the industrial and medical fields often include the use of radionuclide which produce harmful radiation effects.

9. Other sources:- Advanced technological implements such as colour television, X-ray fluoroscopes, radars, and even luminous dials of watches and clocks cause radiation pollution.

4.5.3 Hazards of Radiation Pollution

Radiation pollution manifests its disastrous effects on all kinds of living organisms. Radiation damage depends up on the type of radiation as well as on the period and frequency of exposure. Some very general effects of exposure to ionising radiations are as follows:

1. Sub lethal doses of radiation can cause symptoms like nausea, vomiting, diarrhoea, loss of appetite and general weakness within a few hours of exposure.
2. Exposure to acute doses would produce symptoms of nausea, vomiting, diarrhoea etc., initially and would cause death within a few weeks.
3. Long term exposure to even small quantities, of radiations would cause cancers including leukaemia.
4. Even short term exposure to slightly larger quantities of radiation can cause cancer of the breast, thyroid, lung, or even brain.
5. Radiations can break down enzymes, proteins and nucleic acids, and thereby cause various metabolic disorders.
6. Radiations can cause internal bleeding, and blood vessel damage, which become evident as red spots in the skin.
7. Radiations can damage eye cells and induce cataract.
8. Radiations can cause bone marrow depression, kidney and liver disorders, damage to reproductive organs, and gastrointestinal disorders.
9. Radiations produce genetic effects, including gene mutations, and chromosome abnormalities, which are transmitted to the next generation.
10. Exposure to radiations kills plant cells and thereby destroys vegetation.
11. Water pollution by radio active materials destroys aquatic population through radiation effects.

4.5.4 Control of Radiation Pollution

Radiation pollution can be avoided only through preventive and safety measures.

- (a). X rays for diagnostic purposes and radiations for therapy should be uses as sparingly as possible and adequate protection should be made available to the persons who carry out these operations.
- (b). High chimneys and high ventilators should be used at places where radio active contamination is high.
- (c). While working with radio nuclides, hoods, gloves and masks, made of protective materials should be used.
- (d). Production of radio isotopes must be minimised.
- (e). Extreme care should be taken during the disposal of radio active wastes.
- (f). All safety precautions should be taken to prevent leakage of radiation from nuclear reactors, and power plants.
- (g). The number of nuclear installations should be minimised.
- (h). Nuclear explosions tests and production of nuclear weapons should be banned completely because a nuclear war would obviously wipe out the entire human race from the earth.

4.5.5 Chernobyl Disaster

Chernobyl is considered the world's worst nuclear disaster to date. It occurred on April 26, 1986, when a sudden surge in power during a reactor systems test resulted in an explosion and fire that destroyed Unit 4. Massive amounts of radiation escaped and spread across the western Soviet Union and Europe. As a result of the disaster, approximately 220,000 people had to be relocated from their homes.

Cause

Unit 4 was to be shut down for routine maintenance. A test was conducted to determine the plant equipment's ability to provide sufficient electrical power to operate the reactor core cooling system and emergency equipment during the transition period between a loss of main station electrical power supply and the start-up of the emergency power supply. Workers did not implement adequate safety precautions or alert operators to the electrical test's risks. This lack of awareness led the operators to engage in actions that diverged from safety procedures. Consequently, a sudden power surge resulted in explosions and nearly complete destruction of the reactor. The fires that broke out in the building contributed to the extensive radioactive releases.

A bungled experiment at one of the facility's four reactors created a sudden power surge, which in turn led to a series of blasts that blew the 1,000-ton steel top off of the reactor. A lethal cloud of radioactive material gathered over the nearby town of Prip'yat—which was not evacuated until 36 hours after the explosion—before wafting over large parts of Europe. Soviet officials tried to keep the disaster under wraps, but on April 28 Swedish radiation monitoring stations located more than 800 miles from Chernobyl reported radiation levels 40 percent higher than normal.

4.5.6 Hiroshima and Nagasaki

During second world war, on August 6, 1945 the US dropped an atomic bomb ("Little Boy") on Hiroshima in Japan. Three days later a second atomic bomb ("Fat Man") was dropped on the city of Nagasaki. These were the only times nuclear weapons have been used in war.

Impact at Hiroshima

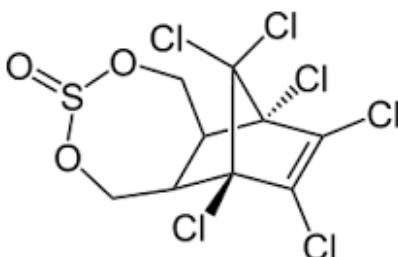
Hiroshima stands on a flat river delta, with few hills to protect sections of the city. The bomb was dropped on the city centre, an area crowded with wooden residential structures and places of business. These factors meant that the death toll and destruction in Hiroshima was particularly high. The firestorm in Hiroshima ultimately destroyed 13 square kilometres (5 square miles) of the city. Almost 63% of the buildings in Hiroshima were completely destroyed after the bombing and nearly 92% of the structures in the city had been either destroyed or damaged by blast and fire. Estimates of total deaths in Hiroshima have generally ranged between 100,000 and 180,000, out of a population of 350,000.

Impact at Nagasaki

Due to the hilly geography of Nagasaki and the bombing focus being away from the city centre, the excessive damage from the bombing was limited to the Urakami Valley and part of downtown Nagasaki. The centre of Nagasaki, the harbour, and the historic district were shielded from the blast by the hills around the Urakami River. The nuclear bombing did nevertheless prove devastating, with approximately 22.7% of Nagasaki's buildings being consumed by flames, but the death toll and destruction was less than in Hiroshima. Estimates of casualties from Nagasaki have generally ranged between 50,000 and 100,000. The fact that the Nagasaki bomb was more powerful and also the narrowing effect of the surrounding hills did mean that physical destruction in the Urakami Valley was even greater than in Hiroshima. Virtually nothing was left standing.

4.5.7 Endosulfan

Endosulfan is an off-patent organochlorine insecticide and acaricide that is being phased out globally.



IUPAC name is 6,7,8,9,10,10-Hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepine-3-oxide. Sprayed on crops like cotton, cashew, fruits, tea, paddy, tobacco etc. for control of pests in agriculture such as whiteflies, aphids, beetles, worms etc.

The two isomers, endo and exo, are known popularly as I and II. Endosulfan sulfate is a product of oxidation containing one extra O atom attached to the S atom. Endosulfan became a highly controversial agricultural[2] due to its acute toxicity, potential for bioaccumulation, and role as an endocrine disruptor. Because of its threats to human health and the environment, a global ban on the manufacture and use of endosulfan was negotiated under the Stockholm Convention in April 2011.

Health Effects

Endosulfan is one of the most toxic pesticides on the market today, responsible for many fatal pesticide poisoning incidents around the world.[38] Endosulfan is also a xenoestrogen—a synthetic substance that imitates or enhances the effect of estrogens—and it can act as an endocrine disruptor, causing reproductive and developmental damage in both animals and humans.[39] It has also been found to act as an aromatase inhibitor.[39] Whether endosulfan can cause cancer is debated. With regard to consumers' intake of endosulfan from residues on food, the Food and Agriculture Organization of United Nations has concluded that long-term exposure from food is unlikely to present a public health concern, but short-term exposure can exceed acute reference doses.

It is a widely-banned pesticide with hazardous effects on human genetic and endocrine systems.

Endosulfan blocks the inhibitory receptors of the CNS, disrupts the ionic channels and destroys the integrity of the nerve cells.

4.5.8 Endosulfan Disaster in Kerala

in Kerala – Kasaragod, once known for its greenery today Kasaragod is haunted by diseases and tragedy. Thanks to hamlets of cashew plantations spread along the district. The diseases are side effects of Endosulfan a deadly pesticide sprayed in these plantations. The UNO classifies Endosulfan as highly dangerous insect killer and banned in 62 countries. Even despite the fact that Endosulfan is banned now, for 26 years Kerala Government sprayed the deadly pesticide in government owned cashew plantations under Plantation Corporation of Kerala.

While about 500 deaths from 1995 have been officially acknowledged as related to the spraying of Endosulfan, unofficial estimates put the total number of deaths since the late seventies around 4000. The insect killer was sprayed aerially with in particular used helicopters. As the plantations are mostly in mountainous areas, the pesticide drains and gets washed down the slopes during rains into drinking water below. Consuming this water will result in diseases ranging from physical deformities, cancers, birth disorders and damages to brain and nervous system. During 2000-2001 the victims got huge media introduction and resulted in Study on the victim's. The study of Endosulfan effects showed larger abnormality such as mental retardation, cancer and infertility in the victims. But the pesticide and fertilizer industries were very fast to refuse the studies. Endosulfan is manufactured and distributed in India by Hindustan Fertilizers limited.

It's clear that the usage of the Pesticide on the Kerala government owned cashew plantation was a result of nexus between Government officials and Pesticide industries. In Kerala all other cashew plantations are grown without pesticides. The Kerala government spends millions on Pesticides to increase yield and have disillusioned the productive land. India is the main producer of Endosulfan in the world and also the consumer. It's not only Kerala facing the dilemma of Endosulfan, Recent reports show some parts of Karnataka too affected badly by the usage of Endosulfan Pesticide.

Even though the Kerala cashew plantations corporation has stopped up aerial spraying Endosulfan in Kasaragod instead they have started using a newer pesticide. Endosulfan has been banned for 2 years in Kerala but Kerala Government is discussing about revoking the ban. People are still facing the side effects of Endosulfan in Kerala and Karnataka but the Indian Government has not yet banned the deadly chemical. The Pesticide is still used for cotton and Cashew plantations in many parts of the nation Karnataka, Punjab, Assam and Andhra Pradesh. India needs an effective chemical norm and should ratify a chemical & pesticide policy which would help people affected from

chemical accidents & disasters; also stop usage of deadly pesticides for agriculture. Even during the Bhopal gas tragedy Government did nothing for the victims. The Endosulfan victims also were turned down by the Government. It is clear that all these chemical disasters are due to ignorant and negligent policies from the Government.
