2. Indiscriminate use of pesticides, insecticides and herbicides:

The first widespread insecticide use began at the end of World War II and included DDT **(dichlorodiphenyltrichloroethane) and gammaxene**. Insects soon became resistant to DDT and as the chemical did not decompose readily, it persisted in the environment. Since it was soluble in fat rather than water, it biomagnified up the food chain and disrupted calcium metabolism in birds, causing egg shells to be thin and fragile. As a result, large birds of prey such as the brown pelican, ospreys, falcons and eagles became endangered. DDT has been now been banned in most western countries. Ironically many of them including USA still produce DDT for export to other developing nations whose needs outweigh the problems caused by it.

The most important pesticides are DDT, BHC, chlorinated hydrocarbons, organophosphates,

aldrin, malathion, dieldrin, furodan, etc. The remnants of such pesticides used on pests may get adsorbed by the soil particles, which then contaminate root crops grown in that soil. The consumption of such crops causes the pesticides remnants to enter human biological systems, affecting them adversely.

An infamous herbicide used as a defoliant in the Vietnam War called Agent Orange (dioxin), exposure to Agent Orange.

Pesticides not only bring toxic effect on human and animals but also decrease the fertility of the soil. Some of the pesticides are quite stable and their bio- degradation may take weeks and even months.

Pesticide problems such as resistance, resurgence, and health effects have caused scientists to seek alternatives. Pheromones and hormones to attract or repel insects and using natural enemies or sterilization by radiation have been suggested

3. Dumping of large quantities of solid waste:

In general, solid waste includes garbage, domestic refuse and discarded solid materials such as Those from commercial, industrial and agricultural operations. They contain increasing amounts of paper, cardboards, plastics, glass, old construction material, packaging material and toxic or otherwise hazardous substances. Since a significant amount of urban solid waste tends to be paper and food waste, the majority is recyclable or biodegradable in landfills. Similarly, most agricultural waste is recycled and mining waste is left on site.

The portion of solid waste that is hazardous such as oils, battery metals, heavy metals from smelting industries and organic solvents are the ones we have to pay particular attention to. These can in the long run, get deposited to the soils of the surrounding area and pollute them by altering their chemical and biological properties. They also contaminate drinking water aquifer sources. More than 90% of hazardous waste is produced by chemical, petroleum and metal-related industries and small businesses such as dry cleaners and gas stations contribute as well.

4. Deforestation and soil erosion:

Soil Erosion occurs when the weathered soil particles are dislodged and carried away by wind or water. Deforestation, agricultural development, temperature extremes, precipitation including acid rain, and human activities contribute to this erosion. Humans speed up this process by construction, mining, cutting of timber, over cropping and overgrazing. It results in floods and cause soil erosion.

EFFECTS OF SOIL POLLUTION

1. Agricultural
   - Reduced soil fertility
   - Reduced nitrogen fixation
   - Increased erosion
   - Larger loss of soil and nutrients
   - Deposition of silt in tanks and reservoirs
   - Reduced crop yield
   - Imbalance in soil fauna and flora
2. **Industrial**
   - Dangerous chemicals entering underground water
   - Ecological imbalance
   - Release of pollutant gases
   - Release of radioactive rays causing health problems
   - Increased salinity
   - Reduced vegetation
3. **Urban**

   Clogging of drains
   - Inundation of areas
   - Public health problems
   - Pollution of drinking water sources
   - Foul smell and release of gases
   - Waste management problems

CONTROL MEASURES OF SOIL POLLUTION

The following steps have been suggested to control soil pollution. To help prevent soil erosion, we can limit construction in sensitive area. 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.

1. Reducing chemical fertilizer and pesticide use Applying bio-fertilizers and manures can reduce chemical fertilizer and pesticide use. Biological methods of pest control can also reduce the use of pesticides and thereby minimize soil pollution.

2. Reusing of materials

Materials such as glass containers, plastic bags, paper, cloth etc. can be reused at domestic levels rather than being disposed, reducing solid waste pollution.

3. Recycling and recovery of materials

This is a reasonable solution for reducing soil pollution. Materials such as paper, some kinds of plastics and glass can and are being recycled. This decreases the volume of refuse and helps in the conservation of natural resources. For example, recovery of one tonne of paper can save 17 trees.

4. Reforesting

Control of land loss and soil erosion can be attempted through restoring forest and grass cover to check wastelands, soil erosion and floods. Crop rotation or mixed cropping can improve the fertility of the land.

5. Solid waste treatment

Proper methods should be adopted for management of solid waste disposal. Industrial wastes

can be treated physically, chemically and biologically until they are less hazardous. Acidic and alkaline wastes should be first neutralized; the insoluble material if biodegradable should be allowed to degrade under controlled conditions before being disposed.

3.1.4 MARINE POLLUTION

Pollution of oceans is damaging the marine environment and is becoming a major problem. Marine environment is interesting for various reasons such as Sea food; Navigation; Adventure; Tourism etc,, Marine Pollution is harmful and its danger can be identified in a variety of ways.

Sources & causes of marine pollution:
Marine pollution originates from one of two sources --- the land or the sea which are explained below:
Marine Oil Pollution: Oil is basically an important pollutant which destroys marine environment. The various sources of oil pollution are:
Run-off oil from streets; disposal of lubricants from machines; Off shore oil and gas exploitation from off-shore drilling; blowouts at off-shore drilling rigs; oil escaping under high pressure from a bore hole in the ocean floor. **Waste chemicals, mud and accumulation of toxic substances in the ocean in theform of mercury, dioxin, PCBs, PAHs (Poly Aromatic Hydrocarbons) Radioactivity. benzene; xylene (colorless, flammable liquids) and heavy metals such as lead; copper; nickel, mercury also cause for marine pollution during the off shore drilling activities. Both dumping and exploitation of ocean resources cause ocean pollution also.**
PAHs: It is a chemical compound and organic pollutant. These occur in oil, coal and tar deposits and are produced as byproducts of fuel burning.
PAHs are lipophilic meaning they mix more easily in oil than water.
Eg for PAHs are: Acenaphthene; Anthracene; Benzopyrene; Chrysene; Coronene; Fluorene; Pyrene.

Other sources from land: The major sources of marine pollution originating from the land vary from country to country. Effluents are discharged either directly into the sea or enters the coastal waters through rivers. Thousands of barrels of oil burn when oil wells were set on fire. Tanker accidents on land carry oil to the nearby streams / canals and cause for marine Pollution. Due to burning of oil, smoke, SO2, NO2, CO is added towards atmospheric contamination.

The effects of oil pollution depend mainly on the following factors:
Type of oil and its viscosity, amount / quantity released, distance covered, time, average water temp etc..
Effects of Marine Pollution:

S No	Source	Effect
1	Sewage & run- off from forestry;	Depletes oxygen in water causes killing of fishes.
2	Sediments from mining	Sediments clog in the gills of fishes
3	Sewage from municipalities, towns; cities etc…	Contaminate sea food
4	Industrial discharge; pesticides from farms	Cause disease in coastal marine life
5	Oil from off shore drilling; industries/ automobiles	Low level contamination kill larvae whereas high level contamination causes death for sea fishes

6	Litter (rubbish), waste, plastics	Marine life disturbs
7	Hot water from power plants	Kills corals.

Marine Pollution Abatement / Prevention & control measures of Marine pollution:

The following are the some of the control measures for marine pollution:

1. Improving existing sewage disposal facilities
2. Ensuring individual houses have sewage disposal systems (such as septic tanks).
3. Large resorts should use and manage their own packaged treatment plants.
4. Marine planning and management should be considered as processes such as land – sea interaction; inter disciplinary co-operation; participation of public & private sector organizations; balance between protection and development public participation
5. Oil tankers are double hulled (two layered bottom) to reduce the chance of oil leakage
6. Recycling facilities for used oil.

3.1.5 NOISE POLLUTION

INTRODUCTION:

Everyone knows that sound is a form of energy that is capable of causing disturbances in human beings. Ears are the hearing organs in human beings.

A thin membrane is called Tympanum (or) ear drum receives the vibrations produced by sound to a limited extent. Human ear is capable of perceiving about 85 decibels of sound. Beyond the limit, the ear drum cannot bear sound.

In nature, we hear different types of sounds. Sound is a kind of vibration which travel through air, water, and are sensed by the ear. This is from music, speech, etc from radio / television / computers etc., one thing in this matter is that we can increase the volume of sound or decrease as per our taste whereas, a noise is a sound which cannot be heard clearly and only mixed sounds will be heard.

For eg: in an office one is talking on mobile, phone ringing another side, ring tones in some person's hands, loud conversations with one and another etc., this is called noise. One cannot increase or decrease the volume of noise. In general, a sound is a vibration from a particular machine, place or material which can be heard clearly whereas a noise a mixed vibrations that will come to us from all directions. A sound can be clear and can be able to hear, whereas a noise will not be clear and cannot be heard.

SOURCES OF NOISE:

Noise is an unwanted sound and noise pollution occurs through different sources:

1. Vehicles produce noise that leads to noise pollution.
2. Automobile industry is another source of noise pollution.
3. Noise pollution is very common in industrial areas where machines are working for factories making more noise.

The sources of noise are more in urban and industrial areas, than in rural areas. The sources of noise may be stationary or mobile. The stationary sources include industries, loud speakers, mining operations, use of machineries, TV, Radio and Grinders etc. The mobile sources include Road Traffic, Highway Noise, Railway Traffic and Air Traffic.

(1) Stationary sources:

a) Industrial noise: The main categories of industrial activity that are particularly relevant to the study of noise are the following:

Product fabrication, Product assembly, Power generation by means of generators, Combusting process in furnaces (burning of gases)

b) Noise from construction works: Construction noise, a major source of noise pollution is emitted by construction equipment. The sources of noise are dozers excavators, front end loaders, soil compactors, cranes, air compressors, concrete vibrators, riveting steel structure during the casting, dismantling of construction materials etc...

c) Noise from other sources: These include sources such as sirens, barking dogs, ambulances, Police vehicles, Fire engines etc.

(2) Mobile sources:

Road traffic: Of all sources of noise pollution, road traffic is the most prevalent and perhaps the most source of noise pollution. More people are exposed to noise from motor vehicles and the noise depends on various factors such as Road location, Road design, Vehicle standards, Driver behaviors, Horns, Traffic density. ,

Noise of common road vehicles

Vehicle type	**Noise (db)**
Medium road traffic (Main roads)	70- 80
Heavy road traffic (High ways)	80- 90
Buses & Trucks upto 3.5 tons	85- 95
Trucks upto 3.5-12 tons	90-100
Motor cycles	90-105

It can be observed that motor cycles with their exposed engines and inadequate silencing arrangements are notorious noise producers, which produce more than 30 times sound than a small passenger car.

a) Railway traffic: Noise from railway traffic is not serious nuisance as compared to the road traffic noise. The level of noise associated with rail traffic is related to the type of engine, the speed of the train, track type and condition. The majority of noise emitted by trains is produced by the engine (or) by the interaction of wheels with the tracks, horns, warning signals at crossings etc..,

b) Air traffic: The noise of air craft is different from that of road traffic in the sense it is intermittent. Noise is maximum during takeoff and landing. Noise made by jet planes is more disturbance than that of propeller driven air craft. Supersonic air craft produce noise at high levels due to its intensity.

EFFECTS OF NOISE:

At 120 decibels the ear registers pain but hearing damage begins about 85 decibels. Apart from hearing loss, noise can cause lack of sleep, irritation, indigestion, ulcers, High B.P., Heart diseases , Stress etc.,.

1. Annoyance (Feeling slightly angry): One of the most important effects of noise on human is

annoyance. Due to this breathing rate affects.

2.Noise- induced hearing loss: Exposure to noise for a long enough duration results in damage to the inner ear and thus decreases one's ability to hear. The louder the noise the less time it takes to cause hearing loss.

3.Effects on sleep: Noise disturbs sleep. It has been found that the cases related to various levels of noise are associated with sleep disturbances. Sleep disturbance by noise depends on the characteristics of the noise such as frequency, loudness and whether the noise is continuous or intermittent.

Other effects: There are many other effects of noises such involve aggression (ready to attack). People may turn mad and nerves may not function normally, People may be deformed in many ways including increased stress and strain, nonfunctioning of hands, legs etc due to noise pollution if exposed continuously.

CONTROL MEASURES:

Noise pollution could be controlled by either reducing the noise at the source or by preventing its transmission.

The first step in the prevention of noise pollution is to control the noise at source itself.

For eg: Lubrication of machines reduces the noise produced, Tightening the loose nuts, Reducing the vibrations produced by machines etc…

Failing to control the noise at its source, the second step is to prevent its transmission for eg: keeping the noise machine covered in an enclosure so that the sound does not escape and reach the receivers, construction of noise barriers on road sides, sound proof the buildings by using heavy curtains on the windows, acoustical tiles on the ceiling and walls, by sealing the cracks in the walls to reduce the noise coming from outside.

If the noise levels are not able to bring down to the desired levels in some cases, the only alternative is to follow:

- Avoiding horns except in emergency situations.
- Sound proof or eco-generators and Turning down the volume of stereos.
- Conducting the awareness programs

3.1.6 THERMAL POLLUTION

Thermal pollution is also known as heat pollution and occurs when heat is released into water or air that produces undesirable effects. Sudden heat release usually due to forest fire or volcanoes or human induced activities. Thermal pollution is also the addition of excess undesirable heat to water that makes it harmful to human, animal or aquatic life.

Sources of Thermal Pollution:

Various sources of thermal pollution include

Thermal Power Plants ; Nuclear Power Plants ; Petroleum Refineries; Steel Plants; Metallurgical industries; Paper Mills; Chemical Plants. Coal fired power plants constitute major sources of thermal pollution. Nuclear plants discharge much heat and also traces of toxic radioactive substances. Many industries use water for cooling purpose and thus the heat effluents are finally discharged into water.

Temperature and its effects: Temperature plays an important role in determining the conditions in which living things can survive.
Birds and mammals require a narrow range of body temp for survival whereas aquatic species can exist at a certain range of temperatures.
Thermal pollution increases water temperature causing a change (lowering) of dissolved oxygen levels. This disrupts and causes decay of plant and animal species.
For eg: The warmer water increases the metabolic rate of fish and other animals in the sea; this decreases the life expectancy of aquatic animals.

Management of Thermal Pollution:
Thermal Pollution is controlled by the following methods:
1. Cooling Towers are designed to control the temperature of water which transfers some of the heat from the water to the surrounding atmosphere by evaporation. There are two types of cooling towers namely wet cooling towers and dry cooling towers.
2. Cooling ponds are employed for thermal discharges. Heated effluents on the surface of water in cooling ponds maximize dissipation of heat to the atmosphere.
3. Artificial lakes are manmade bodies of water which offer possible alternative. The heating effluents are discharged into lake at one end and the water for cooling purpose may be withdrawn from the other end

3.1.7 NUCLEAR HAZARDS

Radioactivity is the phenomenon of emission of energy from radioactive isotopes (i.e., unstable isotopes), such as Carbon-14, Uranium-235, Uranium-238, Uranium-239, Radium-226, etc. The emission of energy from radioactive substances in the environment is often called as 'Radioactive Pollution'.

Sources/causes of nuclear hazards
The sources of radioactivity are both natural and man-made. The natural sources include:
a) **Natural sources:**
1) Emissions from radioactive materials from the Earth's crust.
People have been exposed to low levels of radiation from these natural sources for several millennia. But it is the man-made sources which are posing a threat to mankind.

b) **Man-Made Sources:** The man-made sources of radioactivity are nuclear wastes (i.e., waste material that contains radioactive nuclei) produced during the:
1) Mining and processing of radioactive ores;
2) Use of radioactive material in nuclear power plants;
3) Use of radioactive isotopes in medical, industrial and research applications; and
4) Use of radioactive materials in nuclear weapons.
The greatest exposure to human beings comes from the diagnostic use of X-rays, radioactive isotopes used as tracers and treatment of cancer and other ailments.

Effects of nuclear hazards:
The effects of radioactive pollutants depend upon half-life, energy releasing capacity, rate of diffusion and rate of deposition of the contaminant. Various atmospheric conditions and climatic

conditions such as wind, temperature and rainfall also determine their effects.
The effects may be somatic (individual exposed is affected) or genetic (future generations) damage. The effects are cancer, shortening of life span and genetic effects or mutations.

Some of the possible effects are listed as under:

1) Radiations may break chemical bonds, such as DNA in cells. This affects the genetic make-up and control mechanisms. The effects can be instantaneous, prolonged or delayed types. Even it could be carried to future generations.

2) Exposure at low doses of radiations (100-250 rads), men do not die but begin to suffer from fatigue, nausea, vomiting and loss of hair. But recovery is possible.

3) Exposure at higher doses (400-500 rads), the bone marrow is affected, blood cells are reduced, natural resistance and fighting capacity against germs is reduced, blood fails to clot, and the irradiated person soon dies of infection and bleeding.

4) Higher irradiation doses (10,000 rads) kill the organisms by damaging the tissues of heart, brain, etc.

5) Workers handling radioactive wastes get slow but continuous irradiation and in course of time develop cancer of different types.6) Through food chain also, radioactivity effects are experienced by man.

But the most significant effect of radioactivity is that it causes long range effects, affecting the future of man and hence the future of our civilization.

Control measures:

On one hand, the peaceful uses of radioactive materials are so wide and effective that modern civilization cannot go without them; on the other hand, there is no cure for radiation damage. Thus the only option against nuclear hazards is to check and prevent radioactive pollution. For this:

1) Leakages from nuclear reactors, careless handling, transport and use of radioactive fuels, fission products and radioactive isotopes have to be totally stopped;
2) Safety measures should be enforced strictly;
3) Waste disposal must be careful, efficient and effective;
4) There should be regular monitoring and quantitative analysis through frequent sampling in the risk areas;
5) Preventive measures should be followed so that background radiation levels do not exceed the permissible limits;