

UNIT IV: ENVIRONMENTAL ISSUES, POLICIES AND PRACTICES

4.1. CAUSES, EFFECTS AND CONTROL MEASURES OF AIR, WATER, SOIL, NOISE AND SOLID WASTE POLLUTION

CONCEPT OF POLLUTION AND POLLUTANTS

ENVIRONMENTAL POLLUTION

Pollution is an undesirable change in the physical, chemical or biological characteristics of air, water and soil that may harmfully affect the human life or that of desirable species or industrial processes, living conditions and cultural assets or deteriorate raw material resources. It is thus direct or indirect change in any components of biosphere that is harmful to living components and in particular undesirable for man, affecting adversely the industrial progress, cultural and natural assets or general environment. Environmental pollution may also be defined as unfavorable alteration of our surroundings through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical constitution and abundance of organisms.

POLLUTANT:

Any substance which causes pollution is called pollutant. A pollutant may thus include any chemical or geochemical substance, biotic component or its product or physical factor that is released intentionally by man into the environment in such a concentration that may have adverse, harmful or unpleasant effects. It is also defined as any solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to the environment. Pollutants are often the residues of materials we make rise or throw away e.g. smoke from industries and automobiles, sewage from homes and hotels, radioactive substances from nuclear plants, discarded households articles. However, all pollutants are not waste material. Fertilizers are used to enrich the soil for increasing crop yields but pollute water if present in excess.

A pollutant can be any chemical, such as a radio-nuclide (radioisotopes); organo-phosphorus compound or trace gas or it may be a geochemical, substance such as dust or a sediment or biological organisms or their products. Sometimes a pollutant can be an entity like heat that is released intentionally or inadvertently by man resulting in adverse, harmful or unpleasant or inconvenient effects. These undesirable effects may be direct or indirect, mediated through resource organisms or climatic change. Indeed, any substance can act as a pollutant when present in too large quantities.

AIR POLLUTION

Air being very vital component of earth's environment slight change in its composition can have varied effects on the survival of the life. The presence of certain substances in air beyond approved concentration levels that can lead adverse effects on biotic as well as abiotic environmental factors is termed as air pollution.

Air pollution can best be studied in terms of sources and types of pollution.

SOURCES OF AIR POLLUTION

In general there are three basic categories of sources of pollution. They are:

- i) **POINT OR STATIONARY SOURCE:** It includes industries like petroleum refineries, fertilizer plants, paper factories, iron and steel industries etc. discharge various gaseous pollutants into the atmosphere from a specific point.
- ii) **LINE OR MOBILE SOURCES:** It includes those sources which do not cause pollution at a specific point but are moving sources. These include automobiles as the major sources. Automobile exhausts release, in addition to particulates, various gases as pollutants into the air. These include carbon monoxide, nitrogen oxides, hydrocarbons, carbon dioxide. Lead is another serious pollutant released through the automobile exhaust as it is used as an anti-knocking material in petrol in the form of tetra ethylene lead (TEL).
- iii) **AREA SOURCES:** It includes those sources of pollution which are prevalent in certain specific area e.g., natural sources like volcanic eruptions, pollen grains; mining activities etc. The release of poisonous gas Methyl Iso-cyanide (MIC) which effected large areas adjoining Bhopal. Wars, by releasing various forms of explosives containing poisonous gasses pollute the air and disturb the ecology of those areas. Agricultural activities including the use of various pesticides pollute the air while spraying of weedicides, insecticides and fungicides etc. The fumes from industries are released into the air and cause pollution.

TYPES OF AIR POLLUTANTS:

Air pollutants can be either;

Primarily air pollutants The pollutants that are a direct result of the process can be called primary pollutants. A classic example of a primary pollutant would be the sulfur-dioxide emitted from factories

Secondary air pollutants are the ones that are caused by the inter mingling and reactions of primary pollutants. Smog created by the interactions of several primary pollutants is known to be as secondary pollutant.

The air pollutants can also be ;

1. Gaseous pollutants.

2. Particulate pollutants.

3. Radioactive pollutants

1. Gaseous pollutants: There are numerous gaseous pollutants of air which include carbon dioxide, carbon monoxide, oxides of sulphur, oxides of nitrogen, hydrogen fluoride, photochemical oxidants, ozone etc. Burning of fossil fuels in industry and home, in automobiles, sulphur dioxide and oxides of nitrogen. Carbon monoxide is released as a result of incomplete combustion of fuels. Hydrogen fluoride is released from the soil and rocks rich in fluoride containing minerals. Photochemical oxidants include

peroxyacetylnitrate (PAN), ozone, aldehydes etc. which are formed by reactions between primary pollutants like nitrogen oxides, hydrocarbons etc in presence of light.

2. Particulate pollutants: Particulate is solid or liquid particles which remain suspended in air for prolonged periods. They include metallic dust released from various metallurgical processes; soot from mining and un-burnt fuel particles etc., these particulates can be coal dust, fly ash; sprayed fumes of pesticides; metal dust of lead, chromium, zinc, mercury etc., cotton dust and various forms of chemicals aerosols. Particulate mass levels can cause pollution when the mass levels range between 50 g/m³ and 2000 g/m³. Particulates including mist, fumes, dust etc which have particle size ranging from 0.1 to 1.0 µm provide nuclei for water droplet and ice formation and result in fog which on combining with smoke forms smog, which is known to cause serious respiratory tract disease. Aerosols e.g. chlorofluorocarbons released from refrigeration devices and jet airplanes deplete the ozone layer present in the upper atmosphere.

3. Radioactive pollutants: The harmful radiations emitted from radioactive substances cause air pollution. Expulsion of nuclear substances and wastes of nuclear power plants also release greater radiations, harmful for living organisms.

EFFECTS OF AIR POLLUTION

Some of the major, integrated effects on air pollution in general are as follows

1. Particulate Matter:

It is of two types—settleable and suspended. The settleable dusts have a particle longer than 10 µm. The smaller particles are able to remain suspended for long periods in the air. The important effects of particulate matter are.

(i) Dust and smoke particles cause irritation of the respiratory tract and result in bronchitis, asthma and lung diseases.

(ii) Smog is a dark or opaque fog which is formed by the dust and smoke particles causing condensation of water vapours around them as well as attracting chemicals like SO₂, H₂S, NO₂, etc. Smog harms plant life through glazing and necrosis besides reduced availability of light. In human beings and animals it produces respiratory troubles.

(iii) Particulate matter suspended in air, scatters and partly absorbs light. In industrial and urban areas, sunlight is reduced to 1/3 in summer and 2/3 in winter.

(iv) At a concentration above 150 g/100m³, cotton dust in ginning process produces pneumoconiosis or lung fibrosis called byssinosis. Lung fibrosis produced in other industries includes asbestosis (in asbestos

industry), silicosis (stone grinders), siderosis (iron mill), coal miners' pneumoconiosis, flour mill pneumoconiosis, etc.

2. Carbon monoxide:

It accounts for 50% of the total atmospheric pollutants. It is formed by incomplete combustion of carbon fuels in various industries, motor vehicles, hearths, kitchens, etc. Carbon monoxide combines with haemoglobin of blood and impairs its oxygen carrying capacity. At higher concentration, carbon monoxide proves lethal.

3. Sulphur Oxides:

They occur mainly in the form of sulphur dioxide. It is produced in large quantity during smelting of metallic ores and burning of petroleum and coal in industries, thermal plants, home and motor vehicles. In the air, SO_2 combines with water to form sulphurous acid (H_2SO_3) which is the cause of acid rain. It causes chlorosis and necrosis of vegetation. Sulphur dioxide, above 1 ppm, affects human beings. It causes irritation to eyes and injury to respiratory tract. It results in discolouration and deterioration of buildings, sculptures, painted surfaces, fabrics, paper, leather, etc.

4. Nitrogen Oxides:

They are produced naturally through biological and non-biological activities from nitrates, nitrites, electric storms, high energy radiations and solar flares. Human activity forms nitrogen oxides in combustion process of industries, automobiles, incinerators and nitrogen fertilizers. Nitrogen oxides act on unsaturated hydrocarbons to form peroxy-acyl nitrates or PAN. It gives rise to photochemical smog. They cause eye irritation, respiratory troubles, blood congestion and dilation of arteries.

5. Carbon dioxide:

Due to excessive combustion activity, the content of CO_2 has been steadily rising. As carbon dioxide accumulates in the atmosphere it absorbs more and more of the reflected infrared radiation. This could cause an increase in temperature referred to as the green house effect. Melting polar ice caps and glaciers could cause sea levels to rise, flooding most of the major population centres and fertile lands.

6. Aerosols:

They are widely used as disinfectants. Other sources are jet plane emissions which contain chlorofluorocarbons. Chlorofluorocarbons are also used in refrigeration and formation of certain types of solid plastic foams. Burning of plastics produces polychlorinated biphenyls (PCBs). The latter are

persistent and pass into the food chain. Chlorofluorocarbons and carbon tetrachloride react with ozone layers of stratosphere and hence deplete the same.

7. Photochemical oxidants:

Hydrocarbons have carcinogen properties. Some of these are also harmful to plants because they cause senescence and abscission. In the presence of sunlight, hydrocarbons react with nitrogen oxides to produce ozone, peroxy-acyl nitrates, aldehydes and other compounds. Peroxy-acyl nitrates are a major constituent of air pollution. They cause eye irritation and respiratory diseases.

8. Automobile Exhausts:

They are one of the major sources of air pollution. The important pollutants are Carbon monoxide, Benzpyrene, Lead, Nitrogen oxides, Sulphur compounds and Ammonia.

9. Pollen and Microbes:

Excess of microbes in the atmosphere directly damage the vegetation, food articles and causes diseases in plants, animals and human beings. Excess of pollen causes allergic reactions in several human beings. The common reactions are also collectively called hay-fever. The important allergic pollen belong to *Amaranthus spinosus*, *Chenopodium album*, *Cynodon dactylon*, *Ricinus communis*, *Sorghum vulgare*, *Prosopis chilensis* etc.

CONTROL OF AIR POLLUTION

1. Intensive plantation around the settlements reduces the amounts of particulates like dust etc in the air. The trees having simple leaves have been proven much effective. Social forestry and community forestry programmes prove to be effective in controlling air pollution.
2. Installation of industrial units away from human habitations so as to minimize immediate effects of these gases. Besides these, gases get diluted before reaching the people.
3. Shifting to public transport facilities rather than personal conveniences to minimize the release of automobile exhaust.
4. Using much efficient machinery in industry and automobiles to ensure proper and complete combustion of fuels.
5. Using absorbers, adsorbers for unwanted chemicals at the source and along the paths of diffusion of pollutants.
6. Enactment of environment laws.
7. Creating public awareness through debates, discussion, seminars, symposia, etc about the hazards of air pollution.
8. Use of control equipments .

Air pollution control equipment is used to regulate or negate various system emissions. It can be found in a wide range of manufacturing, processing, research and production facilities. In some cases, air cleaning and purifying systems are used to provide a healthy and contaminant-free work environment, while in others they are in place to prevent the escape of harmful chemicals, vapors or dust into the air. Common types of air pollution control equipment include scrubbers, dust collectors, thermal oxidizers, cyclones, blowers, mist collectors, catalytic converters and electrostatic precipitators. The scrubber is perhaps one of the most well-known devices. Its function is to remove or neutralize harmful substance in an exhaust stream before they leave a given system. Typically, a scrubber infuses a new chemical or mixture into the problematic fumes. In the case of a wet scrubber, vaporized water is infused into the polluted substance and, once the resulting mixture condensed, the pollutants remain in the water while the rest of the gas escapes. Other scrubbers involve powdered lime and other materials, which react with acid and other harmful chemicals in the fumes, converting them into workable, pollution-free components. By contrast, an electrostatic precipitator uses a high-voltage electric charge combined with attractive plates to collect harmful materials. Most car drivers should be familiar with catalytic converters. These devices are installed in automobile exhaust systems, and are now a standard feature in all North American commercial vehicles. They reduce engine emissions by oxidizing carbon monoxide and dangerous hydrocarbons to carbon dioxide and water, two normal components of the environment. They also convert nitrogen oxide to its component parts (nitrogen and oxygen). Catalytic converters use a platinum or platinum/rhodium catalysts to remove and reduce emissions. In addition to their use in automobiles, they serve as air pollution control equipment for numerous industries. Industrial units are much larger, and can handle a far greater volume of emissions.

Cyclones, a fairly widespread type of control equipment, spin polluted vapors at high-speeds. Gravity forces the heavier materials (the pollutants and dust) to the edge of the spinning vapors, where it is collected. The lighter, pollutant-free fumes are then released. These systems, along with a tremendous variety of other specialized or unique pollution control devices are in place at factories and production facilities around the world

WATER POLLUTION

The undesirable changes in the natural characteristics of water lead to water pollution..

SOURCES OF WATER POLLUTION

Water pollution is caused by both natural process of decay and decomposition of animals and plants and the anthropogenic activities such as industrial and domestic effluents, use of pesticides, fertilizers etc. The sources of water pollution can be categorized as:

POINT SOURCES: In which almost definite, constant and fixed composition of effluents are discharged directly into a water body like industrial discharge and sewage etc.

Sewage: It includes domestic sewage containing food wastes, detergents, human excreta and live stock excretory wastes. It generally contains, at an average, more than 99 percent solid matter and less than one percent liquid. It is richer in organic constituents (about 70%). It has been estimated that 60 ppm to 150 ppm chloride content is present in sewage disposal.

Industrial effluents: The discharges from oil refineries, paper and pulp industry, glass, steel, iron, textiles, sugar industry etc. contains high organic load which when added to water causes water pollution. There are various metallic elements which act as accumulating poisons in aquatic systems. Besides these two major sources of pollution, some other sources include Pesticides, Fertilizers, Radioactive materials from nuclear wastes, Pathogenic organisms (including bacteria, helminthes and their eggs, protozoa etc), Oil and excessive salts etc. and Thermal pollution.

NON POINT OR DIFFUSED: In which the effluents are added at different positions with varied composition and volume. These are generally dispersed and diverse in nature e.g. agricultural and domestic run off etc.

EFFECTS OF WATER POLLUTION

Water polluted with domestic sewage can spread such epidemic diseases as cholera, typhoid, dysentery or diarrhoea and a number of minor ailments and water borne diseases. The major effect of sewage in water is that it reduces oxygen content of water. The organic matter content of sewage is higher. The maximum organic content is subjected to chemical and bio-chemical oxidation processes. Since the dissolved oxygen content is less, this leads to anaerobic conditions. The estimation of Biochemical Oxygen Demand (B.O.D.) gives an indication of the amount of pollution in a body of water. The high amount of B.O.D. indicates large bacterial population. The domestic sewage adds nitrates and phosphates. In the same way, excess nitrates from fertilizers run down into ponds, lakes and streams. These nitrates and phosphate encourage a thick bloom of blue-green algae, which depletes the oxygen content of the water. This suffocates the fish and other aquatic life. The rapid algal growth leads to decline of nutrient content in the medium, causing rapid decay of algal filaments. The products of their decay attribute unpleasant taste and smell to the water. The increased productivity of lake and stream water brought about by nutrient enrichment is known as Eutrophication.

The use of nitrates in fertilizers enters the drinking water and cause health hazards. Nitrates are converted to nitrites by bacteria when they enter intestine. The nitrites join the blood stream. Hemoglobin has stronger affinity for nitrites than oxygen and therefore, infants suffer from acute lack of oxygen. This disease is known as methaemoglobinemia (Blue-baby disease).

Industrial wastes have high B.O.D. values. The organic content of such wastes provides an abundant source of food for bacteria and fungi. Owing to the metabolic activities of these organisms, the dissolved oxygen gets reduced and the area is found without oxygen. Aquatic organisms such as fish either evade this area or are killed. The industrial wastes which have high B.O.D. content have inorganic and organic intoxicants and may have high or very low pH. In wood pulp waste, besides sugar, have B.O.D., sodium hydroxide, sodium sulphide, formaldehyde, sodium salts of resin and fatty acids are also present. The presence of even certain wild toxic substances produces lethal effects on organisms such as fish when

present in waters with reduced oxygen. The effluents coming from chemical and metal industries have more toxic substances and organic matter is less. Such substances have low B.O.D. and high toxicity. Effluents containing metals like copper, zinc and chloride are poisonous and could kill fishes even at 0.1-0.22 ppm in fresh water. Ions of heavy metals like mercury, lead, chromium and cadmium, etc., cause harmful effects. Mercury produces heavy nervous disorder and its heavy dose may cause brain damage. Insecticides and herbicides are very harmful. These destroy a number of valuable aquatic food organisms by destroying the larval stages. These depress photosynthetic activity of phytoplankton. Recently it has been noticed that pesticides inhibit photosynthesis in algae. Now, there is a danger to the life for diatoms which produce half of the earth's oxygen and form the main food base of oceanic life. By the food chain process the phytoplankton are seen in the body of carnivores in high concentration and produce fatal effects so that large numbers of fishes are found dead in areas polluted with DDT. The bird population also reduces. In Man DDT enters by through food chain and may cause cancer, nervous disorders and leukemia and other serious ailments.

CONTROL OF WATER POLLUTION

Various legislative methods should be employed to control water pollution. Strict check should be maintained on the quality of drinking water. Improved methods for handling and disposal of sewage, garbage and night soil should be introduced. To control the epidemics and other disease, proper methods of sterilization of water drawn from shallow wells, should be developed. Polluted water is characterised by its oxygen demand and solid content. The city waste and sewage needs proper treatment and it is done in three steps

1. **In Primary Treatment**, the solid objects are separated by coarse screens or sieves. The liquid material passes into the settling tanks. The suspended materials settle down in the tanks and form sludge.
2. **In Secondary Treatment** the effluents are filtered through a bed of rocks, after which the bacterial decomposition of organic materials begins. To hasten this process air is bubbled to increase the oxygen content. This process removes about 90% of the biodegradable materials present in the water. The effluent is also chlorinated to kill the pathogens and is then discharged into the water bodies.
3. **Tertiary treatment** removes the detergents, metal ions, nitrates and pesticides, as these are not removed in the earlier treatments. In this process, the effluents from secondary treatment are passed through activated charcoal to absorb the pollutants. An alternative and less expensive method is to use this water for irrigation to raise crops or to grow algae and aquatic plants for use in biogas plants. This is now being practiced but some sort of preliminary treatment is required to make the polluted water free of pathogens and pollutants.

The creation of public awareness is important to make village ponds, wells and rivers clean and also to maintain cleanliness in urban areas. The most reliable way to control pollution and improve water quality is undoubtedly to stabilize the ecosystem by balancing the input and output of energy and nutrients. Some reasonable ways to increase stability of aquatic ecosystems include reduction in waste inputs, harvesting and removal of biomass, trapping of nutrients, fish management and aeration. In general, pollution means instability whereas a non-polluted habitat is equivalent to a stable ecosystem

that resists perturbation. Waste treatment is by no means the only major consideration in pollution control; various physical and biological methods of stream management can be adopted with a view to restoring an ecological balance and restoring diversification in the ecosystem to control pollution. Aquatic algae and other microbes and lower forms of life are efficient accumulators of radioactive substances from polluted habitats and some of these organisms can concentrate them within their cells to concentrations much higher than those in the ambient water.

The World Health Organization (W.H.O.) has proposed International Standards for drinking water on the basis of which five classes of quality are distinguished, viz., biological pollutants e.g. microbes and pathogens, radioactive pollutants, toxic substances, specific chemicals affecting health, and characteristics affecting the acceptability of water. The maximum permissible concentrations of various kinds of pollutants have been prescribed and the characteristics for water acceptability include such properties as colour, smell, taste, turbidity, pH, hardness, etc.

Various methods are introduced in controlling water pollution like the methods as adsorption, electro dialysis, ion exchange and reverse osmosis. Reverse osmosis is used to separate any substance in liquid or gaseous solution. It involves the use of porous membrane whose chemical nature can be made such that it has a preferential attraction for the solvent and a similar repulsion for the solute. This technique was originally developed to purify sea water but is not playing a significant role in water pollution control, water renovation, water purification and waste reclamation. This technique is also very valuable in the treatment of hard waters rich in calcium and magnesium. Reverse osmosis offers an economical and effective method for upgrading sewage water to a quality suitable for most water uses. The main emphasis of pollution control in many countries has been on sanitary and industrial wastes. Increasing attention is now being given to the problem of urban drainage. The importance of urban water shed management is being increasingly felt in controlling pollution from street run-off. The requirement and methods for possible storm water treatment are now beginning to be considered. In the end there are many choices on the personal and social levels that we must make consciously in our town or country. Our standard of living and way of life is based upon practices which are inherently unclean. Without taking steps of our standards of living, the answer seems to lie in this fact that we have to pay more for goods and services, and also more for the health status.

SOIL POLLUTION

Alteration in soil causing reduced productivity is called soil pollution. Since soil supports plant life which in turn supports animal life, hence soil pollution affects all organisms. Problems of soil pollution are more acute than other pollution types because soil is non-renewable resources due its very slow formation. The weathered earth's crust form soil that supports a variety of microscopic and macroscopic life-forms. The top most layer of soil is rich in nutrients and is composed of various types of minerals, organic and inorganic substances. Biologically soil has a large number of algae, fungi, bacteria, protozoa, nematodes etc. Over the years, soil has been contaminated by a number of ways which is popularly known as soil pollution. One of the major pollution problems is disposal of solid waste material including farm and animal manure, agricultural wastes, industrial wastes such as chemicals, salts, radioactive materials etc.

CAUSES OF SOIL POLLUTION

Wind and Water Erosion:

Out of 69 mha (million hectare) estimated to be degraded in India, approximately 43 mha are non arable and barren including 4 mha of ravine lands. The Himalayan Mountains with weak geological formation and poor physiographic conditions are under great stress and suffer from serious water erosion, though water erosion is also rampant in the hills of Western Ghats and areas of high intensity rainfall. Water erosion not only removes the productive surface layer of soil, but also reduces the storage capacity of reservoirs. Wind erosion is more prominent in the hot arid region occupying 31.7 mha of which 61 per cent is found in western Rajasthan. Removals of vegetative cover and over grazing enhance the intensity and extent of wind erosion and desertification.

Water logging:

Water logging caused by rise in water table poses a great threat to silt productivity and environmental ecology, especially in the irrigated areas. Roughly an area of 100,000 ha is estimated to be affected by water logging annually. Introduction of canal irrigation is the major reason.

Salinisation and alkalinisation:

The development of soil salinity in India started long back and is more prominent in the arid and semiarid areas, though some coastal areas in the humid conditions also suffer due to the ingress of seawater. Continuous use of poor quality groundwater for irrigation also leads to the development of soil salinity or sodicity, particularly in the slow permeable solid. It is more serious in the Indo-Gangetic plain, black soil region, arid areas of Rajasthan and coastal Gujarat.

Nutrient loss:

The factor greatly responsible for enormous removal of the plant nutrients is the soil erosion. In India the nutrient loss is of 5.37 to 8.40 million tones course through erosion every year. The transformation from high internal input agriculture in the past to present day high external input (fertilizers, pesticides) agriculture causes this problem.

Chemicals:

Disposal of industrial waste is the major problem responsible for soil pollution. The industrial wastes contain the colloidal material like clay, Fe_2O_3 ; Al_2O_3 and MgO_2 etc; dissolved cations like Na^+ , K^+ , Ca^{++} , Mg^{++} , Mn^{2+} , CO and Fe ; Dissolved anions like CO_3^{2-} ; HCO_3^- ; OH^- ; Cl^- ; SO_4^{2-} , HSO_3^- etc., organic compounds both bio-degradable and non-biodegradable wastes. The urban and domestic wastes contain mostly the non-degradable wastes like paper, etc.

Pesticides and insecticides: These are sprayed on crops to protect them from the pests. Among pesticides the most important are the chlorinated hydrocarbons e.g. DDT, BHC, aldrin, dieldrin, lindane, chlordane, organo-phosphates include malathion, parathion etc.

Fertilizers: These are chemical manures that are added to the soil to increase the crop yield which generally contain one or more of the plant nutrients i.e. nitrogen, phosphorus and potassium.

EFFECTS OF SOIL POLLUTION

The visible economic impact of land degradation is on agricultural productivity. In a country like India, where 70% of the population is entirely dependent on agriculture, the reduction in productivity of land resources has a telling effect on the socio-economic conditions. The immediate effects of land degradation includes reduced crop yield, increasing need for agricultural inputs and decreasing profits,

reduction in the value of land, loss of water resources, increase infrequency and severity of flood, siltation of reservoirs, rivers etc. and adverse effect on living. Increasingly less remunerative subsistence farming systems lead the peasants to leave the land uncultivated, which then tends to become barren. All the above said reasons ultimately results in shifting the land resources from agriculture to other uses including industry which bring environmental degradation.

1. The industrial pollutants affect and alter the chemical and biological properties of soil.
2. Chemicals and pesticides affect the fertility of soil by killing the soil micro organisms.
3. Pesticides are absorbed by plants and enter to other organisms through food chains and food webs leading to biomagnifications.
4. Application rates of fertilizers are enhanced.
5. Excretory products of human being containing pathogens contaminate soil and vegetable crops.

Control: Since the problem of land degradation is very complex, it is important to approach the issue in a systematic and logical manner. The following are some steps that can be taken for reducing the gravity of the problem:

1. Proper records of land productivity status should be prepared with the help of soil scientists along with the latest technologies like remote sensing.
2. In areas of high water requirement like cropped areas, effective soil and water conservation techniques should be adopted with the guidance of engineers.
3. Industrial activities in the nearby areas, which are hazardous to the environment, should be regulated through laws.
4. Sustainable and effective land use system should be followed.
5. Implementation of agro-forest ecosystem, wherever water erosion is a serious threat.
6. Adoption of integrated water-shed management system and integrated balanced nutrient management system.
7. Auto-regenerating the soil fertility by adding organic matter through micro-organism and incorporation of crop residues should be facilitated.
8. By the use of biofertilizers and manures (which are biological in origin), use of chemical fertilizers can be reduced.
9. By biological control of pests, pesticides can be reduced.
10. Treatment of industrial and municipal sewage can reduce soil pollution, prior to its discharge.
11. Enforcement of environmental regulatory laws.
12. Educating the masses through different media.

NOISE POLLUTION

Noise pollution is defined as unwanted sound that causes discomfort. The release of unwanted sound into the atmosphere is known as noise pollution. Sound is a major means of communication, entertainment and expression. Whether the sound is pleasant or noise depends upon the loudness, duration, rhythm and mode of person. The exposure to found sound is annoying and harmful and is considered as a major criterion for noise pollution. Noise intensity is measured in decibel (dB) unit. According to the Delhi pollution control Committee Study, noise levels during peak hours at major traffic Junctions vary between 75 and 80 dB. Many studies including that of the world health organization (WHO) and European Environmental Agency (EEA), have documented that any regular exposure to noise

pressure above 55 dB could cause annoyance, irritation, aggressive behaviour and sleep disturbances. The EEA report has in fact, gone to the extent of saying that a routine exposure to 65 dB can result in hypertension and noise above 75 dB can lead to increased stress levels. On the basis of studies conducted, the levels of noise acceptable for human health have been suggested to be:

Activities	Level (dB)
Talking	50
In household	40
Motor cycle	65-105
Heavy vehicle like trucks, Buses at 7 meter distance	85-100
Hammer at 2 meter distance	120
Aeroplane at 50-100 meter height	90-100

SOURCES OF NOISE POLLUTION

The main sources of noise pollution are:

1. Industries: Such as printing press, textile mills, engineering works etc.
2. Transport vehicles: Such as trucks, trains, airplanes, buses, cars and other vehicles.
3. Domestic gadgets: It includes noise produces by domestic appliances like TV, radio, washing machines, electric grinders, exhaust fans etc.
4. Defence equipments: Such as tanks, firing practices, rocket launchers etc.
5. Agricultural vehicles: Such as tractors, thrashing and crushing machines etc.
6. Other equipments: Like loud speakers, music systems etc.

EFFECTS OF NOISE POLLUTION

The effects of noise on people can be classified into two categories:

1. Auditory effects.
 2. Sociological or Psychological effects.
1. Auditory effects.

Auditory effects include both hearing loss and speech interference. The most immediate and acute effect of noise pollution is impairment of hearing. A sudden loud noise can cause severe damage to the ear drum. Long exposure to loud noise can cause hearing loss which may become permanent.

2. Sociological or Psychological effects.

Psychological /sociological effects include an acoustical privacy. Noise pollution increases the rate of heart beat. It causes constriction of blood vessels and cause dilation of the pupils of the ear. Fluctuations in arterial blood pressure, impairment of night vision, are some effects. It causes headache, irritability (annoyance) and extreme emotional disturbances. It aggravates existing disease by disturbing peace of mind and sleep. The effects of the noise on the foetus are not fully known. Medical scientists have note that an unborn child will move and kick when there is loud noise.

CONTROL OF NOISE POLLUTION

The noise pollution can be controlled by the following ways:

1. Technically/modifying and fabricating the machines and using the quieter machines to replace the noisy ones.
2. Regular replace of machinery can reduce noise because much of this noise may be due to inefficiency of the machinery.
3. Construction of walls in the highly noisy polluted area can reduce noise in that area.
4. Restricting the use of public address systems.
5. Growing plants can absorb and dissipate sound energy and thus act as a buffer zone.
6. Noise produced by vehicles can be reduced by banning pressure horns and strictly following the traffic laws.
7. Use of silencers, improvement in design and better installation of machinery in industries can minimize the noise.
8. Each industrial establishment must have such facilities in order to have a check on the intensity of noise pollution, being produced throughout the working period.
9. Industrial areas should be planned in such a way that these should be away from residential areas.

SOLID WASTES

It refers to non-liquid waste materials arising from domestic, trade, Industrial, agriculture, and other activities. The solid wastes include the materials; food wastes, paper, metals, plastics, ceramics, worn-out clothes, garden wastes, agriculture wastes, Building wastes, hazardous wastes, dust from mining, hospital wastes including discarded cotton, bottles etc; broken utensils ashes from fires, and a variety of other wastes.

CAUSES OF URBAN AND INDUSTRIAL WASTES:

Due to the rapid development of in every sphere of life, it has been observed that in a very short span of time, pollution came into existence and it has been attributed to

- 1) Rapid population growth
- 2) Urbanisation
- 3) Changing life styles
- 4) Industrialisation

EFFECTS OF WASTES:

- **Health:** For the general public, the main risks to health are indirect and these arise from the breeding of disease vectors primarily flies and rats. The most serious is the transfer of pollution to water, air and soil. Industries are also introducing danger of different kinds like hazardous wastes during transport and disposal, entry of heavy metals in the food chain etc.
- **Environment:** The environmental damage caused by solid wastes mostly pertains to aesthetics. Also, there is the danger of water pollution when the refuse dump enters the water resources. In addition, uncontrolled burning of open dumps can cause air pollution. Water will pollute air and land filling may leach the water and pollute ground water.

CONTROL OF WASTES:

1. Utilization of wastes for generating electricity and biomass.
2. Recycling of the waste.
3. Composting for the generation of organic material and its use as soil conditioner.
4. Land fill disposal
5. Re-organization of the man-power.
6. Incineration
7. Hydro pulping and
8. Pyrolysis.
9. Re-use of waste materials