

PUC Ist year - Semester – II

Unit VII: Environmental issues: Causes, effects and control measures

Module No: 36. Air pollution and Noise pollution

Pollution may be defined as an undesirable change in the physical, Chemical or biological characteristics of our air, water and land, that may harmfully affect living organisms. The substances responsible for pollution are called pollutants. Pollutant can also be defined as a constituent in the wrong amount, at a wrong place or at a wrong time. The growing human population, rapid urbanization, deforestation, industrial growth, lack of knowledge about environment among people is responsible for the existence of pollutants. Increased vehicular traffic, misuse and mismanagement of natural resources by human beings is also responsible for pollution. 5th June is celebrated as world Environment Day. The pollutants which are rapidly dissociated by natural means are called Biodegradable pollutants ex: sewage. The pollutants which are slowly degraded or not degraded at all are called non-degradable pollutants. Ex: plastic, Asbestos etc. The pollutants which are preserved in their original forms after their release are called primary pollutants ex: plastic. The pollutants formed from primary pollutants are called secondary pollutants ex: Nitrogen oxides and hydrocarbons react in sunlight to form ozone and peroxyacetyl nitrate. The secondary pollutants are more toxic than the primary pollutants.

Air Pollution:

Air pollution may be defined as “Occurrence or releasing of any foreign material in the air, which are harmful to man, vegetation, animals and buildings”.

Air is one of the most important constituents of man's environment. Clean and pure air is very essential for health and survival of man.

Sources and Pollutants:

- 1. Industrial Pollutants:** Industries are major sources of pollutants. Different industries release many kinds of pollutants such as CO_2 , CO, SO_2 , H_2S , Chlorines, Hydrogen fluorides, ammonia, hydrocarbons etc. These gases are produced due to burning of coal, petroleum etc. The manufacturing units of fungicides, pesticides, cosmetics and metallurgical industries dump a lot of pollutants into the air.
- 2. Burning of Fuels:** The burning of fuels (Coal and oil) by human beings release most of the gaseous and particulate air pollutants, which includes CO, CO_2 , SO_2 , methane, ash etc.
- 3. Mobile combustion source:** Mobile combustion sources include automobiles, locomotives, air craft etc. In cities vehicular traffic automobiles have become the largest source of air pollution. The major pollutants from mobile combustion are carbon monoxide, oxides of nitrogen and hydrocarbons. Combustion of petroleum used in automobiles emits various particulate lead compounds.
- 4. Thermal power stations:** There are a number of thermal power stations in the country and they use several million tonnes of coal. The chief pollutants are fly ash, SO_2 other gases and hydrocarbons.
- 5. Ionizing radiations:** Ionizing radiations are given out mainly by atomic explosions and testing of atomic weapons. These cause injury to protoplasm.

6. **Agricultural activity:** Pesticides like chlorinated hydrocarbons are extensively used for eradication of pests and insects but their unchecked use has also given us the problem of pollution to face.
7. **Suspended Particulate matter (SPM):** Various industries and operations such as blasting, drilling, crushing, grinding, mixing etc. emit solid and liquid particulates into the atmosphere which includes some of the harmful trace metals such as arsenic, antimony, beryllium, cadmium, lead, mercury, nickel, selenium etc.
8. **Photo chemical smog (Smog = Smoke and Fog):** Photo chemical smog is caused by hydrocarbons, organic substances and oxides of nitrogen, most of which arise from the fumes and exhaust of motor vehicles. Photo chemical smog is a serious health hazard and causes diseases as asthma and bronchitis. It may also damage vegetation.
9. **Natural sources:** They are volcanic eruptions releasing poisonous gases like SO_2 , H_2S , CO etc, forest fires, vegetative decay, marsh gases, cosmic dust, pollen grains of flowers, soil debris, fungal spores etc.

Effects of Air pollution:

1. **Carbon Monoxide:** It accounts for about 50% of total air pollution. It has high affinity for haemoglobin and combines with it to form carboxy haemoglobin. $\text{HbO}_2 + \text{CO} \rightleftharpoons \text{HbCO} + \text{O}_2$ It reduces oxygen carrying capacity of blood leading to hypoxia in body tissues. It also causes headache, nausea, exhaustion, muscular weakness, psychomotor disturbances decrease in visual perception, etc and can also lead to death due to **CO poisoning**.
2. **Sulphurdioxide:** Sulphur dioxide causes serious respiratory problems. It causes chest constriction, headache, asthma, bronchitis, vomiting, and

suffocation, irritation of throat and eyes, respiratory diseases. It damages the membranes of the plant cells. Hence it is referred to as phytotoxic pollutant. It also cause chlorophyll loss, plasmolysis, inhibition of growth and yield reduction. Its concentration in the atmosphere accelerates the corrosion of metals and alloys such as Iron, Steel, Aluminum and Zinc. It is also responsible for the degradation of paper and building material.

3. **Nitrogen oxides:** Inhibits cilia action so that soot and dust penetrate into the lungs, irritation, bronchitis, oedema of lungs.
4. **Hydrogen sulphide:** Causes nausea, irritation of eyes and throat, irritation of respiratory passages and asphyxiation. Darkening of painted surfaces, corrosion.
5. **Suspended particles (ash, soot, smoke etc):** Causes emphysema, eye irritation and possibly cancer, respiratory diseases, diseases like silicosis, asbestosis, bysinosis etc.
6. **Ammonia:** Inflames upper respiratory passages.
7. **Photo chemical smog:** Lung irritation, asthma, bronchitis etc. Destruction of vegetation.
8. **Heavy metals:** Retardation of activities of brain, interference in enzyme activities in liver and kidney.
9. **Carbon dioxide:** Increase in the atmospheric temperature (Global warming and Green house effect), melting of ice at poles and raise of oceanic water level, change in the rainfall pattern, affects productivity of agricultural crops.
10. **Radioactive substances:** These substances cause genetic disorder and cancer in human beings.
11. **Hydrogen Fluoride:** Irritation, diseases of bone, respiratory diseases.

12. Acid rains: sulphur dioxide and nitrogen oxides in atmosphere change into sulphuric acid and nitric acids. During rains, these acids along with water result in Acid rains. The pH of acid rain is 3-4 which causes damage to plants, animals and also change the soil to acidic, due to which forests undergo destruction in that area.

13. Aerosols: An aerosol in the atmosphere is a dispersion of solid or liquid matter in air, which contain fluoro carbons. These destroy the ozone layer in the stratosphere so that ultraviolet rays enter the earth atmosphere, which are harmful to life. The Jet aeroplanes emit aerosols into the atmosphere.

Air pollution – Control measures:

Air pollution at the source can be controlled in two ways

1. By separating the pollutants from the harm less gases.
2. By converting the pollutants to harmless products before their release in the atmosphere.

The technique employed for separating the pollutants from the harm less gases depends upon the size of the pollutants. To separate particles larger than $50\mu\text{m}$, gravity setting chambers or porous filters are being used. Particles smaller than $50\mu\text{m}$ are removed by using cyclone collectors or electro static precipitators. Wet and dry scrubbers are used to separate dust. Wet scrubbers are used in industries for the removal of SO_2 , NH_3 and metal fumes.

Oxidation of pollutants in the air is one of the most common methods of conversion. Other methods of conversion of pollutants include chemical neutralisation of acids and bases.

3. To check pollutant emission from vehicular exhaust several methods can be adopted.
 1. Using new proportion of gasoline and air.
 2. Using gas additives to improve combustion
 3. Using multi point fuel injection engine to reduce unburnt hydrocarbon emission.
 4. Catalytic converter filters in vehicles can convert nitrogen oxide to nitrogen.
 5. Lead free petrol can be used to reduce emission of lead.
 6. Tall chimneys which can release pollutants at higher level in the atmosphere are to be used. These reduce the pollutant concentration at ground level
 7. Deforestation is to be avoided.
 8. Sulphur dioxide may be controlled by using the techniques such as precombustion, desulphurication and removing sulphur after combustion.

Noise Pollution

Noise pollution is defined as the production of unwanted high pitch sound. Sound is a normal feature of our life. Noise is the sound which produces unpleasant effects on the ears. Sound is measured in decibel (dB). During ordinary conversation it is between 30 to 60dB. Critical level for ear damage is 85dB. Jet airplane creates a sound of more than 120dB at take off and this is the threshold of pain and this is hazardous and can damage the ear. A decibel value above 80dB causes noise pollution.

Sources of Noise pollution:

1. **Transport vehicles:** It includes noise of road traffic, rail traffic and air craft.
2. **Industries:** It includes noise caused by industrial machines, such as textile mills, printing presses, engineering establishments, defence equipments etc.
3. **Modern Domestic Gadgets:** It includes noise produced by domestic appliances such as T.V. sets, Tape recorder, radio set, food blender, exhaust fan etc.
4. **Loud speakers:** In India use of loud speakers is very frequent. It is played day – night during festival, religious gathering, elections etc.
5. Crackers, Dynamiting of mountains etc.

Effects of Noise pollution: Noise pollution causes

(1) Fatigue (2) Nervousness (3) Hearing loss (4) Hypertension (5) Headache (6) Unwanted noise increase heart beat (7) Dilation of the pupil of the eye (8) Memory is affected and concentration power is lowered (9) Develops sleep less ness. (10) Too much of noise affects the nervous system. (11) Physiological and psychological disorders

Control of Noise pollutions:

1. Designing, fabricating and using quieter machines to replace the noisy ones.
2. Minimizing the noise at source by proper lubrication and better maintenance of machines.
3. Using ear covers or cotton plugs to reduce occupation exposure.
4. Removing the noisy industries away from residential areas.
5. Restricting the use of public address system in urban areas.
6. Green plants must be planted around the road side to check the noise pollution.

7. Airports should be away from residential areas.
8. Laws should be made and strictly enforced.

Check Points:

- Air pollution is the imbalance in quality of air so as to cause adverse effects on the living organisms existing on earth.
- Pollution causing substances are termed pollutants.
- Major sources of air pollution includes increase in population, deforestation, burning of fossil fuels and fires, emission from vehicles, rapid industrialization, agricultural activities, wars, thermal power stations etc.
- The most important gaseous air pollutants are carbon monoxide, chlorine, halogenated solvents, hydrocarbons, hydrogen sulphide, nitrous oxide and sulphur dioxide.
- The increase in CO_2 content in the atmosphere leads to green house effect and global warming.
- Air pollution effect human and animal lives and also vegetation.
- Air pollution is mainly controlled by separating pollutants from harmless gases and by converting pollutants to harmless products.
- Noise is the unwanted sound.
- Critical level of sound for ear damage is 85dB.
- Vehicles, industries, modern domestic gadgets, loud speakers, etc cause sound pollution.
- Noise pollution causes both physiological and psychological problems.

Object Type Questions:

1. Smog is a combination of
A. Fire and Smoke **B. Smoke and Fog** C. Water and Smoke D. Air and Water.
2. Increase in CO_2 in atmosphere
A. Stops UV rays from the sun **B. Leads to Global warming**
C. Cause Cancer D. Causes respiratory diseases
3. Green house effect is related to
A. **Global warming** B. Increased growth of Algae C. Increased growth Zooplanktons D. None
4. World Environment day
A. **5th June** B. 5th April C. 5th May D. 26th January
5. Photochemical smog is a serious health hazard causes
A. Asthma B. Bronchitis C. Lung irritation **D. All**
6. Radio active substances cause
A. **Genetic disorders** B. Asthma C. Bronchitis D. None
7. Sound becomes hazardous noise pollution if its level goes above
A. 30dB **B. 120dB** C. 50dB D. 85dB
8. Which of the following are the byproducts of burning of fuel
A. Co B. CO_2 C. SO_2 **D. All**
9. Which of the following is the source of SO_2 pollution
A. Volcanoes B. Fossil fuel combustion C. Thermal power plants **D. All**
10. Man dies in the atmosphere of Co because
A. It combines with O_2 present in the body to form CO_2

B. It combines with the haemoglobin of the blood making it incapable of absorbibg O₂.

C. It reduces the organic matter of tissues

D. It dries up the blood.

11. Which is not a natural source of pollution

A. Forest fire **B. Coal fire** C. Volcanoes D. Dust storms

12. What is the intensity of sound in normal conversation

A. 10 – 20 dB **B. 30 – 60 dB** C. 70 – 90 dB D. 120 – 150 dB

13. Automobile exhaust gas that causes major respiratory problem is

A. **Co** B. CH₄ C. NO₂ D. chlorine

14. Nitrogen oxides produced from emission of automobiles and power plants

all the sources of fine air borne particles which lead to

A) Industrial Smag

B) Dry acid deposition

C) Wet acid deposition

D) Photochemical smag

Short Answer Questions:

1. Define pollution and pollutants?
2. List out the effects of Noise pollution?
3. What are the control measures of Noise pollution?
4. Explain the role of Co, and Co₂ as air pollutants?
5. Write short notes on photochemical smog?

Long Answer Questions:

1. Describe the sources and effects of Air pollution?
2. Define pollution and list out control measures of air pollution?
3. Explain sources, effects and control measures of Noise pollution?