



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35



INTRODUCTION

Environmental pollution may be defined as, *“The unfavorable alteration of our surroundings”*. It changes the quality of air, water and land which interferes with the health of humans and other life on earth.

Pollution are of different kinds depending on the nature of pollutant generated from different sources.

Example :

Industry, automobiles, thermal power plants, farming, nuclear reactors, generate different types of pollutants causing pollution to air, water bodies and land.

Types of Pollutants

Biodegradable pollutants

Biodegradable pollutants decompose rapidly by natural processes.

Non-degradable pollutants

Non-degradable pollutants do not decompose or decompose slowly in the environment. Slowly decomposed materials are more dangerous because it is more difficult to remove them.

Classification of Pollution

Different kinds of pollution that affects the environment are,

- (i) Air Pollution
- (ii) Water Pollution
- (iii) Soil Pollution
- (iv) Marine Pollution
- (v) Noise Pollution
- (vi) Thermal Pollution and
- (vii) Nuclear hazards.



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AIR POLLUTION

Definition

Air pollution may be defined as, “the presence of one or more contaminants like dust, smoke, mist and odour in the atmosphere which are injurious to human beings, plants and animals.”

Rapid industrialization, fast urbanization, rapid growth in population, drastic increase in vehicles on the roads and other activities of human beings have disturbed the balance of natural atmosphere.

Chemical Composition of Atmospheric Air

Constituents	%
Nitrogen	78
Oxygen	21
Argon (Ar)	< 1
CO ₂	0.037
Water vapour	Remaining
O ₂ , He, NH ₃	Trace amount

Sources of Air Pollution

- **Natural sources**

Volcanic eruptions, forest fires, biological, decay, pollen grains, marshes, radioactive, materials etc.

These pollutants are caused by the natural sources.

- **Man-made (anthropogenic) activities**



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Thermal power plants, vehicular emissions, fossil fuel burning, agricultural activities etc.,

Classification of Air Pollutants

Depending upon the form (origin) of pollutants present in the environment, they are classified as

- (i) Primary air pollutants.
- (ii) Secondary air pollutants.

1.Primary air pollutants

Primary air pollutants are those emitted directly in the atmosphere in harmful form.

Eg: CO, NO, SO₂, etc.,

Indoor Air Pollutants

Indoor air pollutants are primary air pollutants. The most important indoor air pollutant is radon gas.

Sources (causes) of indoor air pollutants

- 1. Radon gas is emitted from the building materials like bricks, concrete, tiles, etc., which are derived from soil containing radium.**
- 2. It is also present in natural gas and ground water and is emitted indoors while using them.**
- 3. Burning of fuels in the kitchen, cigarette smoke, liberates the pollutants like CO, SO₂, formaldehyde, BAP (benzo-(a) pyrene).**

2. Secondary air pollutants



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Some of the primary air pollutants may react with one another or with the basic components of air to form new pollutants. They are called as secondary air pollutants.



Common air pollutants sources (causes) and their effects

According to the World Health Organization (WHO), more than 1.1 billion people live in urban areas where outdoor air is unhealthy to breathe. Some of the common air pollutants are described below.

Carbon monoxide (CO)

It is a colourless, odourless and is poisonous to air-breathing animals. It is formed during the incomplete combustion of carbon containing fuels.



Human Sources (causes)

Cigarette smoking, incomplete burning of fossil fuels. About 77% comes from motor vehicle exhaust.

Health Effects

Reacts with hemoglobin in red blood cells and reduces the ability of blood to bring oxygen to body cells and tissues, which causes headaches and anemia. At high levels it causes coma, irreversible brain cell damage and death.

Environmental Effects

It increases the globe temperature.

2. Nitrogen dioxide (NO₂)



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Description

It is a reddish-brown irritating gas that gives photochemical smog. In the atmosphere it can be converted into nitric acid (HNO₃).



Human Sources (causes)

Fossil fuel burning in motor vehicles (49%) and power industrial plants (49%).

Health Effects

Lung irritation and damage.

Environmental Effects

Acid deposition of HNO₃ can damage trees, soils and aquatic life in lakes, HNO₃ can corrode metals and eat away stone on buildings, statues and monuments. NO₂ can damage fabrics.

3. Sulphur dioxide (SO₂)

It is a colourless and irritating gas. It is formed mostly from the combustion of sulphur containing Coal burning in power plants (88%) and industrial processes (10%).

Human Sources (causes)

fossil fuels such as coal and oil. In the atmosphere it can be converted to sulphuric acid (H₂SO₄) which is a major component of acid deposition

Health Effects

Breathing problems for healthy people.

Environmental Effects



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Reduce visibility, acid deposition of H_2SO_4 can damage trees, soils and aquatic life in lakes.

4. Suspended particulate matter (SPM)

It includes variety of particles and droplets (aerosols). They can be suspended in atmosphere for short periods to long periods.

Human Sources (causes)

Burning coal in power and industrial plants (40%), burning diesel and other fuels in vehicles (17%), agriculture, unpaved roads, construction etc.,

Health Effects

Nose and throat irritation, lung damage, bronchitis, asthma, reproductive problems and cancer.

5. Ozone (O_3)

Highly reactive irritating gas with an unpleasant odour that forms in the troposphere. It is a major component of photochemical smog

Human Sources (causes)

Chemical reaction with volatile organic compounds (emitted mostly by cars and industries) and nitrogen oxides.

Environmental Effect

Moderates the climate

6. Hydrocarbons (aromatic and aliphatic)

Hydrocarbons especially lower hydrocarbons get accumulated due to the decay of vegetable matter.



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Human Sources (causes)

Agriculture, decay of plants, burning of wet logs.

Health Effects

Carcinogenic.

Environmental effect

It produces an oily film on the surface and do not as such causes a serious problem until they react to form secondary pollutants. Ethylene causes plant damage even at low concentrations.

Control Measures of air pollution

The atmosphere has several built-in self cleaning processes such as dispersion, gravitational settling, flocculation, absorption, rain washout and so on, to cleanse the atmosphere. In terms of a long range control of air pollution, control of contaminants at their source is a more desirable and effective method through preventive or control technologies.

1. Source control.

Since we know the substances that causes air pollution, the first approach to its control will be through source reduction. Some actions that can be taken in this regard are as follows:

- 1. Use only unleaded petrol.**
- 2. Use petroleum products and other fuels that have low sulphur and ash content.**
- 3. Reduce the number of private vehicles on the road by developing an efficient public-transport system and encouraging people to walk or use cycles.**



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4. Ensure that houses, schools, restaurants and places where children play are not located on busy streets.

5. Plant trees along busy streets because they remove particulates and carbon monoxide, and absorb noise

6. Industries and waste disposal sites should be situated outside the city centre preferably downwind of the city.

7. Use catalytic converters to help control the emissions of carbon monoxide and hydrocarbons.

II. Control measures in industrial centers

1. The emission rates should be restricted to permissible levels by each and every industry.

2. Incorporation of air pollution control equipments in the design of the plant layout must be made mandatory.

3. Continuous monitoring of the atmosphere for the pollutants should be carried out to know the emission levels.

Equipments used to control air pollution

(i) To ensure sufficient supply of oxygen to the combustion chamber and adequate temperature so that the combustion is complete, eliminating much of the smoke consisting of partly burnt ashes and dust.

(ii) To use mechanical devices such as scrubbers, cyclones, bag houses and electro-static precipitators, reducing particulate pollutants