

AbhyasMitra.in

Environmental Studies — Revision Notes

UNIT II

Environment Pollution

Topics Covered

- a) Definition of Pollution and Types of Pollution
- b) Air Pollution — Meaning, Sources, Effects, Air Pollution Act
- c) Water Pollution — Meaning, Sources, Effects, Water Pollution Act
- d) Noise Pollution — Meaning, Sources, Effects
- e) Solid Waste Pollution — Meaning, Sources, Effects

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A. Definition and Types of Pollution

1. Definition of Pollution

Pollution means the addition of any harmful substance (solid, liquid, gas, or energy like noise/heat) into the environment, which causes undesirable changes and harms living organisms, including humans, plants and animals.

Easy Definition:

Pollution = Contamination of air, water, soil or surroundings by harmful substances (pollutants) that make the environment unsafe or unfit for healthy living.

The substance that causes pollution is called a Pollutant. Pollutants can be natural (volcanic ash, dust) or man-made (vehicle smoke, plastic waste, industrial chemicals).

2. Types of Pollutants

- **1. Biodegradable Pollutants:** Pollutants that can be broken down naturally by microorganisms over time — e.g., domestic sewage, food waste, paper.
- **2. Non-biodegradable Pollutants:** Pollutants that cannot be broken down easily and remain in the environment for a very long time — e.g., plastic, DDT, heavy metals, glass.

3. Types of Pollution

Pollution is classified into the following major types based on the part of environment affected:

- **1. Air Pollution:** Contamination of air due to harmful gases, smoke and dust particles released from vehicles, factories, etc.
- **2. Water Pollution:** Contamination of water bodies (rivers, lakes, oceans, groundwater) due to sewage, industrial waste and chemicals.
- **3. Soil/Land Pollution:** Degradation of soil quality due to dumping of solid waste, excessive use of pesticides and fertilizers.
- **4. Noise Pollution:** Unwanted or excessive sound from traffic, machines, loudspeakers that disturbs human and animal life.
- **5. Solid Waste Pollution:** Accumulation of solid waste (garbage, plastic, e-waste) that is not properly disposed of or managed.
- **6. Thermal Pollution:** Increase in water temperature due to discharge of hot water/effluents from power plants and industries, which harms aquatic life.

- **7. Radioactive Pollution:** Contamination caused by radioactive substances from nuclear plants, mining or nuclear accidents.

Type of Pollution	Main Cause
Air Pollution	Vehicle smoke, industrial gases, burning of fuel
Water Pollution	Sewage, industrial effluents, chemicals
Soil Pollution	Pesticides, plastic waste, industrial dumping
Noise Pollution	Traffic, machinery, loudspeakers
Solid Waste Pollution	Domestic garbage, plastic, e-waste
Thermal Pollution	Hot water discharge from power plants
Radioactive Pollution	Nuclear plants, radioactive mining

B. Air Pollution

1. Meaning of Air Pollution

Air pollution means the presence of harmful substances (gases, dust, smoke, particulate matter) in the air in such quantity that it becomes dangerous to human health, animals, plants and the environment.

Easy Definition:

Air Pollution = Contamination of the atmosphere by gases, dust, smoke or other harmful particles released from natural or man-made sources.

2. Sources of Air Pollution

Sources of air pollution are divided into two categories:

(I) Natural Sources

- Volcanic eruptions — releasing ash, sulphur dioxide
- Forest fires — releasing smoke and carbon dioxide
- Dust storms — releasing fine dust particles
- Pollen grains and natural decay of organic matter

(II) Man-made (Anthropogenic) Sources

- **1. Vehicular Emissions:** Smoke from cars, buses, trucks and two-wheelers releasing carbon monoxide, nitrogen oxides, and particulate matter.
- **2. Industrial Emissions:** Factories and power plants releasing sulphur dioxide, carbon dioxide, and toxic chemicals.
- **3. Burning of Fossil Fuels:** Coal, petrol, diesel burning for energy production and transport.
- **4. Agricultural Activities:** Burning of crop residue (stubble burning), use of pesticides releasing harmful chemicals into air.
- **5. Domestic Sources:** Burning of wood, coal, or cow dung cakes for cooking in rural households.
- **6. Construction Activities:** Dust generated from construction and demolition of buildings.

3. Effects of Air Pollution

- **1. On Human Health:** Causes respiratory diseases (asthma, bronchitis), lung cancer, heart disease, eye irritation, and reduced immunity.
- **2. On Plants:** Damages leaves, reduces photosynthesis, stunts plant growth, and lowers crop yield.
- **3. On Animals:** Causes respiratory problems and affects reproduction in animals and birds.
- **4. Global Warming:** Increased carbon dioxide and greenhouse gases trap heat, raising the earth's average temperature.
- **5. Acid Rain:** Sulphur dioxide and nitrogen oxides mix with rain water to form acid rain, which damages buildings, soil, and water bodies.
- **6. Ozone Layer Depletion:** Certain pollutants (like CFCs) damage the ozone layer, increasing harmful UV radiation reaching earth.
- **7. Reduced Visibility:** Smog and haze reduce visibility, affecting transportation, especially aviation and roadways.

4. Air Pollution Act (Air Act, 1981)

The Air (Prevention and Control of Pollution) Act, 1981 was enacted by the Government of India to control and prevent air pollution in the country.

Key Provisions of the Air Act, 1981:

1. Established Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) to monitor and control air pollution.
2. Declared certain areas as 'Air Pollution Control Areas' where strict regulations apply.
3. Industries must obtain prior consent/permission from the State Board before operating in control areas.
4. Sets standards for emission of pollutants from industries and vehicles.
5. Empowers boards to inspect industrial units and take samples of air/emissions for testing.
6. Provides penalties (fine and/or imprisonment) for violation of the Act, including non-compliance with emission standards.
7. Authorizes the Board to order closure of any industry/unit that does not follow pollution control norms.

Key Point:

The Air Act, 1981 was India's first major law specifically targeting air pollution control, giving Pollution Control Boards the legal power to monitor and penalize polluting industries.

C. Water Pollution

1. Meaning of Water Pollution

Water pollution means the contamination of water bodies (rivers, lakes, ponds, oceans, groundwater) by harmful substances, making the water unsafe for drinking, agriculture, aquatic life, and other uses.

Easy Definition:

Water Pollution = Presence of harmful or unwanted substances in water that lowers its quality and makes it harmful for living organisms.

2. Sources of Water Pollution

(I) Natural Sources

- Soil erosion bringing sediments into water bodies
- Decaying of plants and animals in water
- Volcanic activity and natural mineral deposits

(II) Man-made Sources

- **1. Domestic Sewage:** Untreated household waste water containing detergents, organic waste discharged into rivers and lakes.
- **2. Industrial Effluents:** Chemicals, heavy metals, dyes and toxic waste released by factories directly into water bodies.
- **3. Agricultural Runoff:** Pesticides, fertilizers and animal waste washed into water bodies during rainfall.
- **4. Oil Spills:** Leakage of oil from ships, tankers and offshore drilling contaminating ocean water.
- **5. Mining Activities:** Heavy metals and chemicals from mining operations leaching into nearby water sources.
- **6. Religious and Social Practices:** Immersion of idols, dumping of flowers and waste during festivals pollutes rivers and lakes.
- **7. Thermal Pollution:** Hot water discharged from power plants raises water temperature, harming aquatic organisms.

3. Effects of Water Pollution

- **1. On Human Health:** Causes water-borne diseases like cholera, typhoid, diarrhoea, jaundice and skin diseases.
- **2. On Aquatic Life:** Reduces dissolved oxygen levels, killing fish and other aquatic organisms; bioaccumulation of toxins in fish.
- **3. Eutrophication:** Excess nutrients (nitrogen, phosphorus) cause excessive algae growth, depleting oxygen and killing aquatic life.
- **4. Loss of Biodiversity:** Destroys habitats of aquatic plants and animals, reducing species diversity.
- **5. Affects Agriculture:** Contaminated water used for irrigation reduces soil fertility and crop quality.
- **6. Economic Loss:** Affects fishing industry, tourism, and increases cost of water treatment for drinking purposes.
- **7. Groundwater Contamination:** Pollutants seep into the ground, contaminating groundwater used for drinking and irrigation.

4. Water Pollution Act (Water Act, 1974)

The Water (Prevention and Control of Pollution) Act, 1974 was enacted by the Government of India to prevent and control water pollution and maintain or restore the wholesomeness of water.

Key Provisions of the Water Act, 1974:

8. Established Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs).
9. Industries and local bodies must obtain consent from the State Board before discharging effluents into water bodies.
10. Sets standards for the quality of effluents that can be discharged into streams, wells or sewers.
11. Boards have the power to inspect industries, collect samples and test water quality.
12. Provides penalties including fines and imprisonment for polluting water bodies or violating standards.
13. Empowers the Board to restrain any person from discharging polluting matter in violation of standards.
14. Allows the Board to take emergency measures to prevent pollution in case of accidents (e.g., chemical spills).

Key Point:

The Water Act, 1974 was the first environmental legislation in India, laying the foundation for the Pollution Control Board system later used for air pollution control as well.

D. Noise Pollution

1. Meaning of Noise Pollution

Noise pollution refers to unwanted, excessive or disturbing sound that disrupts the normal activities, comfort and health of humans and animals. Sound is measured in decibels (dB); sound above 85 dB is generally considered harmful if exposure is prolonged.

Easy Definition:

Noise Pollution = Any unpleasant or excessive sound that disturbs the natural balance and harms human/animal health and comfort.

2. Sources of Noise Pollution

(I) Outdoor/Industrial Sources

- **1. Transportation:** Noise from vehicles, trains, aircraft and ships (horns, engines).
- **2. Industrial Activities:** Heavy machinery, generators, compressors operating in factories.
- **3. Construction Activities:** Drilling, hammering, use of heavy construction equipment.
- **4. Loudspeakers and Public Events:** Religious functions, political rallies, marriages, festivals.
- **5. Firecrackers:** Bursting of crackers during festivals and celebrations.

(II) Indoor/Domestic Sources

- Household appliances — mixers, washing machines, TV, music systems
- Air conditioners and exhaust fans
- Loud conversations and indoor gatherings

3. Effects of Noise Pollution

- **1. Hearing Impairment:** Prolonged exposure to loud noise can cause partial or complete hearing loss.
- **2. Psychological Effects:** Causes stress, anxiety, irritability, sleep disturbance and reduced concentration.
- **3. Physiological Effects:** Increases blood pressure, heart rate, and can contribute to cardiovascular diseases.

- **4. Effect on Children:** Affects learning ability, concentration and academic performance of children.
- **5. Effect on Wildlife:** Disturbs animal communication, breeding patterns and migration of birds and animals.
- **6. Reduced Work Efficiency:** Constant noise reduces productivity and increases errors at workplaces.
- **7. Communication Problems:** Makes verbal communication difficult, leading to misunderstanding and accidents.

Sound Source	Approx. Decibel Level (dB)
Whisper	20-30 dB
Normal conversation	50-60 dB
Heavy traffic	80-90 dB
Loudspeaker / Firecracker	100-120 dB
Jet engine takeoff	120-140 dB

Key Point:

As per the Noise Pollution (Regulation and Control) Rules, 2000, permissible noise limits are different for industrial, commercial, residential and silence zones, with stricter limits during night time (10 PM to 6 AM).

E. Solid Waste Pollution

1. Meaning of Solid Waste Pollution

Solid waste pollution refers to the contamination of the environment caused by improper disposal or accumulation of solid waste materials — such as garbage, plastic, packaging material, construction debris and electronic waste — which are not biodegradable or are dumped without proper treatment.

Easy Definition:

Solid Waste Pollution = Pollution caused by the unscientific dumping, accumulation or burning of solid waste materials in the environment.

2. Sources of Solid Waste

- **1. Domestic/Household Waste:** Food waste, packaging material, plastic bags, paper, and other household garbage.
- **2. Industrial Waste:** Waste generated from manufacturing processes — metal scraps, chemical sludge, packaging waste.
- **3. Commercial Waste:** Waste from shops, offices, markets, and restaurants — packaging, paper, food waste.
- **4. Agricultural Waste:** Crop residue, husk, animal waste, and pesticide containers.
- **5. Construction and Demolition Waste:** Debris, bricks, concrete, and metal from building construction or demolition.
- **6. Biomedical Waste:** Waste from hospitals and clinics — used syringes, bandages, expired medicines (requires special disposal).
- **7. E-Waste (Electronic Waste):** Discarded electronic items — old mobiles, computers, batteries — containing toxic heavy metals.

3. Effects of Solid Waste Pollution

- **1. Soil Pollution:** Waste dumped on land reduces soil fertility and contaminates soil with toxic substances.
- **2. Water Pollution:** Leachate (liquid from decomposing waste) seeps into groundwater and nearby water bodies, contaminating them.
- **3. Air Pollution:** Open burning of waste releases toxic gases and smoke into the air, contributing to air pollution.

- **4. Health Hazards:** Breeding ground for disease-carrying pests (flies, mosquitoes, rats) leading to diseases like malaria, dengue, and cholera.
- **5. Loss of Aesthetic Value:** Garbage dumps create foul smell and unhygienic, unattractive surroundings, affecting tourism and quality of life.
- **6. Harm to Wildlife:** Animals consuming plastic waste or getting entangled in it suffer injury or death.
- **7. Land Degradation:** Large areas of land get occupied by waste dumping sites (landfills), making land unusable for other purposes.
- **8. Climate Impact:** Decomposing organic waste in landfills releases methane, a potent greenhouse gas contributing to global warming.

4. Solid Waste Management — Easy Methods

- Reduce, Reuse, Recycle (3R principle) to manage waste effectively
- Segregation of waste at source — biodegradable (wet) and non-biodegradable (dry) waste
- Composting of organic/biodegradable waste to create manure
- Scientific landfilling with proper lining to prevent leachate contamination
- Incineration (controlled burning) of certain waste with pollution control equipment
- Proper recycling of plastic, paper, glass and metal waste
- Special handling and disposal of biomedical and e-waste as per government rules

Key Takeaway:

Solid Waste Management Rules, 2016 (India) make it mandatory to segregate waste at source into wet, dry and hazardous categories, and assign responsibility to municipalities, bulk waste generators and citizens for proper waste management.

— End of Unit II —

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