Pollution

Pollution is the addition of any substance in the environment which contributes to the deterioration or contamination of the environment, making it less favourable for organisms.

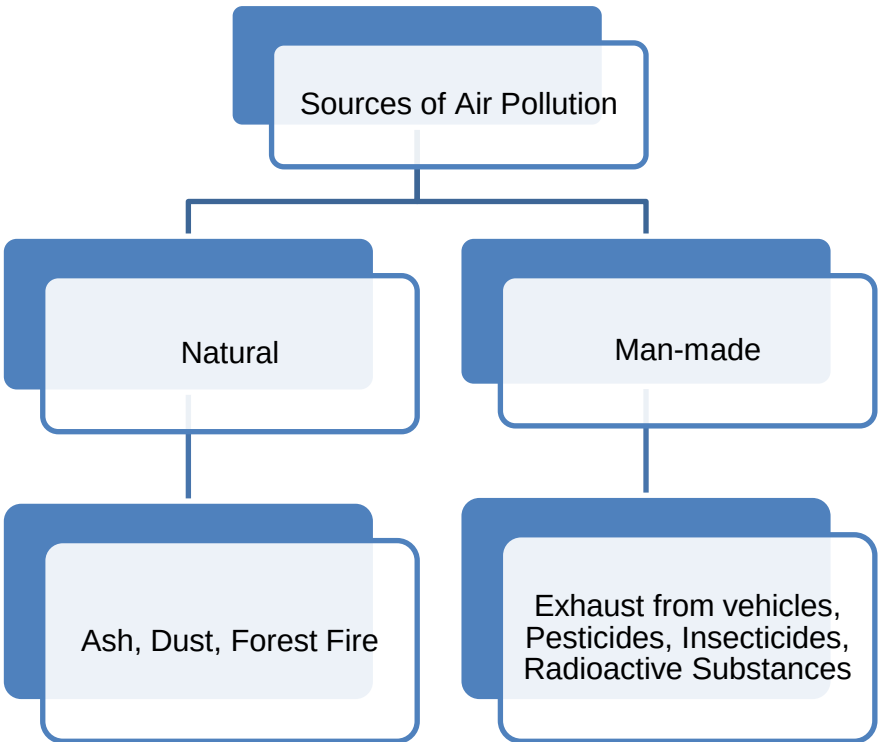
A **pollutant** is any substance which causes pollution.

Nature of Pollutants

Biodegradable Pollutants	Non-biodegradable Pollutants
• These pollutants are organic matter and can be decomposed by the activity of microorganisms.	• These pollutants are inorganic matter and they do not decompose.
• Can be recycled naturally or by humans.	• Cannot be recycled naturally.
• Useful products can be produced after biodegradation.	• They remain unchanged, or if they take part in chemical reactions, their products are also biodegradable.
• Examples: Paper, cow-dung and vegetable peels	• Examples: DDT, synthetic fibres, plastic, metals and *Styrofoam*

Types of Pollution

Air Pollution



Types of Air Pollution

Gaseous Pollution	Harmful gases are given out from a variety of sources.
Particulate Pollution	Particles of dust, smoke, mining, stone drillings and wearing of rubber tyres of motor vehicles.

Some Major Gaseous Pollutants

1. Carbon Monoxide (CO)

- **Sources:** Exhaust from vehicles and burning of farm wastes, dry leaves and domestic and industrial wastes.
- **Harmful Effects:**
  - It combines with haemoglobin and forms an irreversible product carboxyhaemolglobin. Thus, oxygen is prevented from circulating in the blood.
  - This creates problems such as headache, nausea and anaemia. Continuous presence of CO inside the body may cause death.

2. Nitrogen Dioxide (NO_2)

- **Sources:** Lightning and high temperature in the combustion chamber of automobile engines.
- **Harmful Effects:**
  - Presence of NO_2 in the air causes irritation of eyes.
  - Causes acid rain.

3. Sulphur Dioxide (SO_2) and Sulphur Trioxide (SO_3)

- **Sources:** Fossil fuels and heating sulphide ores in excess air.
- **Harmful Effects:**
  - Form smog.
  - High concentrations cause severe lung ailments and even death.

4. Hydrogen Sulphide (H_2S)

- **Sources:** Burning of coal, petrol refineries, volcano eruptions
- **Harmful Effects:**
  - Causes nausea, sore throat and irritation of the eyes.

Effects of Air Pollution

1. Acid Rain	• Sulphur dioxide and nitrogen dioxide combine with the moisture present in clouds and form sulphuric acid and nitric acid, respectively. • These acids fall to the ground along with rain. • Causes corrosion of monuments. Example: The Taj Mahal, India
2. Smog	• It is the heterogeneous mixture of fog, dust, smoke and sulphur dioxide. • In populated and industrial areas, winter mornings are characterised by smog. • Less visibility in smog may lead to road and rail accidents.
3. Greenhouse Effect and Global Warming	• A greenhouse is a small glass house. • The glass panels allow sunlight to enter but do not allow the heat to escape. • This helps in growing plants in the greenhouse.
	• Certain gases, especially CO_2, methane, nitric oxide and nitrous oxide, in

	the atmosphere act as greenhouse gases. • Their increased accumulation in the atmosphere prevents the escape of heat which warms the air. • Overall rise in CO_2 has lead to greater retention of solar radiation in the atmosphere, causing global warming. • Global warming leads to melting of snow caps, rise in sea level, decline in agricultural production and extinction of species such as the polar bear.
4. **Ozone Depletion**	• Ozone absorbs the ultraviolet (UV) rays of the Sun and protects life from their harmful effects. • Compounds such as chlorofluorocarbon (CFC) deplete ozone. • The reduced amount of ozone cannot prevent the entry of UV rays. • Ozone depletion often leads to sun burns, skin cancer and mutations. • 16 September is celebrated as International Ozone Day.

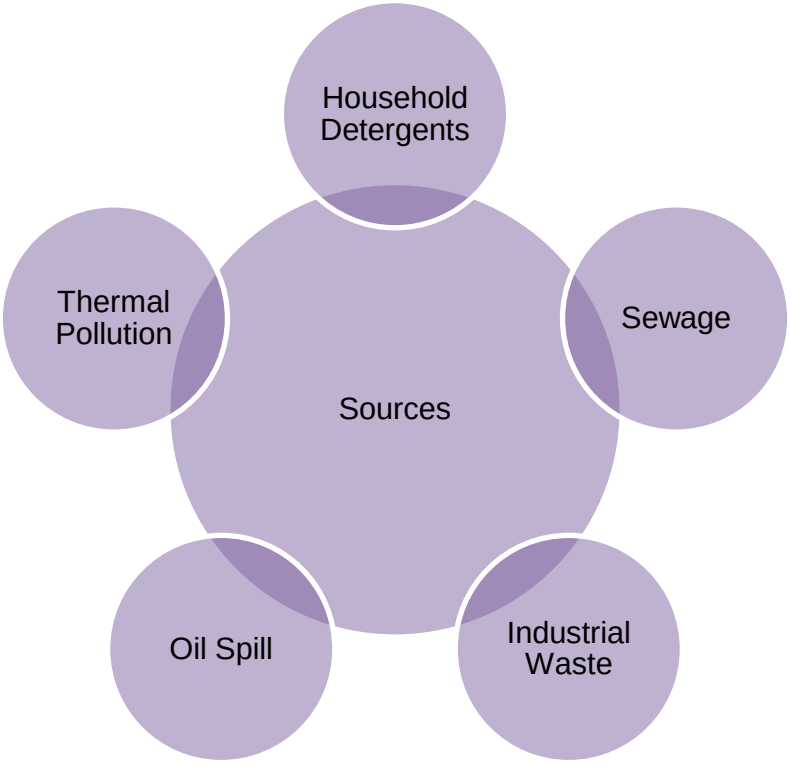
5. Health Problems	
Oxides of nitrogen and sulphur	Eye irritation
Hydrogen sulphide	Respiratory disorders, bronchitis and asthma
Particulate matter	Asthma
Carbon monoxide	Headaches, dizziness, nausea and decreased oxygen-carrying capacity of blood
Heavy metals	Liver, kidney and brain damage Abnormal fertility and pregnancy
Radioactive pollutants	Anaemia
Silica particles	Silicosis (affect lungs)
Cotton fibres	Byssinosis (chronic cough, bronchitis, emphysema and destroyed lung tissues)
Asbestos particles	Asbestosis (respiratory tract inflammation which can lead to cancer)
Coal particles	Black lungs (destroy lungs, leading to death)

Under the Euro/Bharat title, certain norms have been laid down on the emission levels given out by all automobiles.

Water Pollution

Water pollution is any change in the water quality which makes it unsuitable for use by humans and by other living organisms.

Source of Water Pollution



Effects of Water Pollution

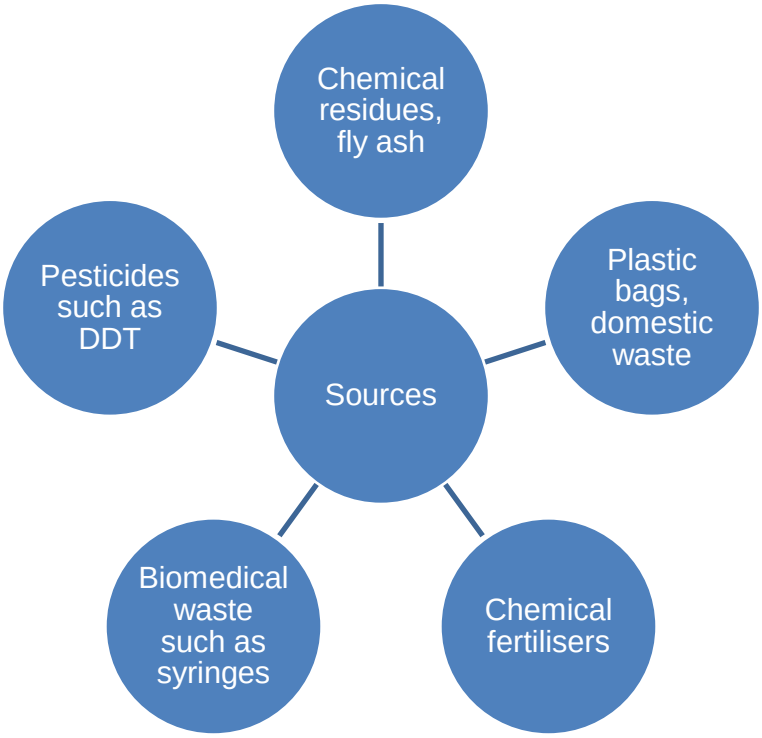
- Brain and nerve damage due to industrial effluents.
- Water borne diseases such as cholera, dysentery, jaundice etc.
- Insects breeding in stagnant water result in malaria, dengue, fever and yellow fever.
- Intestinal parasitism leading to anaemia and weakness.

- Nitrates and phosphates help plants to grow. However, if these nutrients accumulate in water, algae use them as a source of food and multiply rapidly. The lake soon becomes choked by a green slimy mass of green algae. This process is called **eutrophication**.
- The process by which the harmful and toxic substances enter the food chain and get concentrated in the body of living organisms at each successive trophic level is called **biomagnification**.

Soil Pollution

The contamination of soil by pollutants which reduces its productivity is called **soil pollution**.

Sources of Soil Pollution



When soil loses its plant cover, it becomes exposed to wind and rain. It gets blown or washed away rapidly. This condition is known as **soil erosion**.

Effects of Soil Pollution

- Soil pollution mainly lowers soil fertility.
- Fertilisers and pesticides used may enter the food chain which can cause tremendous harm to the organisms of each trophic level.

Radioactive Pollution

Radiation is a form of energy consisting of high-energy particles.

Sources of Radioactive Pollution

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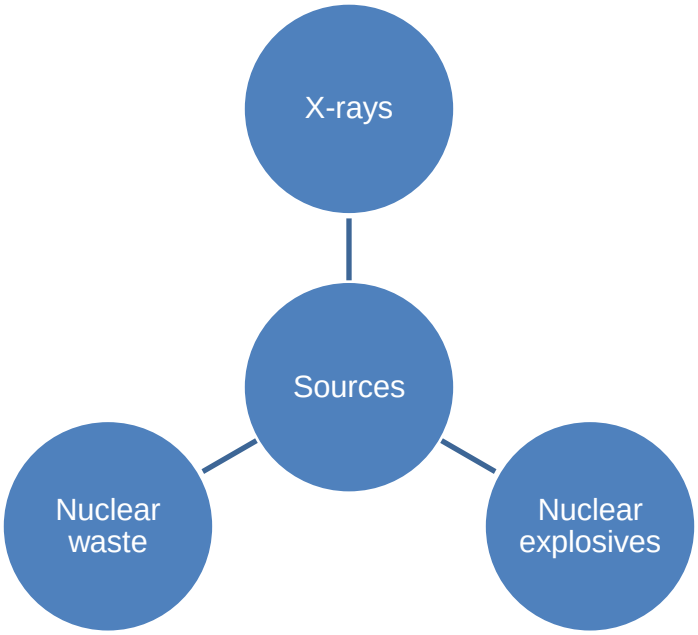

Types of Radiations

- **Alpha Radiation (α):** Penetrates the surface of the skin.
- **Beta Radiation (β):** Usually emitted during nuclear tests. Bears more penetrating strength than α-radiations.
- **Gamma Radiation (γ):** Used in the treatment of cancer. The penetrating power is the strongest.

Effects of Radioactive Pollution

Radioactive rays are harmful to living organisms.

- Destroy living tissues and blood cells.
- Affect the functioning of the cell membrane and cell enzymes.
- Bring about gene mutation.
- May cause cancer such as leukaemia.
- Can cause deformities in the foetus.

Noise Pollution

Noise is any disturbing sound.

Sources of Noise Pollution

- Industrial machines
- Workshops
- Trains and automobiles
- Jet aircrafts
- Loud conversation
- Sounds of radio and television
- Loudspeakers

- Firecrackers

Effects of Noise Pollution

- Prolonged exposure to high-decibel noise damages the ear and brings about permanent hearing impairment.
- Noise pollution can lead to high blood pressure (hypertension), constant headache and lack of concentration.
- It interrupts the thought process, resulting in low efficiency at work.
- It disturbs sleep which causes irritability and nervous disorders.

Measures to Minimise Noise Pollution

- Prohibiting the blowing of horns.
- Use of loud speakers should be banned.
- Airports should be located away from residential areas.
- People should restrain themselves from lighting firecrackers.

Abatement of Pollution

- Use of unleaded petrol and CNG in automobiles.
- Installation of tall chimneys in factories. Tall chimneys must have filters and electrostatic precipitators.
- Treating industrial effluents before discharging them into water bodies.
- Recycling of plastic, glass and metal materials and incineration of non-recyclable materials.
- Planting trees along roadsides and on mountain slopes to reduce soil erosion.

Vehicular Standards

- Introduced in 2000, the Bharat norms are emission control standards that are based on the European regulations (Euro norms).
- It has been upgraded to BS II, BS III and now BS IV norms.
- They set limits for release of air pollutants from equipment using internal combustion engines, including vehicles.
- The Supreme Court recently ordered that only vehicles with engines compliant with BS IV standards must be sold from April 1, 2017.

Clean India Movement

- Swachh Bharat Abhiyan is a Swachh Bharat mission led by the government of India to make India a clean India. This campaign was launched officially by the government of India on 145th birthday anniversary of the great person, Mahatma Gandhi on 2nd of October, 2014.
- The mission has targeted aims like eliminating the open defecation, converting insanitary toilets into pour flush toilets, eradicating manual scavenging, complete disposal and reuse of solid and liquid wastes, etc.