Chapter 17

Pollution of Air and Water

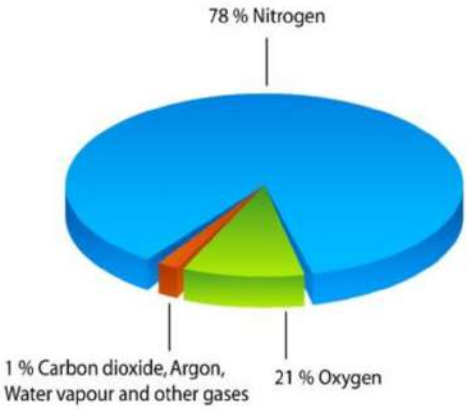
Air Pollution

→ Air consists of a mixture of gases. A mixture of gases by volume contains:

- 78% Nitrogen
- 21% Oxygen

→ Small quantities of carbon dioxide, water vapor, argon, methane, and ozone.

Composition of Air



♦ Air Pollution:

When air is contaminated with unwanted substances that have a harmful effect on both the living and non-living, it is referred to as Air pollution. The substances that contaminate the air are called air pollutants.

⇒ Natural sources of air pollutants:

- Smoke rising from forest fires.
- Smoke and dust arising from volcanic eruptions.

⇒ Air pollutants by Human activities:

- Power plants
- Automobile exhausts
- Burning of firewood and dung cakes

Burning releases smoke

♦ Effects of Air Pollution:

- It causes respiratory problems like Asthma, Permanent lung damage, etc.
- Automobiles produce high levels of pollutants like carbon monoxide that reduce the oxygen-carrying capacity of hemoglobin.
- The air pollutants like oxides of nitrogen combine with fog in winters and form SMOG.

Smoke + Fog = Smog

- This smog causes asthma, cough, and wheezing in children.
- Petroleum factories and industries release Sulphur dioxide and nitrogen dioxide.
- Some industries and petroleum factories release smoke that contains Sulphur dioxide and Nitrogen dioxide. This smoke causes permanent lung disease and other respiratory problems.
- The leaked refrigerators, air conditioners, and aerosol sprays release a component called Chlorofluorocarbons (CFCs) which depletes the ozone layer of the atmosphere. This leads to the entrance of ultraviolet rays of the sun into the Earth's atmosphere and hence pollutes the environment.
- The smoke released by automobiles contains suspended particles that stays in the air for long periods and reduce visibility.

Chimney releasing smoke

Effect of Air pollution on Taj Mahal

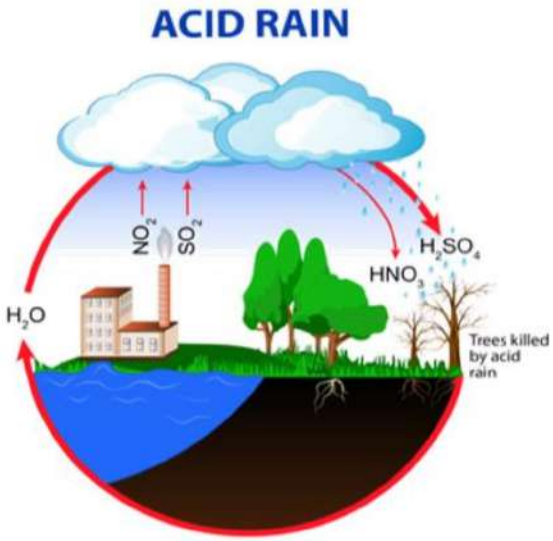
⇒ The Taj Mahal is yellowing day by day due to the release of sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) from the industries located in and around Agra like rubber processing, automobile, chemicals, and especially the Mathura oil refinery.

⇒ These gases react with the water vapor present in the atmosphere to form sulfuric acid (H_2SO_4) and nitric acid (HNO_3).

⇒ The acids drop down with rain, making the rain acidic. This is called acid rain.

⇒ Acid rain corrodes the marble of the monument.

⇒ Since this acid rain is making the Taj Mahal weak day by day, the phenomenon is named “marble cancer”.



Greenhouse Effect

⇒ The radiations that fall on the earth's surface are trapped by the atmosphere just like a greenhouse where the heat is trapped inside a nursery and is not allowed to move out.

⇒These trapped rays warm the Earth's surface. This is known as the greenhouse effect.

⇒The increasing amount of CO_2 leads to the greenhouse effect.

⇒ Reasons for the increasing amount of Carbon dioxide in the environment:

- We know that plants consume carbon dioxide while photosynthesis but nowadays there is little space left for forests. As a result, the amount of carbon dioxide is increasing in the atmosphere.
- We know humans while respiring release carbon dioxide gas and since the population is increasing the amount of CO_2 is increasing at an alarming rate.
- Therefore, the CO_2 amount is increasing because it is not being used up due to deforestation.

⇒ This CO_2 traps the heat and does not let it escape. This thereby increases the temperature of the Earth. This is known as Global warming.

⇒ Other gases than CO_2 responsible for global warming are methane, nitrous oxide, and water vapors.

* To reduce the emission of greenhouse gases, an agreement is made under the name Kyoto Protocol.

What can we do to reduce air pollution?

⇒ When air is contaminated with unwanted substances that have a harmful effect on both the living and non-living, it is referred to as Air pollution.

⇒ The following are the steps we should take to reduce air pollution:

1. We should practice using public transport instead of our own vehicle to save fuel.

2. We should either walk or take the bicycle for commuting shorter distances.

3. We should not burn crackers.

4. We should use cleaner fuels like LPG, CNG, etc.

5. We should plant more and more trees that will help us in preventing air pollution.

6. We should dispose of the garbage properly instead of burning it.

Water Pollution

⇒ Contamination of water with sewage, toxic chemicals, and silt, etc. that harms the aquatic life of a water body is known as water pollution.

⇒ The unwanted substances that make the water dirty or polluted are known as water pollutants. For example sewage, silt, toxic chemicals, etc.

The plans taken to save the River Ganga:

- ❖ Ganga Action plan in 1985. (GAP)
- ❖ National Mission for Clean Ganga in 2016. (NMCG)

⇒ <u>Effects of Water Pollution</u>:

- The chemical factories release chemicals like arsenic, lead, and fluorides into water bodies that lead to toxicity and the death of aquatic life.
- Pesticides and herbicides dissolve in the water and get washed away in the fields and water bodies. They also seep into the ground and hence pollute the groundwater.
- When excessive chemicals from the factories are released into water bodies, they give nourishment to the algae. As a result, the water bodies get covered with algae. This is known as an algal bloom. These algae take up all the nutrients of the water and do not allow oxygen to reach the water. Once these algae die, they become food to the decomposers like bacteria. The bacteria and algae use almost all the oxygen of water bodies and the fishes and other aquatic organisms die due to scarcity of oxygen.
- Water contaminated with sewage may contain several bacteria, fungi, and viruses that cause jaundice, cholera, and typhoid.
- The industries and factories release hot water into the water bodies without treating them. This raises the temperature of the river and causes hazardous effects on the plants and animals living inside it. This ultimately leads to the death of aquatic life.

Industrial waste in river

Potable Water and Water Purification

⇒ Water that is suitable for drinking is called Potable water.

⇒ The ways to filter water are:

(a) Physical method:

The water with impurities is filtered to remove these impurities. The filter found in households is mostly the candle type.

(b) Boiling:

The water with impurities can also be obtained for drinking by boiling it. Boiling will remove all the bacteria and impurities from it.

(c) Chlorination:

Another way of purifying the water is by adding chlorine tablets and bleaching powder. This will make the water fit for drinking.

Ways to prevent water scarcity

⇒ Increasing population, industrialization, and agricultural practices have led to a scarcity of water. This can be overcome if we start using water wisely.

⇒ We should implement the mantra of reuse, reduce and recycle. This means we should reduce the use of water for unnecessary activities.

⇒ We can reuse the water, for example, water used for washing vegetables can be reused for watering the plants in the garden.

⇒ We should always turn off the tap while brushing.

⇒ We should irrigate the field with the drip irrigation technique and the sprinklers.

⇒ We should try to minimize the unnecessary use of water for our daily activities.