Pollution of Air and Water

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Introduction

- Life occurs in the region where the three components of life earth i.e., land or lithosphere, water or hydrosphere and air or atmosphere interact. Parts of the earth which support life together constitute biosphere.
- Human beings are the only organisms who try to manipulate the environment to fulfil their needs and comforts [food, shelter, clothing's, transport etc.]. Increase in human population and great advancement in industry and technology, in the recent past have damaged the balanced and healthy environment. The imbalance in the environment has given rise to various environmental problems and majority of them are related to air, water and soil pollution.

Air Pollution

- Air is invisible, odourless and tasteless mixture of gases. Air also holds water vapours and dust particles. Composition of dry atmosphere is given in the table alongside.
- Addition of unwanted and harmful substances in the air or increase in the quantities of constituents of air beyond the normal level that affects the living organisms is called **air pollution.** Agents or substances that pollute the air are called **air pollutants.**

Component	Volume
Nitrogen [N_2]	78.08 %
Oxygen [O_2]	20.94 %
Carbon dioxide [CO_2]	0.03 %
Argon	0.91 %
Trace components	0.04 %

How does Air Get Polluted?

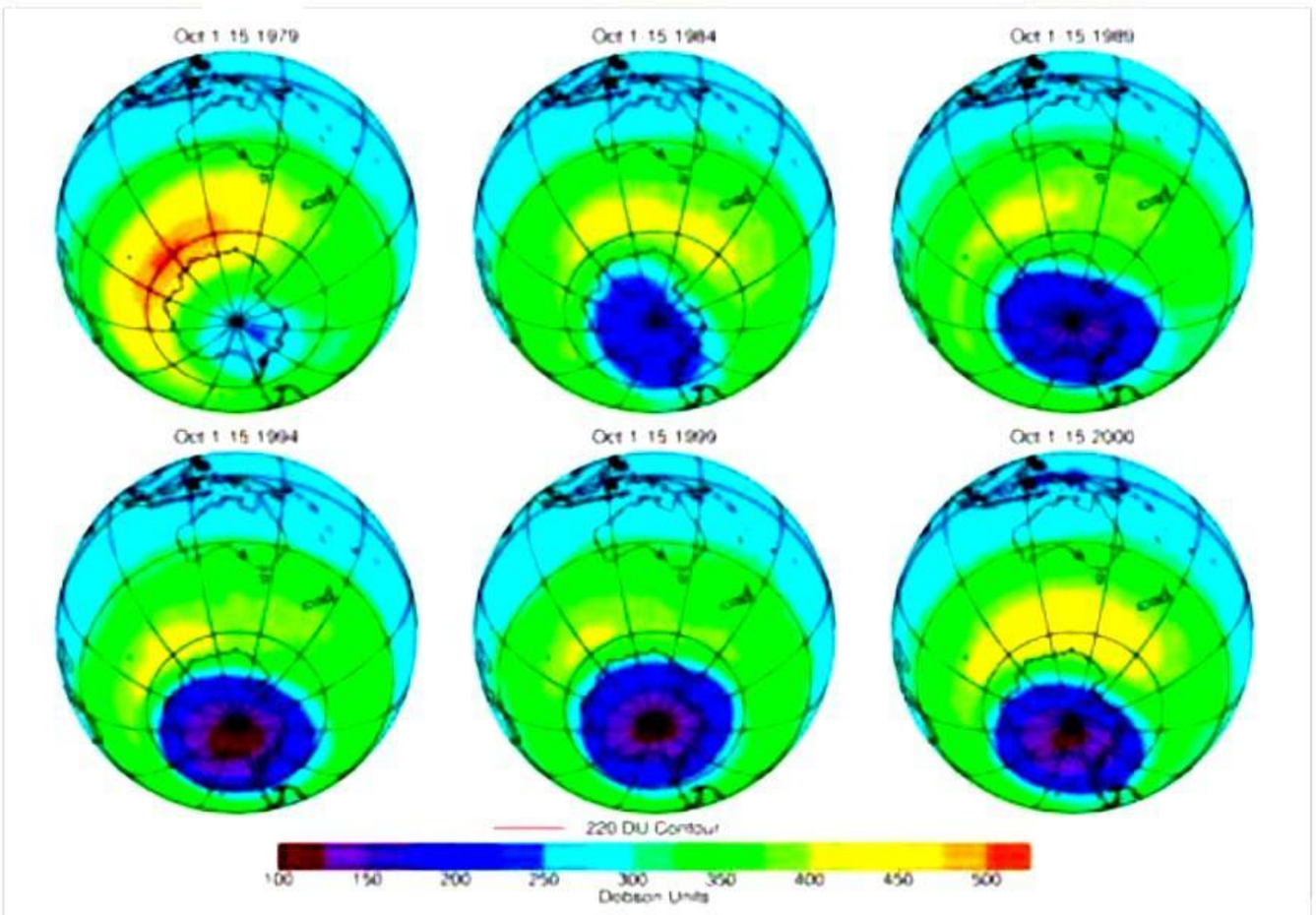
- An undesirable change in the physical, chemical or biological characteristics of the air, because of pollutants which make air harmful for living organisms is termed air pollution.
- Some pollutants are particulate matter and remain suspended in air and called **suspended particulate matter [SPM].**
- Some pollutants are **gaseous substances** include carbon monoxide, excess of carbon dioxide, sulphur dioxide, oxides of nitrogen, hydrocarbons, chlorofluorocarbons [CFCs] hydrogen sulphide, methane and ammonia.

Smog: [Smoke + fog]

- It is a dark fog formed by condensation of water vapour, dust and smoke particles, and various gaseous pollutants. Smog cause toxic effects on man, animals and plants. It produces respiratory problems in human as asthma, cough and wheezing. Smog also reduces visibility leading to accidents.
- **Acid rain:** The rain water contains a mixture of sulphuric acid [H_2SO_4] and nitric acid [HNO_3], gives rise to **acid rain.** Due to combustion of fossil fuels in industries, automobiles and thermal power plants etc, harmful gasses such as sulphur dioxide and nitrogen oxides are produced. It reacts with rain water and form acids.

Ozone hole

- Decline in the thickness of ozone layer over a restricted area is called **ozone hole.** Thinning of ozone shield [ozone hole] was first discovered over Antarctica in 1985.



Ozone hole

Global Warming [Green House Effect]

- A building chiefly made of glass for growing or sheltering the delicate plants is called **green house.** The glass walls allow sun rays to pass into the interior right up to earth's surface. However, reflected back infra-red rays are not allowed to escape by the glass walls CO_2 gas as well a water

vapour present in the air, are also trapped inside the glass house. This makes greenhouse air warmer than the outside air.

- Gases like carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons [CFCs], nitrous oxide, ozone etc are called **greenhouse gases.** Out of these, CO_2 is the most important greenhouse gas to keep the earth warm by trapping infra-red radiations back to the earth.

Water Pollution

- The contamination of fresh water due to addition of harmful substances making it unfit for use is called **water pollution.** Agents or substances that pollute water are called as **water pollutants.** These can be classified into three categories:

1. **Physical pollutants:** Heat and oil spills.
2. **Chemical pollutants:** Organic wastes, detergents, pesticides (e.g. DDT, BHC), inorganic chemicals (e.g. arsenic, cadmium, mercury, lead, nickel, phosphates, nitrates fluorides), and radioactive waste.
3. **Biological pollutants:** Viruses, bacteria, protozoa, helminthes, algae, fungi etc.

Main Sources of water pollution are:

1. Sewage
2. Industrial waste
3. Synthetic soaps and detergents
4. Fertilizers and pesticides
5. Petroleum oil
6. Heat

Eutrophication:

- Eutrophication is the process in which excessive growth of algae occurs as a result of extra loading of nutrients in the water body.
- Presence of sewage, fertilizers nitrates and phosphates in polluted water provide a lot of nutrients to the algae. As a result, excessive growth of algae occurs which is termed **algal bloom.** The algae subsequently die and aerobic decomposers become active. They consume rapidly the dissolved oxygen of the water. In the absence of dissolved oxygen, all the aquatic life in the water body get affected.