

ADVANCED

- The atmosphere is the gaseous envelope surrounding our planet and consists of
- nitrogen (79.1%)
- oxygen (20.0%)
- carbon dioxide (0.03%)
- traces of other gases like argon, krypton, xenon, neon, helium, water vapour, ammonia, ozone and suspended particles (0.07%).
- But today, the percentage of carbon dioxide has increased causing the greenhouse effect due to which the earth is heating up, the polar ice caps are melting, and the ozone layer is disturbed.

We need oxygen for our existence.

Air Pollution

The pollution of air goes unnoticed most of the time. All human activity from domestic cooking to highly mechanised industries contribute to air pollution.

We have poisoned the air, water and soil with pollutants and have upset natural communities in ways that are affecting our place in the complex system that has come to be known as "the great chain of life". We may soon be tipping the balance of the natural forces in the land, atmosphere and oceans in ways that could be disastrous for mankind. In fact we have reached a point where we must protect the environment in order to protect ourselves.

In India alone, stupendous amounts of air pollutants enter the atmosphere per annum. The pollutants comprise of 50 lakh tonnes of particulate matter, 30 lakh tonnes of sulphur dioxide, 10 lakh tonnes of carbon monoxide and 22 lakh tonnes of hydrogen sulphide.

Clean air, which is essential for the survival of all living organisms, is rapidly becoming scarce. At mean sea levels air contains 20.94% oxygen and 78.09% nitrogen. Other elements present comprise less than one percent of its composition.

Air pollution can be due to natural or man-made causes. The former is beyond our control as natural disasters like dust storms, earthquakes and volcanic eruptions throw up large quantities of dust and gases into the atmosphere. Man-made causes, however, should be prevented or controlled as they pose a greater danger by way of toxic emissions from factories, power plants, vehicular traffic, etc. Industries such as mining, thermal plants, brick kilns, etc. also pollute the air. These emissions are particularly intense in urban conglomerations where the density of human habitation is very high.

Types of air pollutants

- Primary pollutants are those which are emitted directly into the atmosphere, like sulphur dioxide, nitric oxides and carbon monoxide.
- Secondary pollutants are pollutants formed by the photochemical reaction of primary pollutants. For example, "smog", is a combination of smoke and fog. Smoke consists of carbon particles and fog is an emulsion of water vapour in air. Smog has become very common in large cities, especially during winter. Similarly acid rain is formed by the combination of sulphur dioxide and water vapour present in the air.

Pollutants in the air can be dispersed by wind movement, temperature and topography.

MAJOR AIR POLLUTANTS AND THEIR EFFECT ON HUMAN HEALTH

Pollutant	Origin of Pollutant	Effects
Sulphur dioxide	industries, especially where coal or oil are used as fuel	irritation of eyes, and respiratory system, increased mucus production, cough and shortness of breath
Carbon monoxide	automobile exhaust and industries	reduction in oxygen-carrying capacity of blood
Oxides of nitrogen	automobile exhaust	irritation of pulmonary tract affecting functioning of lungs
Hydrocarbons Chlorine	automobile exhaust chloralkali industry	lung cancer irritation of mucous membrane
Ammonia	fertiliser industry, agriculture and in poultry farming	irritation of mucous membrane
Hydrogen sulphide	manufacture of coke, viscose rayon, distillation of tar and petroleum	excessive inhalation leads to death
Acids and aldehydes	chemical industries	eyes, nose and throat irritation
Suspended particulate matter (SPM)	industries, automobile exhaust	respiratory diseases
Dust	industries and automobile exhaust	silicosis
Asbestos	roofings, brake linings	asbestosis
Lead	automobile exhaust	cumulative poison, impairment of central nervous system
Beryllium	aerospace industry, hold appliances	fatal to heart and manufacture of house- lungs
Manganese	mining operations	damages nerves and reproductive systems
Benzene	automobile exhaust and manufacture of chemicals	leukemia, chromosomal damage
Pesticides	manufacture and application of pesticides	depression; leads to death if inhaled in excess
Arsenic	thermal power plants	toxic

Other effects of air pollution

- Ozone causes reduced pollination and yellow spot formation on leaves, thus affecting the rate of photosynthesis.
- Sulphur dioxide is converted to sulphuric acid in the presence of moisture and iron, which are present in dust, nails, etc. This results in yellowing, weakening and corrosion of materials.

Domestic Pollution

The worst form of air pollution could be the wood smoke inhaled by women while cooking.

Automobile Pollution

The vehicular population is of three principal types:

- Passenger cars and jeeps powered by four-stroke engines.
- Two and three wheelers powered by small two-stroke gasoline engines.
- Buses, trucks and light commercial vehicles powered by four-stroke diesel engines.

The major emissions from a gasoline powered engine are mainly carbon monoxide (CO), unburned hydrocarbons (HC), oxides of nitrogen (NOx) and others like formaldehyde, acetaldehyde, acrolein and benzaldehyde. Among the particulates, lead is the major significant toxic compound. Indian petrol contains a high percentage of lead, whose emission leads to lung diseases and cancer.

Thermal Power Stations

- All thermal power plants are coal-fired. The major effluents from these plants are fly ash, soot and sulphur dioxide. The sulphur content of Indian coal is less than one percent. But the coal contains a high ash content, in the range of 25 % to 40 %. Fly ash from power stations reduces visibility and contains traces of chromium, arsenic, cadmium, mercury, lead, manganese, etc. Once again, these affect human health.

Fertiliser Factories

- Fertiliser plants produce large quantities of air pollutants. Some of them are fluorine, ammonia, sulphur dioxide, nitrogen oxides and particulates. Although fertilisers are essential for boosting agricultural production, their production has many ill effects, such as health-affecting emission of gases, etc.

Textile Mills

- The major effluents from textile mills are cotton dust, smoke and other combustion wastes, kerosene or naphtha vapours, sulphuric acid, nitrogen oxide, chlorine, formaldehyde, etc. The surroundings of textile mills are generally dusty with deposits of cotton fluff. Continuous inhalation of cotton fluff causes lung disorders.

Acid rain

- Acid rain is the outcome of the emission from industries releasing sulphur and oxides of nitrogen. When these oxides come into contact with water vapour, acids result, with dramatic effects. There is an increased acidity of the soil, damage to crops and forests and frequently, the death of fish in lakes and rivers is observed. Acid rain indirectly mobilises heavy metals such as cadmium and mercury, which are absorbed by plants and enter the food chain.

Ozone Layer

- The earth is protected from the sun's ultraviolet radiation by a layer of ozone high up in the stratosphere. Without this layer of ozone, life would have been impossible. But, again, due to human intervention there is a disruption of the ozone layer leading to certain types of skin cancer.
- Ozone is continuously produced and decomposed. The quantity of ozone is relatively less (3,300 million tonnes) compared to 3865 million tonnes of nitrogen. Some of the factors which lead to the disruption of the ozone layer are the increased release of nitrogen oxides into the atmosphere, the increase of supersonic aircraft (SSTs) and the presence in the atmosphere of Chlorofluorocarbon (CFCs) which are used as refrigerants, in fire extinguishers and as propellants in aerosol spray cans.

Greenhouse Effect

- Carbon dioxide may be an insignificant gas, a mere 0.03% of the earth's atmosphere, but plays a useful role in absorbing the radiant energy of the sun. Due to industrial activity the carbon dioxide level in the atmosphere has increased substantially.
- The effect of carbon dioxide on the temperature of the earth is what is termed the "Greenhouse Effect". It behaves like the glass in a greenhouse, allowing the heat from the sun through to the earth but preventing some of it from being radiated back through the atmosphere. Carbon dioxide traps more heat and thereby increases the earth's temperature. Scientists fear that if the temperature rises by even a few degrees, it will melt the polar ice caps which, in turn will submerge vast areas of land.

WHAT CAN YOU DO ?

Domestic Pollution

- At a domestic level, exposure to smoke while cooking can be curtailed by the adoption of cleaner fuels, improved stoves, better ventilation and the use of biogas.
- The choice of the correct species of tree as fuel as, for example, Acacia nilotica (babul) and Casuarina, produces less smoke as compared to species like mango and neem.
- Utilisation of charcoal is relatively safer than burning firewood.
- Utilisation of smokeless stoves will reduce exposure to smoke.

Automobile Pollution

- Regular tests for automobile emissions should be made compulsory. Environmental groups should pressurise state governments to bring in this legislation.
- Non-leaded fuel alone should be sold. Environmental groups must get together to pressurise the government to make automobile manufacturers modify their designs to suit non-leaded fuel and stop the sale of leaded fuel.
- People should be encouraged to share their vehicles or use public transport. This would mean lesser traffic on the road, and thus, lesser pollution.

Industrial Pollution

- Small pressure groups should be formed to influence industries to install filters, electrostatic precipitators, scrubbers, etc., to control atmospheric pollution.
- Education is the most important solution
- Plan campaigns in schools and colleges on simple issues such as the ill-effects of smoking, and substitutes for domestic fuel consumption such as smokeless chulhas, etc.
- Mobilise your immediate locality to protest against local polluting industries.

Pressurise the government by writing letters to the press, motivating the media and contacting the local MP or MLA. If everyone keeps his immediate environment clean, the macro-environment automatically becomes cleaner.