Air Pollution

About air pollution

4.1 The atmosphere consists of a mixture of many different gases, about 78 per cent of it is nitrogen, about 21 per cent is oxygen and the remaining 1 per cent is a mix of argon, carbon dioxide, methane, hydrogen, helium, neon, ozone and other gases in trace amounts. The atmosphere extends upward for roughly 160 kilometres (kms) above the surface of the earth. Troposphere is the lowermost layer of the atmosphere. Only about 12 kms thick, it is in this relatively thin layer of air that oxygen-dependent life is sustained, clouds are formed, weather patterns develop and most of our air pollution problems occur. Stratosphere, the layer of air above the troposphere is a stable layer that extends upward to an altitude of about 30 kms. The stratosphere contains only a small fraction of the total air mass because of the lower air density and contains much more ozone than the troposphere and ozone in the stratosphere plays an important role in protecting living organisms on the earth from the sun's harmful ultraviolet (UV) radiation. The UV rays are absorbed by ozone molecules and are then converted into heat energy, the ozone acting as a protective filter. Mesosphere, ionosphere and thermosphere are layers of the atmosphere above the stratosphere.

Types and sources of air pollutants

4.2 Air pollution can be defined as the presence of 'foreign' substances in the atmosphere in high enough concentrations and for long enough duration to cause undesirable effects. Substances that are generally recognized to be air pollutants resulting from human activity include particulates, sulphur dioxide, nitrogen dioxide, carbon monoxide, hydro carbons, ozone, lead etc.

Effects of air pollution

4.3 Air pollution can have the following effects:

Effects on Human Health: Major health effects include acute (short-term but severe) illness, or death; chronic (long-term) respiratory illness, including bronchitis, emphysema, asthma, and possibly lung cancer and temporary eye and throat irritation, coughing, chest pain and malaise or general discomfort. Sulphur dioxide, nitrogen dioxide and ozone cause eye and throat irritation, coughing and chest pain. These pungent gases can harm lung tissue when inhaled into the respiratory tract and are associated with bronchitis, emphysema and other lung diseases. Inhalation of particulates also affects the breathing process adversely. Although larger particles are captured by the protective mucus lining and cilia in the nose and throat, smaller particles can penetrate deep into the lungs. Certain particulates are especially dangerous

because of their toxic or carcinogenic properties like lead fumes in automobile exhausts and asbestos fibres. Carbon monoxide (CO), a colourless and odourless gas is very lethal as it can be inhaled without causing irritation or immediate discomfort. It combines readily with haemoglobin in the blood and takes up the place ordinarily occupied by oxygen. The inhaled CO reduces the ability of blood to transfer oxygen to body cells, leading to asphyxiation or suffocation. Even lower concentrations of CO can cause illness or reduced mental awareness.

Effects on plants, animals and the atmosphere: Some air pollutants cause collapse of the leaf tissue; others bleach or discolour leaves. Certain air pollutants also cause harm to cattle and other livestock, but this is usually a localized problem on farms near specific industrial plants that cause the pollution. The most noticeable effect of air pollution is on the atmosphere itself. Specifically, it is the haze and reduction of visibility due to the scattering of light by suspended particles. Particulates can also affect weather conditions by increasing the frequency of fog formation and rainfall.

Greenhouse effect: Greenhouse effect is caused by carbon dioxide which is not ordinarily considered an air pollutant and which is a normal, although a minor component of the atmosphere. Carbon dioxide is released into the atmosphere in vast quantities as a by-product of fossil fuel combustion (coal, oil, gas), which is used in industrial activity and power generation. According to IPCC[1], global greenhouse gas (GHG) emissions due to human activities have grown since pre-industrial times, with an increase of 70 per cent between 1970 and 2004. Global warming, the rise of temperatures worldwide, is usually attributed to the greenhouse effect. The most deleterious effect of global warming would be the melting of the Arctic ice packs, which is expected to raise the sea level by about 1 meter which will cause extensive economic and social hardship in low lying land areas and coastal areas all over the world.

Acid rain: The term 'acid rain' refers to the fact that in recent years, the average pH[2] of rainfall has been decreasing significantly below its normal value. Many species of fish, trees and agricultural

[1] The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body set up by the World Meteorological Organization and by the United Nations Environment Program to provide decision-makers and others interested in climate change with an objective source of information about climate change.
[2] pH is a measure of the acidity or basicity of a solution; pure water is said to be neutral.

crops are very sensitive to pH values and do not thrive under acidic conditions. Many lakes in certain regions no longer support fish life. Most scientists agree that the death of these once productive lakes is directly attributable to acid rainfall. Acid rain also accelerates the rate at which minerals leach out of the soil, which reduces soil fertility, diminishing the growth and productivity of forests and agricultural crops. Leaching of certain metals from the soil into the groundwater may also contaminate drinking water supplies. Finally, acid rainfall speeds up the physical deterioration of concrete, metal and other exposed material.

Measurement of air quality

4.4 It is necessary to measure the amount or concentration of the various pollutants in order to evaluate air quality and to design appropriate air pollution control systems. Ambient samples are collected from the open atmosphere, after pollutants from various sources have been dispersed and mixed together under natural meteorological conditions. Ambient, or atmospheric sampling, serves several purposes. It provides 'background' air quality data in urban or rural areas and a basis for developing and updating ambient air quality standards. Monitoring ambient air quality also provides data to determine if established standards are being met or exceeded. Impending air pollution episodes or emergencies can be predicted in advance, by examining ambient air quality along with meteorological data; this provides time for health officials to warn the public. Source or emissions sampling is performed right at the point of pollutant discharge such as at a vehicle tailpipe or a smokestack. A basic purpose of source sampling is to evaluate the pollution discharged from a specific generator and to use the results to determine if the emission standards are being met. The other purposes of emissions sampling are to provide data for designing and operating air cleaning equipment and to measure the working efficiency of that equipment.

Legislation governing air pollution in India

Acts:
The Air (Prevention and Control of Pollution) Act was enacted in 1981 and amended in 1987 to provide for the prevention, control and abatement of air pollution in India.
Rules

- G.S.R.6(E), [21/12/1983] - The Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983
- G.S.R.712(E), [18/11/1982] - The Air (Prevention and Control of Pollution) Rules, 1982

Notifications

- Revised National Ambient Air Quality Standards, Notification
- G.S.R.935(E), [14/10/1998] - Ambient Air Quality Standard for Ammonia (NH3)
- G.S.R.389(E), [23/9/1994] - CPCB reestablished labs in Delhi, Calcutta, Vadodara and Kanpur