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Air pollutants

An air pollutant is a substance in the air that can cause harm to humans and the environment. Indoor air pollution and urban air quality are listed as two of the world's worst pollution problems in the 2008.

Pollutants can be classified as primary or secondary. Usually, primary pollutants are directly emitted from a process, such as ash from a volcanic eruption, the carbon monoxide gas from a motor vehicle exhaust or sulfur dioxide released from factories. Secondary pollutants are not emitted directly. One example is ground-level ozone.

The transport sector has become one of the main emitters of polluting compounds in the world and one of the main causes of the greenhouse effect. Also, a report by the European Environment Agency (EEA) points out that road transport is the single largest air polluter in Europe. Through the burning of fuel, motor vehicles, cars and trucks emit a range of health damaging pollutants, such as particulate matter, nitrogen oxides, sulphur dioxide, carbon monoxides and Volatile Organic Compounds (VOCs). Some of the substances in motor vehicle exhaust also cause 'secondary pollutants' such as ozone, which are formed through chemical reactions in the air.

Air pollution is especially a problem in urban areas, where there is a lot of traffic. Some pollutants however can travel long distances and may accumulate in suburban or rural areas because of weather conditions such as wind or low pressure.

Compared with traffic, industrial activities are responsible for a larger total emission per year. Main air pollutants are:

- i. **Sulphur oxides (SO_x)** – Mainly Sulphur dioxide (SO₂). It is one of the causes for concern over the environmental impact of the use of fuels as power sources.
- ii. **Nitrogen oxides (NO_x)** - NO₂ is one of the most prominent air pollutants. Nitrogen (N) compounds, emitted as NO_x and NH₃, are now the principal acidifying components in our air and cause eutrophication of ecosystems.
- iii. **Particulate matter** - Particulates, alternatively referred to as particulate matter (PM) or fine particles, are tiny particles of solid or liquid suspended in a gas. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes also generate significant amounts of aerosols.
- iv. **Ozone (O₃)** - Ozone is not directly emitted into the atmosphere but formed from a chain of photochemical reactions following emissions of precursor gases: nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC).
- v. **Carbon monoxide (CO)** - It is a product by incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide.
- vi. **Carbon dioxide (CO₂)** - emitted from sources such as combustion, cement production, and respiration.
- vii. **Heavy metals, such as arsenic (As), cadmium (Cd), lead (Pb) and nickel (Ni)**
- viii. **Benzene and benzo(a)pyrene**
- ix. **Ammonia (NH₃)** - emitted from agricultural processes.

Other remarkable air pollutants that will be explained in separate chapters are:

a. **Volatile organic compounds** - VOCs are an important outdoor air pollutants

b. **Chlorofluorocarbons (CFCs)** - harmful to the ozone layer