

Primary Pollutants: These persist in their original form in environment.

Secondary Pollutants: These are formed from interaction among primary pollutants.
ex: PAN (Peroxyacetyl nitrate)

Quantitative Pollutants: They are naturally occurring substance, become pollutant when their concentration goes beyond their natural level, e.g. CO_2 .

Qualitative Pollutants: These do not occur in nature & you made.

i) Biodegradable

ii) Non-Biodegradable

Air Pollution

CO - colourless odourless gas - produced by incomplete burning of carbon based fuels including petrol diesel & woods.
- Cigarettes etc.

- It lowers the amount of oxygen that enters into blood, slow reflexes.

CO₂ - Principal Greenhouse emitting gas.

CFC - ozone layer reduces due to them.

Lead: petrol, diesel, hair spray, lead batteries affect children in particular. Causes nervous system damage & digestive problems, cancer etc.

Ozone: At ground level it is pollutant with high toxicity. vehicles & factories are major contributors. Lowers resistance to cold & pneumonia, itching in eyes & burning of skin.

NOx: (Nitrogen oxides) - causes smog and acid rains - causes respiratory diseases in children.

Suspended particulate matter (SPM)

Smoke, dust, vapour main source of haze. causes lung damage & respiratory problem.

SO₂ (sulphur dioxide) smog and acid rain. lead to lung diseases produced from burning of coal in thermal power plants.

Smog or photochemical smog (SMOG-FOG+SMOKE)

Photochemical smog: sunlight + certain chemicals (CO₂)

and low level ozone is formed when vehicular emission containing fuel oxide (vehicle exhaust) and volatile organic compounds (paints etc) interact in the presence of sunlight.

Sawtooth causes respiratory disease, bronchial diseases.

Indoor Air Pollution

Carbon monoxide, polycyclic organic matter, formaldehyde.
Formaldehyde - mainly from Carpets, particle boards, insulation foams.

Radon - It is gas naturally emitted by soil. Causes lung cancer.

Fly Ash composition - Aluminium Silicate, Silicon dioxide (SiO_2) and Calcium oxide - CaO . Causes respiratory problems.

Mercury - Nervous disorder - insomnia, memory loss, irritability, irritation, tremor, gingivitis & Minamata.

Lead - Brain damage & CMS.

Cadmium - Affects the heart.

Silica dust - Silicon quartz - silicosis - affects lungs.

Cotton dust - Bysiniosis - involves destruction of lung tissue, cough etc.

Asbestos - Asbestosis - severe respiratory problems & cancer.

Coal dust - Black-lung cancer, pulmonary fibrosis.

- Arrestors & Scrubbers are used to remove particulate pollutants

from air. Arrestors are used to separate particulate matter from contaminated air, Scrubbers - These are used to clean air for both solids & gases by passing it through a dry or wet packing material.

Catalytic Converter filters in the vehicles can convert nitrogen oxide to nitrogen and reduces the potential hazard of NO_x .

- National Ambient Air Quality Standards (NAAQS) were notified in the year - 1982 revised in 1999.

NAAQS have been revised and revised in November 2009 for 12 pollutants - SO_2 , NO_2 , PM_{10} (PM_{10}), $PM_{2.5}$ (particulate matter $\leq 2.5 \mu m$), Ozone, lead, Carbon monoxide, Arsenic, Nickel, Benzene, Ammonia, Benzopyrene.

Water Pollution

Sources Point Sources ^{easy to regulate} these pollutants travels directly from source to water.

Diffuse or non-point sources from various ill defined and diffuse sources. They vary spatially and temporally and are difficult to regulate.

Biodegradability: Process of decomposition of organic matter present in water by microorganisms using oxygen.

Effects of Water Pollution-

polluted water reduces Dissolved oxygen (DO) thereby killing sensitive organisms phytoplanktons, fishes etc.

- Indicator species: species which can survive in highly polluted water like - Tubifex insect larvae etc.

DO (Dissolved oxygen): DO below 8 mg/L - The higher amount of waste increases the rate of decomposition and O_2 consumption thereby decreases the DO content of water.

BOD - Biological oxygen demand: It is the amount of dissolved oxygen needed by bacteria in decomposing the organic waste present in water. expressed in Mg of oxygen per litre of water.

"The higher value of BOD indicates low DO content of water"

Since BOD is limited to biodegradable materials only - therefore it is not a reliable method of measuring pollution load in water.

COD: Chemical oxygen demand (COD) is a slightly better mode used to measure pollution load in water.

It is the measure of oxygen equivalent of the requirement of oxidation of total organic matter (i.e. biodegradable and non-biodegradable) present in water.

- Methyl Mercury: Minamata disease (Water)
- Cadmium pollution water cause Itai-Itai or Ouch-ouch disease

Nitrate: excess nitrate in drinking water reacts with hemoglobin to form non-functional methaemoglobin and impairs oxygen transport. Known as "Blue baby syndrome" Methaemoglobinemia

- Fluoride: Excess fluoride in drinking water causes neuromuscular disorders, gastro-intestinal problems, teeth deformity, hardening of bones & stiff and painful joints.

Arsenic: Over exploitation of ground water may lead to leaching of Arsenic from soil and rock sources and contaminates ground water. Chronic exposure to Arsenic causes Black foot disease, diarrhoea, peripheral neuritis, hyperkeratosis, & also lung and skin cancer.

- Water hyacinth can purify water by absorbing some toxic materials.
- "Bregoli" by product of paper industry resembling saw dust can clear "oil spills".

Soil pollution

Sources: Industrial waste, fertilizers & pesticides, Radioactive wastes
Effects of soil pollution

- ① Reduced soil fertility, erosion, loss of soil nutrients, salinity increase, Bio-magnification, Radioactive materials in ground water etc.

Above 75db. Hearing can be damaged.

Treatment and disposal of solid waste

- ① Sanitary landfills. ② Incineration plants - The process of burning waste in large furnaces at high temp. ③ Pyrolysis: Combustion in absence of oxygen.