

→ Air or Atmospheric pollution

Air is essentially a mixture of gases. It is the foremost susceptible components of our environment prone to pollution. Air pollution may have profound health effects and other consequences.

"Any atmospheric condition in which certain substances (solid particles or gases) are present in such concentrations that they can produce undesirable effects on human and his environment is known as air pollution."

These substances, called air pollutants, include gases (e.g.  $SO_2$ ,  $NO_x$ ,  $CO$ ,  $CO_2$ ,  $O_3$  etc.), particulate matter (e.g. smoke, dust, pollen, fumes, aerosols etc.), radioactive materials and micro-organisms (e.g. virus, bacteria etc.).

\* Air pollutants are divided into two categories: (1) Primary pollutants: Those which are emitted directly from the sources are called primary pollutants. These include particulate matters such as ash, smoke, dust etc., inorganic gases such as  $SO_2$ ,  $CO$ ,  $NO$ ,  $H_2S$ ,  $NH_3$ ,  $HF$  etc.; hydrocarbons and radioactive substances.

(2) Secondary pollutants: Those which are formed in the atmosphere by chemical reactions among primary pollutants and normal atmospheric constituents. e.g.  $SO_3$ ,  $NO_2$ ,  $O_3$ ,  $RCHO$ ,  $R_2CO$ , various sulphates, nitrate salts. These are generally formed by oxidation, dissociation and dissolution.

\* Sources/Causes of Air pollution: (i) The burning of fossil fuels (e.g. coal, petroleum & other factory combustibles) generate  $SO_2$ ,  $NO_x$  (nitrogen oxides),  $CO_2$  etc.

(ii) Exhausts from automobiles (cars, buses, trucks, trains, two wheelers etc.), factories and industries. They have  $NO_x$ , hydrocarbons,  $CO$ ,  $CO_2$  etc.

(iii) Deforestation emits  $CO$ ,  $CO_2$  etc. (iv) Agricultural activities (Plant solvent, pesticides etc) generate hydrocarbons (v) Volcano eruptions generate  $SO_2$ ,  $H_2S$  etc.

(vi) Indoor air pollution/home heating & cooling devices generate CFCs,  $NH_3$ ,  $X_2$  etc.

(vii) Mining operations and construction works (buildings, roads, bridges etc) generate  $SO_2$ , particulates etc. (viii) Minute living organisms/micro-organisms dispersed in air e.g. bacteria, fungi, moulds, virus etc.

\* Effects: (i) Human health: Air pollution produces a long term health effects such as heart disease, lung cancer and respiratory diseases (e.g. emphysema) It can also cause long term damage to human's nerves, brain, kidney, liver and other organs.  $SO_2$  produces drying the mouth, scratchy throat, smarting eyes and brings acute irritant effects.  $NO$  &  $CO$  diffuse into the blood stream and combine with haemoglobin which loses property of oxygen transport. It <sup>also</sup> causes asthma, bronchitis and chronic obstructive pulmonary diseases.

(ii) Vegetation: Air pollution <sup>pollutants</sup> destroy the chlorophyll and disrupt photosynthesis,  $SO_2$  causes chlorosis and hinders growth of lichens on trees, while fluorides destroy the leaf tissue;  $NO_x$  and fluorides reduce crop yields, hydrocarbons cause premature leaf fall, flower bud, shedding, curling of petals & decolouration of sepals

(2)

(ii) Materials:  $\text{SO}_2$  &  $\text{O}_3$  affect fabrics, leather and paint.  $\text{H}_2\text{SO}_4$  mist causes serious damage to structural materials such as marble, limestone, slate.  $\text{H}_2\text{S}$  gas reacts with lead paints led to the blackening of the surfaces.

(iv) Climate: Gases such as  $\text{CO}_2$ ,  $\text{N}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{O}_3$  and CFCs influence the green house effect which result global warming and make winters shorter and summer longer.

\* Prevention/Control: (i) The most basic solution for air pollution is to move away from fossil fuels, replacing them alternative energies like solar, wind & geothermal. Producing clean energy is crucial. But equally important is to reduce our energy consumption by adopting responsible habits and using more efficient devices.

(ii) Various methods have been proposed for reduction of emissions dispersal from air:

(a) Absorption:  $\text{HCl}$ ,  $\text{HF}$ ,  $\text{SiF}_4$  etc are removed by dissolving in acidic water while  $\text{H}_2\text{S}$ ,  $\text{SO}_2$ ,  $\text{Cl}_2$  etc. by alkaline water.

(b) Adsorption: Activated charcoal, Silicagel and other adsorbents are used to capture gas, liquid substances.

(c) Condensation: Hydrocarbons, Organic compounds are removed by condensation in water or air cooled condenser.

(iii) Avoid burning leaves, trash and other materials.

### ⇒ Water Pollution:

80% of the earth's area is occupied by water. 97% of the water contained in oceans and 2.5% makes up the world's total supply of fresh water/drinking water. An average man consumes about 2.2L of water daily.

Man has, however, polluted much of this limited quantity of water by sewage, industrial wastes and a number of synthetic chemicals. Moreover, the rain fall on its way down to earth brings down the air pollutants. Polluted water is the water which has more negative quantities than it has positive ones, i.e., it is no longer fit for any use.

"Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers, ground water etc.), usually, as a result of human activities. It results when contaminants are introduced into the natural environment.

In other words, "the presence of any foreign substances (organic, inorganic, radio active or biological) in water which tends to degrade the quality so as to impair the usefulness of water is called water pollution, and substances as water pollutants".

\* Water pollutants & Sources: The common water pollutants are—

(i) Oxygen demanding wastes/Biodegradable organic compounds, e.g. sewage, wastes from food processing plants, paper mills and tanneries.

(ii) Disease causing agents: Bacteria and virus from sewage or other wastes cause various diseases such as Cholera, typhoid, dysentery, gastroenteritis, poli'o, hepatitis etc.

(iii) Synthetic organic compds - Pesticides, detergents and other industrial chemicals.

(iv) Plant nutrients: Nitrates & phosphates from detergents, fertilizers and sewage treatment plants. (v) Radioactive substances: from power plants, medical and research laboratories and nuclear weapons testing. (vi) Sediments: Enrich soil in water due to soil erosion (vii) Thermal discharges: Heat & water from power plants (viii) Others: mining activities, marine dumping, accidental oil leakage, burning of fossil fuels etc.

\* Effects: (i) If the DO level in water decreases, the aquatic organisms (animals & plants) may not survive. Sometimes it affects the entire food chain. Small fishes face difficulty in breathing.

(ii) The microbes mainly bacteria & viruses, present in polluted water can cause various diseases, e.g. Cholera, typhoid, polio, hepatitis, dysentery etc. in humans (iii) When synthetic organic compounds present in water can act as toxic poisons for plants, animals & humans (iv) Thermal discharges destroy aquatic life, and increase temperature & toxicity of some chemicals in water.

(v) Radioactive substances can enter humans through food & water. These may get accumulated in blood and muscular tissues (vi) At present, level of fluorides in drinking water has considerably increased in different parts of India (world, causing fluorosis (an incurable bone disease) and arsenic ( $As^{3+}$  &  $As^{5+}$ ) in water causes cancer in humans.

\* Control/Preventions: (i) Septic tanks should be used for each house to reduce flow of municipal sewage and human excreta towards river, lake or pond (ii) River, lakes etc. should not be used for bathing and washing purposes (iii) Too much use of pesticides which are toxic and non-degradable should be avoided (iv) Waste water treatment techniques such as physical (e.g. filtration), chemical (e.g. precipitation) or biological (e.g. activated sludge process) should be applied before the polluted water enters to river, lake etc. In particular cases, the process such as carbon absorption, oxidation-reduction, ion-exchange, reverse osmosis, electrodialysis are also used (v) Don't pour fat, oil or grease, household chemicals/cleaning agents down the sink or toilet (vi) Don't flush pills, liquid or powder medications or drugs down the toilet (vii) Avoid using the toilet as a waste basket and a garbage disposal.

### ⇒ Noise pollution

When people talk about pollution first that came to mind usually would be air, water, plastics, all the tangible pollution that we can directly see or smell. However, what's probably less known would be the fact that the noise from construction sites, from busy highways, from our highly urbanised environment. High level of noise have already been embedded in our lives that we tend to overlook it as a type of pollution. And because we are unaware of its potential danger noise pollution received lesser attention as it needed to. Thus, "Noise pollution, unwanted or excessive sound that can have deleterious effects on human health and environmental quality."

\* According to World Health Organisation (WHO), sound levels less than 70 dB are not damaging to living organisms regardless of how long or consistent the exposure is.

\* Noise pollution can be categorised into three main types, namely industrial, transport and neighbourhood. Industrial noise is caused by the running the machinery and appliances, which can produce continuous or impulsive noise. Noise may be physical, physiological, psychological and semantic.

(4)

- \* Sources/Causes: (i) Industrial machinery, vehicles and construction are the most damaging one.  
(ii) Residential areas include loud music, electrical generators and dense population.  
(iii) Transportation includes traffic, rails, aeroplanes etc.  
(iv) Lawn care maintenance, constructions, explosions etc.

\* Measure/detection of noise pollution: A decibel (dB) is the standard for the measurement of noise/sound level. The zero on a decibel scale is at the threshold of hearing, the lowest sound pressure that can be heard. On the scale according to Smith, 20 dB is whisper, 40 dB the noise in a quiet office.

\* Effects: (i) It can cause health problems for human and wild life both on land and in the sea. Loud sound can have a significant impact on human health/physiological health.

(ii) It is associated with several health conditions, including cardiovascular disorders, hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances and other harmful ~~and disturbing effects~~ and disturbing effects.

- \* Protection/controls: (i) Know which noises can cause damage (those at or above 85 dB).  
(ii) Turn your music down, especially when using head phones.  
(iii) Wear earplugs or proper ear muffs are available at hardware and sporting goods stores.  
(iv) Be alert to loud noise in your environment.