

ENVIRONMENTAL POLLUTION: Introduction, Causes & Types

What is Environmental Pollution?

- Environment Pollution is the addition of contaminants into the natural environment that causes detrimental effects to nature, natural resources and mankind.
- Any unnatural and negative changes in all the dimensions like chemical, physical and biological characteristics of any component of the ecosystem i.e. air, water or soil which can cause harmful effects on various forms of life and property is called environmental pollution.

What is a Pollutant?

- Any substance which causes harmful effects or uneasiness in the organisms, then that particular substance may be called as the pollutant.

The materials that cause pollution are of two types:

1. **Persistent pollutants:** Those pollutants which remain consistent in the environment for a long period of time without any change in its original form are called persistent pollutants. For example pesticides, nuclear wastes, and plastics etc.
2. **Non-persistent pollutants:** These pollutants are the opposite of persistent pollutant and break down in the simple form. If this process of breaking down is done by living organisms, then such pollutants are referred to as biodegradable pollutants.

From another perspective, pollutants can be classified as follows:

1. **Primary Pollutants:** Primary pollutants are those which remain in the form in which they were added to the environment for ex. DDT, Plastic
2. **Secondary Pollutants:** Secondary pollutants are formed due to interaction of primary pollutants amongst themselves viz. PAN by the interaction of NO_x & Hydrocarbons.

According to their existence in nature:

1. **Quantitative Pollutants:** These substances are already present in the atmosphere but they become pollutant when their concentration level reaches to a particular level which is above a threshold limit.
2. **Qualitative Pollutants:** These are man-made pollutants eg. Fungicides, herbicides etc.

According to origin:

1. **Man-made Pollutants**
2. **Natural Pollutants**

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According to the nature of disposal:

1. **Biodegradable Pollutants**
2. **Non-biodegradable Pollutants**

Types of pollution:

AIR POLLUTION:

- Air pollution is the presence of one or more disadvantageous content in such quantity and for such duration, as it is catastrophic, or tend to be catastrophic, to human health and welfare, animal or plant life.
- It is the contaminants of air by the discharge of detrimental substances.

Some of the air pollutants, their sources and effects:

| Name of the pollutants | Sources | Health effects |
|------------------------------|---|---|
| Nitrogen oxides | Industries, vehicles and power plants | Problems in the lungs, respiratory systems and causes asthma and bronchitis. |
| Carbon monoxide | Emission and burning of fossil fuels | Severe headache, irritation to mucous membrane, unconsciousness and death. |
| Carbon dioxide | Burning of fossil fuels | Vision problem, severe headache and heart strain. |
| Suspended particulate matter | Vehicular emission and burning of fossil fuels. | Lung irritation reduces development of RBC and pulmonary malfunctioning. |
| Sulphur oxide | Industries and power plant | Irritation in eyes and throat, allergies, cough etc. |
| Smog | Industries and vehicular pollution | Respiratory and eye problems |
| Hydrocarbons | Burning of fossil fuels | Kidney problems, irritation in eyes, nose and throat, asthma, hypertension and carcinogenic effects on lungs. |
| Chlorofluorocarbons | Refrigerators, emission from jets | Depletion of ozone layer, global warming |

- Other pollutants are cadmium, lead, mercury, silica, coal dust and particles and radioactive pollutants.

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Control measures

- Policy measures
- Modification of industrial process and selection of suitable fuels and its utilization.
- Collection of pollutants and convert it into less toxic forms by different methods.

Government initiatives

- National air quality monitoring programme (NAMP)
- National ambient air quality standards (NAAQS)

WATER POLLUTION:

- Addition of certain substances such as organic, inorganic, biological and radiological to the water, which degrades the water quality and makes it unhealthy for use.
- Water pollution is not only confined to surface water but also spread to groundwater, sea and ocean.

Sources

Point sources: These are directly pointed towards the water bodies from the source of origin of pollution and are thus easy to regulate.

Non-point sources: These sources are related to many diffuse sources and are thus difficult to regulate.

Some of the sources are:

- Industrial and community wastewater: Industries like mining, iron and steel, pharmaceuticals, food processing, soap and detergent and paper and pulp.
- Agricultural sources, thermal pollution (discharge of hot water by thermal power plants cause deficiency of dissolved oxygen in water) and underground water pollution.
- Marine pollution: river discharge, manmade pollution and oil spills etc.

Effects

- An excessive amount of mercury in water can cause Minamata disease in humans and dropsy in fishes; Lead in large amount can cause dyslexia, Cadmium poisoning causes Itai – Itai disease etc.
- Polluted water has less amount of Dissolved oxygen (DO) content which is important for sensitive organisms, thereby eliminates sensitive organisms.
- Excess of nitrate in drinking water is dangerous for infants and human health, excess fluoride cause neuromuscular disorder and teeth deformity, hardening of bones and painful joints.
- Biological magnification and eutrophication.

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Note: 'Eu' means healthy and 'trophy' means nutrition. The improvement of nutrients in water bodies causes eutrophication. Domestic waste discharge, agricultural waste, land drainage and industrial waste in a water body leads to a rapid increase in nutrients in a water body which initiates early ageing of water bodies.

Control measures

- Usage of water should be minimized by changing the techniques involved.
- Recycling and treatment of water should be used to the maximum extent possible.
- The quantity of discharge of wastewater can be minimized.
- Excessive use of pesticides and fertilizers should be avoided.
- Organic farming and efficient use of animal residues as fertilizers.

SOIL POLLUTION

- Addition of unwanted substances to the soil which negatively affects physical, chemical and biological properties of soil and reduces its productivity is called soil pollution.
- The factors which disturb the biological balance of the soil and deteriorate the quality, texture and mineral content are called soil pollutants.
- Use of fertilizers, pesticides, insecticides, dumping of solid waste, deforestation and pollution due to urbanization and other anthropogenic substances causes soil pollution.

Sources

- Industrial waste: lead, cadmium, mercury, alkalies, organic substances and chemicals.
- Agricultural waste: fertilizers, pesticides, insecticides and manures.
- Discarded materials and radioactive elements and plastic bags.

Effects

- Agriculture: It reduces soil fertility and thus crop yields; increase soil erosion and salinity.
- Ecological imbalance and imbalance in flora and fauna further increases.
- Problems in urban areas like clogging in drains, release of gases, foul smells and problems in wastewater management.
- Release of radioactive rays, biomagnification and pollutant gases cause health problems.

Control measures

- Afforestation, reforestation and use of organic farming.
- Solid waste management and reduction of waste from the construction area.
- Stop the use of plastic bags and use bags of degradable materials like paper and cloth.
- Biomedical waste should be collected and incinerated in incinerators.

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