

Environmental pollution and its adverse effect on living organism

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A. Introduction–

We know that, a living organism cannot live by itself. Organisms interact among themselves. Hence, all organisms, such as plants, animals and human beings, as well as the physical surroundings with whom we interact, form a part of our environment. All these constituents of the environment are dependent upon each other. Thus, they maintain a balance in nature. As we are the only organisms try to modify the environment to fulfill our needs; it is our responsibility to take necessary steps to control the environmental imbalances.

The environmental imbalance gives rise to various environmental problems. Some of the environmental problems are pollution, soil erosion leading to floods, salt deserts and sea recedes, desertification, landslides, change of river directions, extinction of species, and vulnerable ecosystem in place of more complex and stable ecosystems, depletion of natural resources, waste accumulation, deforestation, thinning of ozone layer and global warming. The environmental problems are visualized in terms of pollution, growth in population, development, industrialization, unplanned urbanization etc. Rapid migration and increase in population in the urban areas has also lead to traffic congestion, water shortages, solid waste, and air, water and noise pollution are common noticeable problems in almost all the urban areas since last few years.

Environmental pollution is defined as the undesirable change in physical, chemical and biological characteristics of our air, land and water. As a result of over-population, rapid industrializations, and other human activities like agriculture and deforestation etc., earth became loaded with diverse pollutants that were released as by-products. Pollutants are generally grouped under two classes:

(a) Biodegradable pollutants - Biodegradable pollutants are broken down by the activity of micro-organisms and enter into the biogeochemical cycles. Examples of such pollutants are domestic waste products, urine and faecal matter, sewage, agricultural residue, paper, wood and cloth etc.

(b) Non- Biodegradable pollutants - Non-biodegradable pollutants are stronger chemical bondage, do not break down into simpler and harmless products. These include various insecticides and other pesticides, mercury, lead, arsenic, aluminum, plastics, radioactive waste etc.

B. Classification of Environmental Pollution –

Pollution can be broadly classified according to the components of environment that are polluted. Major of these are: Air pollution, Water pollution, Soil pollution (land degradation) and Noise pollution. Details of these types of pollutions are discussed below with their prevention measures.S

(1) Air Pollution:

Air is mainly a mixture of various gases such as oxygen, carbon dioxide, nitrogen. These are present in a particular ratio. Whenever there is any imbalance in the ratio of these gases, air pollution is caused. The sources of air pollution can be grouped as under

(i) **Natural**; such as, forest fires, ash from smoking volcanoes, dust storm and decay of organic matters.

(ii) **Man-made** due to population explosion, deforestation, urbanization and industrializations.

Certain activities of human beings release several pollutants in air, such as carbon monoxide (CO), sulfur dioxide (SO₂), hydrocarbons (HC), oxides of nitrogen (NO_x), lead, arsenic, asbestos, radioactive matter, and dust. The major threat comes from burning of fossil fuels, such as coal and petroleum products. Thermal power plants, automobiles and industries are major sources of air pollution as well. Due to progress in atomic energy sector, there has been an increase in radioactivity in the atmosphere. Mining activity adds to air pollution in the form of particulate matter. Progress in agriculture due to use of fertilizers and pesticides has also contributed towards air pollution. Indiscriminate cutting of trees and clearing of forests has led to increase in the amount of carbon dioxide in atmosphere. Global warming is a consequence of green house effect caused by increased level of carbon dioxide (CO₂). Ozone (O₃) depletion has resulted in UV radiation striking our earth.

The gaseous composition of unpolluted air	
The Gases	Parts per million (vol)
Nitrogen	756,500
Oxygen	202,900
Water	31,200
Argon	9,000
Carbon Dioxide	305
Neon	17.4
Helium	5.0

Methane	0.97-1.16
Krypton	0.97
Nitrous oxide	0.49
Hydrogen	0.49
Xenon	0.08
Organic vapours	ca.0.02

Effects of air pollution –

(a) It affects respiratory system of living organisms and causes bronchitis, asthma, lung cancer, pneumonia etc. Carbon monoxide (CO) emitted from motor vehicles and cigarette smoke affects the central nervous system.

(b) Due to depletion of ozone layer, UV radiation reaches the earth. UV radiation causes skin cancer, damage to eyes and immune system.

(c) Acid rain is also a result of air pollution. This is caused by presence of oxides of nitrogen and sulfur in the air. These oxides dissolve in rain water to form nitric acid and sulfuric acid respectively. Various monuments, buildings, and statues are damaged due to corrosion by acid present in the rain. The soil also becomes acidic. The cumulative effect is the gradual degradation of soil and a decline in forest and agricultural productivity.

(d) The green house gases, such as carbon dioxide (CO₂) and methane (CH₄) trap the heat radiated from earth. This leads to an increase in earth's temperature.

(e) Some toxic metals and pesticides also cause air pollution.

(2) Water Pollution:

Water is one of the prime necessities of life. With increasing number of people depend on this resource; water has become a scarce commodity. Pollution makes even the limited available water unfit for use. Water is said to be polluted when there is any physical, biological or chemical change in water quality that adversely affects living organisms or makes water unsuitable for use. Sources of water pollution are mainly factories, power plants, coal mines and oil wells situated either close to water source or away from sources. They discharge pollutants directly or indirectly into the water sources like river, lakes, water streams etc. The harmful effects of water pollution are:

(a) Human beings become victims of various water borne diseases, such as typhoid, cholera, dysentery, hepatitis, jaundice, etc.

- (b) The presence of acids/alkalies in water destroys the microorganisms, thereby hindering the self-purification process in the rivers or water bodies. Agriculture is affected badly due to polluted water. Marine eco-systems are affected adversely.
- (c) The sewage waste promotes growth of phytoplankton in water bodies; causing reduction of dissolved oxygen.
- (d) Poisonous industrial wastes present in water bodies affect the fish population and deprives us of one of our sources of food. It also kills other animals living in fresh water.
- (e) The quality of underground water is also affected due to toxicity and pollutant content of surface water.
- (f) Virtually all water pollutants are hazardous to humans as well as lesser species; sodium is implicated in cardiovascular disease, nitrates in blood disorders. Mercury and lead can cause nervous disorders. Some contaminants are carcinogens. DDT is toxic to humans and can alter chromosomes. Along many shores, shellfish can no longer be taken because of contamination by DDT, sewage, or industrial wastes.

(2.1) Water pollution by industries and its effects -

A change in the chemical, physical, biological, and radiological quality of water that is injurious to its uses. The term “water pollution” generally refers to human-induced changes to water quality. Thus, the discharge of toxic chemicals from industries or the release of human or livestock waste into a nearby water body is considered pollution.

The contamination of ground water of water bodies like rivers, lakes, wetlands, estuaries, and oceans can threaten the health of humans and aquatic life. Sources of water pollution may be divided into two categories. (i) Point-source pollution, in which contaminants are discharged from a discrete location. Sewage outfalls and oil spills are examples of point-source pollution. (ii) Non-point-source or diffuse pollution, referring to all of the other discharges that deliver contaminants to water bodies. Acid rain and unconfined runoff from agricultural or urban areas falls under this category.

The principal contaminants of water include toxic chemicals, nutrients, biodegradable organics, and bacterial & viral pathogens. Water pollution can affect human health when pollutants enter the body either via skin exposure or through the direct consumption of contaminated drinking water and contaminated food. Prime pollutants, including DDT and polychlorinated biphenyls (PCBs), persist in the natural environment and bioaccumulation occurs in the tissues of aquatic organisms. These prolonged and persistent organic pollutants are transferred up the food chain and they can reach levels of concern in fish species that are

eaten by humans. Moreover, bacteria and viral pathogens can pose a public health risk for those who drink contaminated water or eat raw shellfish from polluted water bodies.

Contaminants have a significant impact on aquatic ecosystems. Enrichment of water bodies with nutrients (principally nitrogen and phosphorus) can result in the growth of algae and other aquatic plants that shade or clog streams. If wastewater containing biodegradable organic matter is discharged into a stream with inadequate dissolved oxygen, the water downstream of the point of discharge will become anaerobic and will be turbid and dark. Settleable solids will be deposited on the streambed, and anaerobic decomposition will occur. Over the reach of stream where the dissolved-oxygen concentration is zero, a zone of putrefaction will occur with the production of hydrogen sulfide (H₂S), ammonia (NH₃), and other odorous gases. Because many fish species require a minimum of 4–5 mg of dissolved oxygen per liter of water, they will be unable to survive in this portion of the stream.

Direct exposures to toxic chemicals are also a health concern for individual aquatic plants and animals. Chemicals such as pesticides are frequently transported to lakes and rivers via runoff, and they can have harmful effects on aquatic life. Toxic chemicals have been shown to reduce the growth, survival, reproductive output, and disease resistance of exposed organisms. These effects can have important consequences for the viability of aquatic populations and communities.

Wastewater discharges are most commonly controlled through effluent standards and discharge permits. Under this system, discharge permits are issued with limits on the quantity and quality of effluents. Water-quality standards are sets of qualitative and quantitative criteria designed to maintain or enhance the quality of receiving waters. Criteria can be developed and implemented to protect aquatic life against acute and chronic effects and to safeguard humans against deleterious health effects, including cancer.

(3) Soil pollution (Land degradation):

Soil pollution is due to (i) Deforestation and (ii) Dumping of solid wastes.

Deforestation increases soil erosion; thus valuable agricultural land is lost. Solid wastes from household and industries also pollute land and enhance land degradation. Solid wastes include things from household waste and of industrial wastes. They include ash, glass, peelings of fruit and vegetables, paper, clothes, plastics, rubber, leather, brick, sand, metal, waste from cattle shed, night soil and cow dung. Chemicals discharged into air, such as compounds of sulfur and lead, eventually come to soil and pollute it. The heaps of solid waste destroy the natural beauty and surroundings become dirty. Pigs, dogs, rats, flies, mosquitoes visit the dumped waste and foul smell comes from the waste. The waste may block the flow of water in the drain, which then becomes the breeding place for mosquitoes. Mosquitoes are carriers of

parasites of malaria and dengue. Consumption of polluted water causes many diseases, such as cholera, diarrhea and dysentery.

4.Noise pollution:

High level noise is a disturbance to the human environment. Because of urbanization, noise in all areas in a city has increased considerably. One of the most pervasive sources of noise in our environment today is those associated with transportation. People reside adjacent to highways, are subjected to high level of noise produced by trucks and vehicles pass on the highways. Prolonged exposure to high level of noise is very much harmful to the health of mankind.

In industry and in mines the main sources of noise pollution are blasting, movement of heavy earth moving machines, drilling, crusher and coal handling plants etc. The critical value for the development of hearing problems is at 80 decibels.

Chronic exposure to noise may cause noise-induced hearing loss. High noise levels can contribute to cardiovascular effects. Moreover, noise can be a causal factor in workplace accidents.

5. Conservation and protection of environment-

By now, all of us have realized how important it is to protect the environment for our own survival. The term 'conservation' of environment relates to activities which can provide individual or commercial benefits, but at the same time, prevent excessive use leading to environmental damage. Conservation may be distinguished from preservation, which is considered to be "maintaining of nature as it is, or might have been before the intervention of either human beings or natural forces." We know that natural resources are getting depleted and environmental problems are increasing. It is, therefore, necessary to conserve and protect our environment. Following practices help in protecting our environment.

1. Rotation of crops.
2. Judicious use of fertilizers, intensive cropping, proper drainage and irrigation.
3. Treatment of sewage, so that it does not pollute the rivers and other water bodies.
4. Composting organic solid waste for use as manure.
5. Planting trees in place of those removed for various purposes.
6. National parks and conservation forests should be established by the government.
7. Harvesting of rain water.

6. Some action points to protect or improve the environment -

- (i) Dispose the waste after separating them into biodegradable and non-biodegradable waste material.
- (ii) Start a compost heap or use a compost bin. This can be used to recycle waste food and other biodegradable materials.
- (iii) Avoid unnecessary or wasteful packaging of products.
- (iv) Reuse carry bags.
- (v) Plant trees. They will help to absorb excess carbon dioxide.
- (vi) Observe World Environment Day on 5th June.
- (vii) Never put any leftover chemicals, used oils down the drain, toilet or dump them on the ground or in water or burn them in the garden. If you do so, it will cause pollution.
- (viii) Don't burn any waste, especially plastics, for the smoke may contain polluting gases.
- (ix) Use unleaded petrol and alternate sources of energy, and keep the engine properly tuned and serviced and the tyres inflated to the right pressure, so that vehicle runs efficiently.
- (x) Avoid fast starts and sudden braking of automobiles.
- (xi) Walk or cycle where it is safe to do so – walking is free; cycling can help to keep you fit.
- (xii) Use public transport wherever you can, or form a car pool for everyday travel.
- (xiii) Send your waste oil, old batteries and used tyres to a garage for recycling or safe disposal; all these can cause serious pollution.

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