



Causes, Effects and Prevention of Environmental Pollution

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ABSTRACT

Pollution is the effect of undesirable changes in our surroundings. These undesirable changes in the environment have harmful effects on plants, animals, and human beings. During the last few centuries, we have been contaminated with a variety of waste products sour air, water, and land on which life depends. There are many sources of pollution. Based on sources of pollution, pollution can be of two types namely natural and manmade. Natural sources of pollution include volcanic eruption (smoke, ash, gases, and dust), forest fires, floods, cyclones, etc. Manmade sources of pollution include industries, agriculture, domestic sewage, automobiles, nuclear explosions, etc. Industries are the major sources of pollution. Industries discharge several pollutants such as gaseous matter, solid matter, wastewater that contains many chemical ingredients. Sources of urban pollution include sewage water, solid waste, gaseous exhaust, and liquid effluents. The use of chemical fertilizers, pesticides, and insecticides results in pollution of soil.

Environmental Pollution is one of the most serious problems facing humanity and other life forms on our planet today. Environmental Pollution is the contamination of the physical and geological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected. Any use of natural resources at a rate higher than nature's capacity to restore itself can result in pollution of air, water, and soil. Environmental Pollution is a global problem and is common to both developed as well as developing countries. This has attracted the attention of human beings for their severe long-term consequences. The decline in environmental quality as a consequence of pollution is evidenced by a loss of vegetation, biological diversity, excessive amounts of harmful chemicals in the atmosphere and food grains, and growing risks of environmental accidents and threats to life support systems.

Pollution can be of different types depending on the part of the environment that is getting polluted. Air is the most vital constituent of the environment for the sustenance of life on earth. In pure air, the proportion of different constituents like oxygen, nitrogen, and other gases is fixed and definite. Air

is polluted when its natural composition is disturbed either by natural or by man-made sources. Water is the essential element that makes life on earth possible. Without water, there would be no life. 71% of the earth's surface is covered by water. About 97% of the total water available on earth is found in the oceans and is too salty for drinking or irrigation. The remaining 3% is freshwater. Water has a self-purifying capacity during the water cycle. But it gets polluted when undesirable substances are added by man to water beyond the tolerance level. Soil pollution has become a major challenge that we need to overcome for establishing a healthy environment. Soil is the home for a large part of microscopic and macroscopic living organisms. Soil pollution refers to anything that causes contamination of soil and degrades the soil quality. Soil contamination or soil pollution can occur either because of human activities or because of natural processes. However, mostly it is due to human activities. Every day we hear different kinds of sounds. Some of them are pleasant but others irritate. Imagine a world without sound. It would be very difficult to live in such a world. Sound is a medium for communication. We share our thoughts, feelings, and information with others using sound. Noise Pollution may not seem as harmful as the contamination of air or water. But it is a pollution problem that affects human health and can contribute to a general deterioration of environmental quality. Noise is not a substance that can accumulate in the environment like other pollutants.

Key Words: Pollution, Environment, Prevention, Effect

Introduction

Pollution is the effect of undesirable changes in our surroundings. These undesirable changes in the environment have harmful effects on plants, animals, and human beings. During the last few centuries, we have been contaminated with a variety of waste products sour air, water, and land on which life depends.

Environmental pollutants include solid, liquid, and gaseous substances produced due to human activity. The nature and concentration of a pollutant determine the severity of its detrimental effects on human health. For example, an average human being requires about 12 kg of air each day which is nearly 12 to 15 times greater than the amount of food we eat. So, even a small concentration of pollutants in the air becomes more significant in comparison to similar levels present in food. Pollutants that enter water can spread to distant places. Degradable pollutants can be rapidly broken down by natural processes; e.g., domestic sewage, discarded vegetables, etc. Slowly degradable pollutants remain in the environment for many years in an unchanged condition and take decades to degrade; e.g., DDT (pesticides). Non - degradable pollutants cannot be degraded by natural processes. Once they are released into the environment they are difficult to eradicate; e.g., toxic elements like lead or mercury and nuclear wastes.

There are many sources of pollution. Based on sources of pollution, pollution can be of two types namely natural and manmade. Natural sources of pollution include volcanic eruption (smoke, ash, gases, and dust), forest fires, floods, cyclones, etc. Manmade sources of pollution include industries, agriculture, domestic sewage, automobiles, nuclear explosions, etc. Industries are the major sources of pollution. Industries discharge several pollutants such as gaseous matter, solid matter, wastewater that contains many chemical ingredients. Sources of urban pollution include sewage water, solid waste,

gaseous exhaust, and liquid effluents. The use of chemical fertilizers, pesticides, and insecticides results in pollution of soil.

Meaning of Environmental Pollution

Environmental Pollution is one of the most serious problems facing humanity and other life forms on our planet today. Environmental Pollution is the contamination of the physical and geological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected. Any use of natural resources at a rate higher than nature's capacity to restore itself can result in pollution of air, water, and soil.

Environmental Pollution is a global problem and is common to both developed as well as developing countries. This has attracted the attention of human beings for their severe long-term consequences. The decline in environmental quality as a consequence of pollution is evidenced by a loss of vegetation, biological diversity, excessive amounts of harmful chemicals in the atmosphere and food grains, and growing risks of environmental accidents and threats to life support systems.

Pollution is viewed from different angles by different people but is commonly agreed to be the outcome of urban - industrial and technological revolution and speedy exploitation of natural resources, increased rate of exchange of matter and energy, and ever-increasing industrial wastes and urban effluents.

Holdgate (1979) defined Environmental Pollution as "the introduction by man, into the environment, of substances or energy liable to cause interference with legitimate uses of the environment"

Singh (1991) has defined pollution in a very simple manner, i.e., "disequilibrium condition from equilibrium condition in any system". This definition may be applied to all types of pollution ranging from physical to economic, political, social, and religious.

According to Natural Environmental Research Council (NERC), pollution is viewed as "the release of substance and energy as waste products by human activities which result in changes, usually harmful, within the natural environment".

Pollution is "any undesirable change in the physical, chemical or biological characteristics of air, water, and soil that may create a hazard or potential hazard to the health, safety or welfare of any living species".

The substances which cause pollution are known as pollutants. According to the Indian Environment (Protection) Act, 1986, a pollutant has been defined as "any solid, liquid or gaseous substance present in such concentration as may be or tend to be injurious to the environment". Pollutants can be classified into primary and secondary pollutants and biodegradable and non - biodegradable pollutants.

Types of Environmental Pollution

Pollution refers to the addition of contaminating substances to the natural environment resulting in an adverse impact on the environment. Pollution can be of different types depending on the part of the environment that is getting polluted.

The word Pollution comes from the Latin word 'Polluere' that means contamination. Hence pollution is something that contaminates the environment. The presence of harmful substances in the air, land, and water, which can harm living beings and the environment is pollution. Pollution poses a threat to the sustainability of the environment.

The following are the different types of Environmental Pollution.

1. **Air Pollution:** Air pollution refers to the release of pollutants like toxic gases, biological molecules, and particulate matter into the atmosphere. The pollutants can be derived from

several sources including both natural processes and human activities. Volcanic eruptions, automobile, and industrial effluents, etc, are some examples of air pollution sources. Carbon monoxide, carbon dioxide, chlorofluorocarbons, etc, are some examples of air pollutants. Air pollution can be highly detrimental to the health and well-being of all life forms on earth.

2. **Water Pollution:** The contamination of water bodies like lakes, rivers, ponds, etc. by pollutants is called water pollution. Water pollution is one of the most harmful types of pollution. It can have extremely disastrous consequences for all living beings using contaminated water. A major volume of all the pollutants produced on land end up in water bodies. Toxic wastes released by industries, pathogens released in sewage, harmful chemicals present in agricultural land are some of the water pollutants. The contamination of water can lead to epidemics that can wipe out the population of an entire species. Thus water pollution has a highly adverse impact on the environment, society, and economy of a place.
3. **Soil Pollution:** Soil pollution occurs when the soil of an area is contaminated. The soil is essential to the growth of all plants including crops. Degradation in the soil quality results in lower yields and poor health of crops grown on such soil. Industrial and agricultural chemicals are the common pollutants contaminating the soil.
4. **Noise Pollution:** When the environment is filled with unnecessary or unpleasant sounds that are harmful to human beings, animals, and plants, it is called noise pollution. Transport vehicles, machinery, industries, loud music, etc. are some of the most common sources of noise pollution. Noise pollution can give rise to chronic diseases like cardiovascular diseases. It can also severely affect the psychological health of people.
5. **Radioactive Pollution:** When radioactive substances are present in areas where their presence is undesirable, it results in radioactive pollution. Such substances are highly toxic to all life forms on earth. Radioactive substances trigger mutations in the genetic material of living organisms leading to different types of cancer. Exposure to such toxins can also adversely impact the different systems of the body.
6. **Thermal Pollution:** An induced change in the temperature of large volumes of water causes thermal pollution. This type of pollution leads to the degradation of water quality as the warm water does not provide ideal living conditions for aquatic flora and fauna. Higher temperatures also alter the composition of dissolved elements in the water. The flora and fauna living in the area can be killed by this abrupt change in the water temperature.
7. **Plastic Pollution:** Plastic pollution is caused by plastic accumulation in the environment. Plastic which is a non – biodegradable substance is extremely harmful to all life forms on earth. Every year, thousands of animals die due to plastic pollution. The ingestion of plastics kills these animals. Most of the plastic waste generated in the world ends up in the oceans where they cause great harm to the marine ecosystem.
8. **Light Pollution:** Recently another kind of pollution known as Light Pollution has been identified. In big cities, artificial light sources such as advertisement boards and other light sources that emit bright light have polluted the serene moon light during nights. It is disrupting ecosystems and spoiling the aesthetic environment. It is adversely affecting human health and psychology and disrupting ecosystems. Astronomers have said that it has become difficult to watch celestial bodies clearly during the night in big cities due to this Light Pollution.

Causes, Effects and Prevention of Environmental Pollution

1. Air Pollution

Air is the most vital constituent of the environment for the sustenance of life on earth. In pure air, the proportion of different constituents like oxygen, nitrogen, and other gases is fixed and definite. Air is polluted when its natural composition is disturbed either by natural or by man-made sources.

Causes of Air Pollution

Sulphur dioxide is emitted from the combustion of fossil fuels like coal and petroleum. Carbon monoxide is produced due to the incomplete burning of fossil fuels.

1. Nitrogen oxides are produced mainly by automobiles, aircraft, thermal power stations, and factories.
2. Carbon dioxide is largely released into the atmosphere by the burning of fossil fuels. It is also emitted by volcanic eruptions.
3. Ammonia is a common by-product of agriculture related activities. The use of insecticides, pesticides, and fertilizers in agricultural activities emit harmful chemicals into the air.
4. Industries release a large amount of carbon monoxide, hydrocarbons, organic compounds, and chemicals into the air depleting the quality of air.
5. During the mining process dust and chemicals are released into the air causing air pollution.
6. Chlorofluoro carbons are emitted from industries, refrigerators, air conditioners, cosmetic goods, etc.

Effects of Air Pollution

1. Toxic gases like sulphur dioxide and carbon monoxide affect the respiratory system and cause bronchitis, asthma, and lung cancer. Sudden leakage of toxic gases from chemical and gas plants causes loss of life like we have seen in the case of the Bhopal(Madhya Pradesh) gas tragedy and recently in Vishakapattanam in Andhra Pradesh in India.
2. Air pollution severely affects the weather and climatic conditions of a region. Air pollutants have an impact on humidity, clouds, and rainfall.
3. Global warming is caused due to the increase in the concentration of certain gases like carbon dioxide, nitrogen oxides, and methane, and chlorofluoro carbons in the air.
4. Harmful gases like nitrogen oxides and sulphur oxides released into the atmosphere during the burning of fossil fuels combine with water droplets. Then they fall on the ground in the form of acid rain.
5. Ozone exists in the earth's stratosphere and is responsible for protecting humans from harmful ultraviolet rays. Earth's ozone layer is depleting due to the presence of chlorofluoro carbons and hydro chlorofluoro carbons in the atmosphere.
6. Toxic chemicals present in the air can force wildlife species to move to a new place and change their habitat. The toxic pollutants deposited over the surface of the water can also affect sea animals.

Prevention of Air Pollution

1. People must be encouraged to use more and more public modes of transportation to reduce pollution.
2. Gaseous pollutants can be removed by spraying water, filtration, or absorption.

3. The burning of fossil fuels is to be reduced as far as possible.
4. Engines of automobiles are to be redesigned to reduce the emission of toxic gases. Emission test for vehicles is to be made compulsory.
5. The industrial areas should be located at a certain safe distance from the residential areas.
6. There should be a green belt around townships, industrial areas, and villages.
7. Steps should be taken to prevent forest fires. It is also important to check deforestation.
8. The height of smoke chimneys should be high enough to dilute the smoke.
9. Electrical energy is to be efficiently used because a large amount of fossil fuels is used to produce electricity.
10. The use of alternate sources of energy like solar and wind energy must be encouraged.

2. Water Pollution

Water is the essential element that makes life on earth possible. Without water, there would be no life. 71% of the earth's surface is covered by water. About 97% of the total water available on earth is found in the oceans and is too salty for drinking or irrigation. The remaining 3% is freshwater. Water has a self-purifying capacity during the water cycle. But it gets polluted when undesirable substances are added by man to water beyond the tolerance level.

Causes of Water Pollution

1. Natural sources of water pollution are soil erosion, landslides, volcanic eruptions, and the decomposition of plants and animals. The brown and dirty water is the result of mud mixed in the water due to soil erosion.
2. Urban sources of water pollution include domestic effluents and sewage water. Sometimes sewage water flows into nearby rivers, tanks, or lakes.
3. Industrial sources of water pollution include the effluents generated from industries such as paper, chemicals and petrochemicals, oil refineries, metal works, distilleries, textiles, etc.
4. Agricultural sources of water pollution include excessive use of fertilizers, pesticides, and insecticides.
5. When the acid rain falls it contaminates water bodies including streams, rivers, and lakes.
6. Thermal Power Plants discharge large quantities of heated water into nearby rivers, lakes, or ponds and cause thermal pollution of water.
7. The oil spill in the sea causes pollution of seawater. If there is an accident or leakage of oil spreads on the water surface and cause serious problem to marine animals.

Effects of Water Pollution

1. Consumption of highly contaminated water can cause injury to the heart and kidneys.
2. Polluted water is greatly responsible for several water-borne diseases like cholera, typhoid, diarrhea, dysentery, etc.
3. Toxins within the water can harm aquatic organisms breaking a link in the food chain.
4. The use of polluted water from rivers, lakes, and ponds for irrigation affects food quality.
5. Highly polluted water decreases the fertility of the soil and also kills useful microorganisms.
6. Polluted water obstructs the process of photosynthesis which affects the growth of vegetation.

7. Polluted water changes the physical and chemical nature of water.

Prevention of Water Pollution

1. Drinking water sources must be kept clean.
2. Provision must be made to establish a sewage treatment plant.
3. Industries should not be allowed to discharge their effluents into the water bodies without treatment.
4. There should be a ban on the disposal of dead bodies into water bodies.
5. The use of pesticides in agriculture is to be minimized.
6. The use of plastic bags is to be strictly banned.
7. Awareness is to be created among people regarding water pollution. They need to be educated about water-borne diseases.

3. Soil Pollution

Soil pollution has become a major challenge that we need to overcome for establishing a healthy environment. Soil is the home for a large part of microscopic and macroscopic living organisms. Soil pollution refers to anything that causes contamination of soil and degrades the soil quality. Soil contamination or soil pollution can occur either because of human activities or because of natural processes. However, mostly it is due to human activities.

Causes of Soil Pollution

1. Human activities have led to acidification of soil and contamination due to the disposal of industrial waste like heavy metals, toxic chemicals, dumping oil, etc.
2. Lack of crop rotation and intensive farming gradually decreases the quality of soil causing degradation of land.
3. Disposal of plastics, cans, electrical goods like batteries harms the soil due to the presence of harmful chemicals.
4. The use of chemical fertilizers, inorganic fertilizers, pesticides will decrease the fertility of the soil and alter the structure of soil.
5. The storage of waste products may leak into groundwater.
6. Garbage that cannot be recycled is disposed of off carelessly leading to pollution of land. Some of this waste can take thousands of years to decompose.
7. Acid rain makes the soil acidic which is harmful to crops.
8. Biological agents like pathogenic organisms are also responsible for soil contamination.

Effects of Soil Pollution

1. Soil pollutants can cause cancer, skin diseases, and central nervous system disorders in human beings. For example, a high concentration of lead or mercury in the soil can affect the functioning of kidneys and liver.
2. Crops and plants grown on polluted soils can accumulate poison and become unfit for human consumption.

3. Soil pollution contributes to air pollution by emitting toxic particles and foul gases into the atmosphere. It can also lead to water pollution if toxic chemicals and materials reach the groundwater.
4. When soil is contaminated with poisonous materials and chemicals, it cannot support plant life.
5. The fertility of the soil decreases once the soil is contaminated with chemicals and heavy metals or degraded due to human activities such as mining.
6. Acidification diminished soil fertility and the death of soil organisms in the soil can lead to changes in soil structure.
7. The level of pesticide residues like DDT in fruits, milk, eggs, vegetables beyond the permissible levels is responsible for causing diseases like cancer, sterility, and even death.

Prevention of Soil Pollution

1. It should be mandatory for industrial units not to dump their wastes onto the land. As far as possible the waste products should be recycled or used to make useful products.
2. Materials like paper, glass, metal scraps, and some types of plastics can be recycled.
3. Domestic and urban garbage wastes should be properly managed by municipal corporations.
4. Animal wastes and agricultural wastes can be utilized as manure and for the production of biogas.
5. Biological methods of pest control can reduce the use of pesticides to minimise soil pollution.
6. Use a dustbin to throw the garbage at home as well as in public places.
7. Plant more and more plants to prevent soil erosion.
8. The general public should be given information about the ill effects of soil pollution.

4. Noise Pollution

Every day we hear different kinds of sounds. Some of them are pleasant but others irritate. Imagine a world without sound. It would be very difficult to live in such a world. Sound is a medium for communication. We share our thoughts, feelings, and information with others using sound. Noise Pollution may not seem as harmful as the contamination of air or water. But it is a pollution problem that affects human health and can contribute to a general deterioration of environmental quality. Noise is not a substance that can accumulate in the environment like other pollutants. Sound is measured in a unit called 'decibel' (dB).

Causes of Noise Pollution

1. Various industries such as iron and steel, automobiles, power plants, textiles, petroleum, fertilizers, etc. involve different operations that produce noise.
2. Household gadgets like T.V., radio, music systems, coolers, washing machines, food processors generate noise.
3. Surface transport is one of the major sources of noise pollution in big cities. The horns from cars, buses, trucks, bikes, and two-wheelers cause a lot of noise.
4. Festivals and religious activities where public address systems are used often generate a lot of noise.
5. Construction activities where machinery is used also contribute to noise pollution.

6. Market places, malls, fairs, and exhibitions also contribute remarkably to noise pollution.

Effects of Noise Pollution

1. The most direct harmful effect of excessive noise is physical damage to the ear and temporary or permanent hearing loss.
2. Excessive sound levels can cause harmful effects on the circulatory system by raising blood pressure and altering pulse rates.
3. Noise Pollution can affect the biological functioning of the body and result in anxiety, insomnia, hypertension and giddiness, loss of physical control, etc.
4. Chronic noise may also lead to abortions and congenital defects.
5. Noise Pollution can cause psychological effects such as irritability, stress, lack of concentration, and mental fatigue.
6. Severe Noise interferes with normal auditory communication and hence increases the rate of accidents especially in industries.
7. Excessive Noise can have adverse effects on domestic animals also.

Prevention of Noise Pollution

1. Factories that mainly produce noise should be established away from residential areas.
2. Airports should be located at least 20 kilometers away from residential areas.
3. Vehicles are to be properly maintained. There should be a restriction on high sound horns.
4. Advanced technology silencer must be used. The use of horns near public places like hospitals and educational institutions should be banned.
5. The use of sound amplifiers of high power should be banned in religious, social, and political events.
6. Planting green trees along the roadside reduce the intensity of noise pollution.
7. Construction of soundproof rooms for noisy machines in industries must be encouraged.
8. The use of earplugs can bring down loud noises to a manageable level.

5. Radioactive Pollution

Radioactive pollution is the physical pollution of living organisms and their environment as a result of the release of radioactive substances into the environment during nuclear explosions and testing of nuclear weapons, nuclear weapon production, mining of radioactive ores, handling and disposal of radioactive waste, and accidents at nuclear power plants. Nuclear tests are carried out to determine the effectiveness, yield, and explosive capability of nuclear weapons. The destruction caused by the radioactive materials is because of the emissions of hazardous ionizing radiation like beta or alpha particles, gamma rays, or neutrons in the environment where they exist.

Causes of Radioactive Pollution

1. Nuclear is considered to be the most potent source of energy due to its high latent power. Nuclear accidents in nuclear energy generation plants like Fukushima Daiichi nuclear disaster, Chernobyl disaster left many dead and even many more affected by the radiation released.
2. The use of nuclear missiles and atomic bombs during wars causes radioactive pollution.

3. Radioisotopes are used to make detectors and in industrial activities. Isotopes such as uranium have high concentrations of radiation in them.
4. Mining involves the excavation of mineral ores. For example, radium, uranium, thorium, plutonium are highly radioactive materials.
5. Chemotherapy, a cancer treatment uses radiation to prevent further growth of cancer cells. Scientists have been exposed to radiation leading to their deaths or complications.
6. Cosmic rays that come from outer space to our planet with intense radiation cause radioactive pollution. For example, Gamma rays are said to have the highest level of radiation.

Effects of Radioactive Pollution

1. Radiation has adverse effects when it comes to genetics. It leads to damage of DNA strands leading to a genetic breakup. The resulting mutation makes one highly susceptible to cancer.
2. Radiation causes diseases such as cancer, leukemia, anemia, hemorrhage and premature aging, and premature deaths. Leukemia, for example, is caused by radiation in the bone marrow.
3. Radioactive substances in the soil react together with the various nutrients leading to the destruction of these nutrients rendering soil infertile and highly toxic.
4. Radiation distorts the cells present in living organisms leading to permanent damage of the various organs and organ systems.
5. Burns, red lesions, and sores are caused by radiation which can lead to skin cancer.

Prevention of Radioactive Pollution

1. Proper methods are to be used for disposing of radioactive waste. For example, it should be stored in heavy and thick concrete containers.
2. It is necessary for any material with radioactive content to be labeled and the necessary precautions advised on the content of the label.
3. There should be a banning of nuclear tests which contribute greatly to the overall presence of radioactive substances.
4. We need to focus on alternative and environmentally friendly energy sources namely solar, hydroelectric, and wind power.
5. Radioactive materials are to be stored in radiation-proof containers to ensure no leakage during handling.

Conclusion

Environmental Pollution is the contamination of the physical and biological components of the earth system to such an extent that normal environmental processes are adversely affected. The substances which cause pollution are known as Pollutants. Pollutants can be classified into biodegradable and non - biodegradable pollutants. Pollution can be of different types depending on the part of the environment that is getting polluted. Some of the important types of pollution are air pollution, water pollution, soil pollution, noise pollution, radioactive pollution, thermal pollution, plastic pollution, and light pollution. All these types of pollution pose a threat to the sustainability of the environment.

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