Pollution

Sources of Air Pollution

Air is everywhere around us and we all need clean air for breathing. But did you know that as a result of the addition of some substances to air, it is increasingly becoming toxic for living organisms?

The contamination of air with unwanted substances, which have harmful effects on both plants and animals, is known as **air pollution**.

The substances that cause the contamination of air are called **air pollutants**. Let us explore these sources of air pollution in detail.

Sources of air pollution

There are two sources of air pollution:

- Natural sources
- Man-made sources

Natural sources

You may have seen on television that during the summer season some forests catch fire. These fires are caused when, as a result of high temperatures, dead plant materials such as barks, twigs, and leaves, which are lying on the forest floor, start burning. These fires emit large amounts of smoke into the atmosphere, thereby polluting the air.

The other natural source of air pollution is volcanoes. Volcanoes emit large amounts of harmful gases and dust particles into the atmosphere, thus contributing to air pollution.

Did you know that the Pacific Ring of Fire is an area of high volcanic activity encircling the basin of the Pacific Ocean?

Man-made sources

Although natural sources contribute to air pollution, did you know that human activities contribute the most towards air pollution? Human activities that cause air pollution include emissions from power plants, automobile exhausts, and factories; burning of fossil fuels and firewood, etc.

Let us now explore various air pollutants and their sources.

Carbon monoxide

Carbon monoxide is a toxic, colourless gas. It is produced by the incomplete burning of fossil fuels. It is mainly produced by vehicles.

Smog

Smog is formed by the combination of smoke and fog. It is a highly noxious mixture of pollutants that affects the health of living organisms. Smog is a common winter phenomenon in a large number of modern day cities such as Delhi.

Oxides of sulphur and nitrogen

Sulphur dioxide and nitrogen dioxide are major oxides of sulphur and nitrogen that act as pollutants. These are released from petroleum refineries and also from power plants that use coal as a fuel.

Chlorofluorocarbons

Chlorofluorocarbons are also known as CFCs. They are used in refrigerators, air conditioners, and aerosol sprays. They cause damage to the ozone layer in the atmosphere.

Suspended Particulate Matter (SPM)

These are tiny particles that are produced on the burning of coal and petroleum. They are also released during industrial processes such as mining and making of steel.

Do You Know:

Indian cities such as Delhi, Kolkata, and Kanpur top the list of cities in the world with the highest air pollution levels.

Effects of air pollution

- Increase in the amount of carbon dioxide level can cause increase in global temperature. This is known as "**Green House Effect".** This increase in temperature leads to the melting of polar ice caps and glaciers which increase the water level in seas and oceans.

- **Global warming -** The phenomena of rise in overall temperature of the Earth because of the rise in CO_2 is known as global warming. CO_2 has a tendency to absorb sun's heat and not let them escape. Thus, it increases the earth's temperature.
- Inhalation of certain gases like carbon monoxide (CO) can cause various respiratory diseases like Asthma and lung cancer.

- Sulphur dioxide causes irritation to the eyes and if combines with water vapour present in air, it forms an acid which comes on earth surface with the rain water. This type of rain is called acid rain. Acid rain affects the growth of the plants. It has also damaged "Taj Mahal"

- There is increase in the depletion of ozone layer due to the constant increase in the air pollution.

Do You Know?

Gases like Carbon dioxide, Methane, Chlorofluorocarbon and Nitrous oxide are known as Green House Gases.

Prevention of Air Pollution:

Air pollution can be prevented by adopting various methods like using non-conventional energy sources instead of conventional sources, increasing the efficiency of engines to control the smoke coming out of the vehicles, making factory chimneys at high altitude or using electrostatic precipitators.

Air pollution can be reduced by recycling the plastic and rubber and by planting more and more trees.

Government has introduced **Euro/Bharat norm** (applicable to all vehicles) on the level of vehicular emission. Under this, strict controls are to be maintained in large cities, to cut down sulphur and nitrogen oxides from automobiles exhausts.

Ozone Depletion

- The ozone layer is found in the upper part of the stratosphere.

- It protects the earth from the harmful UV rays of the Sun. High energy UV rays break the bonds within the molecules such as DNA and proteins.

- Ozone is formed by the action of UV rays on oxygen molecule and its thickness is measured in **Dobson units (DU)**.

- The ozone layer is getting depleted by the action of **chlorofluorocarbons** (CFCs) found in refrigerants and perfumes.

- The CFCs are acted upon by UV rays in the stratosphere, liberating the Cl atoms, which act as catalysts to degrade ozone into molecular oxygen.

- The ozone depletion is particularly greater in Antarctica, resulting in the formation of a large thinned ozone layer commonly known as **ozone hole**.

- The UV rays of shorter wavelength cause skin cancers, mutations in the cellular DNA, snow-blindness, cataract, etc.

- To check this ozone depletion, **Montreal Protocol** was passed in 1987 to control the use of substances that cause ozone depletion.

Water Pollution

- Water is very essential for the maintenance of life on earth.

- Due to human activities, water bodies have become polluted all over the world.

- Some of the common pollutants and their sources are:

- **Domestic sewage** − It mainly contains organic matter, which is biodegradable. Microorganisms involved in their degradation consume a lot of oxygen and the BOD of the water body increases leading to the death of fishes and other aquatic life. Sewage also contains many pathogenic microbes, which may cause the outbreak of many diseases such as typhoid, jaundice, etc.

- **Industrial Effluents** − Industrial effluents contain inorganic toxic substances, which may undergo **biomagnification** (increase in concentration of a toxin at successive trophic levels). The toxin gets accumulated in the body of an organism and is passed on to the next level. For example, DDT and other heavy metals such as mercury, cadmium, etc.

- **Oil Spills -** The accidental discharge of petroleum in water bodies is called oil spill. This results in the death of a lot of marine lives.

- **Thermal wastewater discharge** − Heated water flowing out of the thermal power plants increase the temperature of the water body. It eliminates the cold water species and promotes the warm water species. In the long run, it causes damage to the indigenous biodiversity of the water body.

- **Eutrophication**

- It is the ageing of a water body due to nutrient enrichment of its water. It can be natural or artificial.
- The natural process takes thousands of years, but due to human activities, this process has got accelerated (accelerated/cultural eutrophication).

- Release of nutrient rich sewage and industrial effluents lead to introduction of nutrients such as nitrogen and phosphorus and increase in temperature and BOD of the water body, causing increased biological activity, thereby leading to algal blooms. This results in the loss of indigenous flora and fauna.

- In some cases, large masses of floating plants (bog) develop, finally converting the water body into land.

Control of Water Pollution

- Raw sewage can be treated using biological and other means to remove the solid, suspended, and inorganic materials before it is released back into the environment.

- Nitrogenous fertilizers can be denitrified using microbes, which can convert nitrate and nitrite into gaseous nitrogen by a process called de-nitrification.

- **Stonefly**, belonging to phylum Arthropoda, is a good biological indicator of water pollution as it requires highly oxygenated water for respiration.

- **Integrated wastewater management** as practised in Arcata, California- In this approach, the water is first treated by conventional means such as filtration, sedimentation, and chlorine treatment, followed by bioremediation. (Marshes having appropriate plants, bacteria, fungi, and algae were seeded, which assimilate dangerous pollutants such as heavy metals)

Soil Pollution and Radioactive Pollution

Soil Pollution
It is mainly caused by the man-made chemicals or other alteration in the natural soil. It is majorly caused by industrial activity, agricultural chemicals, or improper disposal of waste.

Sources of soil pollution:

- **Industrial Wastes**: Industries give out solid wastes that get deposited into the soil. For example, chemical residue, metallic ash, fly ash etc.

- **Commercial and Domestic Waste**: All the solid wastes from commercial offices and households are collected by municipal corporation and dumped for treatment. For example, kitchen wastes, wastes from tailors, banquet halls, restaurants etc.
- **Chemical Fertilizers:** Excessive use of these are harmful as they pollute the soil and reduce its fertility. Also, they may get washed away by rain and can enter the water bodies, causing water pollution as well. For example, nitrates, phosphates etc.

- **Biomedical Wastes**: Hazardous wastes from hospitals and healthcare centres, such as used syringes, dirty dressings, discarded medicines and research materials, etc, are often carelessly disposed in the garbage. They not only lead to soil pollution, but can also harm humans and other organisms by transmitting various disease causing agents.

- **Pesticides**: These chemical substances do not get decomposed and persist in the environment for longer period of time. They can alter the nature of soil and can reach human body through the food grown on that soil. For example, DDT.

The solid waste can be categorised into into two types:

- **Biodegradable Waste:** Materials which can be decomposed by microorganisms into simpler compounds. For example, vegetable and fruit peels, cow dung, dried leaves etc.

- **Non- biodegradable Waste:** Materials that cannot be decomposed. For example, plastic bags, pesticides like DDT etc.

The preventive measures that can be adopted to reduce soil pollution are as follows.

- Treating the waste products before disposal
- Reducing the use of polythene bags
- Minimizing the use of products made of plastic
- Minimizing the use of pesticide

Radioactive pollution

The release of radioactive substances into the environment as a result of human activity is known as radioactive pollution.

This pollution leads to the contamination and degradation of the environment.

Sources of radioactive pollution

- Mining of radioactive ores (such as uranium and thorium)
- Nuclear power plants accidents
- Nuclear explosions
- Industrial emissions from nuclear reactors
- Use of X rays in medicine

Effects of radioactive pollution

- Radioactive substances emit harmful radiations in the form of alpha, beta and gamma rays. These rays have the ability to penetrate into the body tissues and can bring the cellular damage through ionization. It leads to various diseases such as skin cancer, eye cataract, etc.
- Radioactive substances, when penetrate into the soil, result in soil pollution. They destroy the fertility of the soil.
- Radioactive substances can get transported into the plants through roots. It leads to genetic mutation and hampers the normal functioning of plants.

Prevention of radioactive pollution

The effects of radioactive pollution are long lasting, as they can bring the genetic mutations in

organisms. These mutations can pass on from generations to generations.
As there is no cure for radiation damage, measures should be adopted to prevent radioactive pollution.

Measures to prevent radioactive pollution

- The safety measures during the handling of radioactive substances should be strictly enforced.
- Careless handling of radioisotopes and leakage from nuclear reactors must be avoided.
- The radioactive wastes must be carefully and efficiently dispose off from the environment.
- Industrial wastes carrying radioactive substances must be adequately treated before being discharged into the environment.

Social forestry

This term was firstly used in **1976** by the National commission on Agriculture, government of India. It refers to the protection as well as management of forests with the aim of rural, environmental and social development.

It also aims to reduce the pressure on traditional forest areas by increasing plantations so that, the demand of wood, paper and other forest products can be met.

It has been categorised into different groups namely **community forestry**, **farm forestry**, **agro-forestry** and **extension forestry**.

Organic farming

Organic farming is a type of farming practice which does not utilize chemical fertilizers. In this particular farming, fertilizers that are obtained from organic sources such as green manure and compost are used. It also lays emphasis on crop rotation, mixed cropping and biological pest control.

Swach Bharat Abhiyan

It is a nation-wide cleanliness campaign launched on October 2, 2014 by Prime minister of India, Mr. Narendra Modi. This campaign aims to reduce open defecation and to maintain cleanliness in streets, infrastructure and roads of Indian rural as well as urban areas. In order to achieve this, the government of India has proposed the construction of 90 million toilets across the rural areas of the country.

Noise Pollution

Pollution occurs when there is an excess of some unwanted entity. Noise pollution occurs when there is an excess of unwanted sound in the environment. It is one of the biggest problems of modern era.

Noise pollution like air pollution is largely created by humans. It is mainly caused by factories, vehicles, construction instruments such as jackhammer, bulldozer, leaf blower, air conditioner,

desert cooler etc.

Jackhammer

Leaf blower

Bulldozer

Loudspeakers and crackers produce noise pollution. Televisions and transistors running on high volumes can also contribute to noise pollution. However, the worst offenders of noise pollution are transportation vehicles.

Loudspeaker

Bursting of crackers

Busy traffic

Prepare a list of some sound sources that produce noise pollution.

Effects of noise pollution:

Noise pollution can lead to many health related problems like:

- Insomnia
- Loss of hearing
- Hypertension
- Severe headache
- Stress related diseases
- Aggressiveness in behavior

How can noise pollution be controlled?

To control noise pollution, we must control its source. Hence, silencers must be installed in vehicles such as motorcycles, cars, trucks, buses, and other noise producing machines. We should watch television and listen to music at a low volume. Also, use of loudspeakers as well as horns of buses and trucks should be minimized.

Regular maintenance of automobiles should be done so that noise produced by them can be kept under check. All industrial work should be done away from residential areas. More trees should be planted in residential areas as they help in reducing noise.