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Effect of air pollution on climate

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Abstract
Air pollution is caused by the introduction of unwanted gases ,fumes , dust particles and odours in the atmosphere in a way that it becomes harmful to human life, animals and plants . It causes acid rain and smog which adversely affects the environment by reducing the ozone layer thereby contributing to global warming on one hand .While on the other hand itcausesrespiratory and other diseases .Air pollution can not be eliminated completely in this age of globalisation but some steps can definitely be taken to reduce it . In the present paper we will discuss various sources of air pollution and its impact on environment .
Key words: *Pollutants ,climate,Green house gases.*

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Introduction

Air pollution is an "atmospheric state in which chemicals are present at quantities greater than their usual ambient levels, causing severe consequences on humans, animals, flora, or materials". The entire atmosphere may be divided into four areas with temperatures ranging from -92°C to 1200°C and altitudes ranging from 0 km to 500 km. H_2O, N_2, O_2, CO_2,O_3, NO^+,O_2^+ are chemical species found in the troposphere, stratosphere, mesosphere, and thermosphere, with their presence varying with altitude, temperature, and species. Gases such as sulphur and nitrogen oxides, carbon monoxide, and hydrocarbons; particulate matter such as smoke, dust, and fumes; and radioactive elements are among these pollutants.

Many cities in Asia, Africa, the Middle East, and Latin America are experiencing an increase in air pollution as a result of urbanisation. The unrestricted use of fossil fuels in industry and transportation has become the primary source of gaseous pollutants such SO_2, NOx, VOCs, and particulate matter.

Air pollution can come from both natural and man-made sources. Forest fires, tree emissions, lightning, volcanic eruptions, and erosion of rock/mineral/building surfaces are natural sources; anthropogenic sources include biomass burning, transportation, automotive emissions, industrial activities, and mining.Air pollution can harm both living and non-living systems (plants, animals, and humans) (materials and buildings). The costs of air pollution include not just deaths, but also morbidity and a reduction in life expectancy. The problem of air pollution is not limited to a single location,however, due to the use of large chimneys, rapid industrialization, and the widespread use of motor vehicles, air pollution is also affecting remote areas. The impact of air pollution on the built environment, animal and plant health, agriculture, biodiversity, and ecosystems are among the other expenses.

Climate refers to the average of weather conditions at a given location on the planet. Climate is usually described in terms of projected temperature, rainfall, and wind conditions based on past data. "Climate change" is defined as a long-term shift in either the average climate or climate variability.

The Earth has experienced frequent cold periods (or ice ages) in the past as a result of natural climate change, when glaciers covered vast portions of the Earth's surface. Scientific observations and models, on the other hand, show that the Earth's climate is now changing as a result of human activities and this is known as "Anthropogenic climate change".

Greenhouse gases are released into the atmosphere by human activities like as burning of fossil fuels (coal, oil, and natural gas) to generate electricity and power vehicles, clearing forests for farms and cities, and raising livestock. Carbon dioxide, methane, halocarbons, and nitrous oxide are the most common greenhouse gases. These gases build up in the atmosphere, allowing solar energy to flow through while trapping some of the heat radiated back from the Earth. This is referred to as the green house effect. Increase in the green house effect has resulted in the rise of the temperature of earth. This global warming has caused thechange of rainfall pattern and frequency of weather events like heat waves, droughts,floods,thunderstorms, and hurricanes.
The main focus of this chapter is on traditional air pollution and its negative effects on our climate.

Sources of air pollution

The sources of air pollution are numerous and can be divided into two categories:
(i) natural
(ii) Anthropogenic
Natural sources : These include eruption of volcanoes , forestfires and windblown dust. These release poisonous gases such as sulphur dioxide (SO_2)hydrogen sulphide (H_2S) and carbon monoxide(CO)

Anthropogenic Sources
The biggest anthropogenic causes are automobile pollution, industry, and biomass burning.

Automobiles Exhaust
Every day, 1500 tonnes of pollutants, largely from autos and factories, pollute the environment, which contains three times the tolerance level for sulphur dioxide. The amount of carbon particles in the air is four times the legal limit. The amount of benzopyrenes and other harmful compounds present has yet to be determined, but the effect is evident in the rise in cancer cases. Bronchitis, asthma, and emphysema are all on the rise.

Industrial sources:mainly include following industries
1. Fertilizer industry: Fertilizer industries releases oxides of nitrogen and dust particles whose size ranges from submicron to 1000 microns. Dust particles may be evolved from the process of drying , burning ,calcining ,grinding ,mixing and packaging.
2. Cement factories: Cement dust is a common pollutant near cement industries and construction sites. Chemically it is a mixture of oxides of aluminium , potassium , silica , calcium and sodium. It is found that in the area polluted with cement dust cultivation of plants and wheat in particular will suffer a sizable loss in terms of biological and economic field.
3. Sulphuric acid industry and other industries: Industries producing sulphuric dioxide by contact chamber process or lead chamber process discharge large quantity of SO2 in the air and pollute atmosphere upto few kilometres.
4. Fluoride industry: Industries producesfluoride compounds which have serious impacts on plants, animals and human health.Toxic effect of fluoride on livestock arises from ingesting contaminated forage on which fluoride dust has been settled .Hydrogen fluoride destroys the leaves and fruits in the plants.

Burning of fossil fuel: Burning of wood ,fossil fuels and charcoal causes air pollution by releasing Carbon dioxide ,carbon and sulphurdioxide in the atmosphere.

Agricultural activities: Pesticides and insecticide widely used in agriculture causes air pollution. When these are inhaled by animals and humans, this can create severe problems.

Radioactive fallout : Testing of nuclear weapons adds to nuclear pollution which is very harmful for flora and fauna.

Types of air pollutants

1.On the basis of their origin

(a) Primary pollutants: Those that are directly discharged into the atmosphere from recognised sources, such as particulate matter, SO_2, NO, NO_2, CO, and radioactive chemicals.
(b)Secondary pollutants:such as ozone, formaldehyde, photochemical smog, and peroxyacetyl nitrate (PAN), are not directly emitted into the atmosphere, but are formed during atmospheric transformation reactions of various primary pollutants,

2.On the basis of chemical composition

(a)Organicpollutants :include hydrocarbons, aldehydes, ketones, alcohols, and other carbon and hydrogen-based compounds.
(b) Inorganic pollutants: Inorganic pollutants include oxides of carbon (CO and CO_2), carbonates, sulphur oxides (SO_2 and SO_3), nitrogen oxides (NO and NO_2), and ozone.

3.On the basis of state of matter

(a)Natural Pollutants: Natural pollutants are those that come from natural sources, such as pollen grains that are discharged by weeds, grasses, and trees.
(b) Particulate matter: Particulate matter can be either liquid or solid. Particulate matter is defined as aggregates with a diameter more than 0.002μ m but less than 500 μm.
c) Gases and vapours: Carbon monoxide (CO), sulphur oxides (SO, SO_2, SO_3, and SO_4), nitrogen oxides (N_2O, NO, NO_2, NO_3, N_2O), and hydrocarbons (including aromatic and aliphatic hydrocarbons) are examples of gases and vapours.

Climate and airpollution

Climate and pollution are very closely related to each other. These are like the two sides of the same coin.The amount of sunlight coming to the earth is affected by the pollutants like methane ,black carbon , aerosols and ozone. The ultimate result of which is in the rise of the temperature of earth which causes the melting of glaciers,icebergs and ice.The change in climate and weather have a significant impact on the timing , duration and intensity of outbreaks as well as the global map of infectious diseases.Viral and transmitted parasitic infections are specially sensitive to the change in climate as the warm weather shortens the incubation period of the vector.Water warming as a result of climate change also results in a high frequency of waterborne illnesses.

Spread of epidemics are very closely linked with the natural climatic disasters like storms which are more frequent nowadays. The new emerging infections that are affecting public health are linked to malnutrition and alteration of immune system. Aerosols are the microscopic molecules that have a big impact on climate .They have reduced the global temperature over the last few years by dissipating sunlight (The albedo phenomenon) by reflecting a quarter of sunrays back to space.

Environmental Impact of Air Pollution

Air pollution not only impair human health but it is also harmful for the environment . The most significant environmental effects as follows:

Fine particles scattered in the air cause haze, which reduces the transparency of the atmosphere. Gas emissions in the air is caused by power plants, autos, trucks and industries.

Wet (rain, fog, snow) or dry (particulates and gas) precipitation with dangerous levels of nitric and sulfuric acids is referred to as acid rain. They can harm trees and plantations, as well as buildings and outdoor sculptures, constructions, and statues, by acidifying the water and soil environments.

Ozone exists at both ground and upper levels of the Earth's atmosphere (stratosphere). The Sun's dangerous ultraviolet (UV) rays are shielded by stratospheric ozone. Ground-level ozone, on the other hand, is a pollutant that is detrimental to human health. Unfortunately, ozone-depleting compounds eventually deplete stratospheric ozone (i.e., pesticides, chemicals and aerosols). The UV radiations can enter the earth surface if anyhow this stratospheric ozone is depleted . These radiations can cause skin cancer in human .

Presently change in the climate Globally is an important issue of concern worldwide.The "greenhouse effect" maintains the Earth's temperature constant. Unfortunately, anthropogenic activities have damaged this temperature-controlling mechanism by emitting significant volumes of greenhouse gases, and global warming is worsening, with negative consequences for human health, forests, animals, agriculture, wildlife and water quality.

Toxicants coming from soil , water and air have worsened the wildlife by causing the number of health problems including infertility and birth defectsin them.

Eutrophication occurs when elevated levels of nutrients (particularly nitrogen) encourage the blooming of aquatic algae, which can result in a loss of fish diversity and their mortality.

There is a critical level of pollution that an ecosystem may accept without being destroyed, which is linked to its ability to neutralise acidity.

Hence the air pollution has detrimental effects on both soil as well as water. Presence of particulate matter as pollutant have deleterious effects on yield of crop as well as food .whereas its impact on waterbodies is mainly associated with the survival of living organisms.Ozone penetrates the stomata of plants, causing them to close, preventing CO_2 transport and resulting in a reduction in photosynthesis. Oxides of sulphur and nitrogen are involved in Acid rain which is harmful to plants.

Conclusion

Air pollution is a silent public health emergency as it has adverse effects of our lives in different sectors. Children which are the future of any country are more vulnerable to air pollution during their growth years.

Diseases caused by air pollution have significant economic and social implications. Despite the challenge of eliminating human pollution, a close partnership between authorities, institutions, and physicians can envision a viable solution to put the problem under control. Governments need to disseminate relevant information, educate citizens, and involve experts in these issues in order to better control the occurrence of issues. Air pollution reduction technologies must be followed by all industries and power plants.

Education, training, public awareness, and public participation are some of the most important steps in maximizing the potential for achieving key goals related to climate change and environmental degradation. There is no doubt that technological advances are making our world easier. It may seem difficult to prevent the negative effects of gas emissions, but you can limit their use by looking for reliable solutions. In summary, a

global preventive program to combat anthropogenic air pollution needs to be developed as a complement to the proper management of the adverse health effects of air pollution. Sustainable development techniques should be used in conjunction with research results to effectively address the problem.

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