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Impact of Air Pollution on Health and Environment

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ABSTRACT

Air pollution is a problem for all of us. However, some groups of people are especially sensitive to common air pollutants such as particulates and ground-level ozone. Sensitive populations include children, older adults, people who are active outdoors, and people with heart or lung diseases, such as asthma. If you are sensitive to air pollution, you need to be aware of steps you can take to protect your health.

Keywords: air pollution, health, environment, hazardous impact, particulates.

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INTRODUCTION

Pollution is now a common place term that our ears are attuned to. We hear about the various forms of pollution and read about it through the mass media. Air pollution is one such form that refers to the contamination of the air, irrespective of indoors or outside. A physical, biological or chemical alteration to the air in the atmosphere can be termed as pollution. It occurs when any harmful gases, dust, smoke enters into the atmosphere and makes it difficult for plants, animals and humans to survive as the air becomes dirty.

Air pollution, contamination of the air by noxious gases and minute particles of solid and liquid matter (particulates) in concentrations that endanger health. The major sources of air pollution are transportation engines, power and heat generation, industrial processes, and the burning of solid waste [1].

Air pollution can further be classified into two sections – visible air pollution and invisible air pollution. Another way of looking at air pollution could be any substance that holds the potential to hinder the atmosphere or the well-being of the living beings surviving in it. The sustainment of all things living is due to a combination of gases that collectively form the atmosphere; the imbalance caused by the increase or decrease of the percentage of these gases can be harmful for survival [1].

AIR POLLUTION FACTS

Everyone on earth knows that air pollution is hazardous to health. The effects of air pollution can have devastating effects on your health and the environment. Here is an interesting way to analyze how air pollution is gradually causing so many deaths worldwide. One may even to fail to count the effects of air pollution and the striking figures floating around this environmental issue [2].

The ozone layer considered crucial for the existence of the ecosystems on the planet is depleting due to increased pollution.

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Global warming, a direct result of the increased imbalance of gases in the atmosphere, has come to be known as the biggest threat and challenge that the contemporary world has to overcome in a bid for survival.

Below are the evidences on air pollution:

- An average American breathes 2 gallons of air per minute which means around 3400 gallons of air each day.
- Inhaling air pollution takes away at least 1–2 years of a typical human life.
- It has effects as small as burning eyes and itchy throat to as large as breathing problems and death.
- Pollutants that are released into the air, as opposed to land and water pollutants, are the most harmful.
- Rising levels of air pollution in Beijing has brought a new disease – Beijing cough.
- Air pollution is not a recent occurrence. In 1952, the Great Smog of London killed 8000 people.
- Deaths caused by air pollution cost the European Union €161 billion.
- Electric vehicles produce less air pollutants. They stir up dirt but without producing gases.
- Producing heavy crude oil increases chances of air pollution by 40% than producing Light Crude Oil.
- According to the Lancet journal, air pollution caused by waiting in traffic increases the chances of death caused due to heart attack.
- Toxic air pollution poses a greater threat to children, due to their smaller physical size and lung capacity.
- Air pollution and resulting deaths are increasing fastest in Asia.
- Air pollution that causes smog affects dolphins and makes them suffer from black lung diseases.
- 70% of the air pollution caused in Chinese cities is due to tailpipes.
- 5,000 premature deaths in Southern California are caused due to pollution from diesel trucks.
- Travels at Grand Canyon are unable to see the other side due to air pollution, is 1000 miles away.
- The most hazardous pollutants are released from the air and less from the water and land together.
- The best ways to reduce air pollution are by walking and riding bicycle.
- A single bus caries passengers which are likely to drive 40 cars.
- Fact 20: 28% of the Americans believe they are most affected by air pollution caused by vehicles.
- Air pollution in China can travel up to Central Valley of California.
- Outdoor air pollution outdoor, ranks in the top ten killers on earth.
- 65% of the deaths in Asia and 25% deaths in India are due to air pollution.
- 2 million cars in Manila, Philippines cause 80% of air pollution.
- Air pollution in India is estimated to cause 527, 700 deaths every year.
- The number of people who die in America every year due to air pollution is above 50,000.
- 80% of lung diseases are caused due to pollution from other cars, buses, trucks and other vehicles.
- It is estimated that 750,000 people die in china prematurely due to air pollution.
- Research by MIT proves that around 13,000 British citizens die due to air pollution from vehicles a power plants.
- Air pollution in California kills 25,000 people per year and costs $200 million worth of medical expenses.
- 300,000 in China die every year due heart disease and lung cancer cause by air pollution.
- People in many cities wear masks continually to save themselves from air pollution.
- Heavy crude oil increases air pollution 40% more than Light Crude Oil.

- Air pollution caused in traffic increase the chances of heart attack.
- By 2050, 6 million people will die per year due to air pollution.
- During heavy traffic jam, pollutants outside can seep into your car, making the air inside your car 10 times more polluted than typical city air.
- According to the California Department of Education, Asthma is a leading cause of school absenteeism.
- Indoor air pollution is 2-5 times worse than the air outdoors.
- People who live near high traffic roads face greater risk of cancer, heart disease, asthma and bronchitis as these places contain more concentrated levels of air pollution.
- Switching to more efficient and cleaner fuels from solid fuels (wood, biomass) can help you to reduce indoor air pollution [2-3].

We can do a lot more to contribute to human happiness by following many little steps. Riding a cycle, using public transport, burning less coal on barbeque are like small steps to create a healthy prosperous environment for the future generations and ourselves. Imagine our little acts can do so much like saving thousands of people who die due to cancer, heart attack or other air borne diseases. The figures are definitely striking. So, let your action do some act of heroism and make this world a pollution- free, healthier safer world to live in.

Sources of Air Pollution

The combustion of gasoline and other hydrocarbon fuels in automobiles, trucks, and jet airplanes produces several primary pollutants: nitrogen oxides, gaseous hydrocarbons, and carbon monoxide, as well as large quantities of particulates, chiefly lead. In the presence of sunlight, nitrogen oxides combine with hydrocarbons to form a secondary class of pollutants, the photochemical oxidants, among them ozone and the eye-stinging peroxyacetylnitrate (PAN). Nitrogen oxides also react with oxygen in the air to form nitrogen dioxide, a foul-smelling brown gas. In urban areas like Los Angeles where transportation is the main cause of air pollution, nitrogen dioxide tints the air, blending with other contaminants and the atmospheric water vapor to produce brown smog. Although the use of catalytic converters has reduced smog-producing compounds in motor vehicle exhaust emissions, studies have shown that in so doing the converters produce nitrous oxide, which contributes substantially to global warming.

In cities, air may be severely polluted not only by transportation but also by the burning of fossil fuels (oil and coal) in generating stations, factories, office buildings, and homes and by the incineration of garbage. The massive combustion produces tons of ash, soot, and other particulates responsible for the gray smog of cities like New York and Chicago, along with enormous quantities of sulfur oxides (which also may be result from burning coal and oil). These oxides rust iron, damage building stone, decompose nylon, tarnish silver, and kill plants. Air pollution from cities also affects rural areas for many miles downwind [3].

Every industrial process exhibits its own pattern of air pollution. Petroleum refineries are responsible for extensive hydrocarbon and particulate pollution. Iron and steel mills, metal smelters, pulp and paper mills, chemical plants, cement and asphalt plants – all discharge vast amounts of various particulates. Uninsulated high-voltage power lines ionize the adjacent air, forming ozone and other hazardous pollutants. Airborne pollutants from other sources include insecticides, herbicides,

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radioactive fallout, and dust from fertilizers, mining operations, and livestock feedlots.

When you try to study the sources of Air pollution, you enlist a series of activities and interactions that create these pollutants. There are two types of sources that we will take a look at: Natural sources and man-made sources.

Natural sources of pollution include dust carried by the wind from locations with very little or no green cover, gases released from the body processes of living beings (Carbon dioxide from humans during respiration, Methane from cattle during digestion, Oxygen from plants during Photosynthesis). Smoke from the combustion of various inflammable objects, volcanic eruptions, etc. along with the emission of polluted gases also make it to the list of natural sources of pollution [3].

While looking at the man-made contributions towards air pollution, smoke again features as a prominent component. The smoke emitted from various forms of combustion like in biomass, factories, vehicles, furnaces, etc. Waste used to create landfills generates methane, which is harmful in several ways. The reactions of certain gases and chemicals also form harmful fumes that can be dangerous to the well-being of living creatures.

Effects on Health and the Environment

Air pollution can harm us when it accumulates in the air in high enough concentrations. Millions of Americans live in areas where urban smog, particle pollution, and toxic pollutants pose serious health concerns. People exposed to high enough levels of certain air pollutants may experience:

(1) Irritation of the eyes, nose, and throat
(2) Wheezing, coughing, chest tightness, and breathing difficulties
(3) Worsening of existing lung and heart problems, such as asthma
(4) Increased risk of heart attack

Air pollution is a problem for all of us. However, some groups of people are especially sensitive to common air pollutants such as particulates and ground-level ozone. Sensitive populations include children, older adults, people who are active outdoors, and people with heart or lung diseases, such as asthma. If you are sensitive to air pollution, you need to be aware of steps you can take to protect your health. In addition, long-term exposure to air pollution can cause cancer and damage to the immune, neurological, reproductive, and respiratory systems. In extreme cases, it can even cause death.

Air pollution may possibly harm populations in ways so subtle or slow that they have not yet been detected. For that reason research is now under way to assess the long-term effects of chronic exposure to low levels of air pollution – what most people experience – as well as to determine how air pollutants interact with one another in the body and with physical factors such as nutrition, stress, alcohol, cigarette smoking, and common medicines. Another subject of investigation is the relation of air pollution to cancer, birth defects, and genetic mutations.

Like photochemical pollutants, sulfur oxides contribute to the incidence of respiratory diseases. Acid rain, a form of precipitation that contains high levels of sulfuric or nitric acids, can contaminate drinking water and vegetation, damage aquatic life, and erode buildings. When a weather condition known as a temperature inversion prevents dispersal of smog, inhabitants of the area, especially children and the elderly and chronically ill, is warned to stay indoors and avoid physical stress. The dramatic and debilitating effects of severe air pollution episodes in

cities throughout the world – such as the London smog of 1952 that resulted in 4,000 deaths – have alerted governments to the necessity for crisis procedures. Even everyday levels of air pollution may insidiously affect health and behavior.

Indoor air pollution is a problem in developed countries, where efficient insulation keeps pollutants inside the structure. In less developed nations, the lack of running water and indoor sanitation can encourage respiratory infections. Carbon monoxide, for example, by driving oxygen out of the bloodstream, causes apathy, fatigue, headache, disorientation, and decreased muscular coordination and visual acuity [4].

A relatively recently discovered result of air pollution are seasonal "holes" in the ozone layer in the atmosphere above Antarctica and the Arctic, coupled with growing evidence of global ozone depletion. This can increase the amount of ultraviolet radiation reaching the earth, where it damages crops and plants and can lead to skin cancer and cataracts. This depletion has been caused largely by the emission of chlorofluorocarbons (CFCs) from refrigerators, air conditioners, and aerosols.

The Montreal Protocol of 1987 required that developed nations signing the accord not exceed 1986 CFC levels. Several more meetings were held from 1990 to 1997 to adopt agreements to accelerate the phasing out of ozone-depleting substances [4-5].

Other Effects of Air Pollution

Respiratory and Heart Problems

The effects of Air pollution are alarming. They are known to create several respiratory and heart conditions along with Cancer, among other threats to the body. Several millions are known to have died due to direct or indirect effects of Air pollution. Children in areas exposed to air pollutants are said to commonly suffer from pneumonia and asthma.

Global Warming

Another direct effect is the immediate alterations that the world is witnessing due to Global warming. With increased temperatures worldwide, increase in sea levels and melting of ice from colder regions and icebergs, displacement and loss of habitat have already signaled an impending disaster if actions for preservation and normalization aren't undertaken soon.

Acid Rain

Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of fossil fuels. When it rains, the water droplets combine with these air pollutants, becomes acidic and then falls on the ground in the form of acid rain. Acid rain can cause great damage to human, animals and crops.

Eutrophication

Eutrophication is a condition where high amount of nitrogen present in some pollutants gets developed on sea's surface and turns itself into algae and adversely affects fish, plants and animal species. The green colored alga that is present on lakes and ponds is due to presence of this chemical only.

Effect on Wildlife

Just like humans, animals also face some devastating affects of air pollution. Toxic chemicals present in the air can force wildlife species to move to new place and change their habitat. The toxic pollutants deposit over the surface of the water and can also affect sea animals.

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Depletion of Ozone Layer

Ozone exists in earth's stratosphere and is responsible for protecting humans from harmful ultraviolet (UV) rays. Earth's ozone layer is depleting due to the presence of chlorofluorocarbons, hydro chlorofluorocarbons in the atmosphere. As ozone layer will go thin, it will emit harmful rays back on earth and can cause skin and eye related problems. UV rays also have the capability to affect crops [5].

Types of Pollutants

In order to understand the causes of air pollution, several divisions can be made.

- Primarily air pollutants can be caused by primary sources or secondary sources. The pollutants that are a direct result of the process can be called primary pollutants. A classic example of a primary pollutant would be the sulfur-dioxide emitted from factories.
- Secondary pollutants are the ones that are caused by the inter mingling and reactions of primary pollutants. Smog created by the interactions of several primary pollutants is known to be as secondary pollutant [5].

Causes of Air Pollution

Burning of Fossil Fuels

Sulfur dioxide emitted from the combustion of fossil fuels like coal, petroleum and other factory combustibles is one the major cause of air pollution. Pollution emitting from vehicles including trucks, jeeps, cars, trains, airplanes cause immense amount of pollution. We rely on them to fulfill our daily basic needs of transportation. But, there overuse is killing our environment as dangerous gases are polluting the environment. Carbon monooxide caused by improper or incomplete combustion and generally emitted from vehicles is another major pollutant along with Nitrogen Oxides, that is produced from both natural and manmade processes.

Agricultural Activities

Ammonia is a very common by product from agriculture related activities and is one of the most hazardous gases in the atmosphere. Use of insecticides, pesticides and fertilizers in agricultural activities has grown quite a lot. They emit harmful chemicals into the air and can also cause water pollution.

Exhaust from Factories and Industries

Manufacturing industries release large amount of carbon monoxide, hydrocarbons, organic compounds, and chemicals into the air thereby depleting the quality of air. Manufacturing industries can be found at every corner of the earth and there is no area that has not been affected by it. Petroleum refineries also release hydrocarbons and various other chemicals that pollute the air and also cause land pollution.

Mining Operations

Mining is a process wherein minerals below the earth are extracted using large equipments. During the process dust and chemicals are released in the air causing massive air pollution. This is one of the reason which is responsible for the deteriorating health conditions of workers and nearby residents.

Indoor Air Pollution

Household cleaning products, painting supplies emit toxic chemicals in the air and cause air pollution. Have you ever noticed that once you paint walls of your house, it creates some sort of smell which makes it

literally impossible for you to breathe? Suspended particulate matter popular by its acronym SPM, is another cause of pollution. Referring to the particles afloat in the air, SPM is usually caused by dust, combustion, etc. [6].

Solutions for Air Pollution

To combat pollution in the United States, the Clean Air Act Amendments of 1970 gave the Environmental Protection Agency (EPA) the authority to establish and enforce air pollution standards and to set emission standards for new factories and extremely hazardous industrial pollutants. The states were required to meet "ambient air quality standards" by regulating the emissions of various pollutants from existing stationary sources, such as power plants and incinerators, in part by the installation of smokestack scrubbers, electrostatic precipitators, and other filters. Auto manufacturers were mandated to install exhaust controls or develop less polluting engines. The Clean Air Act, as amended in 1977, authorized the EPA to impose stricter pollution standards and higher penalties for failure to comply with air quality standards [6].

In 1990 when the act was reauthorized it required most cities to meet existing smog reduction regulations by the year 2005. The 1990 amendments also expanded the scope and strength of the regulations for controlling industrial pollution. The result has been limited progress in reducing the quantities of sulfur dioxide, carbon monoxide, nitrogen oxide, ozone, particulate matter, and lead in the air. The EPA also regulated hazardous air pollutants, which in 1992 included mercury, beryllium, asbestos, vinylchloride, benzene, radioactive substances, and inorganic arsenic.

The most satisfactory long-term solutions to air pollution may well be the elimination of fossil fuels and the ultimate replacement of the internal-combustion engine. To these ends efforts have begun in the United States, Japan, and Europe to develop alternative energy sources (see energy, sources of), as well as different kinds of transportation engines, such as one powered by electricity.

A system of pollution allowances based on trading emission rights has been established in the United States in an attempt to use the free market to reward pollution reductions, and the international sale of surplus emission rights is permitted under the Kyoto Protocol (see below). Other proposed solutions include raising electricity and gasoline rates to better reflect environmental costs and to discourage waste and inefficiency, and mechanical controls on coal-fired utility plants.

In 1992, 150 nations signed a treaty on global warming at the UN-sponsored summit on the environment in Rio de Janeiro. A UN Conference on Climate Change, held in Kyoto, Japan, in 1997, produced an international agreement to combat global warming by sharply reducing emissions of industrial gases produced by industrialized nations.

Although the United States abandoned the treaty in 2001, saying it was counter to U.S. interests, most other nations agreed that year on the details necessary to make the protocol a binding international treaty, and the necessary ratifications brought the treaty into force in 2005. Efforts to develop a new, more encompassing binding treaty that would build on the Kyoto Protocol have been unsuccessful, and in 2012 Canada became the first ratifying nation to withdraw. Later in 2012 the Kyoto Protocol was extended to 2020.

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Some other Solution for Air Pollution

Use Public Mode of Transportation

Encourage people to use more and more public modes of transportation to reduce pollution. Also, try to make use of car pooling. If you and your colleagues come from the same locality and have same timings you can explore this option to save energy and money.

Conserve Energy

Switch off fans and lights when you are going out. Large amount of fossil fuels are burnt to produce electricity. You can save the environment from degradation by reducing the amount of fossil fuels to be burned.

Understand the concept of Reduce, Reuse and Recycle

Do not throw away items that are of no use to you. In-fact reuse them for some other purpose. For e.g. you can use old jars to store cereals or pulses.

Emphasis on Clean Energy Resources

Clean energy technologies like solar, wind and geothermal are on high these days. Governments of various countries have been providing grants to consumers who are interested in installing solar panels for their home. This will go a long way to curb air pollution.

Use Energy Efficient Devices

CFL lights consume less electricity as against their counterparts. They live longer, consume less electricity, lower electricity bills and also help you to reduce pollution by consuming less energy.

Several attempts are being made worldwide on a personal, industrial and governmental levels to curb the intensity at which Air Pollution is rising and regain a balance as far as the proportions of the foundation gases are concerned. This is a direct attempt at slacking Global warming. We are seeing a series of innovations and experiments aimed at alternate and unconventional options to reduce pollutants. Air Pollution is one of the larger mirrors of man's follies, and a challenge we need to overcome to see a tomorrow [7].

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