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Overview effects of air pollution on human health in Pakistan

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ABSTRACT

Air pollution is now a significant worldwide issue, having severe negative impacts on human health and the environment in terms of toxicity. The main contributors to air pollution are industrial processes and motor vehicles, despite the existence of multiple sources of emissions. The World Health Organization states that the main air pollutants include ground-level ozone, particle pollution, carbon monoxide, lead, sulfur dioxide, and nitrogen dioxide.

Introduction

Air pollution encompasses the adverse effects stemming from various sources that contribute to the deterioration of the atmosphere. Air pollution is caused by a combination of both human activity and natural processes. These types of pollutants, such as solid particles, liquid substances, and gaseous compounds. This post will not delve extensively into the topic of indoor air pollution. The Pollution Standard Index, frequently employed for evaluations, is a numerical value and indicator of contaminants. The various human activities such as industrialization, agriculture, and the use of motor vehicles have contributed to the overall development. Due to the overuse of fossil fuels, heavy traffic on the roads, excessive use of fertilizers and pesticides, as well as harmful industrial pollutants, the permissible limits for standards have been exceeded. These pollutants are released into the air through exhaust emissions or exploitation. Breathing in this polluted air can lead to serious consequences. Many industrialized nations are confronted with this issue. Pakistan is among those countries where the population suffers greatly from various harmful respiratory illnesses, such as asthma and lung cancer [1].

Smog

This article focuses on the preventative actions needed and the necessary steps to address the issues caused by smog in Pakistan. We suggest implementing both immediate and future actions to assist regulatory authorities in effectively managing the problem of smog.

Types of smog

The composition of smog is constantly changing and varies in different locations, making it difficult to precisely define its chemistry. Nevertheless, it is typically classified into two groups: classical smog and photochemical smog. Both issues are significant and have negative impacts on both the environment and people's well-being. Furthermore, alongside these categories, a separate classification of smog, known as polish smog, has been discovered relatively recently. In this section, we demonstrate the chemical processes involved in the creation of these kinds of smog.

Classical smog

Classical smog is a highly dangerous type of pollution in the environment. London experienced a prolonged period of smog in December 1952, which lasted around 5 days and tragically led to the loss of thousands of lives. Sulfurous smog, which is a type of classical smog, occurs when there are unusually high levels of sulfur oxides due to the burning of fossil fuels, particularly coal. The cause of the London Smog was the excessive buildup of PM in the atmosphere. In traditional smog, the PM size grows as a result of elevated humidity levels, which subsequently serves as the foundation for fog droplets to form. Later on, fog droplets absorb sulfur dioxide and undergo oxidation, converting it into sulfuric acid, which then results in the formation of acid rain. The key elements needed to create classical smog are primary precursors such as soot particles and sulfur oxides. Additionally, secondary precursors like aerosols are necessary along with specific conditions like a temperature inversion, high humidity, and cooler temperatures.

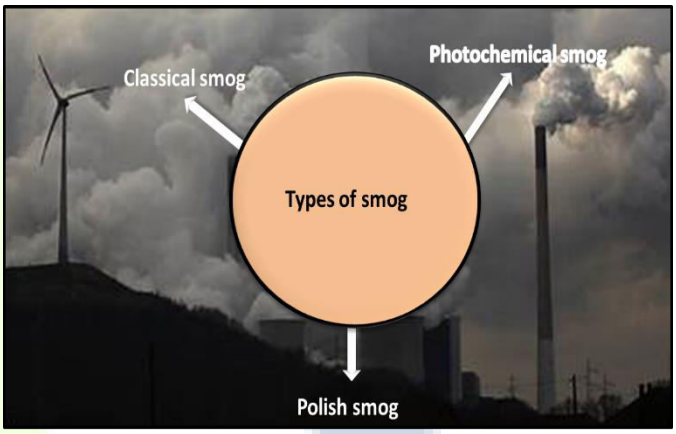

Figure 1: Different type of smog

Photochemical smog

Photochemical smog, which is frequently seen in densely populated regions with heavy traffic, is a distinct form of air pollution. This type of smog is created through the combination of certain chemical species present in urban air and specific meteorological conditions, including sunlight. Photochemical smog primarily consists of a plethora of pollutants such as nitrogen oxides, ozone, carbon monoxide, and aldehydes, which are present in high concentrations. Solar radiation causes nitrogen dioxide from cars and factories to undergo photocatalysis in the air, resulting in the production of nitrogen oxide and unpaired oxygen. The oxygen that is not paired reacts with oxygen radicals, resulting in the creation of more ozone. In typical circumstances, the process persists, resulting in the formation of nitrogen dioxide. Nevertheless, when volatile organic compounds are present, the reaction mechanism can potentially result in fatal photochemical smog instead.

Polish smog

The smog in Poland had a unique composition compared to previously identified types of smog. This kind of smog was produced under high atmospheric pressures and low temperatures, in contrast to London smog which occurs under low atmospheric pressures. The primary reason behind the smog in Poland is the emission of significant levels of PM and PM, along with other harmful substances like benzo, by household boilers. Polish smog is characterized by elevated levels of PM within a high-pressure and low-temperature environment. In the following section, we will provide a concise overview of the possible origins of pollutants that contribute to smog in Pakistan.

Smog in Pakistan and detection methods

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Figure 2: overview of smog in Lahore Pakistan

Air quality in Pakistan is negatively impacted by the emissions released by vehicles, industries, waste disposal, and agricultural activities. Over the course of the last two decades, the number of automobiles, such as cars, scooters, and motorcycles, has witnessed significant growth in correlation with population expansion. With a fleet of more than 10 million vehicles, Pakistan's air pollution levels are significantly influenced. Pakistan's steel mills, power plants, and factories contribute to air pollution by emitting furnace oil, a significant source of sulfur. Burning agricultural residue is a significant smog contributor in different cities of Pakistan, alongside other sources of smog. Nevertheless, this monitoring system falls short in effectively monitoring all instances of smog in Pakistan. Environmental activists in Pakistan's cities of Lahore, Islamabad, and Peshawar are striving to collect precise information on smog occurrences. This article specifically addresses the origins of smog emissions, rather than the typical sources of air pollution. As far as we know, all pertinent studies containing statistical data have been incorporated. The preventive measures suggested for Pakistan can be extended to encompass the entire sub-continent [2].

Air pollution in Pakistan

Pakistan is confronted with a significant problem known as smog. Punjab province, along with the city of Lahore has experienced the most severe impact. Smog is a combination of fog and smoke, forming due to the burning of waste materials and caused by various factors such as car emissions and agricultural waste incineration. Consequently, it leads to a multitude of issues for the populace. Every day in Punjab, lives are being lost due to the deadly effects of smog. Air pollution is a pressing issue concerning public health in Pakistan, as reported by the Global Alliance on Health and Pollution. The industry ranks as the second largest contributor to pollution, making up a quarter of the overall pollution. Agriculture, on the other hand, comprises 20% of the total pollution. The main contributors to air pollution and emissions, which greatly contribute to Punjab's photochemical haze, are power, industry, and transportation. These three sectors account for 80% of the total emissions and pollution. Air pollution can cause harm to all elements of the environment, including groundwater, soil, and air. In addition to that, it presents a substantial danger to living organisms. The environmental impact of air pollution is greatly influenced by acid rain, global warming, the greenhouse effect, and climate change.

Air Pollution Toxicological effect

The consequences of air pollution will not only affect the health of animals and humans, but will also impact the overall environment. Different locations around the world, shifts in climate patterns, and differences in the environment collectively influence the health of living beings, the atmosphere, and the survival of animals.

Air pollution effects on environment

Air pollution can harm the environment by polluting the water, soil, and air. It also presents a big danger to the variety of life. Studies have shown that when there is too much air pollution, it harms various species and makes it harder for crops to grow. Because of pollutants in the environment, animals might have difficulty reproducing. Air pollution has three big effects on nature: acid rain, temperature change, and global climate change caused by greenhouse gases like carbon dioxide.

Particle pollution effect on human health

Ground-level ozone, which can be found in many cities, is harmful to both humans and animals. Side effects can cause changes in appearance, bodily functions, immune system functions, and metabolism. Even though people and rats inhale a lot of ground-level ozone, it doesn't dissolve easily in water so it goes deep into the lungs. But the noses of rats and humans remove about 17% and 40% of its harmful effects, respectively. Ground-level ozone is bad for plants and can stop them from getting carbon. This could cause deforestation and have a bad impact on our food security for a long time.

Sulfur dioxide pollution

Sulfur dioxide is a clear, very reactive gas that is a major pollutant in the environment. It usually comes from burning fossil fuels, volcanoes, and factories. Sulphur dioxide is really bad for plants, animals, and people's health. People who have respiratory disease, children, elderly people, and those who are around Sulphur dioxide more often are more likely to get skin and lung diseases. The most common health risks linked to high levels of Sulphur dioxide are breathing problems and worsened heart disease. Breathing through the mouth instead of the nose lets more Sulphur dioxide get into the lungs. Therefore, people who work out in dirty air inhale more Sulphur dioxide and are more likely to feel annoyed . When there is too much sulphur dioxide in our airways, it turns into sulfite or bisulfite and moves around our body through the fluid that lines our body surfaces. The sulfite seems to affect the sensory organs in the airways and cause narrowing of the air passages, both in a specific area and throughout the body.

Lead pollution

Lead is a dangerous metal that is used in many different types of making things. Lead pollution can come from both inside and outside. This is a substance that is let out by car engines, especially the ones that run on leaded gasoline. Smelters, battery factories, irrigation water wells, and waste waters also contribute to the pollution of Lead in the environment. A study found that traffic police officers may be exposed to lead from pollution. Lead can be very dangerous for pregnant women and children, even if there is only a small amount of it. Lead is found in the blood, bones, and soft tissues of the body. Lead poisoning happens when it enters the body through breathing. Lead poisoning can cause harm to several parts of the body such as the heart, kidneys, and reproductive system. However, it is the nervous system that is most at risk.

Primary source of air pollutants

The primary source of air pollution stems from the utilization of fossil fuels, as evident. Air pollutants are categorized into two distinct classifications, which are determined by the origin of their emission: anthropogenic and natural. The air pollution is attributed to anthropogenic activities, including but not limited to energy acquisition, transportation, and agricultural fertilizers. Natural pollutants are emitted from various origins, including volcanic eruptions, wildfires, and the oceanic environment. When considering matters relating to health, air toxicants are defined as any atypical constituent suspended in the atmosphere which perturbs the physiological operation of human bodily organs. Based on the findings of several published studies, it has been determined that the exposure to air pollution poses the most detrimental effects on various bodily systems, namely the lungs, cardiac, diagnostic, dermatological, neurological, hematological, immunological, and reproductive systems. Persistent molecular and cellular impairments, conversely, can give rise to a wide range of neoplastic conditions. However, studies have revealed that even small quantities of air pollutants can have negative effects on vulnerable individuals [4].

Respiratory disorders in human

The respiratory system serves as the primary barrier against the onset and development of ailments triggered by atmospheric contamination, owing to the fact that the majority of toxic substances gain entry into the body via the air passages. Voice disruptions can arise due to a range of circumstances. Air pollution constitutes a substantial environmental risk component for various respiratory ailments, such as asthma and lung cancer. The deleterious impact of air pollutants, notably particulate matters and other inhalable substances like dust, ozone and benzene, evokes significant damage to the respiratory system. Asthma, an affliction of the lungs, may manifest as a consequence of exposure to airborne pollutants. There is evidence to suggest that an increased likelihood of chronic obstructive pulmonary disease is associated with air pollution stemming from both vehicles and industrial activities, as revealed by selected investigations [3].

Conclusion

Air pollution is really bad for people's health. It can cause many different diseases that make people very sick, and in some cases even die. This is especially true in countries like Pakistan that are still developing. Air pollution control is really important and should be a top priority for the government. The lawmakers in these countries need to make changes to all the laws and rules about air pollution. Many departments that deal with air pollution need to work together and be led by a strong environmental protection agency. To have a good agency that protects the environment, we need enough money for running the agency, doing research and studies, developing new ways to protect the environment, monitoring pollution, and overall keeping the environment safe, especially from air pollution

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