



An Overview of the Environmental and Health Consequences of Air Pollution

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ABSTRACT

The problem of air pollution has ramifications for human health, the environment, and a variety of living sectors. Modern technology has resulted in air pollution and its damaging effects, while also driving the world to make every effort to overcome its negative repercussions. The origin, chemical composition, size, and mode of discharge inside or outdoor environments have all been proven to be air pollutants. Industrial, commercial, mobile, urban, regional, farm, and natural sources of indoor pollutants include cooking and combustion, particle matter rehabilitation, materials used for resources, temperature control, and consumer items, smoking, heating, and organic compounds. Indoor Pollutant Sources Air pollution has an impact on the body, including respiratory systems and heart disorders. Asthmatics, bronchiolitis, lung disease, cardiovascular problems, central nervous system malfunction, and skin conditions are the most common respiratory disorders, as are chronic obstructive pulmonary disease (COPD). The challenges posed by outdoor air pollution are public health risks such as cardiovascular disease, respiratory ailments, COPD, and world-class asymmetry. The impacts of human activities on air quality and climate change may be realized at several sizes, ranging from urban to regional to continental to global. Rapid population growth and increased energy consumption are the principal drivers of massive amounts of hazardous chemicals and greenhouse gases entering the atmosphere, with serious consequences for health and the environment.

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INTRODUCTION

There are several causes of air pollution. such as industry, cars, heating, commercial and home fuels, as well as smoke from tobacco products. In recent years, the health impacts of air pollution have been examined carefully. Results of these studies have revealed that pollution by the climate is hazardous to human health and especially to those whose age as children and seniors or current health issues is already vulnerable. Epidemiological evidence indicates that the harmful impacts on health depend on exposure and exposure duration and long-term exposures have greater cumulative effects than short-term exposures [1]. The health effects of air pollution vary. Even on days with minimal air pollution, vulnerable or sensitive individuals can influence health. Short-term air pollution exposure is directly associated with COPD, cough, breathing shorter, wheezing, asthma, respiratory disease, and a high hospitalization rate (Morbidity

assessment). Asthma chronic, pulmonary failure, the fast effects of air pollution are cardiovascular and cardiovascular mortality. After exposure to long-term air pollution, Swedish cohort research appeared to induce diabetes [2]. In addition, air pollution appears to have different consequences on human health early on, like respiratory, cardiovascular, mental, and perinatal issues [3], leading to baby deaths or chronic illnesses in adulthood [4]. The increased risk of disease and death was indicated in national reports [5]. In several regions around the world, these investigations showed a link between the daily concentration of particulate matters (PM) and daily mortality. The problem could be exacerbated by climate change and global warming. Additionally, for specific reasons and increased hospitalization (morbidity index) has occurred among aged and sensitive people. The quality of urban air is vital and the lives of living beings are improved. Recent studies in various parts of the world show that ozone levels (O_3) and particle matter (PM) are

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increasing and that breathing and cardiovascular problems are more likely to result in casualties. The chemical reaction of several contaminants from different sources resulted in outdoor air pollution [6]. It is like an enormous amount of smog leading to various health problems. In warmer seasons than colder seasons, the impact of ambient air pollution is more significant. External air pollution is caused by both human and natural factors, such as the emission of carbon as a result of cow fermentation, wildfire emissions, radioactive decay, and the sulfur and chlorine deposits following an eruption of a volcano. The principal environmental issues of outdoor air pollution include acid rain, greenhouse effects, and ozone depletion. The major cause of air pollution is the emission of greenhouse gases for energy generation and mobility. More fossil fuel is used in most emerging countries, leading to higher industrial carbon emissions, which are also increasing the air pollution rate in the country. Another major factor for pollution is the growing number of people and the cities are overwhelmed [7].

Indians' outlook

Many of our daily activities, such as at home, in the job, and our automobiles, rely on the (IAQ) (indoor air

quality). Fuel for bioenergy (wood, dung, and crop leftovers) is commonly utilized for heating and cooking in 75% of Indian households. This represents 80 percent of India's household energy use. Primarily used in open fires and small stoves, with little or no ventilation or chimneys, this fuel is commonly found indoors. Small kids and mothers are exposed to severe air pollution inside for long periods because of this condition. Approximately As a result of exposure to this radiation, 500,000 individuals die early each year. Bio-smoke air quality is also one of the primary environmental triggers for any sort of sickness, according to the World Health Organization (WHO) [8].

LITERATURE REVIEW

Related works from air pollutants

Due to their ability to move long or short distances, air pollutants differ in the types of chemicals, the responses they cause, how long they are emitted, and how they linger in the environment. Pollutants in the air the two items, however, have certain similarities and can be organized into different groups, as shown in Table 1.

Table 1. The impact of various air pollutants

Pollutants	Origin	Effects on health	References
Heavy Metals	Among the natural sources are volcanoes, mineral deterioration, forest fires, soil and water evaporation. releases of materials from the use of heavy metals, such as the production of coal and heat, Digging and other metallurgical processes; deliberately extracted discharges and hard rock utilization, such as Extraction of heavy metals, manufacturing of leatherette, electrical electroplating, and the manufacture of heavy metal goods; discharges of waste incineration, dumpsites, etc.	Epidemiological research has indicated that metals including plum, mercury, arsenic, and cadmium have greater blood and body loads in persons living close to garbage incinerators. However, they can become poisonous at larger (albeit very low) levels.	Heavy metals are the core ingredients of a range of operations involving plumage, mercury, cadmium, arsenic, and other hazardous metals such as garbage, coal combustion, Digging and refining of metals, different industrial activities, and atmospheric deposition [9].
Long-term organic pollutants	Some such industrial substances and Other chemical and/or combustion process by-products originate as non-intentional pesticides.	Birds egg coat thicknesses Organochlorines such as DDT Impacts fish-eating birds' reproductive potential. Brief person exposure to elevated levels of dioxins may lead to lesions of the skin, such as chloracne and skin patches, and a change in the function of hepatitis.	A dangerous group of compounds is persistent organic pollutants. It covers pesticides, dioxins, furans, and PCBs [10]. Generically, polychlorinated biphenyls (PCB) or polychlorinated biphenyls (PCB) are referred to as "dioxin-like chemicals" and may behave in the same way as dioxin-like toxicity,' using the generic word "dioxins" [11].
Sulfur dioxide	Sulfur dioxide, the main sources are industrial locations such as smelters, stationery factories, power stations, and steel plants.	Injury of asthma. Lower Air Tract Disease Clinic visits. It irritates the nose, throat, and respiratory tract to make the chest cough, wheat short, or tight. Sulfur dioxide is felt extremely fast and in 10 or 15 minutes after it is breathed, most people will suffer the worst symptoms.	An extra hazard in industrial areas is sulfur dioxide. SO2 is mostly produced through the combustion of sulfur-containing fossil fuels. The combustion of high-sulfur carbon and oil is mainly the source of SO2 [12].

Carbon monoxide	Monoxide of carbon Produced by automobile emissions that do not fully use coal gasoline.	Injury of asthma. Lower respiratory tract illness clinical visits, headache. The circulation of carbon monoxide lowers the oxygen supply to the organ and the tissues of the organism. Excessive CO release leads to vision loss, reduced work capacity and decreased dexterity of the hand, poor learning skills, and complicated jobs.	Environmental monoxide (CO) concentrations are considerably contributing to motor vehicles. Motor vehicles release CO, however, most CO issued from this source is emitted by cars driven by light-duty gasoline [8]. In addition to CO exposure health problems, As Carbon monoxide may not react in a near-road environment, it may be a helpful indicator for immobile, primary fuels of releases from products shipped. Carbon monoxide is created in greater quantities in colder weather or at a higher altitude when combustion isn't effective (i.e., badly tuned engine). The air half-life of toxic gases is 1–2 weeks and can spread from its source for a few thousand kilometers [13].
Nitrogen dioxide gas pollutants	The dioxide of Nitrogen Fuel combustion and atmospheric reactions at high-temperature results.	Asthmatic symptoms. Symptoms. Nitrogen dioxide may irritate the lungs and decrease breathing resistance, for example, influenza.	In urban as well as industrial areas, NO ₂ , a precursor of photochemical smog is found in outdoor air and produces O ₃ with the help of sunshine and hydrocarbons. NO ₂ is a gas by-product of fossil fuel burning. Mobile sources are the main source of NO ₂ in many urban areas. Due to its poor water solubility, NO ₂ is more likely to reach the lower airways than SO ₂ [14]. In addition, NO ₂ can react as an oxidant as well.
Ozone	Ozone: Ozone Chain reaction under the light from the sun of NOx and volatile organic molecules (vehicle emissions) (VOC).	Lung growth decreases. The aggravation of asthma. Every breathing hospital. Infection with asthma. Airborne disease school absenteeism.	Ozone is no special source of additional pollution as such but is created by the photocatalytic atmosphere with oxides of nitrogen and reacting carbohydrates [15].
Unsettled particulate matter	Heavy vehicle, bus, and truck exhaust; burning wood (fireplaces, stoves) in manufacturing and construction	Infant respiratory mortality Decreased lung function occurs. The growth of the lungs reduces. Asthma has the	Particular air pollution has a significant short-term health impact, even when absorbed into human lungs, at low ambient levels [16].

Depending on the geographic position, temperature, wind, and weather conditions, the effect of air pollution differs. In large cities in many developing nations, the World Health Organization determined that air quality is exceptionally poor and that very many individuals in such nations are subjected to environmental quantities of Air contaminants that significantly exceed air quality standards of the World Health Organization.

POTENTIAL SOURCES OF EXPOSURE

Most environmental contaminants are known to be produced by a wide variety of human activities, including the usage of industrial machines, power plants, burning engines, and automobiles. On a wide scale, these activities account for a considerable amount of pollution, and vehicles are believed to be responsible for nearly 80% of it [17]. Other activities by human beings are also less likely to affect our environment: field techniques, gas stations, fuel tank heaters, and purification methods [18], and nature-based origins, such as volcanism and wildfires, and dirt.

The pollutant classifications are based mostly on pollution producers.

The four primary sources adopting this style of categorization are therefore worth mentioning: primary sources, area sources, mobile sources, and natural sources. The main sources include pollutant emissions from power plants, refineries, and legal expenditures. Taking into account the economic aspect, the competitiveness of the petrochemicals, chemical, fertilizer, metallurgical and other industrial and, lastly, municipal incineration sectors [19].

Domestic cleaning, dry cleaner, print shops, and gas stations can be found in the door area sources. Mobile sources include autos, vehicles, ferries, airplanes, and other transport types. As indicated previously, natural sources include forest fires, volcanic erosion, dust storms, agricultural burns, as well as other physical disasters [20].

EFFECT OF HEALTH FROM AIR POLLUTION

Ozone at ground level and particulate matter are the most common contaminants. The two primary categories of air pollution are:

- Environmental pollution is outdoor pollution
- The pollution caused by the combustion of domestic fuels is called indoor pollution.

The symptoms of illnesses and conditions are less or more significant in those who exhibit high levels of air pollution. These consequences are classified into short-term and long-term health consequences. As previously extensively mentioned, the relative amount of short-term and long-term impacts cannot be fully elucidated by different epidemiological methods and exposure mistakes following a recent epidemiological study of the Harvard School of Public Health. New models for analyzing human exposure data in the short and long term are being proposed. Therefore, the more prevalent short-term and long-term health effects are reported in this part, but there are also general concerns about both sorts of consequences because they are largely dependent on ambient circumstances, dosage, and individual susceptibility [21]. The short-term effects are transient and vary from basic discomfort to severe conditions such as asthma, pneumonia, bronchitis, lung and heart problems. They include eye irritation, nose, skin, throats, wheezing, cough, and chest tenderness. Air pollution can also induce short-term exposure to headaches, nausea, and dizziness [22]. These issues could be increased by extending long-term exposure to pollution, and by causing cancer and even rarity of mortality to neurological, reproductive, and respiratory systems. The pollutant component, its source, and dose should be linked to damage to target cells. Health consequences rely strongly on the country, region, season, and time as well. In connection to the foregoing criteria, the greater exposure time to the pollutant should also bias towards a longer-term health effect [23].

Impact on health from outdoor air pollution

Air pollution can be any air condition in which specific pollutants occur at levels that may have detrimental consequences for humans and their environment. Air pollution is a global health threat that has substantial public health consequences, especially for children and the elderly. All gases present in the atmosphere that are pollutants, particulates, and biologically derived particles are considered air pollution. The community demographic and social features can affect the vulnerability to air pollution [24]. 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. When people are exposed to high enough quantities of particular air pollutants, they may suffer the following symptoms:

- Irritation of the eyes, nose, and throat
- Wheezing, coughing, chest tightness, and breathing difficulties

- Worsening of existing lung and heart problems, such as asthma
- Increased risk of heart attack

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 [25].

Children's health risks

Increased exposure to air pollution is presented to children more prone to negative effects than to adults since children spend more time outside than adults; More respiratory tract issues have been connected with residency in the vicinity of high traffic density areas in children (e.g. wheeze, productive cough and hospitalization of asthma) (particularly truck traffic). Diverse childhood malignancies have been connected with traffic proximity by other research. Lung development has decreased in children with urbanization pollution (acid vapor, nitrogen dioxide, aerodynamically intermediate matter of particulates smaller than 2.5 [PM 2.5]), and primary carbon (diesel exhaust), and children who have spent more time outdoors have experienced larger lung growth deficiencies. Asthma, an illness that can be chronic, is perhaps the most common health issue induced by air pollution [26]. All recognized to trigger asthma have been ozone, sulfur, and particulates such as dust, ash, and nitrogen oxide. Approximately 30% of children with asthma are the direct effect of environmental pollution, especially air pollution from the outside. Health risks for seniors low to moderate levels of external air pollution in the older population can cause a significant rise in breathing issues. A 1980–1995 study of 65-year-old residents of Tokyo indicated that increased concentrations of airborne outdoor PM10 are associated with considerably higher levels of bronchitis and asthma. In Vancouver, Canada, greater PM2.5 levels were related to considerably greater levels of chronic obstructive pulmonary disease hospitalization among older patients. Higher outdoor levels of O₃, PM10, SO₂, and NO₂ in Minneapolis, Minnesota have been connected, though not with considerably greater intakes from chronic obstruction in the hospital in Birmingham, Alabama, with considerably higher rates of hospital admission of chronic pulmonary obstruction disease [27].

Planting hazards

Plants also exhibited reactions to air pollution, such as SO₂ and NO₂. In the lack of visual, i.e. chronic damage, visible damage typically develops after exposures to pollutant levels more than one point above the growth and yield threshold. Acute damage produced by these pollutants ranges from a tiny sting to huge areas of infected cells in the appearance of various necrotic lesions, with hues ranging from white to brown-black [24]. Air pollution can damage crops and trees in a variety

of ways. Ground-level ozone can lead to reductions in agricultural crop and commercial forest yields, reduced growth and survivability of tree seedlings, and increased plant susceptibility to disease, pests, and other environmental stresses (such as harsh weather). As described above, crop and forest damage can also result from acid rain and increased UV radiation caused by ozone depletion [28].

Risk to animals

An extreme UV radiation of the earth's atmosphere in the higher sun through the ozone level, which some of these pollutants may dissolve, can cause harm to the lung tissues of animals by producing wild skin cancer [29], which is found in the air. Toxic pollutants in the air, or deposited on soils or surface waters, can impact wildlife in a number of ways. Like humans, animals can experience health problems if they are exposed to sufficient concentrations of air toxics over time. Studies show that air toxins are contributing to birth defects, reproductive failure, and disease in animals. Persistent toxic air pollutants (those that break down slowly in the environment) are of particular concern in aquatic ecosystems. These pollutants accumulate in sediments and may biomagnify in tissues of animals at the top of the food chain to concentrations many times higher than in the water or air [30].

Risk to material

Air pollution has a wide range of consequences for materials, such as metal corrosion, material and layer deterioration, and dye fading. There have been several efforts to quantitative economic costs from harmful air pollution impacts [31]. Calcareous building shops and ferrous metals are the materials most vulnerable to pollution. Damage manifestations include weight losses and porosity, color, and breakdown alterations. In the case of stone, historical levels of pollution can hardly be separated from current levels and the in the lack of contaminants, baseline erosion rates or degradation can be calculated [32].

Impact on health from indoor air pollution

Indoor pollution originated with the use of flames in the caverns. There was no doubt that the problem with indoor air was far more obvious than it is today. Soot found on prehistoric cave ceilings provides ample evidence of excessive pollution coupled with insufficient ventilation of open fires. In the late 11th century, when the chemist first featured in Europe's households, in most big, medieval constructions the central hall that was ventilated with a roof cover remained. The chimney stacks were only in common usage throughout the sixteenth century. 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 [27].

Greater influence on women and babies

Energy methods in households vary greatly across the world, as does the resulting indoor air pollution death toll. While over two-thirds of indoor respiratory infection-related childhood deaths occur in the WHO Eastern and South-Eastern Asian regions, about half of the respiratory tract deaths caused by poor indoor air quality occur in the Western Pacific. In most countries, women are responsible for cooking and spend three to seven hours in a household every day preparing food. About 59 percent of all lady fatalities are due to household air pollution[34]. Some infants are usually carried on their mother's back or by the fire. As a result, newborns spend many hours each day inhaling indoor smoke, making them especially sensitive to dangerous contaminants [28]. Consequently, 56% of fatalities from household air pollution occurred for kids under the age of 5years old. Furthermore, Wives and kids may have a significant time impact on fuel collecting. This saves women time to build, including babysitting, activities and helps youngsters finish their schoolwork.

IMPACT OF AIR POLLUTION ON THE ENVIRONMENT

The environmental influence is shown hereby as most significant; The environmental influence is shown hereby as the most significant; acid precipitation (Rain, Fog, Snow), which contains deadly quantities of nitric and sulfuric acid, can be dry (particular and gaseous) rain. They can acidify the soil and water surroundings, harm trees, plants, and even harm structures, sculptures, and monuments in the open air [29].

Haze is produced when little particulates are dispersed throughout the air and the purity of the environment is obscured. Air emissions in manufacturing sites, power stations, automobiles, and vehicles are affected [30].

The ozone mentioned before exists on the ground as well as in the higher (stratospheric) atmosphere of the Earth. The ozone layer protects humans against dangerous UV radiation from the sun. On the other hand, ozone at the floor level is a pollutant that is damaging to human health. Sadly, ozone-depleting compounds in the stratosphere are being increasingly destroyed. If this protective temporary stratospheric ozone barrier is slenderized, UV radiation can be detrimental to human life and plant life on our earth. In plants, ozone enters the tomatoes and causes them to shut, inhibiting the transmission of carbon dioxide [31].

Worldwide climate change is a major human problem. As we know, the "greenhouse effect" maintains the earth's

stability. Anthropogenic activities have, regrettably, destroyed these protective thermal effects by generating enormous volumes of greenhouse gas emissions, and the warming of the world is accentuating with negative consequences for people. Research declares that global warming adds to impoverished people's health concerns. People living in badly unsuitable buildings and homes in warm climate nations are rising at high temperatures and face heat-health issues [32].

Animals are overburdened by hazardous air, ground, or water pollutants, such that animals may have health problems if high levels of pollutants are exhibited. Consideration was given to birth and hormonal problems [33].

CONCLUSION

As a result of constantly increasing anthropogenic activities and interventions, human beings have a significant influence on and influence various environmental components (for example air, water, and soil resources). Housing, working environment, outdoor environment, and transit environment, for example, provide several threats to human health. Accordingly, a major public good is targeted at achieving considerable social benefits throughout the globe to reduce severe environmental exposure impacts. The worldwide environmental burden of disease is acknowledged as one of the primary contributors to air pollution. Also in comparatively low contamination nation's concentrations, there is widespread scientific evidence of detrimental health impacts. Air pollution causes damage, including direct economic impacts, to land and aquatic resources. The sources and consequences of rising temperatures, as well as many other major environmental stresses, such as bad air quality, are all intertwined. The causes and impacts of global climate change, as well as many other local environmental stressors, such as poor air quality, are all intertwined. In short, air pollution has significant implications for both human and environmental health and therefore requires a holistic, comprehensive, integrated policy program. Additionally, governments all around the world need to make quick choices on motor vehicle-related air pollution to reduce future medical and environmental expenses. Additional research is necessary to lessen the detrimental impacts of pollutants on the health of atmospheric pollution, medicines, and nutritional treatments.

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**Persian Abstract****چکیده**

مشکل آلودگی هوا پیامدهایی بر سلامت انسان، محیط زیست و بخش‌های مختلف زندگی دارد. فن‌آوری مدرن منجر به آلودگی هوا و اثرات مخرب آن شده است، در حالی که جهان را به تلاش برای غلبه بر پیامدهای منفی آن سوق داده است. منشأ، ترکیب شیمیایی، اندازه و نحوه تخلیه در محیط‌های بیرونی یا درونی همگی آلاینده‌های هوا هستند. منابع صنعتی، تجاری، متحرک، شهری، منطقه‌ای، مزرعه و منابع طبیعی آلاینده‌های داخلی شامل پخت و پز و احتراق، احیای ذرات، مواد مورد استفاده برای منابع، کنترل دما و اقلام مصرفی، سیگار کشیدن، گرمایش و ترکیبات آلی است. منابع آلاینده داخلی آلودگی هوا بر بدن تأثیر می‌گذارد، از جمله سیستم تنفسی و اختلالات قلبی. آسم، برونشیت، بیماری ریوی، مشکلات قلبی عروقی، اختلال در عملکرد سیستم عصبی مرکزی و بیماری‌های پوستی شایع‌ترین اختلالات تنفسی و بیماری‌های انسداد مزمن ریه (COPD) هستند. چالش‌های ناشی از آلودگی هوای بیرون، خطرات سلامت عمومی مانند بیماری‌های قلبی عروقی، بیماری‌های تنفسی، COPD و عدم تقارن در سطح جهانی است. تأثیر فعالیت‌های انسانی بر کیفیت هوا و تغییرات آب و هوا ممکن است در اندازه‌های مختلف، از شهری گرفته تا منطقه‌ای، قاره‌ای و جهانی درک شود. رشد سریع جمعیت و افزایش مصرف انرژی، محرک‌های اصلی ورود مقادیر زیادی از مواد شیمیایی خطرناک و گازهای گلخانه‌ای به اتمسفر است که پیامدهای جدی برای سلامتی و محیط زیست دارد.