

The impact of air pollution on human health and Environment with mitigation Measures to reduce Air Pollution in Kabul Afghanistan

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Abstract: Air pollution is a serious issue in the world, which has a significant effect on both human health and environment. There are various sources of air pollution but vehicles and industrial processes lead to the majority of air pollution. The major air pollutants element is including, ground-level ozone, carbon monoxide, sulfur oxides, lead and nitrogen oxides. The consequence of the exposure to these toxicant impact human health including the respiratory disorders, cardiovascular diseases, nervous system, skin diseases, and chronic diseases such as cancer. Air pollution has a negative effect on various environmental aspects which directly or indirectly affect the quality of human health by progressing of some diseases such as asthma, lung cancer, autism, retinopathy, and low birth weight. The air pollution also causes various environmental effects to the groundwater, soil, and air which result in global warming, formation of acid rain, aerosol formation and depletion of Ozone and many other effects. This review article is an attempt to discuss the updated knowledge on the threat of major air pollution on human health and environment and discuss the sources of air pollution in Kabul. Finally, come up with the practical measures and recommendations to reduces air pollution in Kabul Afghanistan.

Keywords: Air pollution, Human Health, Environment, Diseases, Awareness, Kabul

I. INTRODUCTION

Air pollution has been a significant problem in recent decades, having a significant toxicological effect on human health and the environment. Pollution causes ranging from small amounts of cigarettes and natural sources like volcanic activity to massive amounts of pollution from vehicle vehicles and manufacturing activities Long-term consequences of air pollution on the emergence of diseases including respiratory, inflammations, cardiac disorders and cancer are widely accepted and air pollution is linked to millions of deaths globally each year. Latest research has found a connection between male sterility and air pollution (Ghorani-Azam, Riahi-Zanjani, & Balali-Mood, 2016).The Types of Air Pollution- (indoor and Outdoor) has been effected by the atmosphere and environment in global, and regional level. The major hazards posed by indoor air pollution are critical to consider. For instance, during which a large part of the population still relies on traditional biomass fuels for cooking and heating, indoor air pollution could pose an increased health threat than outdoor pollution. Burning these fuels in a confined area generates generally high levels of smoke as well as other pollutants (Six, 1999). An airborne substance which is regarded as an air pollutant can be averse to human health and the environment. Pollutants could be in the type of particles, dust particles of liquid, or gases. They may also be natural, or man-made. It may be classified as primary or secondary pollutants. Primary emissions are usually produced directly from the process, including ash from a volcanic eruption, carbon monoxide gas from an engine from either a motor vehicle or sulphur dioxide from factories. Secondary emissions aren't explicitly emitted. Instead, as primary pollutants respond, or connect, they form in air. ozone at ground level is one infamous example of a secondary pollutant. One of several secondary emissions that cause photochemical smog. Certain pollutants could be primary and secondary: they are both explicitly produced and formed from other primary pollutants (Choudhary, Mahendra Pratap and Garg, 2015).

Air pollution causes an estimated 7 million deaths a year, or one in eight early deaths annually which make it the greatest environmental health threat throughout the world and one of the world's biggest health risks-equivalent to "traditional" health hazards including smoking, high cholesterol, high blood pressure and overweight. There are almost 4.3 million air pollution-related deaths which are caused by air pollution indoor and 3.7 million deaths are caused from air pollution in the outdoors. The majority of the pollution-related deaths are from heart disease, led by chronic obstructive lung disease, severe and chronic respiratory diseases and cancers. The factors of air pollutant usually related to excess disease and death is PM_{2.5} (particulate matter less than 2.5 micrometers in diameter), which is extensively emitted both by diesel vehicles and wood, coal and kerosene combustion. There has been growing proof that nitrogen oxides (NO_x), a big contributor to ozone and released extensively by diesel vehicles, are also associated with significant health hazards (World Health Organization, 2012). The air pollution is having a significant health impact in society. The health consequences of pollution are serious—one third of stroke, lung cancer and heart disease deaths are caused by air emissions. Household air pollution kills 4 million people per year and continue to affect African countries and Asia in which every single source of polluting fuels and technologies is being used. Every other day for cooking, lighting and heating especially at home. Women and children who appear to spend longer indoors are most impacted by this. Air pollution is having a devastating impact on children. Globally, close to 14 per cent of children between the ages of 5 and 18 have asthma related to factors including air pollution. 543 000 children younger than 5 years die every year from pollution-related respiratory illness. There is also a connection between air pollution and childhood cancers. Pregnant women are vulnerable to air pollution, which can affect the development of the fetal brain. In each of these children and adults air pollution is also linked with cognitive decline. About 20% of the worldwide Earth's population lacks adequate access to safe water, while around 40% suffer from the consequences of disgraceful hygienic cases. The rise in surface / soil emissions could affect human and terrestrial life structures a considerable amount (Fajardo et al., 2016). In addition, A considerable fear that air pollutants (particularly sulfur oxides, ozone, and nitrogen oxides) can change plant physiological processes and therefore impact growth patterns. Air pollutants harm the nails of the leaves and damage the conductivity of the stomata. They could also affect photosynthetic systems, leaves longevity, and carbon distribution trends in plants. Emissions communicate with the other external factors and could even affect interactions between plant and climate at such a regional level (Zhong, Yu, & Zhu, 2019)

No major epidemiological research in Afghanistan has been undertaken to determine the effect of air pollution on public health, primarily due to the lack of data on air quality. However, a range of newspaper articles record concerns from residents about the rising pollution and its health impacts for instance, Storms of dust in the northeastern province of Nimroz allegedly caused vehicle accidents and lead to death. (Quirishi and Hyder, 2006). A public opinion survey conducted by ADB and NEPA in Kabul from 28 May to 26 June 2005 further confirms concerns about the effect of air pollution on public health. Approximately half (46%) of the respondents stated they face breathing problem while others reported skin issues and irritations to their eyes, nose and throat. (ADB, 2006) The issue of air pollution is one of the greatest challenges facing the Afghan people, especially the Afghan's living in Afghanistan's Capital (Kabul). Kabul city is suffering from a lack air quality and overpopulation. Kabul, a town of around 6 million residents, became one of the world's worst polluted cities among other polluted cities like New Delhi and Beijing. The four decades of war have damaged the city infrastructure and led to the overpopulation and storm of displaced people ("Afghan capital's air pollution may be even deadlier than war," 2019). In recent years, the air quality in the city has worsened which makes the visibility down to less than a hundred meters in most days. (B. A. Sediqi, n.d.).

II. AIR POLLUTION

Clean air is very crucial to all living human and animals for being healthy and their well-being. Nevertheless, the air is constantly polluted because of unstoppable urban development. Urban indoor air is more polluted than the overall environment due to high population size and human activity; it emits air contaminants at a greater rate relative to less developed areas and natural world (Oliver Ling, Ting, Shaharuddin, Kadaruddin, & Yaakob, 2010). Many cities in developing countries experience increasing pollution from vehicle emissions as well as from manufacturing and domestic heating resources at rates that surpass the potential to spread and dilute pollutants to semi-harmful exposure levels

(UN, 2001). according to World Health Organization (WHO) reported the consequence of air pollution as an infamous public health issue which led to premature deaths of 2 million annually could be linked to the effects of urban outdoor air pollutant and indoor pollutant. (WHO, 2006). Pollution, an unnatural destruction by man and naturally caused threats to the natural world, is a problem the world is facing today. The number of individuals is growing rapidly, due to the expansion of the world population. Emissions is accepted as an issue, not for a group but for everyone. The pollution of the

environment includes pollution of air, water and land (or soil). Poor are most vulnerable group effected by Air and climate pollutants however, poor are not specifically victims of air pollution society. In general, minimizing the threats of household pollution from smoky wood and coal cook stoves could help reduce the burden of disease connected to poverty. In many lowand middle-income cities and (Mabahwi, Leh, & Omar, 2014). Air and climate pollutants have their greatest health impacts among the poor – but the poor are not the only victims of air pollution. Reducing household pollution risks from smoky biomass and coal cook stoves, in particular, can help alleviate the burden of poverty-related diseases. Urban air pollution levels also tend to be higher in many Including middle-income cities, and big-income towns in bad neighborhoods. This means cuts in SLCPs could bring extremely significant medical benefits to lower income brackets as well as to kids, elderly man or women (World Health Organiation, 2012).

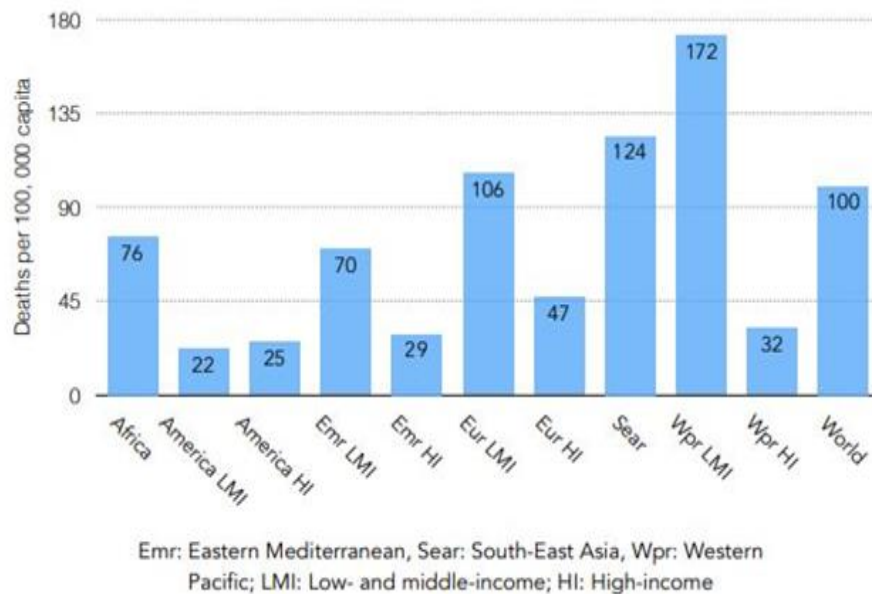


Fig1: Deaths per capita attributable to the joint effects of household air pollution and ambient air pollution by region, 2012 (C. Dora, WHO)

III. FACTORS RESPONSIBLE FOR AIR POLLUTION

Air pollution is the result of both human activities as well as natural events. Air-polluting natural phenomena involve wildfires, earthquakes, wind erosion, pollen distribution, organic chemical precipitation, and natural radiation. Air pollution sources refer to the different locations, behaviours or causes that are accountable for the emission of contaminants into the air (Nakashima, 1975). The causes of pollution could be categorized by their composition, primarily as natural, chemical and biological origins, furthermore as natural and manmade sources, further relevant to or not linked to the climate change. The physical atmospheric pollution is indeed a result of an energy consumption including sound and heat energy. Most significant causes of environmental emissions are specific thermal, environmental or anthropogenic. The local weather is changed by the heat (nutritional input) generated by industry, households, agriculture and transportation as well as the air from the atmosphere will have an elevated regional heat. Indirect environmental emission results from the greenhouse gases which occurs in the troposphere and is associated with natural anthropogenic pollution and its greenhouse gases. The chemical pollution of the environment is a result of the application of chemicals into the constituents of the natural air and is of organic and inorganic source (Popescu & Ionel, 2010). Air pollutants occur from both natural phenomena (volcanic activities, rivers, wetlands, etc.) and human actions (combustion of fossil fuels, transportation, emissions from power stations, or pollution from certain industrial processes). Classification of air pollutants could be as primary or secondary. Primary pollutants are materials which are generated directly by a method, including ash from a volcanic explosion or monoxide gas from an exhaust from a vehicle. Throughout the lower atmosphere, primary pollutants could be converted by radiation and energy into secondary pollutants, like ozone (O₃) as well as other photochemical pollutants (Pénard-Morand & Annesi-Maesano, 2004). The majority of air pollution in urban areas originates from mad-made sources. These sources may either be categorized as mobile (cars, buses, aircraft, marine vessels, etc.) or point-source (factories, power plants, etc.). To date, traffic is the leading cause of pollution in the main industrialized world's cities. Carbon burning was composed of oils (natural gas, diesel fuel, wood,. NO_x is the

consequence of mixing air nitrogen and oxygen from either the combustion at a temperature of coal and oil found within engine fuel. Due to coal, chemical industries and transportation, and NO_x from burning in power plants and automobiles, human actions increased the number of VOCs. O₃ is therefore, more intense and smog exists more than in populated and industrial areas (Pénard-Morand & Annesi-Maesano, 2004).

Industry responsible for 21% of greenhouse gases of the us, whereas electricity generation stood with another 31%, as per the Union of Concerned Scientists. In the meantime, petrol-burning vehicle emissions-i.e. CO, CO₂, nitrogen oxides, particulates and water vapour are a major source of pollution (“Sources of Greenhouse Gas Emissions | Greenhouse Gas (GHG) Emissions | US EPA,” 2017) . Furthermore, Natural sources of pollution were those resulting from natural phenomena. This indicates that they have been triggered by regular events not man-made or the product of human activity. There are several types of natural causes of air pollution, such as dust that fall from natural sources, typically arising without or little plants in exhausted areas. Kabul town is suffering from poor air quality and overpopulation. The city's air temperature condition has degraded so much in recent years that it might rank amongst the world's worst cities when it comes to air pollution. Various carcinogenic substances resulting from burning tires, plastic, recycled motor oil, as well as other materials are emitted into the air. There are many factors which lead to pollution in this city of Kabul. The big air pollution cases the city to use many old and smoking cars, Burning plastic, recycled engine oil and tires as a fuel source-Urban gentrification. The city's bowl-shaped landscape surrounding by both the mountains which trap air pollutants and induce inversion (A. Sediqi, 2010).

IV. HEALTH EFFECTS OF AIR POLLUTION

Any unusual suspended material in the atmosphere that triggers difficulty in the function of the human bodies is described as air toxicants. Based on the most recent evidence available, air pollutant contamination mainly affects the respiratory, cardiovascular, ophthalmological, dermatological, neuropsychiatric, hematological, immunological and reproductive organs. Nevertheless, the long-term exposure of substances and cells can also cause a number of cancers. From the other side, this is proven that even small concentrations of air toxins are dangerous for vulnerable groups like children and the elderly people, as well as patients with respiratory and cardiovascular disease. Air contaminants are constantly contributing towards higher mortality and hospitalization. The various nature of emissions, the dosage and frequency of ingestion, and the fact that so many people are typically subjected to pollutant mixtures as opposed to a single contaminant, could have a variety of effects on human health. Impact on public health can vary between discomfort and breathing difficulties or discomfort of the skin to cancer. They also include deformities, serious pediatric developmental delays, And decreased immune system function that leads to the variety of diseases (Kampa & Castanas, 2008).

According the 2008 report of the World Health Organization (WHO), about 1.3 million deaths globally were reported to also be attributable to ambient air pollution. In year 2012, the figure increased to 3.7 million, that was almost tripled. Two million deaths were attributed to the effects of pollution from the households in 2008. This numbers also raised since almost doubled (4.3 million) based to WHO's most recent report based on 2012 (Sahidin, 2018). Worldwide, the combined consequences of household and ambient air pollution in 2012 were attributable to Seven million deaths. A variety of toxicological and clinical studies conducted in low- nations have found a link between indoor. Based on the meta-analysis reported by Pope and colleagues determined that the RR of low birth weight and stillbirth attributable to indoor air pollution in developing nations was 21 percent and 26 percent, respectively.

Furthermore, more recent systematic review found a clear link between household air emissions through solid fuel usage as well as the risk of adverse events of pregnancy; such exposures culminated in such an 86.43 g decline in low birth and a 35 per cent and 29 per cent increased risk of birth weight and stillbirth. Interventions aimed at reducing exposure to household air pollution will result in an improvement of survival outcomes for all children (Mannucci & Franchini, 2017). There are much other long-term health effects of air pollution on human. In addition to the above series effect of air pollution the skin is also can be affected because the skin especially the epidermis 'upper surface, performs the role of a shield, but also one of the air pollutants' first major objectives. Pollutants involve environmental contaminants and that of anthropogenic origin(Drakaki, Dessinioti, & Antoniou, 2014) The pollutants which effect the human skin are including ultraviolet radiation (UVR), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), nitrogen oxides (NO_x), particulate matter (PM), and tobacco smoke are major air contaminants with skin consequences. In the nature of other air pollutants and also with the interaction of UVR, the actions of various air pollutants can be exacerbated and form significant inert ingredients of pro-oxidant smog (Valacchi et al., 2012).

a) Respiratory disorders:

The gateway of almost 15,00 liters of air are respiratory system which air access through the nostrils, and arriving at the fragile system structured by the lung parenchyma after its correct conducting. Gas absorption occurs at such a site, and oxygen diffuses through cytoplasm Pneumocystis I to reach the hemoglobin of the erythrocyte, moving through endothelial cell (Fortoul et al., 2011). We bring air pollutants deep into our lungs as we breathe in polluted air, so it is no surprise that pollution is doing significant harm to the respiratory system. being valunerable to to air pollution can induce cases of cancer of allergies, exacerbate (aggravate) an established respiratory disease and lead to chronic diseases, like lung cancer, to grow or improve the chronic disruptive pulmonic disease, and emphysema. Air pollutants frequently negatively and seriously affect the function of the lungs, providing an potential risk variable for the subsequent development of lung diseases (Responsibility, 2009). In recent years the effect of air pollutants on the respiratory system has been recorded extensively and regularly. Brief-term consequences involve reductions in lung function, changes in immune factors and respiratory symptoms, arrhythmias of coronary artery disease (COPD) and infections. Air pollution increases the intensity infections of respiratory system specially among children. In general, outdoor contamination in large cities is correlated with such a high burden of multiple acute respiratory infections, which together contribute for about a third of all deaths in children under age of 5. (Kim, Chen, Zhou, & Huang, 2018).

b) Cardiovascular dysfunctions

In urban community's pollution is progressively known as a significant and changeable determining factor of cardiovascular disease. Severe exposure has been associated with a variety of adverse cardiovascular outcomes such angina hospital admissions, infarction and heart failure. Long-term infection increases the risk of mortality from cardiovascular disease in a person's life. The main arbitrator of such negative health effects would likely to be nanoparticles resulting from burning that contain toxic organic and transition metal components (Mills et al., 2009). Based on a 2013 meta-analysis, the estimated cardiovascular death rise of 11 per cent was associated with such a rise of 10 µg / m³ in yearly PM_{2.5} concentrations. Mortality connected with coronary heart disease was observed with the highest correlations, and persisted even after correction for cardiovascular variables and socioeconomic status. Nevertheless, in certain research, negative effects of PM_{2.5} were higher for persons with the poorest education, possibly due to low fruit intake due to low antioxidants intake. Fine and antireflective coating particles had the most significant effect on cardiovascular disease compared to small particles. In addition, the nature of PM is an important issue to consider, with findings showing greater cardiovascular toxicity of carbonaceous pollutants from combustion sources, including road traffic, fossil fuels and wood burning (Dakkak W, 2017)

c) Nervous System

Air pollution has also been correlated with nervous system (CNS) diseases throughout the recent history, namely stroke, Alzheimer's disease, Parkinson's disease, and neurodevelopmental disorders. It's been shown that various pollution materials, such as nanosized particles, can effectively be transferred to the CNS in which immune cell defenses can be triggered. Consequently, systemic activation of the respiratory or cardiovascular system could impact the lives of the CNS. Epidemiological and observational research have also shown that sensitivity to environmental pollutants could already lead to neurodegenerative disease outcomes from early childhood, on, particularly once the persons are subjected to the pollutants continuously. Air pollutants may directly affect the CNS by carrying nanosied particles into the CNS, or indirectly by chronic inflammations. Any of the other consequences can be triggered by the particle's own physical characteristics or by toxic substances that solubilize on the particles (Genc, Zadeoglulari, Fuss, & Genc, 2012).

V. ENVIRONMENTAL EFFECTS OF AIR POLLUTION

In ecological terms, pollution can cause substantial risk to the groundwater, soils and atmosphere (Lovett et al., 2009). This also poses a significant threat to life's diversity. Research of the interaction between pollution and habitat diversity reduction clearly show the detrimental effects of environmental pollutants on plants and animals extinction of species(Camargo & Alonso, 2006). Toxicants which are suspended through air could also trigger reproductive effects in animals. Several significant ecological effects of air pollution involve acid rain, temperature inversion and global climate change due to greenhouse gas emissions to the atmosphere(Hashimoto, 2019) . Various environmental impacts could be caused by air pollution, including acid rain, soil erosion, haze and ozone depletion, forest degradation and global climate change. (Patrick, 2016). In the past 150 years, mankind has pumped enough carbon dioxide to increase their levels above what they've been for hundreds of thousands of years. Certain greenhouse gases contain methane from sources such as

landfills, the natural gas industry and livestock emissions and sulfur oxides (CFCs), that were used in the solvents and aerosol liquid fuel until their deteriorating impact on the Earth's ozone layer was prohibited throughout the late 1980's ("Air pollution, facts and information," 2019).

a) Global warming: Global warming mostly indicates the worst environmental consequences of air pollution. The global warming increase the temperature of the planet's surface which could lead to a worldwide impact. Based on the opening of the climate scientists the main cause of climate change is the greenhouse effect. Greenhouse gases absorb heat and certainly-emit in every way, heating up the lower atmospheric and the ground of the Earth. The combustion of oil and fossil fuels, mainly from outlets including automotive combustion engines and chemical manufacturing, emit large quantities of molecules in to the atmosphere, where they react with carbon dioxide (CO₂) with oxygen. ("Air pollution effects: Global Warming | AirGO," 2018). Based on the most recent estimates, since 1998, all the 10 hottest years on history occurred, and since 2005, 9 of the 10 occurred. Year 1998 has been one of the ten warmest periods on record from the nineteenth century. going through the previous history to the year of 1988, a trend emerges: with the exception of 2011, as each new year is applied to the historical evidence, it becomes one of the top 10 warmest in record today ("Climate Change: Global Temperature | NOAA Climate.gov," 2020)

b) Formation of photochemical smog: At ground level photochemical smog is defined by elevated ozone concentrations. It forms when, underneath the control of sunshine and temperatures, urban air pollutants, primarily nitrogen oxides (NO_x) and reactive organic matter (ROC) from automobiles and several other origins react together for a few hours (Grieco, Mountford, & Kleinfelder, 1996). Photochemical smog impacts people's health by decreasing surface-level ozone concentrations can irritate the skin, nose and throat. As smog enhances, it can trigger further severe health issues, namely asthma, bronchitis, coughing and chest pain; it also improves sensitivity to respiratory infections and reduces lung function and physical performance. (Cockerill, n.d.).

c) Formation of acid rain: Acid rain is considered to be among the main hazardous environmental polluting factors. This rain contains greater levels of both the hydrogen ions (H⁺) due to sulphur and nitric contamination. It reduces the pH (potential hydrogen) scale of marine environments Northeast America, Central Europe and China were identified as the world has ever known three main areas influenced by acid rain (Zhang, Lee, & Cao, 2011). In the contemporary globalized world, the adverse impact of acid rain is considered one of the most severe environmental problems. The consequences of acid rain have penetrated significantly in the industrialized countries that are influenced by global ecology. For most countries of the world, it becomes a major local environmental issue. Recently, international alarm regarding acid rain has risen due to global pollution, such as fish kills, dying trees, mortality of lakes and other marshes, and damage to temples and other historical objects (Mohajan, 2019). The main cause of acid rain is the excessive presence of sulfur dioxide and nitrogen oxides in rain water. Caused by human actions, including burning of coal and oil in electric power plants, recyclable waste, vehicles and aviation, emissions of these gasses have increased in the environment. A few developed countries have adopted steps to reduce the gases causing acid rain. To reduce and secure global acid rain, the triggers and protection methods of it have to be identified (Mohajan, 2019).

d) Aerosol formation: Aerosol pollutants are ubiquitous in the Atmosphere, and are essential to several environmental concerns; from both the convective budget of the Planet to human safety. Availability of both the size of aerosols and chemical composition are crucial parameters which determine their atmospheric mechanics. Anthropogenic and natural sources of aerosols occur from vehicle emissions to dust resuspension. For urban areas, atmospheric aerosol concentrations are elevated with lower levels at rural sites. Atmospheric aerosols arise from either natural phenomena or from human induced exercise. Major natural aerosol causes involve volcanic emissions, marine spray, and pollution of mineral dust, while anthropogenic sources include manufacturing and burning processes. PM influences could be main in nature or secondary in nature. The primary sources are primarily natural, although secondary molecules arise from the chemical conversion of carbon dioxide precursors such as sulphur dioxide, nitrogen oxides and volatile organic compounds (Colbeck & Lazaridis, 2010). Aerosol could affect solar activity and thermal force, in exchange impacting the Earth system's atmosphere and geothermal-causeologic cycle, it might strongly affect human living condition. While several studies have been conducted on the influence of spray on weather, the effect (particularly the indirect effect) of spray on climate remains unclear (Ren-Jian, Kin-Fai, & Zhen-Xing, 2012).

Aerosol particles are ubiquitous in the Earth's atmosphere and are central to many environmental issues; ranging from the Earth's radiative budget to human health. Aerosol size distribution and chemical composition are crucial parameters that determine their dynamics in the atmosphere. Sources of aerosols are both anthropogenic and natural

ranging from vehicular emissions to dust resuspension. Ambient concentrations of aerosols are elevated in urban areas with lower values at rural sites

e) **Depletion of Ozone:** Ozone (O₃) is a stratospheric surface that plays a major role in helping survival of the human race. For several economic, biological, and ecological phenomena it is an essential factor. The rain-emitted ultraviolet (UV) radiation are captured by ozone and thus provide a healthy ontological structure in the biosphere. Different anthropogenic behaviors including pollution of CFCs, HCFCs, as well as other organ halogens contribute to ozone depletion. The loss of ozone resulted in the secondary generation of an ozone layer close to the ground (terrestrial ozone layer), which is responsible for adverse effects on plants, humans and climate with an increased number of bronchial diseases in humans (Aggarwal et al., 2013). Ozone depletion happens once the usual equilibrium between stratospheric ozone production and degradation is disrupted. Though environmental occurrence that trigger depletion of ozone, human activities such as CFCs are now recognized as the primary cause of depletion. All chemicals which deplete ozone include chlorine and bromine. CFCs seem to be extremely volatile and non-combustible, so they disappear very rapidly and therefore can barely reach the ozone particles throughout the stratosphere. (Anwar, Chaudhry, Nazeer, Zaman, & Azam, 2016) .

VI. AIR POLLUTION IN KABUL AFGHANISTAN

Air pollution has currently caused several environmental and health problems in Afghanistan as a developing nation. Afghanistan is identified one of the most endangered nations in the world attributable to the negative effects of climate change according to the United Nations Framework Convention on Climate Change. Afghanistan is more susceptible to climate change at the 2018 Global Risk Index, and least competent for the effects. The dangers depend primarily on Afghanistan's location and topography, but the exposure of the country to disaster also relies on the combination of low risk and low awareness, readiness and ability for disaster risk management. (Beier, 2019). Furthermore, air pollution levels in many urban areas of Afghanistan are particularly high. In the year 2005–6 a systematic study was conducted out on Kabul air quality. It revealed susceptibility to elevated amounts of particulates PM₁₀ (fine anthropogenic dust), nitrous oxides (NO_x) and sulfur dioxide (SO₂) by 60% of the populace. It induces an estimated increase around 2 000 people per year in deaths, increased respiratory diseases and allergies. Though a majority of the public accepted that Kabul air quality is low and unacceptable (89 per cent), only 30 per cent thought that air pollution in the region influenced them tremendously.

The primary factors contributing are persistent utilization outdated and poor maintenance vehicles; poor fuel quality; small-capacity roads in poor repair; and rapidly increasing vehicle numbers. In winter, the capital city Kabul is coated with a cover of dust and pollutants at nighttime and in the mornings due to a phenomenon known "atmospheric inversion" that collects pollutants around the region. Air pollution seems to be very high throughout spring and summer whenever the air is dry and dusty which lead to spike in asthma attacks (NEPA, 2008). based on the Ministry of Public Health (MoPH), the consequence of air pollution in the capital of Afghanistan air pollution in Kabul will lead to the death of more than 3,000 people per year. The MoPH epidemiological research also indicate that cardiovascular and respiratory diseases due to water pollution in Kabul increase the total death rate of the nation by four percent per year (irinnews, 2009). Based on the estimation of Afghanistan Government air pollution in Kabul case almost 3,000 deaths per year which is high as last year's number of civilians killed in Afghanistan during the ongoing war (Laura, 2012). In the following table PAH pollution from automobile emissions throughout the years of 2002 to 2004. Since 2004, the overall number of vehicles recorded in Afghanistan were 402,422, about 18% more than in 2003 and 129% than in 2002 (ADB, 2006)

Number of Vehicles in Afghanistan

Vehicle Type	2002	2003	2004
Lorries/Trucks	51,527	76,236	83,374
Buses	29,098	40,042	40,590
Passenger Cars (small Cars and Taxis)	71,222	176,723	197,449
Motorcycle	13,189	33,098	62,417
Foreign Vehicles	9,900	10,458	12,237
Rickshaws	419	3,044	6,355
Total	175,355	339,601	402,422

Source: Ministry of Economy and Planning (2005).

Fig2: Number of vehicles in Afghanistan

In addition, homes in urban areas often depend on fuelwood from forests to increase production for everyday cooking and sometimes use waste plastics and leather as fuel as well. In 85% of rural homes and about 15% of urban households, animal manure is used. the table below table describes the national-sector fuel.

Usage of Domestic Fuels for Cooking, and Space and Water Heating, 2002

Fuel	Overall Share of Household Use (%)	Tons Per Year
Fuelwood	65	6,144,775
Charcoal/Others	25	1,012,875
Coal	3	121,545
Kerosene	2	54,676
Liquefied Petroleum Gas	5	135,050

Source: ADB (2006c).

Fig3: Usage of Domestic fuel for cooking, and Space and Water Heating,2002

A major source of air pollution throughout the country is use of diesel generators during power shortages. In the city of Kabul only around 173,755 diesels (99 per cent) are there and differing ability gasoline power generators. Almost all of those generators (99.5 percent) are used by households

VII. SOURCES OF AIR POLLUTION IN KABUL

There are vary of factors responsible for the deterioration of the air quality in the Kabul city. The majoring of these sources of pollution emerge through vehicle exhausts (diesel, petrol). High numbers old vehicles that release more smoke by their exhausts including CO₂, CO, NO₂, SO₂, PMs and others, which all cause large emissions and constitute a "significant" health threat of residents of Kabul. Based on the sampling of the United Nations Environment Program (UNEP) which was carried out find out that the large concentrations of polyaromatic hydrocarbons (PAHs) and dust. The inventory of pollution implies that perhaps the greatest source of pollution in the region are mobile sources led by generators (ADB, 2006) .

Inventory of Emissions of Air Pollutants in Kabul (Annual Emissions, Tons)

Source	PM	NO _x	SO ₂	CO	CO ₂	TOC
Vehicles						
Gasoline Vehicles	310	1,700	113	34,450	—	—
Diesel Vehicles	1,387	9,475	1,625	9,615	—	—
Resuspension	7,278	—	—	—	—	—
Total Vehicles	8,976	11,175	1,739	44,065	—	—
Residential Sources						
Residential/Commercial Heating	5,562	1,241	381	38,077	511,833	7,333
Bakeries	463	44	7	3,492	—	736
Hammams	160	15	2	1,209	—	255
Total Residential Sources	6,408	4,431	597	45,807	632,655	8,648
Industrial Sources						
Thermal Power Plant	63	347	110	32	—	16
Industrial Generators	12	185	10	7,121	17,629	239
Brick Kilns	3,691	44	25	44	30	0.19
Asphalt	448	2	3	0.10	532	0.64
Total Industrial Sources	4,214	578	148	7,197	18,191	256
Grand Total	19,597	16,183	2,484	97,068	650,846	8,903

PM = particulate matter, NO_x = Nitrogen oxide, SO₂ = Sulfur dioxide, CO = Carbon monoxide, CO₂ = Carbon dioxide, TOC = total organic carbon.
Hammams = public bathhouse.
Source: ADB (2006d).

Fig4: Inventory of Emissions of Air Pollutions in Kabul (Annual Emissions, Tons)

VIII. PROPOSED CONCEPTUAL SOLUTION

Industrialization is undoubtedly a key component of every country's economic growth. This improvement also caused negative impact where industrial pollution is held responsible for the dangers to health as well as to the environment.in addition to air pollution ,the impact could be further by creating noise, vibrations, enervators greenhouse effect and social issues such us anxiety and exhaustion (Magsi, 2015). By comparison to other cities around the world, Kabul has taken no substantial efforts to reduce air pollution. Realizing that transportation is indeed a significant source of air pollution in Kabul city, any strategy directed at reducing or controlling air pollution should include a program for enhancing

transportation. There are still some effective solutions for reducing air pollution in Afghanistan. Kabul's primary pollution control strategies need to consider the enhancement of Kabul transportation system by reducing the number of private vehicles and limiting the imports of older cars and imposing taxes on hybrid cars, strictly controlling the performance of imported fuel, encouraging the citizen for the low sulfur diesel usage, to control engine situations.

Although combustion in outdated or poorly managed vehicles is a primary cause of monoxide and unburnt hydrocarbon pollution, enforcement of preventive maintenance standards must be additional traffic goal. In addition, the necessity of compulsory program and methods implemented in other countries for the betterment and improvement of air quality in the Kabul city. This method is already implemented in United States of America. In addition, the government need find a way for reducing of lead and sulfur and improve the construction of the city to prevent from populated the dusty roads, clear areas, and encourage green ecosystem which will significantly reduce air pollution caused from dust and winds. Furthermore, The government need to pass legislation and implement it on all mass media for awareness campaign on air pollution and organizing program and projects to aware the community about health impact of air pollution ,prevention of air pollution and the recycling (B. A. Sediqi, n.d.).In this article some important strategies have been recommended to reduce the air pollution in Kabul.:

A. Improving the transport sector: The improvement in the transportation sector is one of the key solution to reduce the air pollution in Kabul city. The transport sector generates almost half of world oil output and emits about a fifth of all anthropogenic carbon dioxide emissions. IN Kabul it's necessary to control use of old car as well as its import. In order to tackle air pollution the transport system needs to be strengthened by upgrading old buses, private vehicles with new, cleaner and more efficient technology. In addition, there should be vehicle maintenance policy which will enhance the number of cars maintained and possibly working on gross-emitter / high-mileage vehicles. In addition, the infrastructure need to be improved and designed and constructed for ensuring the quality of air pollution in the city by promoting green transport modes. This green transportation is a standard method for Afghanistan is to make sure "Affordable", "Safe", "Clean", "Accessible" and "Integrated" in Afghanistan. Green urban transport should be 'clean' in Kabul Clean transportation considers transport's contributions to the nation's wider environmental objectives in order to reduce air pollutants, traffic pollution and greenhouse gas emissions, and the protection of the soil and water (Habibzai, 2014). Also, Research reveals that the poorest road infrastructure and transportation system in South Asia is in Afghanistan. Current infrastructure is limited in Afghanistan and that is essential for a successful transport sector. 85 per cent of the country's road system is in poor or unpaved state. The transportation sector is known as the major source of air pollution in large cities in Afghanistan (*Challenges of Traffic Development in Kabul City*, 2010). There is indeed a huge demand and need for a nation-wide rail transport service, particularly connecting rural areas, however the country's insecure environment doesn't provide the resources needed to build a suitable railway system(Project, Liyanage, Dias, Amaratunga, & Haigh, 2017).

B. Standardization of vehicle's fuel: One of the way to reduce the air pollution is to reduce the usage of the fuel at per unit of travel could have significant benefits in reducing emissions of hazardous urban pollutants, including fine particulate matter, which might also lead to decreases in greenhouse gas (GHG) emissions. The main drawbacks to this arise where steps are taken to boost fuel economy at the cost of increased emissions of local pollutants (Vehicle Technology) or by moving from Gasoline fuel consumption to diesel. There are also many ways to minimize the air pollution. The important way is increasing the inherent fuel economy for all private vehicles. Also, we need to promote vehicle operations which reduce fuel consumption. Furthermore, there is an efficient way for reduction in air pollution of certain pollutants. For example, by reducing lead and sulphur in fuel could reduce air pollution which are associated with lead aerosols or sulphate based particulates. Moving the form of transportation, such as those from motorized to non-motorized transport or through private vehicles to public transit, could also reduce fuel usage. Encouraging or preserving non-motorized transport could usually proceed to a significantly reduced fuel efficiency and could in every situation be supported for equity purposes. Among the most significant steps developing nations could undertake to improve the fuel economy is moving from mechanical to electronic fuel injection (Gwilliam & Kojima, 2004)

C. Public awareness to reduce air pollution. Awareness is perhaps one of the efficient and effective methods of tackling the issue of air pollution, certain actions should be taken that need greater attention, such as school and university environmental education, environmental campaigns as well as other green plans including both governmental and non-governmental organizations. Media is also a platform where it can be used to aware people by providing the best reason for air pollution as well as its challenges, actively communicating and passing issues to public by effective means, attempting to radically habituate citizens and motivating them to do air pollution management activities. It must also

make the audience prioritize to their participation in efforts to reduce air pollution. One of the most critical measures that developing nations could take to improve the fuel efficiency is moving from mechanical to electronic fuel injection. Also, trying to target the public at large in shaping attitudes toward air pollution and its health consequences. The public need to be educated to develop an understanding of how much the amount of their individual decisions impacts day-to-day standard of living they live. The need for such an awareness indicates that public education and literacy are requirements in every society. (Gorham, 2002).

1X. CONCLUSION

Air pollution has been a major concern of past several decades, with considerable toxicological impacts on human health and the environment. Air pollution sources range from small units of tobacco and natural sources including volcanic activity to large volumes of pollution from vehicle engines and manufacturing operations. Pollution is regarded as the main environmental risk factors. In the occurrence and development of certain diseases, including asthma, lung cancer, ventricular hypertrophy, Alzheimer's and Parkinson's disorders. Air pollution has become an enormous challenge on Kabul people, threatening the lives of thousands of people each year. The condition is evident to escalate in the years to come unless immediate corrective measures are taken in time. This is of the utmost importance to educate ordinary people about dangerous implications of pollution and also to prevent the necessary preventative ranges of immortal income. In this article the impact of air pollution on human health and environment with the major sources of air pollution in Kabul have been discussed. The article has also purposed solution and recommendation to reduce air pollution in this city.

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