



## Review

## Impact of climate change on health in Afghanistan amidst a humanitarian crisis

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## ABSTRACT

Climate change is considered an important factor contributing to increased mortality and morbidity. Particularly, climate change in Kabul, Afghanistan has affected the health of millions of people by increasing their susceptibility to infectious diseases, respiratory problems, and other health conditions. Prompt climate preservation and health-related interventions could be a community-wide approach to improve the current conditions. In this review paper, we highlight the health implications associated with climate change in Afghanistan and discuss preventive measures to tackle the climate-associated adverse health conditions in the future.

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## Introduction

The accelerating deterioration of human health due to climate change is one of the major ongoing worldwide concerns. Climate change possesses both direct and indirect impacts on human health [1]. Fatalities, injuries, and mental health impacts due to dreadful storms, flooding, and intense heat waves are a few of the direct impacts of climate change on human lives. Besides this, respiratory problems, cardiovascular diseases, malnutrition, and diarrheal diseases are some of the indirect long-term impacts of the global climate revolution [1]. Climate change is consolidated in a major way by geographical location, demographics, and economic resources [2].

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Afghanistan, a landlocked country with a population of 39 million, has been severely affected by climate change since it began due to negligence, depleted resources, and continuing political turmoil [3]. According to the World Health Organization (WHO), deaths due to environmental risks and pollution constitute 26% of overall mortality in Afghanistan [4].

*Kabul, Afghanistan*

Kabul is the most populated city in Afghanistan with an average population of over 4.6 million people [5]. Rapid urbanization has led to the capital city being the fifth fastest-growing in the world, with a population that is currently increasing at a growth rate of 2.71% per year and estimated to rise above 6.7 million by 2035 [5,6]. Such estimates raise alarming concerns for the health, environmental, and economic sectors of the city. Of these, climate change, including a potential temperature rise, could result in drastic health implications for the densely populated area [7,8]. As overcrowding ensues, old cars, poor quality fuel, trash burning, industrial brick

kilns, and small-scale smelting plants, as well as pollution coming from power plants, generators, and households, have caused air pollution levels to increase; this rise in air pollution could subsequently decrease the life expectancy of Kabul's resident by one year and eight months [9].

With some of these concerns being addressed separately, the impact of climate change on Kabul is an issue that is yet to be discussed. Overpopulation in the capital has led to starvation, poverty, unemployment, insufficient natural resources, infectious disease transmission, and declining mental health. It also contributes to global warming, which worsens the aforementioned issues. Infections like tuberculosis, HIV, poliomyelitis, pneumonia, and hepatitis C along with malnutrition, leprosy, and maternal deaths are on the rise in Kabul [10,11]. These factors, along with COVID-19 and the economic and humanitarian crises from the Taliban's seizure of the country in August 2021, will drastically increase many health concerns [12,13,14]. This paper will highlight how climate change in Afghanistan will also worsen health amidst these multiple crises.

## Methods

A comprehensive literature search was performed using PubMed and Google Scholar databases using the search terms "climate change" and "health implications" in Afghanistan. Other search terms included; "heat illness", "infectious diseases", "air pollution", "drought", "malnutrition", "respiratory diseases", "gastrointestinal diseases" and "zoonotic borne diseases". The reference list of each article was also searched for additional articles. The literature search uncovered 40 articles published from 2002 to 2021.

## Climate Change Effects on Afghanistan and Current Steps

Since the pre-industrial era (1850-1900), the National Aeronautics and Space Administration Global Climate Change states that the global average temperature has increased by 1.0 °C and continues to rise by 0.2 °C every decade [15]. Since Afghanistan is a developing nation with a turbulent political climate, the deteriorating economy and high poverty rate restrict its ability to successfully prevent and fight the effects of climate change, making it extremely vulnerable. Increasing temperatures, changes in monsoon season and snowfall, severe droughts, floods, forest fires, and the melting of Himalayan glaciers are a few notable impacts of climate change.

Climate change is responsible for frequent and more intense natural disasters and extreme weather conditions. Afghanistan has experienced many droughts over the last two decades and is currently facing one in 2022. By 2050 about 90 percent of the country will experience drought as predicted by the Afghanistan Drought Risk Management Strategy [16]. Furthermore, since October 2021 there has been a decline in rainfall and the number of precipitation days in Afghanistan [16]. There was also an extreme drop in snow depth as measured on 1st March 2021, which contributed to a 12-meter decrease in groundwater table in Kabul city in 2021 [16]. The lack of water has led to crop failure and water shortages contributing to food insecurity.

In recent years Afghanistan has taken steps to fight climate change by building greenhouses for women farmers, early warning systems for natural disaster notification, water systems in distant areas, and by endowing funding programs for cultivating high quality eco-friendly crops such as saffron [8]. Along with raising awareness about climate change [8], a climate change strategy and action plan were devised.

The Green Climate Fund (GCF) provided 20 million dollars in grants to expand renewable energy [13]. Also, national climate targets were to be presented in the 2021 United Nations Climate Change Conference (COP26); however, due to the current political situation concerning the Taliban take-over, Afghanistan was not represented

in COP26 [13]. Furthermore, violence, disputes, violation of human rights, and child marriages due to food insecurity, water shortage, and mass displacement have become dangerously common this year, reflecting and contributing to climate change [13].

## Health Implications Of Climate Change in Kabul

### Infectious Implications

Infectious diseases are considered a rapidly emerging factor in increasing morbidity around the globe. Climate change, increased international/national migration, and inadequate health care systems are some of the overriding factors for increasing the susceptibility to infectious diseases [17]. Environmental changes such as elevated temperatures and rainfalls serve as an optimal breeding ground for zoonotic borne diseases such as dengue, malaria, and Lyme diseases [18]. Additionally, in extreme conditions such as drought, scarcity of water resources increases the risk of contamination of water leading to a strongly increased susceptibility to amoebiasis, hepatitis A, typhoid, paratyphoid, and West Nile virus [19]. Other infectious diseases such as cholera, salmonellosis, and giardiasis are reported after rainfall seasons [18].

Infectious diseases such as lower respiratory infections and diarrheal diseases were ranked amongst the ten top causes of death by the World Health Organization (WHO) in 2019 [20].

Afghanistan's political unrest, instability of health facilities, and ecological disasters for the past 40 years have predisposed it to increase infectious diseases transmission and outbreaks [21]. Besides this, lack of epidemiologic data, paucity of assessment and screening facilities, and absent therapeutic facilities have increased the mortality and morbidity of treatable infectious diseases amongst the population [21]. A study by Anwar et al. evaluated the incidence of communicable diseases amongst the children in Afghanistan in 2013 and found that 75% of all new public health visits were reported infections, with respiratory being the commonest amongst them [22]. A study by Wagner et al. assessed the incidence of different infectious diseases in Afghanistan with seasonal changes and found a significant rise in diarrheal and typhoid cases during hot temperatures, pneumonia in cold temperatures and measles in late spring, while viral hepatitis and meningitis showed no association with seasonality [23].

Additionally, drastic seasonal changes in Afghanistan, especially in Kabul, predispose to after-effects such as increased vector breeding ground, excess proliferation of mosquitoes, poor sanitation facilities, and lower immunity resulting in an influx of mosquito-borne infectious diseases [24]. A recent study by Sahak et al. on the epidemiology of dengue fever reported 15 confirmed cases from all across Afghanistan, with Kabul contributing 20% of the cases [25]. Likewise, according to the World Malaria report 2020, Afghanistan is reported to have a 25% rise in malarial cases in 2020 as compared to 2015 [26]. Besides this, the rapidly growing population of Kabul at a rate of 2.63% serves as a risk factor for zoonotic invasion.

Gastrointestinal diseases such as watery diarrhea occupy the vast majority of cases in the Afghan community during summer [23]. Afghanistan is among the top 5 countries with the highest diarrheal-related mortality rates amongst children [27]. Poor socio-economic conditions and extreme temperatures are predictive factors. A study by Elyan et al. on the etiology of diarrheal diseases in Kabul, Afghanistan found that 75% of diarrheal cases were associated with rotavirus [28]. Similarly, Aluisio et al. identified the factors associated with diarrheal diseases among the children of Kabul, and found that the prevalence of diarrheal diseases in cold temperatures was 63% lower compared to summers [27]. The main factors influencing these conditions include poor sanitation facilities, lack of knowledge, low socio-economic conditions, and climatic changes in Kabul [27].

### Air Pollution Implications

Contamination of air is clearly hazardous to health. Human-made air pollutants such as vehicle emissions, chemical pollutants from industries, heat-producing substances, and power generating plants, along with natural pollutants such as smoke from wildfires, gases from decomposition, ashes from volcanic eruption, etc. are all contributing factors to air pollution [29]. Ischemic heart diseases, chronic obstructive pulmonary diseases (COPD), strokes, and upper and lower respiratory infections are some of the frequent health complications associated with air pollution [30].

Increased air pollution during the winter season has been recently reported in Afghanistan particularly due to overutilization of poor quality fuels, burning of trash, and inefficient technologies to heat homes [31,32]. Kabul is ranked amongst the most polluted cities of the world, reporting around 3000 individuals dying each year due to air pollution [9]. The recent data by WHO indicates Kabul's Air Quality Index as a PM<sub>2.5</sub> reading of 58.8  $\mu\text{g}/\text{m}^3$  which exceeds the normal range, thus identifying the air as polluted and unhealthy [33].

Long-term exposure to air pollutants produces pulmonary and systemic oxidative stress in the body leading to inflammation and increasing the susceptibility to atherosclerotic diseases and cardiovascular disorders. A study by Hayes et al. investigated the risk of cardiovascular events associated with long exposure of particulate matter PM 2.5 and found a 16% increase in mortality due to ischemic heart diseases and a 14% increase in mortality due to stroke [34]. Thus, this indicates a risk of increase of these diseases in Kabul if left uncontrolled.

Besides this, air pollution is directly linked with decreased lung function and an increased risk of respiratory mortalities [35]. A UK-based study by Doiron et al. assessed that PM 2.5 is significantly related to decreased lung function and increased prevalence of COPD [35]. A similar study by Sharkey et al. investigated asthmatic and lower, and upper respiratory problems in US military deployed in Kabul and found a subsequent increase risk of asthma and COPD among personnel in Kabul as compared to other countries [36].

### Drought and Malnutrition Implications

According to recent news, September and October 2021 showed an increase in food insecurity across Afghanistan, leaving around 19 million individuals with severe food and living crises [37]. The main factors contributing to these crises include climatic changes with the winter season leading to limited physical access, financial and political crises, and unemployment [37]. Moreover, the recent drought conditions in the country have left the citizens with living predicaments and grave food and health crises [37]. According to the study, around 32.9% of children under 5 years of age are underweight with 3.5 % exhibiting severe muscle wasting in Afghanistan. Stunted growth is observed in around 60%, thus highlighting severe malnutrition in the country [38]. It has been evident in several research findings that drought-stricken areas are associated with malnutrition, poor health conditions, and socio-economic problems leading to detrimental lifestyles [19,39]. A possible way of reducing the risk of malnutrition is by introducing community health-related policies and funding.

### Future action on current environmental policies

Climate change and weather extremes have a disastrous impact on human health. According to WHO, an approximate rise of 250 000 deaths per year between the years 2030 and 2050 from malnutrition, malaria, diarrhoea and extreme temperatures is predicted [40]. The Medical Society Consortium on Climate and Health recently reported a profound increase in climate change for the past two decades and declared climate change as a human health emergency. Climate

change is mainly due to greenhouse gas emissions like CO<sub>2</sub> and methane gases which adversely affect human health [41]. The United Nations (UN) Secretary-General Antonio Guterres announced that international organizations will work together for long-term economic stability to help millions of people who are facing hunger and limited health facilities to endure the winter season [42]. Different non-governmental organizations and United Nation Sustainable Development Goals (UN SDGs) funding and policies could help to fight poverty, improve health, increase economic growth, and tackle climate change. With environmental factors and climate change being the top factors contributing to the well-being of people, the UN aims to implement the 2030 agenda and support the activities of SDGs. Out of 17 SDGs, those targeting climate, clean water, sanitation, urbanization, affordable energy, sustainable energy, and communities would help improve the public health in Kabul [43].

Besides this, other factors that could contribute to future successful approaches to climate change include public awareness, communication, and environmental education. With the Taliban claiming to open schools and universities in 2022 across all provinces of Afghanistan [44], it is an opportune time to educate the public regarding environmental changes and their effects on physical health. Initiating sustainability programs such as limiting waste production, reducing carbon and greenhouse gas emissions, and introducing recycling programs in educational institutes could help limit pollution. Additionally, with 99% of the population of Afghanistan being Muslim [5], education about climatic crises and encouragement of preventive activities in religious places (mosques) could help generate a broader societal impact. Additionally, introducing better sanitation facilities and a clean water supply across the country could help reduce the infectious diseases that are exacerbated by climate change.

### Conclusion

Climate change has always wreaked havoc on human health. Rising air pollution, extreme temperatures, and improper food and sanitation facilities along with the political turmoil in Afghanistan will exacerbate mortality rates. Thus, it is key that the authorities address climate-related issues and initiate immediate conservation programs to limit the health-related implications of climate change.

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### Consent for publication

All authors agreed to the publication of this manuscript.

### Authors' contributions

Waniyah Masood wrote the abstract, discussion (health implications of climate change), conclusion, edited the revised draft and organized references; Sakina Aquil wrote the discussion (Kabul's climate change), Hamidullah wrote the future recommendations on environmental policies, Arsalan Nadeem and Hassan Mehmood wrote the introduction; Mohammad Yasir Essar, Shoaib Ahmad, and Zarmina Islam made the critical comments and revision. All authors revised and approved the final draft.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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