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The Effects of Climate Change on Human Health in Iran

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Since counties industrialized huge quantities of green-house gases have been released in atmosphere that has led to increased global temperature. Scientific evidence shows that many world countries including Iran have been hit by climate change. Iran's temperature is predicted to increase by 1.5-4.5 ºC by 2100 and the frequency of hot extreme temperature events are on the rise. Cardiovascular, respiratory and traumatic deaths have been reported to increase in extreme temperature in Iran. Diseases like malaria, leishmaniasis and cholera may change pattern and appear in provinces not prevalent before. Climate change and drought has worsened the ambient dust problems. Sea level rise will change the coastal lines in Iran and lead to population displacement and other severe consequences. The Iranian Government needs to work alongside the global community to alleviate the effects of climate change in Iran.

Keywords: Climate Change, Iran, Humans, Health

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After the industrial revolution and the rapid growth of industries and increased use of fossil fuels, the amount of green house gases and particularly CO_2 increased in global atmosphere. This causes more absorption of the earth's infra red radiations by green house gases and therefore increases in world temperature [1]. Nowadays global warming has turned into a global dilemma and has attracted the attention of many world scientists in various disciplines. In 2015 the United Nations Climate Change Conference, held in Paris aimed to achieve a legal binding and universal agreement on slowing down climate change. Leaders of 150 nations, along with 40,000 delegates from 195 countries, attended the 2015 United Nations Climate Change Conference, in order to tackle climate change on a global political level [2]. This paper uses evidence from recently published studies to show a glimpse of the effects of climate change on future human health in Iran. More than 82% of Iran's area is in the arid and semi-arid climate zone and the average annual rainfall is less than 250 mm, which is less than one third of the world average precipitation. The nation's average temperature varies between -20 and +50°C around the year [3].

If ambient CO_2 continues to rise and reach the predicted 2-fold increase in 2100, Iran's average temperature will increase 1.5 to 4.5 °C [3, 4]. This increase will be higher and more intense in the central and desert zones of Iran but less in the coastal zones of the Caspian Sea in the north and Oman Sea in southeast of Iran [4]. Recent studies have showed that the frequency of hot extreme temperature events has increased in Iran from 1962 to 2004, while a negative trend has been observed in the frequency of cold extreme temperatures. The strongest increasing tendency was detected in the annual number of hot nights, warm nights, warm days, and the heat wave duration indices [5]. Over the last 15 years (1995–2010), the annual frequency of warm days and nights in Iran has increased by 12 and 14 days/decade, respectively. The number of cold days and nights has decreased by 4 and 3 days/decade, respectively. The annual mean maximum and minimum temperature averages across Iran both increased by 0.031 and 0.059 °C/decade. The probability of cold nights has gradually decreased from more than 20 % in 1975–1986 to less than 15 % in 1999–2010, whereas the mean frequency of warm days has increased between the first 12-year period (1975–1986) and the recent 12-year period (1999–2010) from 18 to 40 % respectively.

Statistically significant changes in extreme temperature events have occurred at more than 85 % of all weather stations, forming strongly coherent spatial patterns [6].

In Iran, cardiovascular and respiratory deaths have been reported to increase in extreme temperatures [7] and traumatic deaths have been reported to increase with higher temperature and less humidity [8]. Diseases such as malaria and leishmaniasis are still prevalent in Iran and are dependent on environmental conditions such as temperature and rainfall. These diseases may change pattern and appear in areas not prevalent before. Cholera was also found to be significantly related to higher temperature and humidity and lower precipitation in southeastern Iran [9]; and mean temperature (°C), accumulated rainfall (mm), and maximum relative humidity (%) were significantly correlated with monthly incidence of CCHF [10] as well.

Ambient dust is another important environmental problem caused by climate change and drought. Factors such as low relative humidity, high evaporation rate, inadequate rainfall, frequent and relatively high wind speed, vast areas with dry climates, drying of marshes, and the ongoing drought, in Iran, Saudia Arabia and Iraq has worsened the ambient dust problem over the recent decades. This dust consists of fine particles that can be lifted to heights of 900-1800 meters. Because the particles are small and light, they remain suspended for a long time and are scattered in large areas with speeds of 40-80 km per hour. The fine dust particles become haze when they are mixed with urban pollutants and further exacerbate the situation. Due to the Iran-Iraq war (1980-1988) and the Iraq-US wars and chemical bombardment, this dust is also contaminated with heavy metals and traces of radioactive elements [11].

In the past this region was wetlands and lakes. However, persistent droughts beginning in 1991 have caused the drying lakes and wetlands. Reduced rainfall, low humidity, water divisions by man, dam construction and the indiscriminate use of river water for agriculture have dried up the water, destroyed vegetation and canebrake. Particle bed, lakes and wetlands that are fine (clay size) are easily suspended in the strong monsoon winds and create a storm in the surrounding areas [11]. These dust storms have caused increased respiratory mortality [12] and emergency department visits [13].

Global warming by melting arctic ice is causing increased sea levels around the world. As sea water level rises, changes in temperature and precipitation, will lead to decline in fresh water resources, and will further restrain the countries scarce drinking water resources. Sea water level has been rising at an average value of 4.5 mm/year [3]. Sea level rises can impose serious damages in Iran's coast lines. In the north, Iran's main agricultural region, sea level rise will damage agriculture land, shrink forests, and further restrain food production and force people to immigrate from villages to cities [3]. In the south, in the Persian Gulf and Oman Sea, sea water rise can threaten the energy industry, oil installations and exports. The largest exporting ports of Iran are located in the south coastal area. Fresh water resources (both surface water and underground water) will get contaminated and saltwater intrusion will particularly happen in the Karoon River [3]. Climate change will lead to more droughts with more frequency and more intensity despite other areas being stroke by severe rainfall and floods [3]. In the agriculture sector, based on data from 1984-2004, researchers have forecasted that climate change in Iran through increased temperature and decreased rainfall will lead to a 41% decrease in the countries wheat production in the next 100 years [1]. Temperature rise can also lead to rice sterility, reduced formation of tuber bulking in potato and loss of pollen viability in maize. Climate change will have a significant effect on forestry sector and will reduce wood production [3]. Decrease in hydropower production resulting from lower water levels in dams, destruction of coastal and off shore, oil, gas, and petrochemical installations in the southern coastal zones by severe sea storms or hurricanes happening from climate change, [3] can led to more expensive energy. On the other side global warming will increases the energy demand [3] as people will need more air conditioning to keep their houses cool. Studies have indicated that in Iran drought has priority to other natural disasters in the frequency of occurrence, duration, extent, loss of life, economic and social impacts and severe effects in the long run [14]. There is a window of opportunity for avoiding the most damaging effects of climate change, but the window may be closing soon [3]. The Iranian government has taken positive measures for the development of renewable energy sources including solar, wind energy, geothermal waves, tidal energy, hydrogen energy and hydropower and nuclear energy.

The head of Iran's Environmental Protection Organization, Dr Ebtekar warned about the dangers of climate change and said that climate change would impact not only Iran and the Middle East region but the world, calling climate change a serious threat and also warned about the water crisis in Iran, saying that according to Iran's Energy Ministry, the water situation of 14 cities in the country have alarming conditions [2].

According to Iran's meteorological service, with the exception of just three years, Iran has experienced 23 consecutive years of reduced rainfall and increases in temperature. This isn't the first time that Iranian officials have warned about the dangers of the country's water crisis, nor of climate change. In July 2013, former Agriculture Minister, Issa Kalantari warned that Iran would become uninhabitable, if it does not address the water crisis. He even said that in 30 years, millions of Iranians would be forced to migrate [15].

On November 17, 2015 the Leader of the Islamic Revolution Ayatollah Seyyed Ali Khamenei set general environmental policies, issuing them to the heads of the executive, judiciary, and legislative branches of the Iranian government. Among other things, the policies mandate the creation of a consistent national system for environmental protection, the coordinated and systematic management of environmental resources, the criminalization of environmental damage, and the institutionalization of environmental-friendly culture. Standing out among the policies is also an obligation for the development of green economy with emphasis on the development of low-carbon industries, clean forms of energy, organic agriculture, and management of waste material and water [2]. The Iranian President Hassan Rouhani has also set out a transitional course to achieve a very robust, low carbon and green economy in Iran. Iran is now working with the global community to achieve a legally-binding and universal agreement on reductions in greenhouse gas emissions meant to hold global average temperatures short of a 2-degree Celsius increase over pre-industrial global temperatures [2].

Conclusion

Climate change in likely to cause severe health consequences in Iran. The Iranian Government needs to work alongside the global community to alleviate the effects of climate change in Iran.

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