

The Severe Consequences of Climate Change in Iraq: A Case Study

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How to cite this paper: Sissakian, V.K., Adamo, N. and Al-Ansari, N. (2023) The Severe Consequences of Climate Change in Iraq: A Case Study. *Engineering*, 15, 242-260. <https://doi.org/10.4236/eng.2023.154019>

Received: March 15, 2023

Accepted: April 22, 2023

Published: April 25, 2023

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Abstract

Iraq, like most Middle Eastern countries, is suffering from the effects of Climate Change. The effects are in form of deterioration and degradation of lands, including agricultural lands, an increase in dust storms, an increase in daily temperatures, decreasing annual rainfall, decreasing annual snowfall, decreasing annual water income in the main rivers, streams and ephemeral wadis, increasing of desertification, increasing of areas covered by sand dunes, decreasing of green areas, decreasing of wetlands. According to regional studies, the living conditions and environment after 3 - 4 decades in Iraq and some neighboring countries will be very difficult, especially due to increasing daily temperatures and decreasing annual rainfall. To conduct the current study, we have reviewed tens of published articles, and scientific reports followed by relevant interviews on TV, and daily observations of events caused by climate change. One of the most common reasons for climate change is the emission of CO₂, and the most common reason contributing to the increase of the effects of climate change is the absence of awareness in the community and the deficient official preparedness. The preparedness, however, to avoid and/ or mitigate the effects of climate change is very low, not only on the governmental level but also on popular scales. Therefore, the harsh effect of climate change increasing in severity and causing great damage to infrastructure, and personal properties, and is leading to more casualties. Recommendations to mitigate the consequences of climate change are given in two scales, governmental and popular.

Keywords

Climate Change, Greenhouse Gases, Awareness, Preparedness

1. Introduction

Climate is the average of different weather conditions at a certain point on the

planet earth, where we are living. Typically, the climate is expressed in terms of expected temperature, rainfall, and wind conditions based on historical observations. Climate change: however, is a change in either the average climate or climate variability that persists over an extended period [1].

Climate change is an international issue challenging all people living on our planet. The effects of the climate change differ widely between different countries and even within one country. Iraq, however, is one of the most affected countries in the world [2]-[7].

Climate change is an interesting subject for sociologists because anthropogenic climate change, which is caused by different activities, including man and natural effects, is embedded in human social life. Greenhouse gases are emitted due to different daily social life activities like eating, working, and conditioning our homes; consequently, contribute to climate change. Responses to climate change also have social impacts that are unevenly distributed in different parts of the world. Therefore, the first global dilemma, which is possessed by climate change, is one of the proven intractable at different governance scales with different impacts. The impacts differ in different countries based on 1) Awareness of the people; 2) Governmental preparedness to the legalized instructions and laws; 3) Level of living conditions; 4) Financial allocations by the government to deal with the emitted greenhouse gasses; 5) The severity and intensity of the emitted greenhouse gases. Currently, scientific observations and performed models indicate that the Earth's climate is now changing due to human activities. This is called "anthropogenic climate change" [1].

1.1. Objective of the Study

The main objective of the current study is to elucidate the severe consequences of climate change in Iraq and how it impacts living conditions, agriculture, community culture, and other living conditions. We have presented different examples from different parts of Iraq indicating the severe consequences and what will be in the future. Moreover, we have many recommendations to mitigate the consequences.

1.2. Literature Review

With the increasing effects of climate change, the number of published articles concerning these effects is increasing too. This is a good indication of the increase in the awareness of communities; among them is the Iraqi community. However, still there is a lot that should be done as far as awareness is concerned. Meanwhile, the preparedness of the governments should be increased too. It can be said accordingly, that the number of published studies has increased, as well as interviews on TV channels, especially in Iraq and more specifically after the last dust storm events and other effects of climate change.

The following published articles are concerned with climate change in Iraq: Sissakian *et al.* [8] mentioned the harsh effects of dust and sandstorms on dif-

ferent activities and social life in Iraq. Holthaus [3] described the effects of climate change on destabilization in Iraq. Adamo *et al.* [5] stated the harsh effects of climate change on the Iraqi environment. Adamo *et al.* [9] [10] also outlined the future of the Tigris and Euphrates Rivers as far as the decrease in annual rainfall and the decrease in water flow in both rivers and their tributaries. Al-Ansari *et al.* [6] [7] explained the effects of climate change on the quality of water in the Tigris and Euphrates Rivers and its consequences on the environment of the rivers' basins. Ahmed and Al-Zewar [11] mentioned the many socio-economic effects of saltwater intrusion in the Shat Al-Arab and its adverse impact on fishery activities. Sissakian *et al.* [12] mentioned the increase in desert areas in Iraq due to climate change. Al-Obaidi *et al.* [13] studied the impact of climate change and concluded that "Iraq and many other parts of the Middle East are having been facing desertification threats in the last twenty years". The removal of vegetation cover, overgrazing, deforestation in times of war, poor irrigation practices, and water scarcity are some of the main causes of desertification in Iraq.

1.3. Importance of the Study

The given recommendations in the current study will help the Iraqi Government as well as the Iraqi people to work collectively in order to decrease the severe consequences of climate change on Iraq. The severe consequences are harshly affecting different living aspects, which have caused different problems for the Iraqi people.

2. Materials Used and Methodology

To conduct the current work, we have reviewed tens of published articles, which dealt with climate change and/or global warming. We also have followed many interviews with specialists concerning climate change and water shortage in Iraq on different TV Channels in Iraq as well as abroad to elucidate the opinions of those specialists. Unfortunately, the majority of the given information and recommendations in the interviews were ignored. We also have followed news about the water shortage and announcements of high-rank officials in the Ministry of Water Resources (MoWR) in Baghdad; we have referred to those who have significant interest in water shortage and water inflow in Iraqi rivers and their consequences. Moreover, we have selected and presented many photos of the consequences of water shortage in different parts of Iraq, which clearly show the severe consequences such as in dry marshes, perished animals, abandoned farms, and farmhouses. We also have discussed different opinions about the reasons for the water shortage, and many recommendations are presented.

3. Climate Change

This is one of the most significant aspects that have a very harsh impact on the living conditions, social life, and even food shortage in Iraq. Climate change includes: 1) Water shortage; 2) Decline of the annual rainfall amount; 3) Increase

in annual temperature; 4) Increase in sandstorm's frequency and intensity, and an increase of sand dunes' areas.

3.1. Decrease in Water Inflow in the Tigris and Euphrates Rivers and their Tributaries

In the Third World and elsewhere, there are many river basins that are shared by more than one country; those are about 165 of such river basins [14]. In these river basins, there is usually a dominant regional power among the other riparian countries which dominates the sharing of water of the river basin, and in the case of the Tigris-Euphrates basin, Turkey, is the dominant power [15], followed by Iran.

The part of the catchment which lies in Saudi Arabia very rarely contributes any water to the river. However, when precipitation takes place in this part the wadis which originate from Saudi Arabia (Figure 1) start flowing towards the Euphrates River and may supply large amounts of water. Among those wadis are Hauran, Al-Ubaidi, and Tab'bal..., etc.

The implications of these variations led all riparian countries to build as many dams as they can to overcome these variations and ensure the availability of water in both rivers and their tributaries [16]. The main project of dam construction in the basin of both rivers is the Greater Anatolia Project (GAP), which

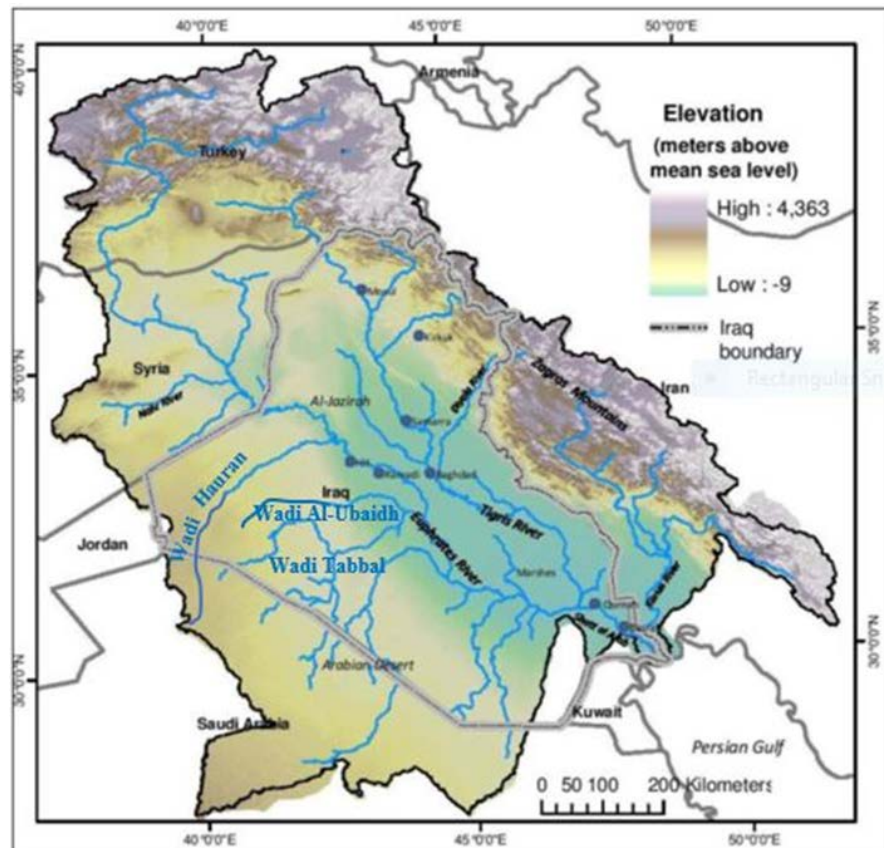


Figure 1. Tigris and Euphrates rivers' catchment area (modified from [18]).

includes 22 dams (14 on the Euphrates and 8 on the Tigris) including 19 hydro-power stations [17]. In Iraq, there is the Haditha Dam on the Euphrates and the Mosul Dam on the Tigris while another dam is under construction, which is the Makhul Dam. However, on its tributaries there are three dams, which have been built so far, these are the Adhaim Dam on the Adhaim River and Derbendi Khan and Hemrin Dams on Diyala River.

In the Kurdistan Region of Iraq, there is a large and ambitious project to construct 103 dams (Figure 2) which are listed as follows:

- 5 dams on the Khabur River: 3 first priority, 1 fourth priority, 1 under construction. All of these are large dams over 15 m in height.
- 38 dams on the Greater Zab River: 24 first priority, 7 fourth priority, 6 under

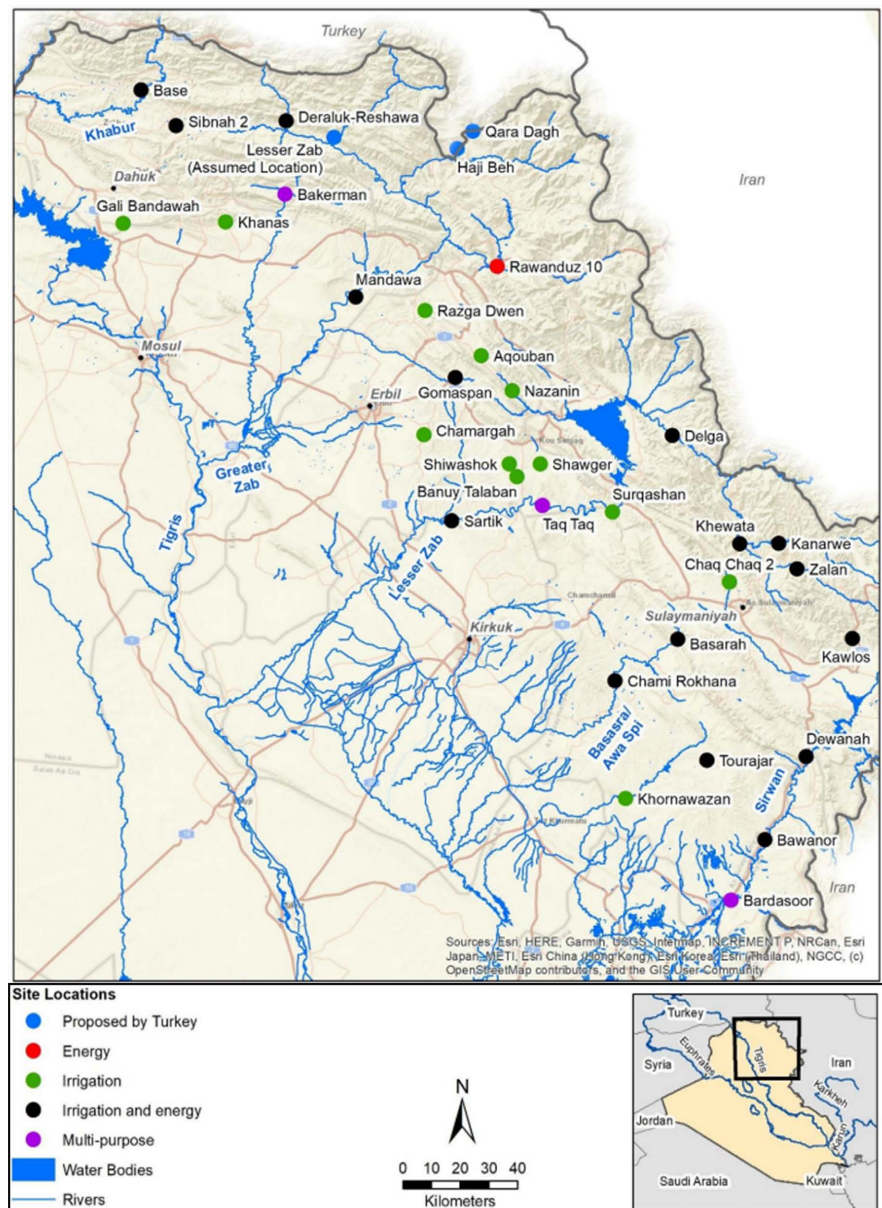


Figure 2. Dams’ project in the Kurdistan Region Iraq (from [20])

construction, and 1 completed. 23 of these are large dams over 15 m in height.

- 36 dams on the Lesser Zab River: 19 first priority, 8 fourth priority, 5 under construction, and 4 completed. 33 of these are large dams over 15 m in height.
- 11 dams on the Sirwan River: 6 first priority, 1 fourth priority, 2 under construction, and 2 completed. 10 of these are large dams over 15 m in height.
- 13 dams on the Basara and Awa Spi Rivers: 4 first priority, 2 second priority, 2 under construction and 5 completed. 11 of these are large dams over 15 m in height.

According to Chenoweth *et al.* [19] the average annual discharge in the Euphrates-Tigris Rivers may decrease by about 9.5% between 2040 and 2069, with the greatest decrease being 12% in Turkey and only 4% in Iraq. They also predicted more decrease in the two rivers in the period 2070-2099; however, the decrease would be <1%.

Most of the water which inflows in the Tigris and Euphrates rivers originate from Southeastern Anatolia, which is located within the Middle East and East Mediterranean climate zone (MEEM). This climate zone is a part of (MENA) and it is influenced by the same climate elements over the zone. Therefore, the zone also is witnessing a decrease in annual rainfall.

3.2. Decrease in Monthly and Annual Rainfall

The monthly (Figure 3) and annual rainfall (Figure 4) records for different periods show that there is a drastic decrease in the precipitation in Iraq. These decreased amounts in annual rainfall; are not only in Iraq but in the neighboring countries too. Accordingly, the amount of inflow water has decreased in the Tigris and Euphrates rivers and their tributaries. Moreover, decreased amounts of surface runoff and infiltration of surface water to recharge the groundwater have been experienced. Consequently, this has led to increased droughts seasons and increased desertification, especially, in the southern parts of Iraq, moreover, decreased the amount of storage water in reservoirs and other natural lakes like

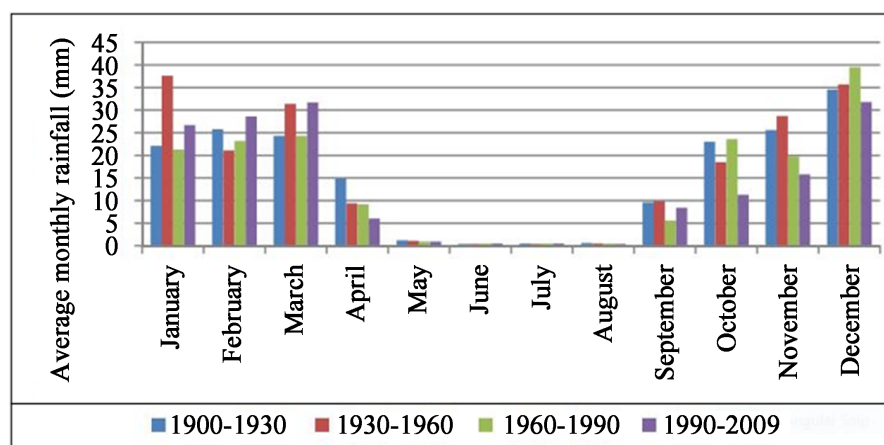


Figure 3. The change of average monthly rainfall for the period 1900-2009 in Iraq (From [21]).

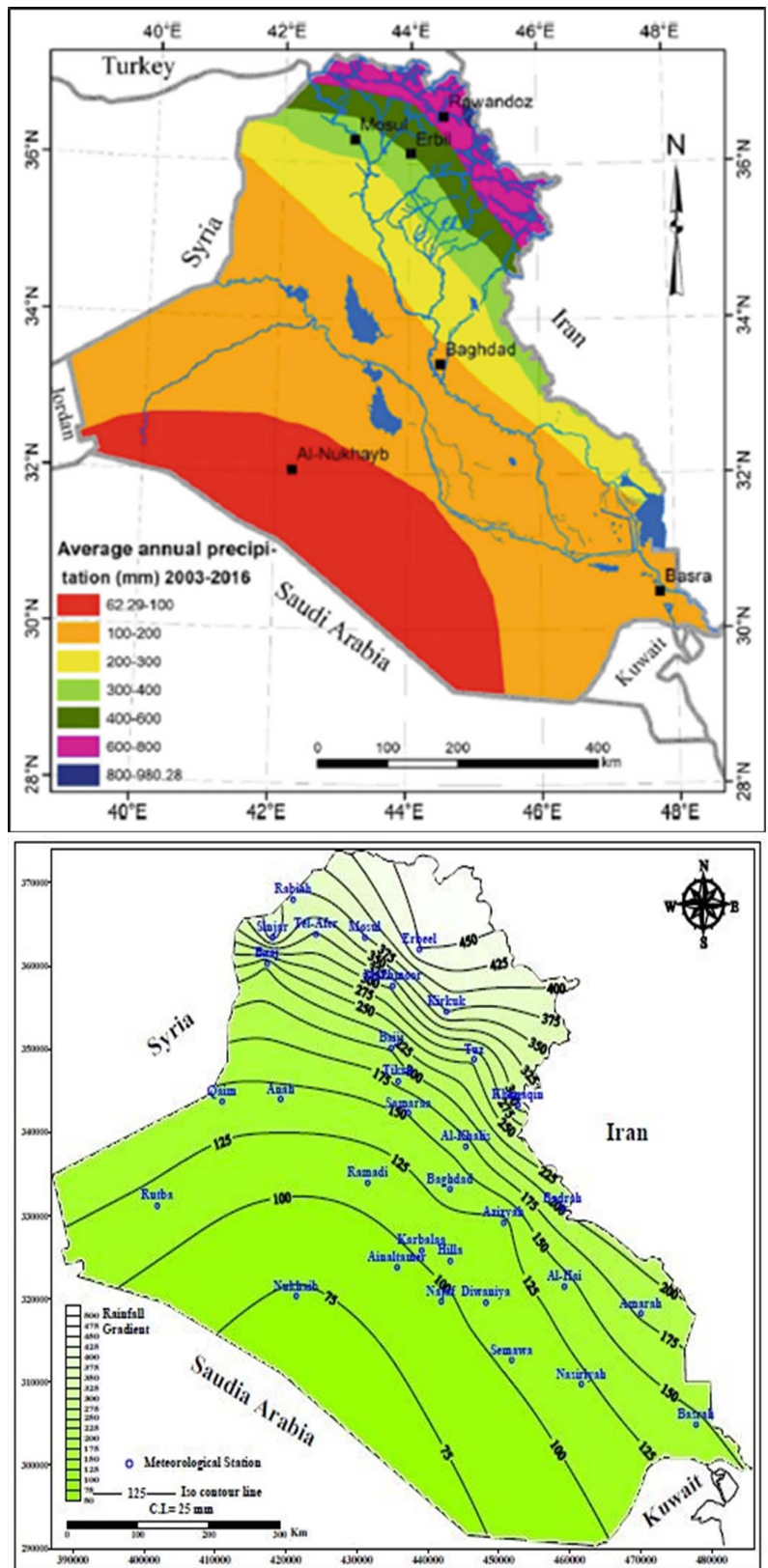


Figure 4. (Top) Average annual precipitation map of Iraq for the period (2003-2016) using TRMM data (Bottom) contour map of annual summation of Rainfall in Iraq (After [23])

Al-Tharthar, Al-Razzaza, Al-Habbaniyah and all Iraqi marshes, which already suffer from water shortage due to the drastically decreased amounts of water inflow in the Euphrates and Tigris rivers and their tributaries.

Therefore, it is normal that the same climate change impacts are felt over the (MEEM) zone causing a decrease in the Euphrates and Tigris rivers' water resources since this area contributes to the largest part of these water resources. Long-term analyses of the climate database (period 1901-2006) along with regional climate change model projections for the 21st century [22], suggested a continued and gradual strong warming of the area of about (1 - 3)^oC in the near future (2010-2039) to (3 - 5)^oC in the mid-century period (2040-2069) and, (3.5 - 7)^oC by the end of the century (2070-2099).

3.3. Temperature Changes

Together with decreasing annual rainfall and water inflow in the Euphrates and Tigris rivers and their tributaries, the annual temperature is increasing in Iraq, and there was a drastic increase from 1991 to 2001 (Figure 5). We have selected mean annual temperatures in the centers of the 18 governorates in Iraq during four different dates; the results are shown in Table 1.

3.4. Dust Storms and Dunes

The occurrences of dust storms in Iraq, especially in the central and southern parts have also increased as compared with those before the last decades. The northern parts (Kurdistan Region of Iraq, KRI); however, are also exhibiting dust storms more than before. It is worth mentioning that dust storms are reaching the extreme northern and northeastern parts of KRI, even if, at the same time, the dust storms are not hitting the central and southern parts of Iraq.

Dust storms count among the most common natural hazards in Iraq, as winds loft fine particles into the air from dry rivers, lakes, floodplains, and marsh sediments. Silt-rich soils, which lend material to most of this region's dust storms,

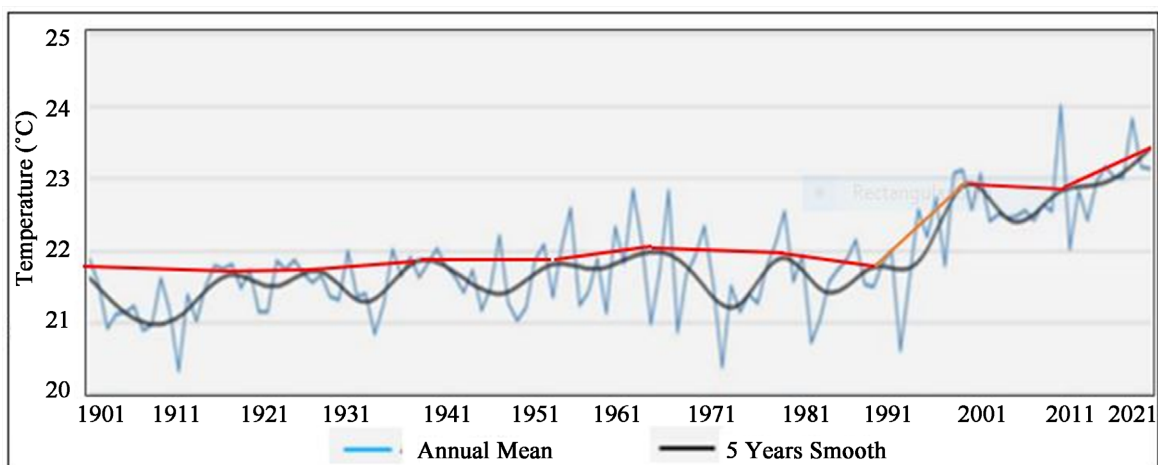


Figure 5. Mean Annual temperature changes in Iraq from 1901-2021 (from [24]). The red line shows the peak of annual temperatures; added by the authors.

Table 1. Mean Annual temperature records during three different years.

No.	Governorate	1992	2013	2017	No.	Governorate	1992	2013	2017
1	Amara	23.2	24.2	26.4	10	Kirkuk	19.3	21.0	22.2
2	Baghdad	22.2	22.8	24.0	11	Kut	23.1	23.8	26.4
3	Baquba	22.7	22.6	24.4	12	Mosul	19.0	19.8	20.9
4	Basra	23.7	24.8	27.2	13	Najaf	20.9	22.3	23.5
5	Diwaniyah	23.8	23.9	25.4	14	Nasiriyah	23.6	24.7	26.7
6	Duhok	18.0	19.2	18.9	15	Ramadi	20.8	22.2	23.4
7	Erbil	21.0	20.5	20.6	16	Samawa	22.3	24.3	25.7
8	Hilla	23.0	23.4	24.7	17	Sulaimaniyah	17.8	18.9	19.7
9	Karbala	22.2	21.3	23.8	18	Tikrit	20.2	22.2	22.7

1992: From [25], 2013: From [26], 2017: Internet data [4].

occur over large portions of the country.

Dust storms cause soil loss from the dry lands, and worse: they preferentially remove organic matter and the nutrient-rich lightest particles, thereby reducing agricultural productivity, and the abrasive effect of the storm damages young crop plants [27]. Other effects that may impact the economy are: reduced visibility affecting air and road transportation; reduced sunlight reaching the surface; increased cloud formation increasing the heat blanket effect, and effects on human health of breathing dust [28].

The number of dusty days in Iraq has increased drastically this year (2022); it reaches 100 days starting from 01 January until 08 August 2022 (Mr. Umer Al-Shaikhly, [29]). The dust storms have very harsh consequences in daily life among them are: Airports in Baghdad, Basra, Al-Najaf, Erbil, and Sulaimaniyah were closed for a few days; thousands of people were hospitalized suffering from respiratory problems, 6 death cases were recorded in Tuz Kurmatu town in the central part of Iraq [30], withering of plants; cultivated and naturally growing, traffic accidents were reported along highways due to decrease in visibility range to less than 150 m.

According to Sissakian *et al.* [8], the main reasons for increasing the occurrences of sand storms in Iraq are climate change and the shortage of water in the main two rivers, the Tigris, and Euphrates, and their tributaries. The consequences of the drastic changes in the mean annual precipitation, temperature, and amount of available water in the rivers have increased the dry and barren lands; not only, in the Iraqi territory but, in the near surrounding areas too.

Since the beginning of April 2022, Iraq has been hit by a series of severe dust storms (Figure 6). News media reported that Iraq had been hit by at least eight dust storms in the past six weeks (16 May 2022) [30].

Othman *et al.* [31] conducted a study on the changes in land use-Land cover in Iraq and constructed a map showing different types of sand dunes at different

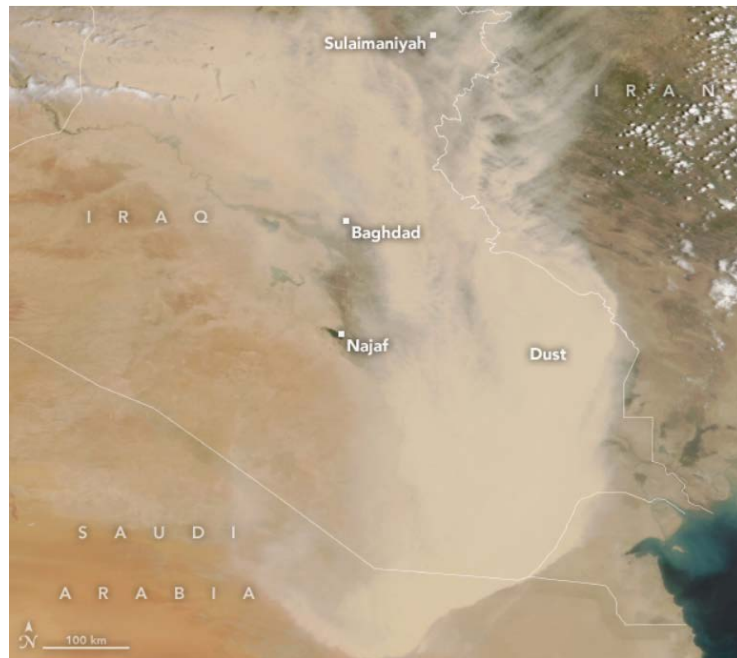


Figure 6. Dust storm (16 May 2022) Aqua MODIS image.

parts of Iraq during different time intervals which they monitored. As per their calculations, the coverage area of sand dunes in 2000 was 9891.29 km², whereas, in 2016, the coverage area was 14,419 km². The increased areas of sand dunes were the result of climate change. They are potential areas for agitating dust storms, which have severe consequences on the daily life of the Iraqi people, especially, those living in western, central, and southern parts of Iraq.

According to daily weather forecasting news, dust events have become more frequent in Iraq as compared to the last decade. Iraq is facing drought conditions during recent years, as well as land-use changes and overuse that mean there is more loose soil available to be lofted into the atmosphere as dust storms. The World Bank cited Iraq as one of the most vulnerable countries to desertification and climate change impacts [32].

4. Results

Climate Change has very harsh impacts on Iraqis and the Iraqi environment leading to disasters, which may cause severe damage to infrastructure and living conditions in large parts of Iraq, especially, the southern parts. Some of the recorded consequences of climate change in 2022 are:

- 31 May; according to the Ministry of Water Resources (MoWR), water levels in the Iraqi rivers have decreased by about 60%, and the cultivated areas have decreased by about 50% [29];
- 01 June; the dust storms have affected refugee camps (Bzaibez and A'miriyat Al-Falooja) in the western part of Iraq, Al-Anbar Governorate [29];
- 02 June; Hor Al-Huwaiza will not be considered a UNESCO World Heritage due to the shortage of water in the marshes and its consequences [29];

- 02 June; in Al-Salman Protected Area, tens of deer perished (**Figure 7**); only 61 are still alive due to water shortage and high temperatures [32];
- 17 June; according to specialist Miss Zeena Sultan, about 100,000 acres were lost as agricultural lands due to water shortage and the number of fishing boats decreased from 4000 to only 400 due to an increase in the salinity of Shat Al-Arab [33];
- 17 June; according to FAO, in 2030 number of the refugees will be 700 M and in 2050, 75% of the lands will change to desert (Dr. Abdul Adheem Al-Wa'idh, General Director) [34];
- 20 June; the maximum recorded temperature in Ain Al-Tamer was 52°C, being the second maximum recorded temperature in the World [29];
- 26 June; Mr. Basim Antwan (Economic Expert) announced that from 40 M acres of arable land, only 4 M acres were cultivated and among the 4 M only 50% were allowed for irrigated cultivation by the Ministry of Agriculture (MoA) due to water shortage [29];
- 28 June; 4 days were continuously dusty days in Baghdad, and the western and southern parts of Iraq. Accordingly, Baghdad International airport was closed for a few hours each day [29];
- 29 June; it was reported that huge amounts of trees were cut to be used for charcoal production, causing deforestation in Altun Kopri town in Kirkuk Governorate [29];
- 04 August; all governmental offices (apart from those in KRI) except those of health, police, and security were closed due to the high daily temperature records (49 - 50)°C [29];
- 05 August, in an interview with farmers in the southern part of Iraq, the farmers demanded water for domestic uses not for cultivation; claiming that they abandoned their farms [29];
- 08 August; according to Dr. Umer Al-Shaikhly (Environmental expert), the economic loss of each dusty day in Iraq is 10 billion Iraqi diners, and 7 million



Figure 7. Perished deer in Al-Salman Protected Area [32].

Iraqis are at risk of migration from their lands due to water shortage and desertification. Moreover, there are many reports on Environmental Global Outlook No.1 issued by UNAMI which date back to 10 - 15 years clearly stating that Iraq will experience a harsh environment, and a disaster will occur if no serious actions will be taken to overcome the water shortage [29];

- 08 August; number of the dusty days in Iraq starting from 2022 is 100 days [29];
- 16 August; number of the date palm trees has decreased in Karbala Governorate from 3,800,000 trees to 3,000,000 trees due to deforestation demanded by housing and other building constructions [35];
- 16 August; the amount of water in Al-Adhaim Dam's reservoir has decreased by about 400 million cubic meters [35];
- 18 August, was reported the perishing of 600 - 750 water buffalos in the Iraqi marshes due to a shortage of water, an increase in salinity, and high temperatures [30];
- 18 August; the amount of water in Al-Razzaza lake has decreased from 26 billion m³ to 0.6 billion m³ [29];
- 25 August; the total surface area of the Iraqi marshes has decreased to 10% of their original surface area (Mr. Nawfal Al-Asadi, [29]), accordingly; the Iraqi marshes will not be considered as UNESCO World Heritage anymore if they continue decreasing in the same manner.

5. Discussion

As far as the increasing harsh effects of climate change in Iraq are concerned, the Preparedness of the Iraqi government and awareness of Iraqis of the problems associated with these changes have to be looked at seriously. These two vital aspects are discussed hereinafter.

5.1. Government Preparedness

The shortage in water resources of the Tigris and Euphrates rivers and their tributaries is one of the most significant issues, which should be faced by MoWR. According to MoWR, the amount of incoming water to Iraq is reduced by 60 %; accordingly, the agricultural lands are reduced by 50%; due to water shortage and a decrease in the annual rainfall. Moreover, according to the Minister of water resources, many memoranda were sent to Iran concerning the diversion of water resources by this country, but all the attempts were in vain; therefore, the issue was transferred to the Ministry of Foreign Affairs to handle the issue diplomatically [29].

This vital aspect not only affects the size of the cultivated areas, but also causes dryness of large parts of the Iraqi marshes (**Figure 8**). After 2003, around 40% - 60% of the marshes were flooded again intentionally. A large part of the marshlands, together with three ancient cities, has now been registered on UNESCO's World Heritage List [36] as a result. However, due to water shortage in the Ti-

gris and Euphrates rivers and the decrease in the annual rainfall, the surface area of the marshes has shrunk is now to about 10% of its original area (Al-Asadi, 25 August 2022 [29]). Consequently, people living in the marshes are migrating to nearby towns and cities, abandoning their rural life, and losing their water buffalos (Figure 8(a), and Figure 8(b)). The migration of people from the marshes is going to increase the number of unemployed people, aggravates the housing crisis, increase the number of illiterates in these towns and cities, and cause more social problems. Of real concern is that habitant birds (residents, breeders, passage migrants and winter visitors, summer visitors..., etc.) (Figure 8(c) and Figure 8(d)), and fish numbers and species in the marshes will decrease drastically. All these were good natural food resources for the people living in the marshes (Figure 9(a)). Moreover, the increasing salinity of the water in the marshes due to the shortage of inflow is resulting in the loss of, thousands of fish (Figure 9(b)). In conclusion, therefore, the loss of the birds and fish may be counted as another serious reason for the immigration of the local people of the marshes and for abandoning their homes and lands.

For protection from dust and sand storms, the Iraqi Government has had



Figure 8. (a) General view of the partly dried marsh, (b) Water-buffalos in a narrow water passage in a dried marsh, Amounts of birds (c) before and (d) after of dryness of the marshes.



Figure 9. (a) Fisherman distributing fishes according to type and size to sell them; (b) Perished fishes due to shortage of water and increased salinity

plans since the last century to establish a Green Belt Project to protect Baghdad and other main cities and towns from the effect of dust storms. Part of the belt was planted at different places. For example, the green belt in the Karbala Governorate includes 200,000 date palms, 40,000 olive trees, and 400,000 Eucalyptus; it has cost 15 million US\$, but the water shortage, decrease in the annual rainfall and the negligence of the project have caused total or partial disappearance of the Green Belt (**Figure 10**).

In 2012, the ex-minister of MoWR (Dr. Hassan Al-Janabi) suggested the establishment of a National Green Belt (**Figure 11**). It was planned that the length and width of the belt will be 1000 km and 3 km, respectively. The estimated



Figure 10. Aerial view of Karbala Green Belt

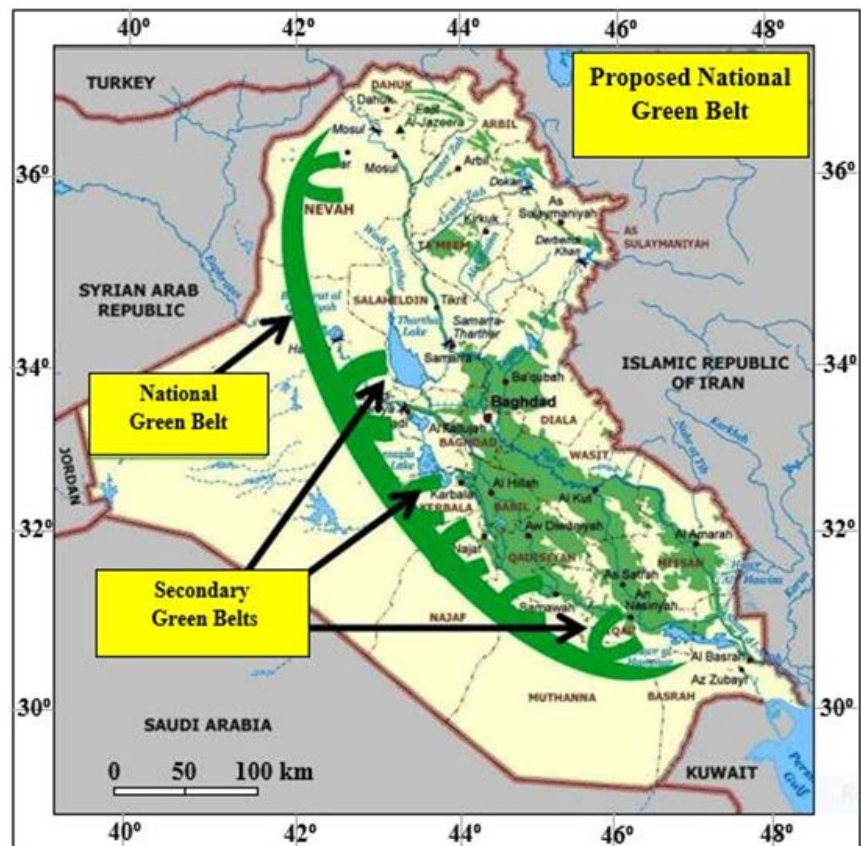


Figure 11. Planned National green belt (Modified from [37]) approximate coordinates and scale are added by the authors.

number of trees was 220 million, including different types of Fruit trees and Eucalyptus. According to the Ministry of Agriculture (MoA), a green belt to cover the whole Iraqi territory needs 14 billion trees. This will give work opportunities to about 500,000 persons with various education levels and specialties. Baghdad Mayor (Mr. Ammar Kadhim) announced on 01 June 2022 that the first stage of the Baghdad Green Belt has started after the completion of the first stage of the Green Belt around Baghdad [29].

Iraq is suffering from drought as it was officially announced in 2007. This is due to reduced precipitation in the past years. Another significant reason is that Iran, Syria, and Turkey have constructed a large number of dams on the Tigris and Euphrates and their tributaries which inflow into Iraq, and/or diverted flowing streams and perennial wadis into their territories. The construction of GAP project in Turkey, which includes 22 dams on the Euphrates and Tigris rivers [38] is an example. Upon completion of all constructions in GAP, Turkey can control 80% of the water flow in the Euphrates and Tigris rivers [39]. At the same time, Iraq has not yet treated this vital problem (draught). The only action taken is the construction of the Makhul Dam on the Tigris River, which may face the same karstification problems as the Mosul Dam if the site of the dam is not well studied. However, KRI is planning to construct 105 dams (Figure 2), which will significantly affect the amount of inflow water in the Tigris River.

5.2. People's Awareness

Most Iraqis do not seem to be concerned about climate change or show awareness of its impacts in their daily personal lives or with their performed work. This awareness decreases in rural areas as the people, there are less educated. A good example may be cited from their agricultural activities, especially in the growing of wheat, barley and rice. Old irrigation techniques are still used, which need large water quantities. With decreasing annual rainfall (Figures 3-5) and water resources of the Tigris and Euphrates rivers [5] [6] [18] [40] and high losses from irrigation channels (Figure 12(a)), the available water for irrigation has decreased too. Therefore, thousands of farmers are abandoning their farms (Figures 12(b)-(d)), and hundreds of cattle and water buffalos have perished (Figure 12(e)). The prefix "non" is not a word; it should be joined to the word it modifies, usually without a hyphen.

Farmers are immigrating to nearby towns and cities, accordingly, increasing the number of jobless people in these towns and cities and changing their culture and demography. Moreover, this is leading to increasing rates of poverty, homeless people, illiteracy, crimes, and other social problems.

People in rural areas are also not aware of the importance of observing and abiding with their water shares (rations), which are planned by the local agricultural offices. Many of them do not keep to their irrigation water shares and take over the shares of their neighbors. So, lots of problems have been encountered, which affect other agricultural lands and occasionally lead even to fighting



Figure 12. (a) Dry irrigation channel; (b) Abandoned farmhouse; (c) Abandoned farm; (d) Abandoned date palms farm; (e) Perished sheep; (f) Shortage of water in the southern marshes (all photos are from [29]).

crimes. However, those living in marsh areas are forced to leave their lands due to the shortage of water in these marshes (**Figure 12(f)**) and losing their lands from which they were having their domestic life needs.

According to Mr. Jassim al-Asadi, the marshes offer an ideal environment for migratory birds, and this distinctive biodiversity is what helped put the site on the UN's World Heritage list. But at the same time, this environment is exposed to the effects of illegal poaching. "There are many destructive hunting strategies used by poachers to catch birds, including protected ones [41]." This again shows another very significant aspect of the low-level awareness of some Iraqis.

Another significant aspect of low-level awareness is changing agricultural lands to residential sites. This causes the diminishing of large, cultivated areas and converting them to urban areas; however, a large part of this is done illegally. Haphazard construction of residential sites is a big issue, which adds to the increase in the harsh consequences of climate change. Deforestation is also very common in different parts of Iraq, either to change farm areas to residential or industrial sites, or for charcoal production. However, locally, people are forced to do this due to the enormous shortage of water for irrigation and other domestic uses.

6. Conclusion

From the presented data, we can conclude that climate change in Iraq is having very severe consequences on Iraqis and Iraq's infrastructure. The main concerns are the shortage of governmental preparedness and the low-level awareness of

many Iraqi people, especially in rural areas. However, natural effects of climate change, including a decrease in annual rainfall, a decrease in the inflow of water amount in Iraqi rivers from neighboring countries, an increase in annual temperatures, and increases in dust storms are very significant reasons for land degradation, immigration of local people from rural and marsh areas to nearby towns and cities, and with all the other harsh consequences. Climate change has also significant influence on the retrogression of the ecosystem and biodiversity, especially in the marsh and rural areas.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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