

# Iraq

## 1. Country overview

Iraq, officially the Republic of Iraq, is a country in Western Asia bordered by Turkey, Syria, Jordan, Saudi Arabia, Kuwait and Iran. Iraq also has 58 kilometres (km) of coastline on the Persian Gulf. The population of Iraq is 39.3 million people, with an average life expectancy of 70.5 years ([World Bank 2019](#)). Its gross domestic product (GDP) is 234 billion US dollars ([World Bank 2020](#)). Iraq is ranked 126th on the Notre Dame Global Adaptation Initiative (ND-GAIN) climate change readiness index ([ND-GAIN 2020](#))

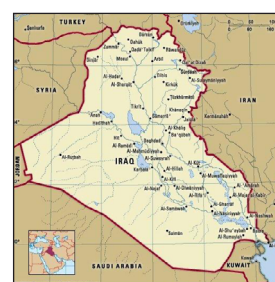


Figure 1: Map of Iraq.  
Source: [Britannica](#)

### 1.1 Climate

The southern part of Iraq has a desert climate, with the hottest months being June–August. In these months, daytime temperatures can reach well over 40°C during the day and drop just below 30°C at night. What little rain that does fall in this region tends to come in the cooler season, from December–March ([International Research Institute for Climate and Society \(IRI\) n.d.](#)).

Rainfall is higher in the northernmost part of the country, where summer temperatures are also less extreme (highs of 35°C). However, in the winter, especially in January, temperatures hover around freezing. This region sees rain throughout the year, with the exception of June–September, which tends to be very dry ([IRI n.d.](#)).

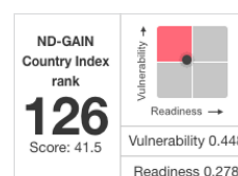


Figure 2: Iraq's ND-GAIN  
Ranking (ND-GAIN 2021).

## 1.2 Climate change

### Historical climate

#### Temperature

Temperatures have risen in Iraq over the last century, and the country is at least 0.7°C hotter, on average, than it was 100 years ago ([World Bank Group n.d.](#)).

Extreme heat is becoming more frequent around the country ([Salman et al. 2017](#)).

Extremely cold nights are decreasing in frequency in Baghdad and in the north, with other areas of the country not experiencing a significant change ([Salman et al. 2017](#)).

#### Precipitation

Rainfall has been highly variable over the last 100 years, with different trends in different parts of the country ([IRI n.d.](#); [World Bank Group n.d.](#)).

#### Other

Dust storms are on the rise due to a combination of climate change, land degradation and water management practices. During the period 1951–1990 there were an average of 24 days per year with dust storms in Iraq. Today, they occur over 100 times per year on average ([United Nations Country Team in Iraq 2013](#); [Sissakian et al. 2013](#)).

### Projected climate

Temperatures will continue to rise across the country in the next 100 years. Depending on how much climate change progresses, temperature could rise by 2–3°C on average by the end of the century ([World Bank Group n.d.](#)).

Temperature extremes will also rise with climate change, and the hottest day per year could be 4–8°C hotter than it is today ([World Bank Group n.d.](#)).

Changes to rainfall in the future for Iraq are still uncertain, with some models showing some wetter regions, and other models showing drying ([World Bank Group n.d.](#)).

Dust storms are projected to increase further in the future ([UN Country Team in Iraq 2013](#)).

## 2. Humanitarian sectors and climate change

### 2.1 Water and habitat

#### Water

The impacts of climate change on water in Iraq is an increasingly important question raised by academics, governments and international agencies. Expected impacts include water resource depletion, both in quantity and quality, as well as water-related conflict. Indeed, the quantity and quality of water in Iraq is of major humanitarian and political concern. The large Tigris and the Euphrates rivers, which supply most of the country's water (45.4 cubic kilometres (km<sup>3</sup>) and 25.52 km<sup>3</sup> respectively) originate in Turkey, which means that Iraq is reliant on transboundary water management upstream in the catchment ([Issa et al. 2014](#)). All the tributaries on the Euphrates originate outside Iraq, while 60 per cent of Iraq's water on the Tigris comes from sources within the country's borders ([Issa et al. 2014](#)). Until recently, glacial melt from the mountains in both river basins flowed mostly uninterrupted to Iraq, supporting a permanent and seasonal hydrological system of smaller rivers and marshlands in the southern part of the country, which formed part of the Fertile Crescent ([Janabi 2013](#)). In modern times, however, the depletion of the water from both rivers, due to increases in demand and climate change, is a fundamental issue.

First, increased demand for water in Turkey, as well as resource pressure along the catchments in Syria and Iran, is putting an increasingly critical strain on Iraq. The lack of any water treaty or agreement in the region, notably due to decades of conflict and instability, makes Iraq particularly vulnerable in this hydrological interdependence and without any recourse to achieve security ([United States Agency for International Development \(USAID\) 2017](#)). This situation is becoming increasingly worrisome as both the Tigris and the Euphrates are experiencing drying, with a recent UN report projecting that they are expected to be dry in the next 20 years, by 2040 ([USAID 2017](#); [Al-Ansari, 2013](#)).

In 2020, it is estimated that Iraq will experience a significant water shortage with estimated water demand (at 72.07 km<sup>3</sup>/year) projected to now exceed water supply (63.46 km<sup>3</sup>/year) ([Issa et al. 2014](#)). This trend in increased demand has mainly been led by agriculture, which takes up 90 per cent of the country's consumption. A water withdrawal rate at almost double the world average has notably been linked to a mismanagement of the resource, through a lack of adequate infrastructure and planning ([USAID 2017](#)). Decreases in water supply (and, in some cases, demand) are linked to a range of climate trends, such as increases in evaporative losses and the frequency and severity of droughts. The worst droughts recorded since the 1940s occurred in 2007 and 2009, caused by precipitation below 70 per cent of the annual average ([USAID 2017](#); [NASA 2009](#)). Droughts have been occurring at increasing intensity – the impacts of this phenomenon notably seen in 2018 ([Faraj 2018](#)). There are clear trends towards significantly reduced precipitation and increased temperatures.

Accompanying this issue of water depletion comes an issue of water quality – droughts and flooding have a negative impact on the potability of water for human consumption, as increased erosion and runoff change the chemical compositions of the already stressed resource, and can make it unfit for human consumption. Saline intrusion into groundwater, for instance, can make water unusable ([Janabi 2013](#); [USAID 2017](#)). One-third of the country's population is estimated not to have access to safe water. However, it is also important to note that potable water does reach 100 per cent of urban settlements in the country, but only 54 per cent of rural areas ([Al-Ansari 2013](#)). The port city of Basra, on the Euphrates, is known as a place of particularly grave public health concerns, such as large outbreaks of cholera and gastrointestinal illness caused by the lack of potable water ([World Health Organization, Eastern Mediterranean Regional Office \(EMRO\) 2018](#); [Aboulenein and Levinson 2020](#)). For instance, in 2018, over 118,000 cases of water-related illnesses were recorded by health authorities ([Human Rights Watch \(HRW\) 2019](#)). Following this, HRW drew a causal link between decreased water levels in the rivers and canals that supply the city, the waterborne illnesses and civil unrest in the city in August of 2019 ([HRW 2019](#)).

## Power and electricity

Decades of conflict and instability have left the country with little reliable electricity supply and grid connection, which constantly threatens the power supply and infrastructure in the country. Additionally, climate change and economic trends are putting increased pressure on what is currently in place. Indeed, the country's main energy source is petroleum, which is a particularly valuable export that represented a revenue of 80,027 million US dollars in 2019 ([Organization of the Petroleum Exporting Countries \(OPEC\) 2019](#)). The Iraqi portion of Kurdistan notably holds a third of the country's oil reserves and has been a site of much tension in the past few years ([The New York Times 2018](#)). This reliance on fossil fuels makes the country, and the region at large, vulnerable to fluctuations in oil prices and global market trends, which can lead to stranded assets<sup>1</sup> in a global context where reliance on fossil fuel is declining.

The country's next largest source of energy comes from its seven hydroelectric power stations that supply 9.22 per cent of the country's electricity ([Pilesjo and Al-Juboori 2016](#)). However, with the climatic changes described above, declines in river water levels are decreasing this potential. Iraq's largest dam, the Mosul Dam, has an installed capacity of 750 megawatts (MW), but projections show that climate change will decrease its generation power by 5–10 per cent by 2050 ([Pilesjo and Al-Juboori 2016](#); [USAID 2017](#)). By the opposite token, increased severe precipitation events and flash flooding also threaten the country's energy infrastructure, particularly in the southern region of the country where the collapse of levees along the Tigris occurs regularly ([Food and Agriculture Organization of the United Nations \(FAO\) 2016](#)).

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<sup>1</sup> Stranded assets are defined as resources or infrastructure that once were valuable but are no longer, often due to external factors such as changes in technology, habits, acceptability etc. These assets are understood to be at the end of their economic life, no longer valuable enough to meet the owner's rate of return. Currently, the term is often used to refer to fossil fuel assets that have not yet been extracted and have lost their investment value notably due to the energy transition.

## Infrastructure

Two-thirds of Iraq's population lives in cities of which the capital, Baghdad, is the largest – the ancient city now has an estimated population over 7 million people ([World Population Review 2020](#)). Baghdad experiences severe flooding – often flash floods – due to extreme precipitation events and inadequate drainage infrastructure ([Reliefweb 2015](#)). In the 1950s, large flood prevention schemes were built but they are falling into disrepair, caused by limited public finances as well as the Gulf War (1990–1991) and Iraq War (2003–2011), and are no longer adapted to the increasing height of floodwater as experienced in recent years ([Britannica n.d.](#)).

## 2.2 Economic Security

The economy of Iraq is mainly led by oil production. A founding member of OPEC, it holds 12 per cent of the world's known crude oil reserves and exports over 4 million barrels of oil per day, making it the world's third-largest exporter ([World Bank Group 2018](#); [OPEC 2019](#)). Other exports include natural gas, phosphates and sulphur ([OPEC 2019](#)).

Importantly, Iraq's position in the Fertile Crescent has meant that it has a longstanding tradition of agriculture and irrigation, particularly in the region between the Tigris and Euphrates ([Adamo et al. 2018](#)). Agriculture accounts for approximately 5 per cent of the country's GDP and supports a quarter of livelihoods ([USAID 2017](#)). Main crops include wheat and barley, along with cash crops such as dates and livestock ([USAID 2017](#)). Most of the agricultural production occurs in small-scale farms. In the northern part of the country, these are generally rainfed; in fact, rainfed agriculture techniques are responsible for one-third of the country's cereal production ([FAO 2008](#)). In the rest of the country, the agricultural lands must be irrigated ([USAID 2017](#); [FAO 2008](#)). Like in most countries in the region, climate change is acutely felt in Iraq's agricultural sector. Patterns include visible and prolonged loss of arable land and declines in agricultural productivity ([USAID 2017](#); [Adamo et al. 2018](#); [Ewaid et al. 2019](#)). In particular, many crops in Iraq (wheat, for example) are highly coupled with the climate, dependent on certain parameters of precipitation and temperatures and may become less suitable with climate change ([Zampieri et al. 2020](#)).

Dealing with water scarcity requires a complex combination of management techniques and agricultural strategies including more efficient irrigation, land conservation, equity in distribution, and cyclical treatment of wastewater ([FAO 2018](#)). Salinization and increased erosion of agricultural land are also an issue ([Al-Dabbas 2013](#); [Dhehibi et al. 2015](#)), and desertification has been calculated to now threaten 92 per cent of the country's arable land ([USAID 2017](#)). Droughts have decimating impacts on the country's agricultural seasons – notably, a drought in 2008 and 2009 affected more than 50 per cent of the northern arable lands. It is estimated that droughts have already reduced agricultural production by an average of 30 per cent ([World Food Programme \(WFP\) 2019](#)). Agricultural land and production is additionally destroyed through the compound impacts of erosion and flooding ([Global Agriculture Monitoring 2019](#); [Sleet 2020](#)).

Finally, climate change also has an impact on animal health, notably causing increases in vector-borne diseases and parasites in livestock; for instance, bluetongue disease and Rift Valley fever. This is of particular concern in Iraq and the region at large as highlighted by a 2012 report by the FAO ([van de Steeg and Tibbo 2012](#)). In the region, climate change is altering the geographical range of these diseases, allowing their propagation notably through decreased water resources and higher temperatures as well as decreased amounts of available fodder ([van de Steeg and Tibbo 2012](#); [Kebede et al. 2018](#)).

All these trends are causing large social and economic impacts which include significant rural to urban migration due to crop failure and economic losses, a reduction of the agricultural sector's input to the country's GDP, and, as will be seen below, links to political instability and conflict. Food insecurity is of major concern. In 2016, the WFP's extensive study of food security in the country calculated that more than half (53.2 per cent) of Iraq's permanent population is vulnerable to food insecurity; this proportion jumps to 65.5 per cent for those people considered internally displaced (IDP). The proportion of the population that can be considered currently food insecure is 2.1 per cent – food insecurity is more pronounced in rural regions than in cities ([WFP 2016](#)). Importantly, rural households spend as much as 37 per cent of their income on food ([WFP 2016](#)).

## 2.3 Health

It is well documented that climate change has a significant impact on individual and community health. In Iraq, all of these climate impacts on health are occurring on the backdrop of an already overwhelmed healthcare system ([USAID 2017](#)). With reductions in water quantity and quality, waterborne diseases are also increasing in incidence. For instance, an outbreak of cholera in 2015 brought over 2,800 confirmed cases, which led to a large vaccination programme by the Iraqi government, supported by UNICEF and the World Health Organization ([WHO 2015](#)). Research has shown that the frequency of these outbreaks is increasing ([Hussain and Lafta 2019](#)). Other health impacts of environmental changes include the increased incidence of respiratory diseases due to frequent sand- and dust-storms that come with desertification, which is projected to increase ([Trigo et al. 2010](#)). Heatwaves are of particular concern. In the summer of 2020, record temperatures were reported from Baghdad at 51.8°C on 28 July ([Cappucci and Salim 2020](#); [O'Neill 2020](#)). The health implications of heatwaves are particularly dangerous for those with pre-existing conditions such as heart disease and diabetes, with disabilities, and people above 65 years of age. In the case of extreme heat, warnings, along with adaptation and response measures, are key. However, reports have highlighted that Iraq's electricity crisis leaves many households without power for most of the day, limiting access to power fridges, fans or air conditioners - which are lifelines in such temperatures ([Cappucci and Salim 2020](#)). Protests about the grid failures and electricity shortages, and the lack of basic services during the heatwave saw two protesters shot this summer ([Al Jazeera 2020](#)).

Finally, a range of health impacts related to hydrometeorological hazards, such as storms, are also significant and include displacement, injury and mortality. While recent general statistics may be difficult to find, anecdotal evidence illustrates the devastating impacts. For instance, a severe flood in 2006 affected over 60,000 people ([USAID 2017](#)), and a flash flood in November 2018 is reported to have displaced thousands and killed at least 21 people ([FloodList 2018](#)). Flooding is projected to increase in the region in frequency and intensity, as well as in unpredictability; making these impacts more likely and more significant in the near future ([Amiri and Eslamian 2010](#)).

## 2.4 Protection

The region is under a significant burden of conflict – most of the research read for this report has mentioned it in some form. This cascade of impacts has deep roots in environmental and climate-related dimensions. For instance, visible links between water scarcity, agricultural, drought, migration and conflict are well-documented (for example, see [Detges \*et al.\* 2017](#)). A significant proportion of the population is listed as living in poverty: 22.5 per cent ([Central Intelligence Agency \(CIA\) n.d.](#)) and this number is soaring – notably, the effect of climate change on decreased agricultural productivity and fluctuations in oil prices are significant drivers of this trend ([USAID 2017](#)). Widespread conflict has displaced 3.3 million Iraqis since 2014 with approximately 6.7 million needing humanitarian assistance. As of 2019, 2.2 million people remain displaced, 71 per cent of these in the Kurdistan region ([United Nations High Commissioner for Refugees \(UNHCR\) n.d.](#)). There are also 300,000 refugees from Syria and neighbouring countries who have similarly escaped conflict.

These populations face additional risks related to the changing climate and its impacts on the range of topics described above; notably, internally displaced communities are more likely to be food insecure and more vulnerable to disease outbreaks, as a result of living conditions within IDP camps ([UNHCR 2021](#)). Climate change may additionally be exacerbating the known drivers of conflict, and its impacts are also taken advantage of for conflict purposes – for instance, it has been highlighted that Al-Shabaab and ‘Islamic State’ are recruiting largely in agropastoral regions where the pressure of climatic and environmental changes is making livelihoods very difficult to sustain. These communities will be particularly vulnerable to recruitment by state and non-state armed groups as it is often presented as the only viable economic choice ([Schwarzstein 2017](#)).

Around the world, prisoners frequently have heightened vulnerability to natural disasters due to: spatial marginalization resulting from prison locations on hazard-prone land and/or isolation from emergency evacuation services; limited to no connections to social networks, which are crucial aspects to hazard resilience; and political marginalization, including lack of policies and services to prevent disaster impacts on imprisoned populations ([Gaillard and Navizet 2012](#)). While specific information is not available for Iraq, these vulnerabilities, coupled with more frequent and intense disasters due to climate change may leave prison populations particularly vulnerable to climate-related hazards such as extreme heat, extreme cold and floods.



## 2.5 Policy

Iraq has signed but has not ratified the 2015 Paris Agreement. It submitted its first nationally determined contributions (NDC) in November 2015 ([Apparicio and Sauer 2020](#)). It notably proposes a 6 per cent reduction in per capita greenhouse gas emissions in 2010–2030 ([University of Melbourne 2017](#)). In 2013, the National Environmental Strategy and Action Plan for Iraq was published, which identifies the major areas of concern and priority for the country such as improving air, water and soil quality, ecosystem protection, and minimizing pollution ([United Nations Environment Programme \(UNEP\) n.d.](#)). It also set the groundwork for the development of legislative processes and institutional frameworks ([UNEP n.d.](#)). Adaptation also was an important focus of the country's NDC, with adaptation outcomes set as increased resilience, food and water security, and sustainable development among others ([Nature-based Solutions Policy Platform n.d.](#)). If climate change adaptation has been highlighted by the government as a national priority, political and practical challenges in planning and implementing such policies are wide-reaching. Indeed, political instability and uncertainty are important barriers to climate change adaptation and impact mitigation ([USAID 2017](#)).



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