

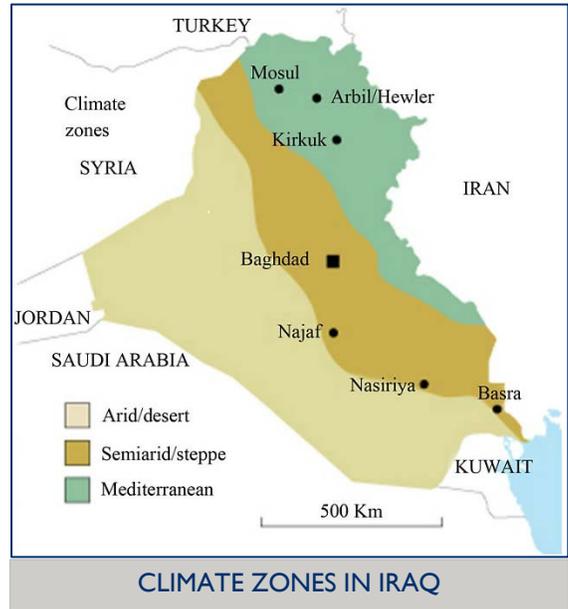


CLIMATE CHANGE RISK PROFILE

Iraq

COUNTRY OVERVIEW

Iraq is a nation grappling with significant and interconnected environmental, security, political, and economic challenges. The effects of climate change, many of which are already evident, will likely increase the extent of these challenges. Iraq was part of the famed Fertile Crescent, the breadbasket of the ancient world, but rising temperatures, intense droughts, declining precipitation, desertification, salinization, and the increasing prevalence of dust storms have undermined Iraq's agricultural sector, already long in decline. Compounding these trends is the threat of water scarcity. Iraq's water security is based on two declining rivers, the Tigris and Euphrates, and is inextricably tied to two neighbors, Turkey and Syria. Both Turkey and Syria lie upriver and rely heavily on the twin rivers. From 2007 to 2009, Iraq and Syria endured their worst droughts since 1940, with precipitation levels dropping up to 70 percent below annual averages. This followed a drought of nearly equal impact in 1998–2000. In Syria, these repeated



CLIMATE PROJECTIONS



Increase in average annual temperatures of 2°C by 2050, with more frequent heat waves



More extreme weather, with intense precipitation, floods and droughts



Decrease in average annual rainfall of 9 percent by 2050

KEY CLIMATE IMPACTS

Agriculture

Reduced agricultural productivity
Desertification of arable land



Water Resources

Increased water scarcity
Longer and more severe droughts
Reduced water quality



Human Health

Increased food insecurity
Intensified epidemics (e.g., cholera)
Compromised respiratory health



Energy and Infrastructure

Reduction in electricity generated from hydropower
Damage and destruction of vital infrastructure (e.g., levees)



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This document was prepared under the Global Environmental Management Support Project (GEMS) and is meant to provide a brief overview of climate risk issues. The key resources at the end of the document provide more in-depth country and sectoral analysis. The contents of this report do not necessarily reflect the views of USAID or the United States government.

droughts are seen as a primary driver of rural migration into urban areas, with the resulting social pressure and conflict contributing to Syria's devastating civil war. Iraq, too, has seen large-scale migration to urban centers, and the risk of a parallel scenario is substantial, with the pressures of poverty and insecurity already serious problems in Iraq. Poverty has soared to 22.5 percent of Iraq's 36.42 million people, and the Islamic State (IS)-fueled humanitarian crisis has internally displaced 3.4 million people and left 10 million people vulnerable. National and regional political volatility and uncertainty will make mitigating the effects of climate change and addressing the critical issue of transnational water management very difficult. The current trajectory of increasing temperatures, reduced precipitation, and increasing water scarcity will likely have serious implications on the state of Iraq for years to come. (2, 10, 13, 15, 16)

CLIMATE SUMMARY

Iraq has three major climate zones, primarily delineated by rainfall quantities: a largely uninhabited and extremely arid lowland desert, a semi-arid steppe, and a moist Mediterranean region in the sub-humid upland and mountainous north and northeast.

The Iraqi desert is extremely hot and arid, with average diurnal temperatures ranging from 4°C to 17°C in the winter, and rising to 25°C to 43°C in the summer months. Extreme temperatures ranging from -8°C in the winter to over 48°C in the summer can occur. Annual rainfall is negligible. The Iraqi steppe is also very hot, though rainfall is substantially higher than it is for the desert floor. The average diurnal temperature in Baghdad, located in the steppe, ranges from 5°C to 18°C in the winter. In the summer, temperatures increase, rising from 26°C to 46°C daily. The steppe receives 200–400 mm of precipitation per year, with nearly all of that falling between November and April. In the mountains, the climate is considerably wetter but only marginally cooler than the steppe. In the northern city of Kirkuk, the diurnal winter temperature ranges from 4°C to 15°C, while the summer range is from 27°C to 44°C. Rainfall in the mountains varies by location, but ranges from 400 mm to more than 1,000 mm, falling mostly between November and March.

The south/southeasterly sharqi winds and the north/northwesterly shamal winds result in significant dust storms from April to June and from September to November. Evaporation is high, particularly in the arid lowland region, where annual evaporation is approximately 2,100 mm. Temperatures exhibit little year-to-year variation nationwide. (1, 3, 16)

HISTORICAL CLIMATE

Key climate changes since the 1950s include:

- Increases in mean annual temperature at a rate of approximately 0.7°C per century.
 - Variable changes in annual rainfall:
 - In the northeast, annual rainfall has increased at a rate of 2.4 mm/month per century.
 - In the southeast, annual rainfall has decreased at a rate of 0.88 mm/month per century.
 - In the west, annual rainfall has decreased at a rate of 5.93 mm/month per century.
- (16)

FUTURE CLIMATE

Projected changes include:

- Increase in mean annual temperature by 2°C by 2050.
- More frequent heat waves and fewer frost days.
- Decrease in mean annual average rainfall by 9 percent by 2050, with the greatest reduction (-17 percent) expected during December, January, and February.
- Decrease in the maximum amount of rain that falls in any 5-day period, but overall increase in rainfall intensity.
- Decrease in runoff of 22 percent (countrywide average). (16)

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

Although Iraq's economy is dominated by oil, agriculture is the second largest contributor to the country's GDP (approximately 5 percent) and serves as an important source of livelihood for 25 percent of the population. Agriculture is characterized by small-scale farms that are mostly rain-fed in the north and irrigated in other regions. Main crops include wheat and barley, with dates as a cash crop and livestock as an integral part of farming systems, particularly in the northern rain-fed regions. The decline of the agricultural sector (due, in part, to environmental drivers) has been evident in the continued loss of arable land, losses in productivity, and reduction in agriculture's overall contribution to GDP. Decreased rainfall and runoff have contributed to widespread desertification (estimated to threaten 92 percent of the country). The southern province of Basra has dealt with salinization of once arable land, and salinization rates are expected to increase with future sea level rise. Prolonged drought has taken a toll on rain-fed crops in the north, damaging approximately 50 percent of northern agricultural lands and devastating livestock in 2008 and 2009. Drought is expected to significantly impact future livestock production, which is already limited by feed shortages. In 2013, severe flooding damaged approximately 75,000 acres of cropland in southeastern and eastern Iraq. Sand and dust storms further threaten cropland and productivity by causing soil loss, decreasing soil fertility, and removing organic matter. Currently, dust storms sometimes occur at a rate of over 100 times annually, but could occur up to 300 times annually in ten years. Further reductions in arable land and productivity could also result in loss of livelihoods and increased food insecurity. (1, 4, 6, 11, 12, 13)

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Increased temperatures	Decreased agricultural productivity
Greater Frequency and Intensity of drought	Loss of arable land due to desertification and sand and dust storms
	Increased soil salinization
Increased intensity of rainfall events	Migration from rural to urban areas due to crop failures and loss of livelihoods

WATER RESOURCES

The Euphrates and Tigris Rivers supply more than half of Iraq's freshwater resources. Both rivers originate in Turkey, and Iraq's water supply relies on Turkey and other upstream consumers (i.e., Syria and Iran). There is a lack of formal agreement among these countries regarding riparian rights. This is a potential source of conflict, as the rivers have been in decline, and water demand has been increasing due to population growth and economic development, particularly in Turkey. The ongoing Syrian conflict and the transnational conflict with IS effectively preclude the establishment of enforceable international riparian agreements in the short term. Despite this significant supply vulnerability and existing scarcity, Iraq has a water withdrawal rate that is almost double the world average, due to a lack of adequate national water management policies. This inefficient water use is a critical threat to Iraqi agriculture, which accounts for as much as 90 percent of water consumption nationally. By 2020, average estimated water demand (72.07 km³/yr) is expected to surpass estimated water availability (63.46 km³/yr), with river discharges potentially running dry by 2040. Yearly fluctuation in annual discharge has caused severe flooding, and these fluctuations are projected to further intensify flood occurrences in the future. Yearly variability in river flow has

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Source water depletion
Decreased average rainfall	Increased lack of access to safe drinking water
	Increased conflict over water
Increased drought	Saltwater intrusion into groundwater sources
Sea level rise	

partly contributed to prolonged droughts, which are also expected to worsen. Drought and low rainfall have also compromised the water quality of the rivers, making the shallower waters more prone to pollution from sources such as wastewater and petroleum industry waste. Coastal areas in the south are more vulnerable to saltwater intrusion and salinization of groundwater sources, and future sea level rise could exacerbate this issue. (1, 5, 6, 9, 15)

HUMAN HEALTH

Climate change impacts on agricultural productivity and water availability further exacerbate Iraq’s existing food insecurity challenge. About 1.9 million Iraqis (or 5.2 percent of the population) are food-deprived, and 4 million Iraqis (or 11 percent of the population) are vulnerable to food insecurity. Source water depletion and increased water pollution can intensify epidemics, particularly cholera. Cholera outbreaks can correlate with high temperatures and extreme weather events, both of which are expected to increase in Iraq. A cholera outbreak in late 2015 resulted in 2 deaths and almost 3,000 cases in 17 governorates. Furthermore, intensified floods could lead to displacement, injuries, and loss of life. In 2006, flooding impacted over 60,000 and killed 20 people. The health impacts of sand and dust storms, which can cause serious and sometimes chronic respiratory infections, are also of concern. Already limited hospitals and other healthcare facilities are overwhelmed with cases of infections stemming from sand and dust storms. The occurrence of these storms is projected to increase, which could overwhelm healthcare facilities even further. (10, 12, 14, 16, 17)

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Reduced quality and quantity of drinking water, leading to increased risk of waterborne illnesses (e.g., cholera)
Decreased average rainfall	
Increased drought	Heightened food insecurity leading to increased and severe malnutrition (particularly in children)
Increased intensity of rainfall events	Respiratory infections from sand and dust storms
	Displacement, injuries, and death from floods and storms

ENERGY AND INFRASTRUCTURE

The Iraqi power supply is inconsistent, and improvement has been hampered by years of war. Iraq predominantly depends on fossil fuels for domestic electricity generation, but 7.6 percent of its electricity originates from hydropower. This represents a valuable resource in a power-stressed environment, especially in the northern region of Kurdistan. With the continued decline of major rivers, Iraqi hydropower seems likely to decline. A study conducted on the effects of climate change on hydropower generation at Iraq’s third largest dam concluded that by 2050, power generation would decrease by 5–10 percent. Infrastructure, especially water infrastructure (e.g., levees), in the southern part of the country has been destroyed by flooding in the Tigris River. Increased high-intensity rainfall events are expected to aggravate damage to Iraq’s infrastructure assets. (8, 16, 17)

Climate Stressors and Climate Risks ENERGY AND INFRASTRUCTURE	
Stressors	Risks
Decreased average rainfall	Reduced hydropower generation
Increased drought	
Increased intensity of rainfall events	Damage to and destruction of infrastructure (e.g., levees, dams, and roads)
Sea level rise	

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

In 2003, the Ministry of Environment (MoE) was established in Iraq to implement state policy that protects and improves the quality of the environment, partly through adoption of frameworks for sustainable development and integrated environmental management. The MoE also serves as a participant in international environmental agreements. Iraq ratified the UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 2009 as a Non-Annex I country, and the MoE has worked with the UN Environment Programme (UNEP) and other partners to develop National Communications. (9)

NATIONAL STRATEGIES AND PLANS

- [Initial National Communication](#) (2015) (Note: Electronic copy of this document appears to be unavailable.)
- [The National Environmental Strategy for Iraq](#) (2011)
- Other related sectoral policies include the [National Development Plan](#) and the [National Biodiversity Strategy and Action Plan](#).

KEY RESOURCES

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17. World Bank Group. 2014. [Turn Down the Heat: Confronting the New Climate Normal](#).

Map from: Al-Ansari, N. 2013. [Management of Water Resources in Iraq: Perspectives and Prognoses](#).

SELECTED EXPERIENCES

Selected Program	Amount	Donor	Year	Implementer
Developing Disaster Risk Management Capacities	\$6.5 million	UNDP	2013–2016	Ministry of Science and Technology, Ministries of Planning, Agriculture, Environment, KRG, Governorates of Erbil, Ninewa, Missan
Improving Food Security and Climate Change Adaptability of Rain-fed Barley Farmers in Iraq and Jordan	\$1.5 million	International Fund for Agricultural Development (IFAD)	2010–2014	International Centre for Agricultural Research in Dry Areas
Iraq Crisis Response and Resilience Programme (ICRRP)	\$58.7 million	UNDP and partner agencies	2014–2017	UNDP and partners
Iraq Emergency Fiscal Stabilization, Energy Sustainability, & SOEs DPF	\$1200 million	International Bank For Reconstruction And Development/World Bank	2015–2016	World Bank
Regulatory Reform: Environment	\$50,000	Government of Iraq	2013–unknown	USAID-Tarabot
Support Development of National Communication to UNFCCC	\$1 million	UNDP	2010–unknown	Global Environmental Facility, UNEP, Republic of Iraq Ministry of Environment