



# CLIMATE CHANGE RISK PROFILE JORDAN

## COUNTRY OVERVIEW

Much of Jordan's territory is inhospitable to human settlement. Approximately 90 percent of the country's population is concentrated in the northwestern quadrant, where rainfall is highest and water is most accessible, making the population density in the inhabited part of the country among the highest in the world. As one of the four driest countries in the world, water scarcity is by far the greatest impediment to planned growth and development, with far-reaching impacts across all sectors. Water scarcity is expected to be exacerbated by climate change, which has already decreased rainfall levels and increased temperatures. Jordan's economy is heavily dependent on donor assistance, international loans, foreign remittances and trade as a result of its limited water and other natural resources. Population growth in Jordan, which has increased rapidly due to large inflows of refugees from the Palestinian Territories, Iraq and Syria following periods of political unrest from 1948 to today, puts even greater pressure on food and water resources, infrastructure and social services. Food imports have increased as a result of both climate change and population growth and are widening the country's trade deficit, which reached \$15.3 billion in 2014. As global food prices rise, this situation is worsening, with families spending up to 40 percent of their income on food. (2, 3, 5)



## CLIMATE PROJECTIONS



2°C increase in temperatures by 2050



Decrease in annual precipitation; increase in drought conditions and heat waves

## KEY CLIMATE IMPACTS

### Water

Reduced water supply  
Degraded water quality



### Livestock

Loss of pasture lands and water resources for livestock



### Human Health

Increased risk of water-, food- and airborne diseases



### Agriculture

Shorter growing season  
Reduced yields and crop failure



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## CLIMATE SUMMARY

Jordan is situated in the eastern Mediterranean region. Winters typically bring heavy rainfall from December–March, and are followed by hot, dry summers from April–November. Jordan has three ecological zones:

- The **Jordan Valley**, which sits 200–400 meters below sea level, experiences warm winters (19°–22°C) and hot summers (38°–39°C), with average annual rainfall ranging between 102–300 mm.
- The **Western Highlands** experience the highest precipitation levels: rainfall averages 350–500 mm per year and temperatures range from 9°–13°C in the winter to 26°–29°C in the summer.
- The **Badia**, an arid and semi-arid area to the east, covers approximately 85 percent of the country. Average annual rainfall levels fall below 200 mm, and temperatures range from 14°–16°C in the winter to 35°–37°C in the summer. (2, 3, 4, 5, 6)

### HISTORICAL CLIMATE

Historical climate trends since the 1960s include:

- Rise in annual maximum temperatures of 0.3°–1.8°C and rise in annual minimum temperature of 0.4°–2.8°C across all regions (minimum temperatures rose at a faster pace than maximum temperatures).
- Increase in the average number of heat waves across the country, particularly in the desert.
- Increase in the number of consecutive dry days nationwide (highest in the desert, followed by the highlands and then the Jordan Valley).
- Decline in annual precipitation by 5–20 percent across the country, except Ras Muneef in the highlands and Ruwashed in the *Badia*, where rainfall has increased by 5–10 percent.

### FUTURE CLIMATE

Projected climate changes include:

- Rise in annual maximum temperature of up to 5.1°C and rise in annual minimum temperature of 3.8°C by 2085 (warming is stronger during the summer). Some models project temperatures to rise evenly across the country while others suggest the increase will be strongest in the eastern and southern regions.
- Increase in the frequency of heat waves.
- 10-day increase in the number of consecutive dry days from 2040–2070 (increase will be greatest in the southern Aqaba region).
- Precipitation projections are highly variable but point to an overall decrease between 15–60 percent from 2011 to 2099.

## SECTOR IMPACTS AND VULNERABILITIES

### WATER RESOURCES

Jordan is one of the most water-constrained countries in the world, with water availability levels far below the standard water poverty threshold of 500 m<sup>3</sup> per capita per year. Water levels per capita were 3600 m<sup>3</sup>/year in 1946, but fell to 145 m<sup>3</sup>/year by 2008 due to population growth and climate change. These will continue to fall to just 90 m<sup>3</sup>/year by 2020 if no substantive action is taken to conserve existing resources and generate additional sources of potable water. This downward trend is alarming given that since 2014, demand for water outpaced supply by as much as 50 percent. Climate change will continue to have significant impacts on water scarcity in Jordan as a result of lower precipitation levels and rising temperatures. Both trends decrease water availability and quality by reducing runoff and creating environments conducive for microorganism and bacterial growth. The realities of supply deficits have put pressure on groundwater aquifers (which provide 70 percent of potable water),

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Rising temperatures	Reduced surface water and groundwater resources and recharge rates
	Reduced water quality for industrial and household use
Drought and reduced rainfall	Constrained agricultural and economic growth
	Increased regional tensions over water access

where recharge rates have been exceeded as a result of falling precipitation levels and surface water runoff. Transboundary river systems also exacerbate the challenges, as long-standing agreements with Syria and Israel have not been observed, leaving Jordan with less than 10 percent of the total flow of the Upper Jordan and Yarmouk Rivers, potentially causing further destabilization and conflict in the region. (5, 6, 7, 8)

## HUMAN HEALTH

Limited access to clean water as a result of climate change is among the greatest threats to human health. Reduced rainfall levels, and drought in the most severe cases, reduce the replenishment rates of surface and groundwater systems, leading to lower water availability for human consumption. In response to concerns about water resources, the Jordanian government proposes to increase the use of treated wastewater to supplement irrigation rather than rely on potable water. This solution is not without its risks, as poorly treated water can increase the risk of pathogen transmission, such as those carrying diarrheal disease and cholera. The reduced availability of water forces communities to resort to marginal or compromised reserves for household and agricultural use, increasing the risk from waterborne diseases. Declining agricultural production of Jordan's primary staple crops raises concerns about food security and malnutrition, particularly because Jordan already imports over 80 percent of its domestic food requirements. Access to

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Rising temperatures  Drought and reduced rainfall	Increased incidence of food-borne diseases (Salmonella and Shigella) through crop contamination
	Increased incidence of waterborne diseases (typhoid fever, cholera, Hepatitis A and E, giardiasis, bilharzia)
	Increased food insecurity and malnutrition

affordable, nutritious foods will be out of reach for many communities living in Jordan, particularly displaced and other vulnerable populations, as a result of rising food prices. (2, 4)

## AGRICULTURE

Only 10 percent of Jordan's land is considered suitable for agricultural production, and predominantly lies in high rainfall areas of the highlands and the Jordan Valley. Rapid urbanization due to high population growth and domestic and international population flows are forcing development into these areas. This is pushing production to marginal lands in the badia region to the east and south, which suffer from drought and soil degradation. Climate change is expected to further stress these already marginal lands. Wheat and barley, the primary staple crops in Jordan, are especially susceptible to changing climate patterns. Barley yields in the Yarmouk Basin are projected to decrease 5–50 percent by 2050 due to reduced rainfall and higher temperatures. As rainfall declines and temperatures rise, Jordan's ability to maintain sustainable production levels of water-intensive exports such as fresh fruits and animal products becomes jeopardized. Invariably, this also forces increased dependence on imported food to meet domestic consumption demands. Although irrigated

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Rising temperatures  Drought and reduced rainfall	Crop loss or crop failure as a result of diminished rainfall
	Increased water demand of crops; reduced water available for irrigation
	Shortened growing season
	Desertification and degradation of arable land
	Loss of income from inability to cultivate export crops
	Increased food imports, increasing the trade deficit

land accounts for only 33 percent of total cultivated area, the agriculture sector still consumes more than 60 percent of total available water resources. (1, 5, 9, 10)

## LIVESTOCK

Livestock products provide food and income for more than 250,000 Jordanians and comprise 58 percent of agricultural GDP revenue. Cattle and poultry rearing are primarily concentrated in the *Badia*, with some sheep and goat herding practiced in the highlands. Herd size is highly dependent on access to water and pastureland, and hence at risk to climate stressors. Declining rainfall levels and rising temperatures have reduced the availability of drinking water and the fertility of pasturelands for grazing. Barley yields, traditionally used as the dominant fodder for sheep, goats and other small ruminants, have fallen due to higher temperatures and rainfall variability. This decline in grazing lands has led to a shortage of feed by as much as 77 percent, causing imports to rise. Higher temperatures have also increased the incidence of livestock diseases and parasitic infestations such as

## POLICY CONTEXT

### INSTITUTIONAL FRAMEWORK

The Ministry of Environment (MOE) is primarily responsible for overseeing the policy and legal frameworks that guide climate change mitigation and adaptation efforts in the country, including development of the Third National Communication (TNC) to the United Nations Framework Convention on Climate Change (UNFCCC). MOE works closely with the Ministry of Agriculture (MOA), the Ministry of Health (MOH) and the Ministry of Water and Irrigation (MWI), which is responsible for managing water resources by implementing irrigation policy, determining water allocation, constructing water infrastructure and establishing water conservation programs.

### KEY RESOURCES

1. Al-Bakri et al. 2011. [Potential Impact of Climate Change on Rain-fed Agriculture of a Semi-Arid Basin in Jordan.](#)
2. GEF. 2014. [JordanLINK "http://unfccc.int/resource/docs/natc/jornc3."](#)
3. GEF. 2009. [JordanLINK "http://unfccc.int/resource/docs/natc/jornc2.pdf" a Semirk Convention on Climate Change \(UNFCCC\).](#)
4. FAO. 2008. [Jordan.](#)
5. MOH. 2012. National Climate Change Health Adaptation Strategy and Action Plan of Jordan.
6. UNDP. 2013. [The National Climate Change Policy of the Hashemite Kingdom of Jordan 2013–2020.](#)
7. UNDP. 2014. [Integrated Investment Framework for Sustainable Land Management in Jordan.](#)

## Climate Stressors and Climate Risks LIVESTOCK

Stressors	Risks
Rising temperatures	Decline in surface water systems and pastureland for drinking water and grazing
Drought and reduced rainfall	Higher rate of livestock illness and death
	Loss of income and nutrition due to decline in livestock herds

toxoplasmosis and brucellosis. As livestock are the second largest export by both volume and value, any impacts on the sector have a significant effect on the economy as a whole. (11, 12)

### NATIONAL STRATEGIES AND PLANS

- [Intended Nationally Determined Contribution \(INDC\)](#) (2015)
- [Initial National Communication](#) (1999)
- [Second National Communication](#) (2009)
- [Third National Communication](#) (2014)
- [Jordan Poverty Reduction Strategy](#) (2013)
- [Climate Change Adaptation and Low Emission Development Strategy](#) (2013)
- [Water for Life: Jordan's Water Strategy](#) (2008–2022)
- [National Strategy and Action Plan to Combat Desertification](#) (2006)

8. WHO. Nd. [Climate Change Adaptation to Protect Human Health.](#)
9. GEF. 2014. [JordanLINK "http://unfccc.int/resource/docs/natc/Change."](#)
10. USAID. 2012. [ISSP Water Valuation Study: Disaggregated Economic Value of Water in Industry and Irrigated Agriculture in Jordan.](#)
11. National Center for Agricultural Research and Technology Transfer. Nd. [Country Report on the State of Animal Genetic Resources in Jordan.](#)
12. FAO. 2006. [Country Pasture: Forage Resource Profiles.](#)

Map modified from: UNDP. 2014. [Jordan's Third National Communication on Climate Change.](#)

## SELECTED ONGOING EXPERIENCES

Given the severity of water shortages in Jordan, the vast majority of international funding is rightly targeted towards water and sanitation activities.

Selected Program	Amount	Donor	Year	Implementer
Climate Change Adaptation to Protect Human Health	\$0.55 million	GEF Special Climate Change Fund (SCCF)	2010–2014	WHO
Intersectoral coordination for the implementation of the climate change policy of the Jordanian Ministry of Environment (GF-ICE)	Not available	German Federal Ministry for Economic Cooperation and Development (BMZ)	2014–2015	Ministry of Environment (MOEnv)
Badia Ecosystem and Livelihood Project for Jordan	\$14.68 million	World Bank	2012–2017	N/A
Water and Wastewater Infrastructure Project	\$34.1 million	USAID	2010–2010	CDM International Inc.
Emergency Services and Social Resilience for Municipalities Affected by Syrian Refugees	\$17 million	CIDA	2014–2016	World Bank
Rural Economic Growth and Employment Project	\$15.2 million	IFAD	2014–2020	IFAD
Wadi Al Arab Water System II Project	\$54 million	EIB, Agence Française de Développement and the EU Neighbourhood Investment Facility (NIF)	2015–2018	Ministry of Planning and International Cooperation, Ministry of Water and Irrigation, and the Yarmouk Water Company
Reduce vulnerability in Jordan in the context of water scarcity and increasing food/energy demand	CHF3.2 million	SDC	2015–2018	Ministry of Water and Irrigation, Ministry of Agriculture, Ministry of Energy and Mineral Resources, and MOE
Strengthening of Food Security Information and Early Warning Systems for Effective Resilience-based Response in Countries Affected by the Protracted Syrian Crisis	\$394,214	FAO	2015–2017	Ministry of Agriculture, iMMAP
Mitigating the Impact of the Syrian Refugee Crisis on Jordanian Vulnerable Host Communities	\$11.4 million	Multi-donor	2013–2015	UNDP