

Jordan

This climate fact sheet summarizes the available information on the climate of Jordan and the impact of climate change on humanitarian activities in-country. Each fact sheet in the series was written using information from peer-reviewed academic papers, government publications, and other documentation from international non-governmental organizations.

1. Climate overview

Average temperature: The annual average temperature in Jordan varies between 16–24°C.

Average annual rainfall: The annual total precipitation varies sharply from one climatic region to another, from less than 50mm in the southern Badia region to a maximum of 600mm in the upper northern highlands region.

Observed Climatology of Temperature and Precipitation (1991-2020)

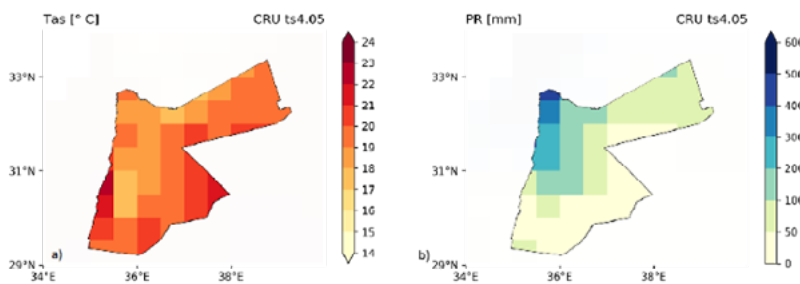


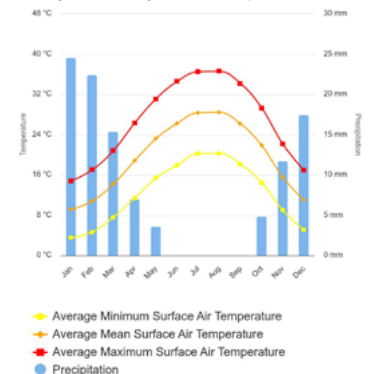
Figure 1. Observed climatology of (left to right) (a) mean temperature and (b) annual mean total precipitation from 1991 to 2020 (Adapted from World Bank Climate Change Knowledge Portal, 2022a)

Short overview

Jordan's climate ranges from arid desert to Mediterranean with hot, dry summers and cool, wet winters. The rainy season extends from around October to May with high amounts of seasonal rainfall occurring throughout December to March; reaching a maximum average during January. The climate variation across the country is influenced by its topography. Jordan has three distinct ecological zones: (i) The Jordan Valley, which forms a narrow strip located below mean sea level with warm winters (19–22°C) and hot summers (38–39°C) and average annual rainfall ranging between 100–300mm;

Figure 2. Average monthly climatology 1991–2022. (from World Bank Climate Change Knowledge Portal, 2022a).

Monthly Climatology of Average Minimum Surface Air Temperature, Average Mean Surface Air Temperature, Average Maximum Surface Air Temperature & Precipitation 1991-2022; Jordan



(ii) the Western Highlands where rainfall is relatively high (300–600mm per year) and temperatures range from 9–13°C in the winter and 26–29°C in the summer; and (iii) the Badia, an arid and semiarid inland region to the east (estimated to cover over 80 per cent of the total area), where annual rainfall is below 50mm and temperatures range from 14–16°C in the winter and 35–37°C in the summer (GEF, 2014).

The diverse and varied geography of Jordan means that it is exposed to a broad array of environmental hazards (hydrometeorological as well as geophysical) which are directly impacted and exacerbated by the impacts of climate change across the country. Jordan is one of the higher risk countries in the world for humanitarian crises and disasters; ranked 69th out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022). The country is exposed to droughts, floods, heatwaves, cold waves, rising temperatures and increasing aridity.

Climate change in Jordan

Historical climate change

Projected climate change

Temperature

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| <ul style="list-style-type: none"> ▪ The mean annual temperature over Jordan increased at a rate of 0.3°C per decade in 1961–2015 (Gutiérrez <i>et al.</i>, 2021a). ▪ Since the 1950s, hot extremes have become hotter and the number of warm days has increased, while the number of cold days has decreased (Dunn <i>et al.</i>, 2020). ▪ There has been an increase in heatwave intensity, frequency and duration (Perkins–Kirkpatrick & Lewis, 2020). | <ul style="list-style-type: none"> ▪ Mean temperatures over the region are projected to rise until 2050 by at least 3–4°C for a high greenhouse gas concentration scenario (SSP5–8.5) and by 2–3°C for a low greenhouse gas concentration scenario (SSP2–4.5) (Gutiérrez <i>et al.</i>, 2021b). ▪ Maximum and minimum temperature will increase, and heatwaves will intensify in duration and peak temperatures for every increase in global warming levels above the pre-industrial values. In line with rising mean annual temperatures, the annual number of very hot days (days with daily maximum temperature above 35°C) is projected to rise and with high certainty (Gutiérrez <i>et al.</i>, 2021b; Ranasinghe <i>et al.</i>, 2021; Seneviratne <i>et al.</i>, 2021). |
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Precipitation

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| <ul style="list-style-type: none"> ▪ Annual mean precipitation shows a high level of spatial variability over the Jordan region. During 1980–2015 there was a downward trend in mean annual precipitation (GEF, 2014; Gutiérrez <i>et al.</i>, 2021b). ▪ Dry conditions along with drought magnitude and frequency have increased over the region (GEF, 2014; Seneviratne <i>et al.</i>, 2021). | <ul style="list-style-type: none"> ▪ Mid-century (2040–2060) estimates of annual precipitation over Jordan under a low emission scenario (SSP2–4.5) as well as a high emissions scenario (SSP5–8.5) project a decrease of around 5–15 per cent (Gutiérrez <i>et al.</i>, 2021b). ▪ With decreases in precipitation and increases in temperature and evaporation, droughts are projected to intensify as a result of climate change over the region. In contrast, when rainstorms occur in the wet season they are projected to be more intense as a result of the warmer atmosphere (Gutiérrez <i>et al.</i>, 2021b; Ranasinghe <i>et al.</i>, 2021; Seneviratne <i>et al.</i>, 2021). |
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2. Priorities of the Red Cross Red Crescent Movement under climate change

2.1 Scale up climate-smart disaster risk reduction (DRR), early action and preparedness

Existing hydrometeorological hazard	Projected risk
Floods	
<p>Flood risk exists across Jordan and is especially a concern regarding flash floods, which are increasing with rapid urbanization combined with lack of carrying capacity of drainage systems (WFP, 2019a). Urban sprawl into areas of natural drainage (<i>wadis</i>) is resulting in a particularly acute risk of floods for urban populations.</p>	<p>A map developed by the World Food Programme (WFP, 2019a) denotes the areas particularly susceptible to floods. This was done using rainfall data and physio-geographical data combined with a hydrological model. The results show the most susceptible areas to floods that will require activities to increase adaptation are located mostly in the north-west of the country, namely: Ain Al-Basha, Ajloun, Al-Jāmi'ah, Al Mazar al Shamali, Al-Shuna al-Shmalyah, Ar-Ramtha, As-Salt, Bani Kinanah and Kufranjah.</p>
Droughts	
<p>Jordan is one of the most water scarce countries in the world (IWMI, 2022). Annually, the availability of water is approximately 100m³ per capita, which falls below the global benchmark of absolute water scarcity of 500m³ per capita. Jordan is currently experiencing drought conditions.</p>	<p>IWMI (2022) estimates that by 2030, 40 per cent of Jordan's groundwater basins are likely to be severely depleted. The WFP's drought hazard risk map highlights the most at-risk areas, especially in the north-western regions. Climate change is already impacting drought frequency and intensity in Jordan and is projected to continue to be a challenge for the country in the coming years (IWMI, 2022).</p>

It is important to note that many of these hazards are interrelated and produce compound risks in the same areas and communities. In addition, risk must be understood as the interplay between hazard, exposure and vulnerability which makes certain individuals, communities and sectors more impacted by the hazards. All project design should take such compounding risks into account.

Disaster risk management strategies

The country's disaster relief operations are highly centralized and managed by the Higher Council of Civil Defence (HCCD). The duties of the HCCD range from response planning and entering international DRR agreements at the national level to more local-level activities such as volunteer training. The country plans to establish a National Center for Security and Crisis Management (NCSM) to effectively manage national crises and changing environmental dynamics (The Hashemite Kingdom of Jordan, 2019).

Disaster Risk Management Law and Policies

- [The Jordan National Strategy for Disaster Risk Reduction](#) has the mission of creating a coordinated and integrated effort for disaster risk reduction, stakeholder collaboration and innovative use of skills, technologies and resources.
- [Jordan Vision 2025](#) seeks to improve and secure the welfare of citizens and ensure the continued delivery of services; this includes during and following disasters. The strategy mentions DRR in several contexts.
- [The National Climate Change Policy of the Hashemite Kingdom of Jordan \(2013-2020\)](#) is also an important part of the DRR strategy of Jordan and highlights the many overlaps between climate change adaptation and DRR for the country.

2.2 Reduce health impacts of climate change

Water scarcity (as precipitation declines and temperatures increase) is one of Jordan's most significant health threats (USAID, 2017; WHO & UNFCCC, 2015). Water scarcity will negatively affect irrigation and rainfed agriculture, raising concerns about food security and malnutrition (USAID, 2017; WHO & UNFCCC, 2015). Reduced rainfall and droughts will lead to lower water availability for human consumption. As communities are forced to resort to marginal or compromised reserves there will be increased risk of waterborne diseases (USAID, 2017). Increasing temperatures pose additional risks such as a rise in vector-borne diseases and the number of people exposed to extreme heatwaves, especially in urban areas (Alwadi & Abdulla, 2022). Flooding – for example, the flash floods that greatly impacted the country in 2018 – can result in serious physical injuries and death (The Guardian, 2018).

Low water availability could force people to use contaminated water sources or reduce water for hygiene and sanitation, causing water- and food-borne illnesses (Ministry of Environment, 2021). Low-income people and other vulnerable groups are likely to be impacted the most. In addition, frequent flooding could disrupt water and sanitation infrastructure and also contaminate water. According to the Ministry of Environment (2021), water-scarce desert and arid regions will be at highest risk as water harvesting projects provide breeding grounds for vectors, especially mosquitoes.

Furthermore, higher temperatures, flooding, water scarcity, droughts and displacements affect agricultural production leading to breakdowns in food systems, thereby causing malnutrition (WHO & UNFCCC, 2015). In addition, frequent droughts and higher temperatures could increase pollutants and pathogens in the air, leading to respiratory infections ((Ministry of Environment, 2021; WHO & UNFCCC, 2015).

2.3 Ensure sustainable water supplies

Water, Sanitation and Hygiene (WASH)

The core climatic risks to water resources in Jordan are decreasing precipitation, increasing temperatures leading to high evaporation rates and frequent droughts (Ministry of Environment, 2021). Jordan is the second most water-stressed country globally (UNICEF, n.d.; USAID, 2022). Population growth and the influx of refugees are increasing water demands, with groundwater being used twice as quickly as it can be replenished (USAID, 2022; Whitman, 2019).

Frequent droughts and declining precipitation significantly reduce runoffs (Salameh & Abdallat, 2020). In addition to droughts and low rainfall, higher evapotranspiration rates will reduce surface water resources. It is estimated that Jordan could receive 51–75 per cent less water from the Yarmouk River due to droughts (Rajsekhar & Gorelick, 2017). The number and intensity of drier days are expected to increase, which will affect aquifers' recharge that supply two-thirds of Jordan's water (Whitman, 2019). Furthermore, rising temperatures are expected to increase human and agricultural water demand (Whitman, 2019; Al Qatarneh *et al.*, 2018). Therefore, overuse of groundwater resources may lead to their depletion. The Azraq water basin is particularly at high risk of drying up (Hubendick & Gupta, 2021).

Extreme precipitation events and resultant flooding may also increase due to climate change (UNICEF, n.d.). The risk of flash flooding is high in Jordan, with frequent events causing mortality. The risk stems from the country's topography. In this scenario, floods can lead to the deterioration of water quality by transporting huge quantities of sediments into water bodies (Al Qatarneh *et al.*, 2018).

Most of Jordan's water resources are transboundary, requiring careful resource and political management. The Lower Jordan River basin, in particular – in terms of access and extraction quantities – is one source of contention; at times resulting in military intervention (SIWI, 2017).

2.4 Enable climate-resilient livelihoods and economic security

In Jordan, the most susceptible livelihood sector to frequent droughts, temperature rises, floods, changing rainfall seasons and declining rainfall amounts is the agricultural sector, which is essential for the livelihoods of most people in rural areas (Ministry of Environment, 2021).

The agricultural sector faces dynamic threats as a result of climate change. Half of those working in the agricultural sector are rural women (Borghuis *et al.*, 2022). Agriculture also contributes 4 per cent of Jordan's GDP but uses more than 50 per cent of the available water resources (Giordano & Rüttinger, 2021). However, industrial and domestic water use is taking priority over agriculture due to their higher economic value (Borghuis *et al.*, 2022). Other risks are related to increasing water scarcity (due to decreasing rainfall, droughts and increasing demand) as well as declining agricultural productivity due to climate change.

Temperature rise, decreasing rainfall, changing rainfall seasons, and frequent droughts and floods will lead to a reduction in rainfed and irrigated crop productivity (Ministry of Environment, 2021). In addition, field crops such as barley and wheat are highly sensitive to temperature increases and show yield declines of 7–21 per cent for wheat and 18–35 per cent for barley under extreme heat conditions (Ministry of Environment, 2021).

As the water allocated for agriculture is reduced, decreasing precipitation, rising temperatures and extreme droughts due to climate change will increase irrigation water demands (World Bank, 2022b). Therefore, the likelihood of crop failures will increase. In addition, rainfall seasons will become more variable and shorter, while rainfall events will be fewer but more intense (Ministry of Environment, 2021; USAID, 2017; World Bank, 2022b). Furthermore, droughts will lead to desertification and poor soil quality, affecting productivity (Netherlands Ministry of Foreign Affairs, 2019; USAID, 2017). World Bank (2022b) also noted that events of high-pressure systems could lead to very cold conditions during specific parts of the winter period leading to widespread frost affecting food trees.

Climate change will also affect the incomes of those who depend on livestock. Water shortages and declines in pastures could affect the livestock sector, starting with cattle, followed by goats and sheep (Netherlands Ministry of Foreign Affairs, 2019). Deaths of animals and livestock diseases such as toxoplasmosis and brucellosis, will also increase due to climate change (Ata *et al.*, 2021). Livestock make up 58 per cent of the agricultural GDP revenue and provide income for over 250,000 Jordanians (Netherlands Ministry of Foreign Affairs, 2019). Thus, climate change impacts on agricultural production directly affect farmers and farming communities more broadly.

2.5 Address climate displacement and protection

Current and future displacement challenges

Jordan is a major refugee-hosting country, with over 760,000 refugees registered with UNHCR, mainly from Syria alongside refugees from Iraq, Yemen, Sudan and Somalia (UNHCR, 2021). The refugee population is highly urban, with 83 per cent living outside of camps (*ibid*). Jordan has only a small number of internally displaced persons (IDPs), with 138 disaster displacements recorded in 2020 (the last year of available data) due to flooding and storms.

- **Water challenges will likely increase for refugees in both urban areas and refugee camps in Jordan** (UN-Habitat, n.d.). As an already vulnerable population, refugees experience the strongest impacts of climate change, such as poor water quality and rationed amounts of water in the Azraq refugee camp (Bjerkestran, 2022).
- **Syrian refugees in Jordan are projected to continue to increase pressure on limited water resources in the country** (Arsenault, 2017). Tension over water was already present far before the arrival of Syrian refugees, with issues such as drought, transboundary water resource tensions, and water mismanagement all factors in the current water stress (Hussein *et al.* 2020). However, given that the vast majority of Syrian refugees are likely to stay in the country in at least the medium-term, it has been estimated that expected water demand and wastewater generation will nearly double by 2045, if current numbers of Syrians remain (Government of Germany & Government of Jordan, 2021).
- **Positive climate change adaptation exists in refugee camps in Jordan, such as the creation of the largest solar power plant ever built in a refugee camp in Za'atari** as well as hydroponics projects in the Azraq and Za'atari camps (UNHCR, 2021). Azraq refugee camp is the first in the world to be powered by renewable energy (*ibid*).
- **Extreme weather events such as flooding, which is a frequent occurrence at Za'atari refugee camp, will likely increase – but effective adaptation has already reduced its impact on refugee populations** (Freij, 2016). Although significant flooding in 2013 destroyed many shelters and much infrastructure, the development of sewage and drainage networks has significantly reduced the impact of annual flooding in the camp (ACTED, n.d.; Freij, 2016).

Potential needs of migrants and displaced people

- Displaced women and girls will be disproportionately affected by the impacts of climate change in Jordan, such as water shortages (UNFPA, 2022). Already the water network in the country has unequal distribution, with refugees and those in rural communities the most marginalized (*ibid*). Water scarcity is projected to increase domestic and intimate partner violence, with already existing evidence of rising tension around water availability among households in Azraq camp (*ibid*).

Migration law and policies

- [UNHCR-Government of Jordan Memorandum of Understanding \(MoU\)](#), 1998 (partially updated 2014). Although Jordan is not a signatory to the 1951 Refugee Convention, through this MoU its main protection commitments are outlined and affirmed.
- [Jordan Compact](#), 2016. This international commitment offers support for Syrians and Jordanians to obtain work permits and decent work.
- [Global Compact for Safe, Orderly and Regular Migration \(GCM\)](#), 2018. The GCM is the current global framework for addressing migration globally.
- [Law of Residency and Foreigners' Affairs](#), 1973. Jordan's Law of Residency and Foreigners' Affairs guides migrant rights and protection in the country, with refugees being subject to Law no. 24 of the document.

Protection

Around the world, people in detention 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 & Navizet, 2012). These vulnerabilities, coupled with more frequent and intense disasters due to climate change, may leave prison populations in especially precarious positions to hazards such as extreme heat and floods.

2.6 Policy

Relevant information from the [Nationally Determined Contribution \(NDC\)](#) (2021)

Emission target: Reduction of greenhouse gas emissions of 3 per cent by 2030 compared to business as usual in the energy, transport, waste, industry, and agriculture and forestry sectors.

Area of focus on adaptation: Water resource management; agriculture and food security; biodiversity and ecosystem; health; urban resilience and disaster risk reduction; coastal zone management; cultural heritage and tourism; socio-economic impacts.

Inclusion of DRR: Yes, DRR is one of the areas of focus. It includes measures on green infrastructure, readiness in urban areas, enhancing community resilience, and building efficiency. In addition, early warning systems are a recurrent adaptation measure in the other areas of focus.

National designed entity: Ministry of Environment, National Committee on Climate Change

Other national policies on climate

- [National Climate Change Policy of the Hashemite Kingdom of Jordan 2013–2020](#) (2013). The objective of the policy is ‘to build the adaptive capacity of communities and institutions in Jordan, with consideration for gender and addressing the needs of vulnerable groups, to increase the resilience of natural ecosystems and water as well as agricultural resources to climate change, and to optimize mitigation opportunities’. The adaptation sectors are consistent with the NDC, including additional and more detailed measures on DRR.
- Jordan revised its [Nationally Determined Contribution \(NDC\)](#) on Climate Change in October 2021 and has committed to a greenhouse gas emission reduction target of 31 per cent by 2030, with 26 per cent being subject to international support. Adaptation and resilience areas, as well as DRR, are included in the revised NDC and the adaptation vision of the NDC is directly linked to Jordans National Adaptation Plan published in the same year. The main areas of the NAP are same as the adaptation areas in the NDC (noted in table above), while the key strategic objectives are: (i) strengthen institutional framework, governance, policies, strategies and legislations; (ii) support the coordination mechanism between public, private and community-based organizations and other relevant stakeholders to ensure the mainstreaming of NAP in their strategies; (iii) improve the related knowledge, awareness, and communication tools; (iv) build a dynamic and sustainable funding instrument for NAP implementation; (v) support research and capacity building programmes in the climate adaptation field; (vi) develop a data management system for climate change adaptation (UNEP & LEAP, 2021).

Climate finance

They are two national Green Climate Fund (GCF) projects focusing on adaptation in Jordan: one working on coral reef protection and another on ‘building resilience to cope with climate change in Jordan through improving water use efficiency in the agriculture sector’ (GCF, 2022).

National Societies cannot apply directly for climate finance from [the GCF](#), but they can be an implementing partner for an accredited entity (Climate Centre, 2022a).

National Societies can explore options for accessing climate funds through smaller funds, such as the [GEF’s Small Grants Programme](#) or the [FFEM’s Small Scale Initiatives Program](#). Other funding from bilateral donors, national climate funds or multilateral climate funds like the Adaptation Fund, CREWS, or GCCA+ could be explored (Climate Centre, 2022a).

Engaging in national climate adaptation planning is vital for accessing climate finance.

Additional resources

Climate Centre. (2022a). *Fact sheet on climate finance*. Red Cross Red Crescent Climate Centre. <https://www.climatecentre.org/wp-content/uploads/Fact-Sheet-on-Climate-Finance.pdf>

Climate Centre. (2022b). *Entry points for National Societies on climate finance partnerships*. Red Cross Red Crescent Climate Centre. <https://www.climatecentre.org/wp-content/uploads/Entry-Points-for-Climate-Finance-Partnerships.pdf>

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