



Iran

This climate fact sheet summarizes the available information on the climate of Iran 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 average monthly temperature across Iran between 1991 and 2020 ranged from 5.9°C in January to 30°C in July (World Bank, 2021).

Average rainfall: Rainfall across Iran ranges from as low as 25mm per year in the south-east, to around 1800mm in the Caspian Sea plains (World Bank, 2021).

1.1 Short overview

Around 88 per cent of Iran is located in arid and semi-arid regions (Ashraf Vaghefi *et al.*, 2019), apart from the northern coastal areas and parts of western Iran (World Bank, 2021). The climate is continental with hot and dry summers and cold winters, especially in the inland areas. Climate variation across the country is influenced by its proximity to the coastline as well as the high mountain ranges that

Observed Climatology of Temperature and Precipitation (1991-2020)

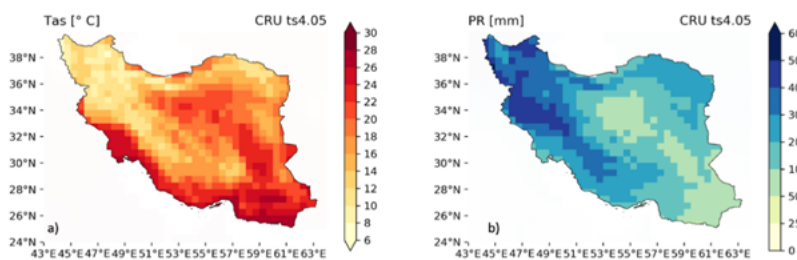


Figure 1. Observed climatology of (left to right) mean temperature (a) and annual mean total precipitation (b), between 1991 and 2020 (Adapted from World Bank Climate Change Knowledge Portal).

Monthly Climatology of Average Minimum Surface Air Temperature, Average Mean Surface Air Temperature, Average Maximum Surface Air Temperature & Precipitation 1991-2020; Islamic Republic of Iran

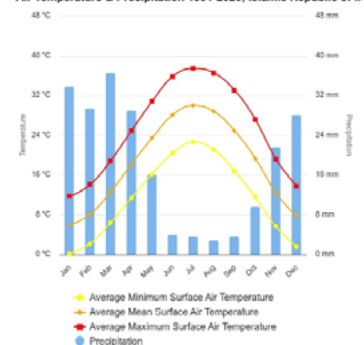


Figure 2: Observed average monthly climatology 1991–2020. (Adapted from World Bank Climate Change Knowledge Portal).

affect both temperature and rainfall. The rainfall season occurs during the boreal winter, from November to May; while the highest temperatures are during the boreal summer, from April to October. The year-to-year climate variability across Iran is influenced by the El Niño–Southern Oscillation (ENSO) as well as other drivers such as the North Atlantic Oscillation (NAO). Warm ENSO (El Niño) events are sometimes associated with wetter rainy seasons in Iran. The negative phase of the NAO is similarly associated with higher rainfall in some parts of the country.

The diverse and varied geography of Iran 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. Iran is a medium risk country for humanitarian crises and disasters, ranked 52nd out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022). The country is exposed to droughts, flash floods, flooding, landslides and tropical cyclones along with their associated hazards. In addition, Iran is impacted by earthquakes which, while not related to climate change, can produce compound risks with flooding and landslides.

1.2 Climate change in Iran

Historical climate change

Temperature

- The mean annual temperature over Iran has increased at a rate of around 0.3°C per decade since the 1950s and 0.5°C per decade since the 1970s. Iran has warmed by around 2°C since the 1950s. (World Bank, 2021).
- Both minimum and maximum temperatures have increased, with minimum temperatures increasing at a rate two times that of the maximum (Alizadeh-Choobari & Najafi, 2018).

Projected climate change

- Mean temperatures over the region are projected to rise by 2100 by about 1.1°C under a low emissions scenario (SSP1-2.6), by 2.8°C under a medium emissions scenario (SSP2-4.5) and by approximately 6.4°C under a high emissions scenario (SSP5-8.5) (Bustos Usta *et al.*, 2022).
- Maximum and minimum temperature will increase, and heatwaves will intensify in duration. 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 increase significantly during the hot summer months (Ashraf Vaghefi *et al.*, 2019).

Precipitation

- Rainfall across Iran experienced a shift during the 1970s with higher rainfall in more recent decades. Overall rainfall trends are weak across the country with no clear signal of change.
- There is no clear signal of increases in extreme rainfall over Iran.
- Increases in drought indices have been identified (Emadodin *et al.*, 2019), particularly where the role of temperature in evaporation is included.

- Precipitation projections in Iran are varied, with some studies reporting a decline of 35 per cent in precipitation by the end of the century (Mansouri Daneshvar *et al.*, 2019) while other models suggest that both declines and increases in precipitation are possible and depend on emission scenarios (Ashraf Vaghefi *et al.*, 2019).
- The frequency and intensity of heavy precipitation events are projected to increase slightly under all scenarios with potential resultant increases in flash flooding (Ashraf Vaghefi *et al.*, 2019).
- While projected changes in rainfall are uncertain, increasing water scarcity resulting from increased evaporation driven by increasing temperatures is possible (Mansouri Daneshvar *et al.*, 2019).

NOTE: The quality and consistency of observational records over Iran limits the reliability of rainfall and temperature trend analysis.

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 hazard	Projected risk
<p>Droughts</p> <p>Droughts have historically been the most expensive and arguably impactful climate-related hazard in the country with cumulative estimated response costs of 14 billion US dollars since 1920 – this is reportedly equivalent to over 90 per cent of all allocated government response funds (Seddighi & Seddighi, 2020). Relatedly, Iran has also seen rapidly increasing desertification linked to meteorological drought (i.e., below-average rainfall) as well as anthropogenic factors such as population growth, soil salinization and poor management of relatively scarce resources (Emadodin et al., 2019). A severe drought occurred in three consecutive seasons in 1999–2001, affecting around 50 per cent of the population.</p>	<p>Whilst projections about the frequency of meteorological drought in the country may be inconclusive, increased socioeconomic pressures on water sources risk exacerbating this issue in the future (Mansouri Daneshvar <i>et al.</i>, 2019).</p>
<p>Floods</p> <p>Flooding is the most frequent type of climate-related hazard in Iran, mostly caused by heavy and episodic rainfall events (Seddighi & Seddighi, 2020). In Iran, floods are the most frequent climate-related disasters in the last 100 years according to budget regulations (Seddighi and Seddighi, 2019). One of the most severe floods in recorded history occurred in March 2019, affecting an estimated 10 million people in over 2,000 cities (IFRC, 2019).</p>	<p>With precipitation trends, flooding is projected to increase significantly in the country (Almasi & Soltani, 2016; Maghsood <i>et al.</i> 2019).</p>
<p>Heatwaves</p> <p>Heatwaves are of growing concern in Iran and exacerbated by increased urbanization and population growth. Heatwaves have been linked to excess mortality (Elham Ahmadnezhad et al. 2013) particularly for women and people over 65 years of age (Khanjani et al. 2019).</p>	<p>As global temperatures rise and exposure increases, the risk of severe heatwaves will increase.</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 law and policies

- [Integrated National Disaster Management Plan](#) (Third Edition, 2002). This document from 2002 set out the structure of disaster management at the national, regional and local levels. It makes reference to both hydrometeorological and geological hazards.
- [Law on the statute of the National Disaster Management Organization](#) (2008). In 2008, the National Disaster Management Organization (NDMO) was mandated to lead the country's preparedness and response to natural hazards. Included in the organization are the Iranian Red Crescent Society, government ministries, Islamic Republic of Iran Broadcasting, mayors, the armed forces and many more (ADRC, n.d.).
- [National Disaster Management Strategy of Islamic Republic of Iran](#) (2021). In 2019, through the NDMO, the Iranian Parliament passed an extensive national disaster management law. It makes many mentions of climate change and climate projections and their implications for hazard frequency and severity in the country.

Disaster risk management (DRM) strategies

There is limited literature available in English about disaster risk reduction (DRR) in Iran, but a recent paper by Seddighi and Seddighi has shown that Iran's DRM strategies over the last century have emphasized response and recovery over preparedness and mitigation ([Seddighi & Seddighi, 2020](#)).

2.2 Reduce health impacts of climate change

The health impacts of climate change are associated with projected increases in temperature and resulting heat stress (Mayruhber *et al.*, 2018, Khanjani, 2016; WHO & UNFCCC, 2022), increased dust and sand storms causing air pollution and respiratory health risk (WHO & UNFCCC, 2022), as well as the rise of vector-borne disease. The mean annual temperature is expected to rise by 5.2°C by the end of the century under a high emissions scenario so that, eventually, 65 per cent of the days could be 'hot days' in Iran (WHO & UNFCCC, 2022). The projected increase in mean temperature and prolonged heatwaves will lead to heat-related illnesses such as dehydration, rash, cramps, heat stroke, heat exhaustion, cardiovascular disease and death (WHO 2022; Mousavi *et al.*, 2020). The risk of heat stress is high in urban areas due to the urban heat island effect (Mayruhber *et al.*, 2018). In addition, those with underlying health conditions and the elderly are likely to be impacted the most (Mayrhuber *et al.*, 2018; WHO & UNFCCC, 2022). For children, droughts increase the risks of skin and eye diseases and affect cognitive development in addition to respiratory problems (IFRC, 2022).

Air pollution is a significant problem in Iran, with Tehran being one of the world's most polluted cities (Broomandi *et al.*, 2020). Air pollution causes at least 13,321 annual deaths, loss of life expectancy by an average of 0.43–1.87 years and over 5.8 billion US dollars in economic losses due to lost lives (Hadei *et al.*, 2020). These figures will increase due to climate change. Temperature rises and frequent droughts will increase sand and dust storms (WHO & UNFCCC, 2022). Sand and dust storms lead to significant air pollution by increasing particulate matter and carrying harmful substances and pathogens.

The risks of vector-borne diseases, especially malaria and leishmaniasis, will likely increase due to climate change as rising temperatures create favourable conditions for disease vectors (Mousavi *et al.*, 2020). Malaria is a significant burden to Iran and spreads most in the country (Vatandoost *et al.*, 2019). The country plans to eliminate the disease by 2025 (Vatandoost *et al.*, 2019), but temperature rises could increase the incidence of the disease (Mohammadkhani *et al.*, 2016). In addition, depreciation of the quantity and quality of water will lead to an increase in water-borne diseases, such as cholera (Asadgol *et al.*, 2019). Flooding decreases water quality, while low precipitation and higher temperatures could provide swifter bacterial replication (Asadgol *et al.*, 2019; Masoumi-Asl *et al.*, 2020).

Malnutrition and food-related illnesses will increase as climate change-induced droughts and floods disrupt agriculture and food systems (WHO & UNFCCC, 2022). Extreme droughts, storms and floods due to climate change are expected to increase displacement, injuries and deaths (Mousavi *et al.*, 2020). In addition, these disasters increase the risks of mental and psychosocial disorders (Khanjani, 2016; WHO & UNFCCC, 2022). Most recent data (2019) shows that Iran's health expenditure is 6.71 per cent of GDP. Consequently, an increased risk of morbidity and mortality due to climate change will put pressure on the country's healthcare system, infrastructure and overall spending (WHO, 2022).

2.3 Ensure sustainable water supplies

Water, Sanitation and Hygiene (WASH)

Projected increases in droughts and temperature rises are expected to reduce water availability in Iran (WHO & UNFCCC, 2022). Groundwater recharge will decrease in the future as evaporation increases, complicating drinking water supplies (Islamic Republic of Iran, 2017a). Declining recharge rates coupled with over-abstraction will lead to declines in groundwater levels (Vaghefi *et al.*, 2019). Rising temperatures will further reduce water availability through increasing evaporation rates. Water insecurity is a significant challenge in arid and semi-arid regions (Ashofteh *et al.*, 2020). Droughts, excessive building of dams and higher temperatures may lead to the disappearance of lakes (such as Hamun, Parishan and Shadegan) as well as rivers (Brussels International Center, 2019; Fanack Water, 2021; Vaghefi *et al.*, 2019). Water challenges in Iran are complicated by mismanagement, population increase and corruption (Shokri, 2021).

Flooding with the consequent destruction of water and sanitation infrastructures is expected to increase with the changing climate (Afshar & Fahmi, 2019; Islamic Republic of Iran, 2017a; WHO & UNFCCC, 2022). The risk of spring flooding due to earlier spring snow melts will increase, which will cause enormous damage (Afshar & Fahmi, 2019; Fanack Water, 2021). In the coastal areas, sea-level rise will contaminate surface and groundwater sources, reducing the available freshwater (Khanjani, 2016).

Infrastructure and electricity

The manifestations of climate change put key parts of Iran's national and private infrastructure at risk. In particular, important ports and industry are built on the coast of the Caspian Sea and vulnerable to erosion and saline intrusion, which, along with hydrometeorological hazards, pose a significant threat to these assets. Additionally, around 75 per cent of Iran's population lives in an urban setting (Enayatrad *et al.*, 2019) and, therefore, depends on infrastructure which can be particularly vulnerable to the impact of natural hazards such as heatwaves and flooding depends on infrastructure which can be particularly vulnerable to the impact of natural hazards such as heatwaves and flooding. Notably, Tehran has a population density of 11,800 people per kilometre (Tehran Times, 2019). However, Iran's vernacular architecture is particularly well-adapted to extreme heat. Research has shown that the technique of building with mud bricks in the Iranian Plateau is more energy efficient, cooler and has components of water and ice storage which makes structures particularly well-adapted and sustainable to the climate, in contrast with many modern buildings (Kazemi & Shirvani 2011).

Iran is a major producer of oil and gas, and a founding member of OPEC (the Organization of the Petroleum Exporting Countries). It is a net exporter of these resources: oil exports, in fact, correspond to 15.8 per cent of the country's GDP (Roche & Dienst, 2018). As a result, Iran is among the leading greenhouse gas emitting countries in the world (Mansouri Daneshvar *et al.*, 2019).

Electricity use per capita is quite low compared to global averages, at around 3,000 kilowatt-hours (kWh)/capita; this demand is mainly met by natural gas at 61 per cent and oil at 37 per cent (Roche & Dienst 2018). Some have argued that high levels of energy lost due to mismanagement of energy infrastructure have been a key pattern in the energy sector (Moshiri & Lechtenböhmer, 2015). Stranded assets are of particular concern here. Climate change – specifically rising temperatures and more frequent heatwaves – are projected to significantly increase energy demand for cooling and require longer periods of continuous supply (Roshan *et al.*, 2012).

Notably, to address these issues, an energy subsidy reform has been undertaken since the early 2000s. The 2010 law on energy consumption patterns and its 2014 reform have led to a rise in domestic energy prices, the creation of new energy service providers and the promotion of energy efficient technologies (Roche & Dienst 2018). Similarly, the reformed law on energy consumption patterns aimed to feed-in renewable energy reform following the target of reducing energy intensity by 30 per cent by 2015 (Roche & Dienst 2018).

2.4 Enable climate-resilient livelihoods and economic security

Iran's agriculture primarily depends on irrigation, and projected water shortages caused by climate change will likely affect production (Islamic Republic of Iran, 2017b). Agriculture, tourism and fisheries are the sectors that will be impacted most by climate change. For example, agriculture provides 20 per cent of the country's employment and contributes about 10 per cent to Iran's GDP (Maghrebi *et al.*, 2020) so any changes in production will have a significant impact on people and produce. Iran's economy and incomes also rely heavily on petroleum and natural gas (Islamic Republic of Iran, 2017a).

As temperatures increase and effect the supply of water, yields of crops such as maize and wheat are expected to decrease (Karimi *et al.*, 2018). Furthermore, drought is causing more frequent and severe dust storms as well as an increase in soil salinity; and desertification will increasingly reduce agricultural productivity in Iran (WHO & UNFCCC, 2022). In addition to water shortages, floods cause extensive crop and agricultural infrastructure damage (Yadollahie, 2019). Droughts and floods will also increase the incidence of crop pests, such as locusts (Yadollahie, 2019). Scarcity of water resources and ineffective distribution leads to projections of decreased cereal production of between 10–30 per cent under different climate change scenarios. Similarly, rainfed wheat production is projected to decrease by 27 per cent by 2025 and 36 per cent by 2050 (Nassiri-Mahallati *et al.*, 2006; Moradi *et al.*, 2008). Agricultural failures will lead to loss of income, food insecurity and several socioeconomic challenges, especially in rural areas (Elmore, 2021; Karimi *et al.*, 2018).

As a result of climate risks and because of a dependence on international trade and limited agricultural productivity, Iran is considered to be a particularly food insecure country. In fact, it has been calculated that up to 49 per cent of households in the country can be considered food insecure (Behzadifar *et al.*, 2016). Food prices and shortages are rising, a trend particularly dramatic in Tehran – reports indicate that prices increased by 50–100 per cent in 2019, making many staple foods and meat out of the reach of many households (Gharagozlou, 2019).

Reducing water levels and quality will affect the fish in major water bodies, such as the Caspian Sea, Persian Gulf and Oman Sea, and aquaculture in inland water bodies (Islamic Republic of Iran, 2017b). On the Caspian coast, drier and hotter conditions could impact sensitive ecosystems and will affect tourism and coastal activities. Similarly, sea level rise and increased coastal erosion in the Persian Gulf and the Oman Sea will cause damage to coastal infrastructure and ecosystems with negative consequences for tourism (Islamic Republic of Iran, 2017b). Furthermore, extreme temperatures will lead to heat and cold stress and limit tourism development (Esmaili & Ghalhari, 2014).

2.5 Address climate displacement and protection

Current and future displacement challenges

Iran is a major refugee-hosting country, primarily due to regional conflict in Afghanistan and Iraq (UNHCR, 2022). It hosts 800,000 refugees and at least 2.6 million undocumented Afghans. Significant flooding in 2019 triggered widespread internal displacement, contributing to the nearly 1 million Iranians who have been internally displaced due to disasters since 2010 (IDMC, 2022).

- Refugees in Iran are mainly located in urban areas, and often not part of formal humanitarian assistance systems (DRC, 2022), which increases their risk of lacking protection and assistance during extreme climate events (ACAPS, 2022). Over 96 per cent of refugees live in Iranian cities or in peri-urban settlements (UNHCR, 2022). Increased and often unplanned urbanization creates a heightened risk of the impacts of climate change on urban communities in Iran (Taravat *et al.*, 2016). The challenges of migration and urbanization in the country include poverty, pollution in large cities, informal settlements, and a lack of assistance to migrants in destination cities (Mahmoudian, 2016).
- A rise in temperature and a reduction in rainfall has been shown to be significant push factors for inter-province migration in Iran (Shiva & Molana, 2018), suggesting internal migration will continue as these climate trends continue.
- Most internal migration in Iran has been urban-to-urban since the mid-2000s (IHD, 2021). The east and west regions have seen a decrease in population as the provinces around Tehran become more populated. Tehran and Alborz provinces have the highest level of urbanization in Iran (Enayatrad *et al.*, 2019).
- Although rural-to-urban migration has decreased over decades (Mahmoudian, 2016), climate shocks like droughts lead people to leave their homes in search of economic and social opportunities, contributing to rural-to-urban migration alongside general labour migration.
- Refugee communities in Iran face issues of documentation, access to work and general economic and social vulnerability which puts them at greater risk of climate shocks and at greater pressure as this risk increases (MPI, 2006). Whether the cause of displacement is climate-related or not, internally displaced persons (IDP) and refugee populations can be particularly vulnerable to climate shocks, facing additional risks due to precarious living conditions and lack of access to services and resources. They are often more food insecure and impacted by disease outbreaks.

Potential needs of migrants and displaced people

In Iran and elsewhere, gender equality intersects with climate change as women and children are particularly vulnerable to a range of climate shocks and impacts, particularly given their economic and social barriers to resilience. Globally, women and children are 14 times more likely to die in floods (UNDP, 2013); and, in Iran, child marriage often increases in years of drought (Keshavarz *et al.*, 2013). As such, Goal 5 of the United Nation's Sustainable Development Goals specifically on gender equality becomes a fundamental component of climate change resilience (UNDP, 2016).

Migration law and policies

- [1951 Convention relating to the Status of Refugees and its 1967 Protocol](#), 1976. Although Iran acceded to the 1951 Convention and its 1967 Protocol on 28 July 1976, it held reservations to Article 17 (wage-earning employment), Article 23 (public relief), Article 24 (labour legislation and social security) and Article 26 (freedom of movement).
- [Solutions Strategy for Afghan Refugees](#) (SSAR), 2012. The SSAR was co-developed by the Government of Iran, UNHCR and other actors, and acts as the regional framework to support Afghan refugee-hosting countries, and Afghans' voluntary repatriation and reintegration.

Protection

Around the world, people in detention frequently have heightened vulnerability to climate-related 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). While specific information is not available for Iran, vulnerabilities such as these, 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 [Intended Nationally Determined Contribution \(INDC\)](#)

Iran has signed but not ratified the Paris Agreement. It has not submitted a Nationally Determined Contribution (NDC), nor transferred its INDC into an NDC.

Emission target: Committed to a reduction of up to 12 per cent by 2030 of its greenhouse gas (GHG) emissions compared to a business-as-usual scenario with international support. While being one of the biggest GHG emitters per capita (ranked 17: Climate Resource, 2022), Iran has insufficient climate ambitions that would result in a temperature increase of over 4°C if applied by all countries (Climate Action Tracker, 2022).

Area of focus on adaptation: Water and resources management, agriculture and food security. A budget of 100 billion US dollars has been set to achieve the adaptation objective (double the mitigation budget).

Inclusion of DRR: Yes, adaptation measures include a system to monitor wildfires, while a climate observation system and early warning system include sandstorms.

National designated entity: Presidency Center for Progress and Development of Iran

- [National Strategic Plan on Climate Change](#) (2017). This document is only available in Persian and focuses on mitigation through water resource management, agriculture, food security, natural resources, biodiversity and human health (Umwelt Bundesamt, 2018).
- [Third National Communication to the UNFCCC](#) (2017). The communication sections include water resources, agriculture, forest and rangeland, coastal zones, human health – which mentions early warning systems, biodiversity, economy and energy. The document includes the Third National Action Plan in which risk reduction is one of the guiding principles.
- There is no National Adaptation Plan in Iran.

Climate finance

National Societies cannot apply directly for climate finance from the [Green Climate Fund \(GCF\)](#), 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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