Climate Centre

جمعیت هلال احمر
جمهوری اسلامی ایران

Country-level | Climate fact sheet

Iran

The following climate factsheet summarizes available information on the climate of Iran, climate change and impacts of these changes on humanitarian activities in country. Each of the factsheets were written as a compilation of information from peer-reviewed academic papers, government publications, and INGO documentation.

1. Climate overview

Average temperature: The average annual temperature across Iran is around 18°C but varies from as low as 10°C in the high mountains, to as high as 28°C along the south and south-west coastlines.

Average rainfall: Rainfall across Iran range from as low as 2 5mm per year in the south-east, to as high as 500mm per year in the high mountains in the north-east.

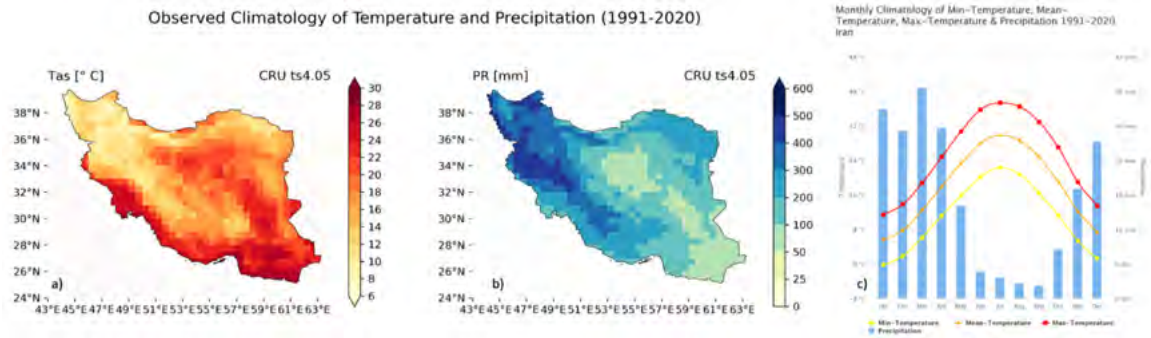

Figure 1. Observed Climatology of mean Temperature (a), annual mean total precipitation (b) and monthly climatology (c) over 1991-2020. (Adapted from World Bank, 2022)

1.1 Short overview

Iran is located in a mainly arid and semi-arid, strongly continental climate region (UNFCCC NC 2015). The climate variation across the country is influenced by proximity to the coastline, and high mountain ranges influencing both temperature and rainfall. A Mediterranean climate means that the rainfall season is during the boreal winter, from November to May, while the highest temperatures are during the boreal summer, from April through to October. The year-to-year climate variability across Iran is influenced by El Nino Southern

Oscillation (ENSO) as well as other drivers such as the North Atlantic Oscillation (NAO). Warm ENSO (El Nino) events are sometimes associated with wetter rainfall seasons in Iran. The negative phase of the NAO is sometimes associated with higher rainfall in parts of Iran.

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. Ranked 52 out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022), Iran is categorized as a medium risk country. The country is exposed to flooding, flash floods, landslides, droughts and tropical cyclones and their associated hazard. 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	Projected 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 more than 2°C since the 1950s. High mountain regions have warmed faster than the rest of the country. (World Bank, 2022. ▪ The frequency and intensity of hot extremes have increased and cold extremes have decreased.	▪ Mean temperature over the region are projected to rise by between 1° C and 4°C for a high greenhouse gas concentration scenario (SSP5-85) and between 1° C and 3°C for low greenhouse gas concentration scenario (SSP2-4.5) by the 2050s. ▪ Maximum and minimum temperature will increase, and heat waves 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 increase significantly during the hot summer months.
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, Reinsch, and Taube, 2019) particularly where the role of temperature in evaporation are included. *NOTE: The quality and consistency of observational records over Iran limits the reliability of rainfall and temperature trend analysis.*	▪ Mid-century estimates (2040-2060) of annual precipitation changes over Iran under a low emission scenario (SSP2-4.5) are small ranging from around 8% drier to 15% wetter. Under a high emissions scenario (SSP5-8.5) similar changes are projected. ▪ The frequency and intensity of heavy precipitation events are projected to increase slightly under all scenarios with potential resultant increases in flash flooding. ▪ While projected changes in rainfall are uncertain, increasing water scarcity resulting from increased evaporation driven by increasing temperatures are possible.

2. Priorities of the Movement and climate change

2.1 Scale up climate-smart DRR, early action and preparedness: DRR portrait

Existing Hazard	Projected risk
Drought	
Droughts have historically been the most expensive and arguably impactful climate-related hazard in the country with cumulative estimated response costs of 14 billion USD since 1920 – this is reportedly equivalent to over 90% of all allocated government response funds (Seddighi and 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 salinisation, and poor management of relatively scarce resources (Emadodin, Reinsch, and Taube, 2019). A severe drought occurred in three consecutive seasons between 1999 and 2001, affecting around 50% of the population.	Whilst projections about the frequency meteorological drought in the country may be inconclusive, increased socio-economic pressures on water sources risk exacerbating this issue in the future.
Flood	
Flooding is the most frequent type of climate-related hazard in Iran, mostly caused by heavy and episodic rainfall events (Seddighi and Seddighi, 2020). The World Bank counts 79 occurrences between 1980 and 2020 (World Bank Group, 2020). One of the most severe floods in recorded history occurred in March 2019, affecting an estimated 10 million people in over 2000 cities (IFRC, 2019).	With precipitation trends , flooding is significantly projected to increase in the country (Almasi and Soltani, 2016; Maghsood, *et al.* 2018.).
Heat waves and extreme heat	
They are a growing concern in Iran and exacerbated by increased urbanization and population growth. Heatwaves have been linked to excess mortality (Elham *et al.* 2013) particularly for women and people over 65 years (Khanjani, *et al.* 2019).	As global temperatures rise and exposure increases, the risk of severe heatwaves will increase.

It is essential to note that many of these hazards are interrelated and produced compound risks to the same areas and communities. In addition, risk must be understood as the interplay between hazard risk, exposure, and vulnerability which make certain communities, individuals, and sectors more impacted by the hazards.

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 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 was mandated to lead preparedness and response to natural hazards in the country. Included in the organization are the Iranian Red Crescent, government ministries, the Broadcasting Corporation, mayors, the Armed forces and many more (ADRC, nd.).
- 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 Strategies

There is limited literature available in English about 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 and 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 vertor borne disease. The mean annual temperature is expected to rise by 5.2°C, and eventually, 65% of the days could be 'hot days' in Iran (WHO & UNFCCC, 2022). The projected increase in mean teamperature and prolonged heat waves will lead to heat-related illnesses such as dehydration, rash, cramps, heat stroke, heat exhaustion, cardiovascular diseases 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 to 1.87 years and over USD 5.8 billion in economic losses due to lost life (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 is most spread 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 is 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% 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 Sustainable water: resources management, infrastructure and access

Water, Sanitation and Hygiene

Projected increases in droughts, temperature rise are expected to reduce water availability in Iran (WHO & UNFCCC, 20222). Groundwater recharge will decrease in the future as evaporation increases, complicating drinking water supplies (Islamic Republic of Iran, 2017). 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) and 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, 2017; 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, Power 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 due to high population density and limited infrastructure. Notably, Tehran has a population density of

11,800 people per kilometre (km) (Tehran Times 2019). However, Iran's vernacular architecture is particularly well-adapted to extreme heat, however. 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 make them particularly well-adapted and sustainable to the climate, in contrast with many modern buildings (Kazemi and 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 gross domestic product (GDP) (Roche and Dienst 2018). As a result of this, 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 and Dienst 2018). Finally, 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 and Lechtenböhmer 2015). Stranded assets are of particular concern here, as will be highlighted later. Climate change, and specifically rising temperatures and more frequent heat waves, 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 and 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 and 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, 2017). Agriculture, tourism and fisheries are the sectors that will be impacted most by climate change. For example, agriculture provides 20% of the employment and contributes about 10% to Iran's GDP (Maghrebi *et al.*, 2020). Iran's economy and incomes rely heavily on petroleum and natural gas (Islamic Republic of Iran, 2017). However, agriculture, tourism and fisheries are other significant (Fanack Water, 2021). As temperatures increase and effect water supply, 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, 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 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 socio-economic 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 have 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, 2017). 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 of coastal infrastructure and ecosystems with negative consequences for tourism (Islamic Republic of Iran, 2017). 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 significant 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 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 refugee 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 (Refugees & Migrants 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 urbanisation 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 put 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, 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 for migrants and displaced people

In Iran and elsewhere, gender equality intersects with climate change as women and children are particularly vulnerable to the range of climate shocks and impacts, particularly given 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 UN'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, 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 and 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 a NDC.

Emission target: Committed to a reduction of up to 12% by 2030 of its GHG emission compared to a business-as-usual scenario with international support. While being one of the biggest GHG emitter per capita (ranked 17 - Climate Resource, 2022), Iran has insufficient climate ambitions that would result in a temperature increase of over 4C 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 USD is asset to achieve the adaptation objective (double the mitigation budget).

Inclusion of DRR: Yes, adaptation measures include system to monitor wildfires and climate observation system and early warning system including sandstorm.

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 though mitigation, water resource management, agriculture, food security, natural resources, biodiversity and human health. (Unwelt Bundesamt, 2018).
- Third National Communication to the UNFCCC (2017). The communication sections include water resources, agriculture, forest and rangeland, costal 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

There is currently only one Green Climate Fund project in Afghanistan focusing on mitigation (in addition to Readiness activities) (GCF, 2022). National societies cannot directly apply 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 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). Factsheet on Climate Finance. 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. https://www.climatecentre.org/wp-content/uploads/Entry-Points-for-Climate-Finance-Partnerships.pdf

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

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