QATAR Climate Fact Sheet

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I- GENERAL CLIMATE OVERVIEW

Qatar has a desert climate. The country experiences long summers from May to September characterized by intense dry heat, with temperatures rising above 45°C. Winter temperatures are mild but may fall below 5°C. Rainfall is only experienced during the winter with the northern parts of the country receiving 30% more rainfall than the south. Qatar is impacted by Shamal winds, which cause sand and dust storms throughout the year (WB CCKP, 2021).

II- CLIMATE CHANGE TRENDS

The ND-GAIN Country Index summarizes a country's vulnerability(1) to climate change and other global challenges in combination with its readiness(2) to improve resilience. Qatar's ND-GAIN Index rank is 38. It is the 139th most vulnerable country and the 44th most ready country. The low vulnerability score and high readiness score of Qatar places it in the lower-Bottom quadrant of the ND-GAIN Matrix, which means that adaptation challenges still exist, but Qatar is well positioned to adapt (University of Notre Dame, 2023).

From Past to Present:

The average annual mean temperature in Qatar for the year 1901 was 27.5 ºC. This number increased to reach 29.42 ºC in 2021 (+ 1.92 ºC) (figure 1).

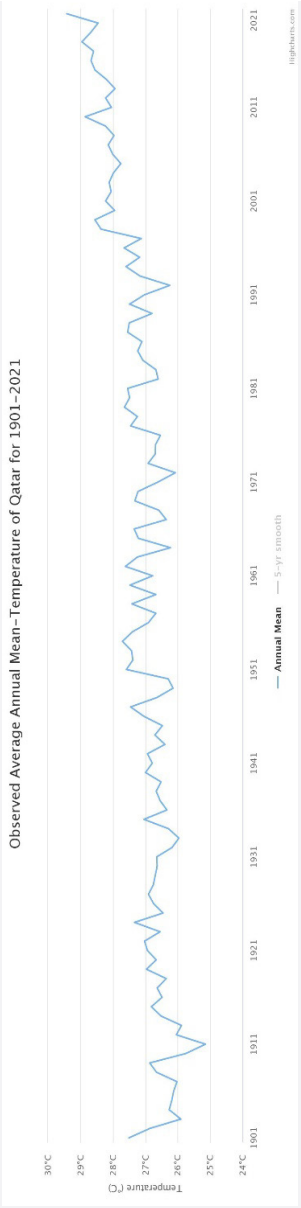


Figure-1: Observed Average Annual Mean Temperature (1901-2021) (WB CCKP, 2021)

Projected:

- **Temperature:** While mean temperature for the reference period 1995-2014 was between 27.6 and 28.34 ºC, it is expected to

1 Vulnerability measures a country's exposure, sensitivity, and ability to adapt to the negative impact of climate change. ND-GAIN measures the overall vulnerability by considering vulnerability in six life-supporting sectors – food, water, health, ecosystem service, human habitat, and infrastructure.

2 Readiness measures a country's ability to leverage investments and convert them to adaptation actions. ND-GAIN measures overall readiness by considering three components – economic readiness, governance readiness and social readiness.

increase and reach 30.19 ºC by mid-century under a high-emission scenario(3), and 34.14 ºC by the end of the century under a high-emission scenario (figure 2, Top). In addition, the number of hot days where the maximum temperature (Tmax) is greater than 35 ºC is expected to rise from 178.05 days (2014 reference) to reach 197.89 days by mid-century and 234.43 days by end of century under a high-emission scenario (figure 2, Bottom).

- **Precipitation:** While the average precipitation for the reference period 2014 was 46.19 mm, it is projected to increase by mid-century under a high-emissions scenario to reach 54.88 mm and by end of century under a high-emissions scenario to reach 80.84 mm (figure 3).

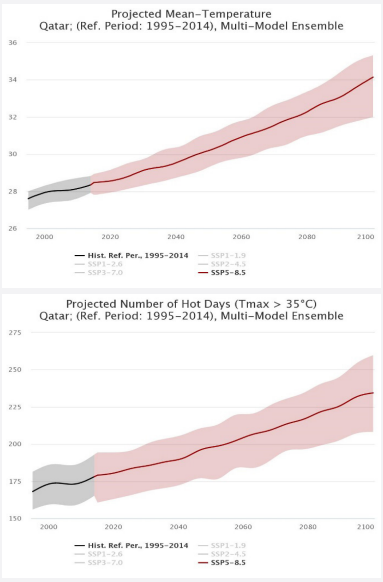


Figure-2: Projected Mean Temperature (Top) and Projected Number of Hot Days [Tmax greater than 35 ºC] (Bottom) (WB CCKP, 2021)

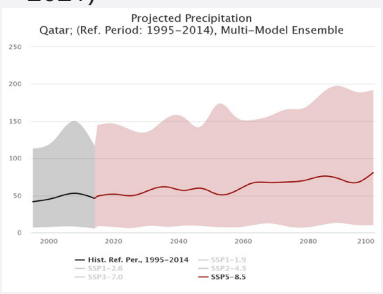


Figure-3: Projected Precipitation (WB CCKP, 2021)

III- CLIMATE CHANGE IMPACTS

a- Natural Hazards

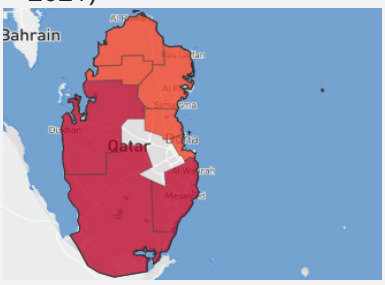
Figure 4 summarizes the risk level of natural hazards in Qatar. It shows that the country has a high risk of coastal floods, extreme heat, and water scarcity that will increase due to climate change.

Rainfall in Qatar is extremely unpredictable and highly variable with short intense events, which produce heavy storms that often lead to flooding in coastal areas. A recent example are the 2018 flash floods caused by heavy rains, which affected more than a thousand people and caused a total damage of 11 655 000 $ (EM-DAT, 2023).

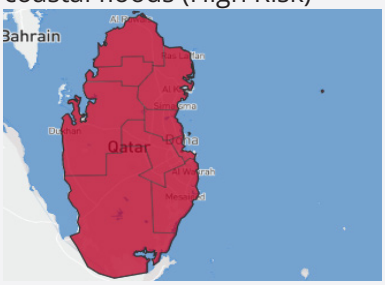
Heavy rainfall is normally followed by long dry periods that result in drought, desertification, and water shortages. It is projected that the population at risk will rise with an increased length in dry periods. Sand and dust storms in Qatar are a result of strong forceful winds called “Shamals” that sweep over the desert area. They are dangerous because they tend to reduce visibility and cause respiratory-related illnesses (WB CCKP, 2021).

Figure 5 shows that under a high-emissions scenario, sea level rise is projected to increase and reach 0.21 m by mid-century and 0.59 m by the end of the century.

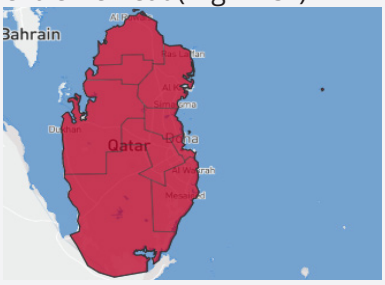
A large proportion of Qatar’s industrial investments are located along the coast and offshore, which include oil and gas facilities, petrochemicals factories, oil and gas export terminals, and power- and water-generating facilities. Even a small change in the sea level will pose serious threats



coastal floods (High Risk)



extreme heat (High Risk)



water scarcity (High Risk)

3 SSP5\RCP8.5-The highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century, depicting a world of rapid and unconstrained growth in economic output and energy use.

in terms of land inundation and coastal erosion, impacting population settlements and aquatic resources. Qatar is one of three countries, along with Kuwait and Bahrain, in the Arabian Gulf exhibiting "extreme" vulnerability to sea level rise. It is estimated that Qatar is susceptible to inland flooding with 18.2% of its land area and 13.7% of its population at less than 5 meters above sea level (Meltzer et al., 2014).

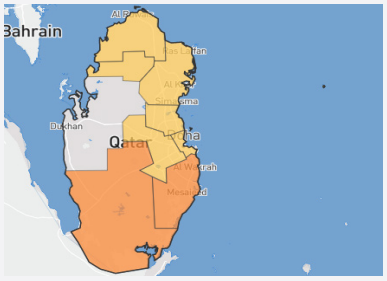
b- Water

Qatar has no major freshwater resources, such as rivers and lakes. The evaporation rate is high and therefore the groundwater replenishment is limited. The current use of ground water for agricultural uses is far greater than the rate of replenishment. The per capita water use in Qatar is in the top few countries in the world. The losses from water transmission and distribution together with leakages contributed to 45% of the total water consumption. The annual per capita water consumption has increased from 182m3 in 1990 to 247m3 in 2005. Nearly 96% of the water needs in the country are met from desalinated water (Qatar's First National Communication, 2011).

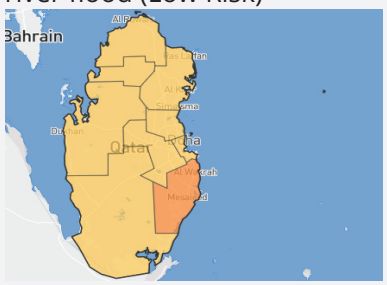
Figure 6 shows the projected annual Standardized Precipitation Evapotranspiration Index (SPEI)(4) in Qatar. The projected maximum annual SPEI drought index under a high-emissions scenario will score a value of -1.95 by 2050 and will reach -2.27 by the end of the century, implying an increasing high pressure on water resources in the country which leads to water scarcity. A consequence of water scarcity could be a decline in agricultural productivity especially for crops that need irrigation. Other consequences include inadequate sanitation which can lead to deadly diarrheal diseases and other water-borne illnesses (WWF, 2023).

c- Agriculture

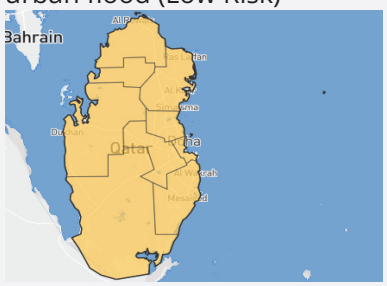
Limited land availability, chronic water scarcity and constraints in agricultural growth have led to growing concerns about food security in Qatar. In fact, the country imports over 90% of its food requirements due to the scarcity of irrigation water, poor quality soils and the inhibitions due to climatic conditions. The increasing dependence on foreign food imports is leading to a growing sense of food insecurity in Qatar. As a response, the country started investing in sustainable agriculture technology. An example is The Sahara Forest Project which allows for sustainable production of food, water and energy while revegetating and storing carbon in arid areas (Suresh, 2022).



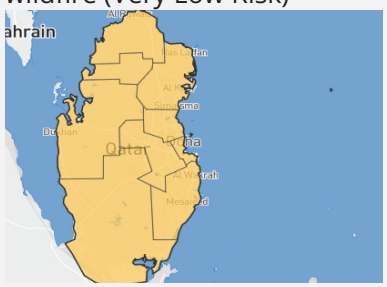
river flood (Low Risk)



urban flood (Low Risk)



wildfire (Very Low Risk)



landslide (Very Low Risk)

Figure-4: Climate-Related Natural Hazards Risk Level (ThinkHazard, 2020)

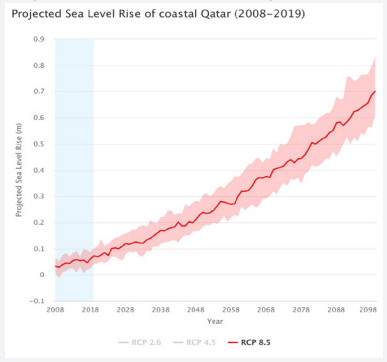


Figure-5: Projected Sea Level Rise of Coastal Qatar (WB CCKP, 2021)

4 An index which represents the measure of the given water deficit in a specific location, accounting for contributions of temperature-dependent evapotranspiration and providing insight into increasing or decreasing pressure on water resources. Negative values for SPEI represent dry conditions, with values below −2 indicating severe drought conditions, likewise positive values indicate increased wet conditions.

d- Energy

Figure 7 (Top) shows that electricity consumption in Qatar increased from 1990 (4.57 TWh) to 2019 (47.1 TWh). This rise in consumption also increased the total CO2 emissions from the energy sector by 599.03 % from 1990 to 2019 (figure 7, Bottom). It is expected that electricity consumption will keep on augmenting especially with the projected increase in the warm spell duration index(5) until the end of the century under a high emission scenario (figure 8).

Renewable Energy: Qatar, among the biggest producers of liquified natural gas, aims to increase its solar power output to 1.6 GW by 2024. The country has also a target of having 5 GW of solar-generated power by 2035. Two new solar energy projects are the Mesaieed Industrial City (MIC) which will have a capacity of 417 MW, and the Ras Laffan Industrial City (RLIC) which will have an output of 458 MW. These plants will be spread over a combined area of over 10 square kilometres. These projects will be the second in Qatar after the 800 MW Al-Kharsaah solar farm (Fast Company MENA, 2022).

e- Health

Heat exhaustion and heat-stroke cases could increase due to further warming in Qatar. With increased density of population in the urban areas, the effects will be more serious. Due to a probable increase in desertification, suspended particulate matter may increase which will lead to an increase in the respiratory problems in the population especially among children, asthmatic, and elderly. Chances of increased formation of secondary pollutants, particularly photochemical oxidants, cannot be ruled out. The current levels of ozone and photochemical oxidants in Qatar are already very high and have raised public health concerns. Further increase in the level of ambient photochemical oxidants under climate change scenarios may be alarming (Qatar's First National Communication, 2011). Dust storms and emission from vehicles and from industry are the main causes of polluted air in Doha. The concentration of the pollutant PM2.5 in this city was 48.2 µg/m³ at the beginning of 2021 (IQAir, 2023).

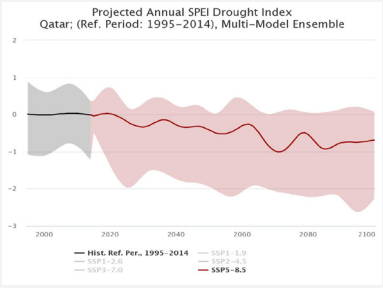
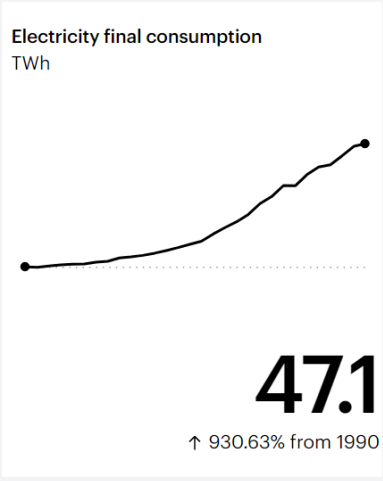


Figure-6: Projected Annual SPEI Drought Index (WB CCKP, 2021)



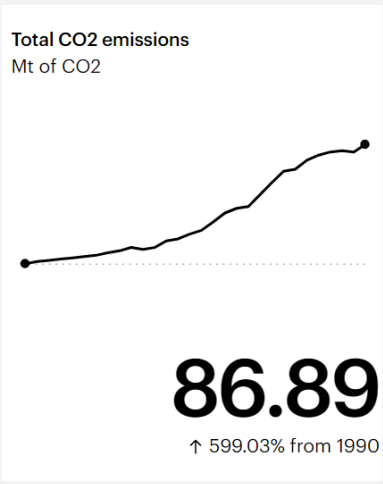


Figure-7: Electricity Final Consumption (Top) and Total CO2 Emissions (Bottom) (IEA, 2019)

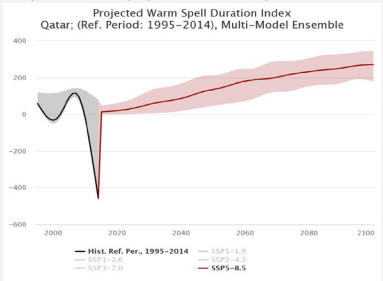


Figure-8: Projected Warm Spell Duration Index (WB CCKP, 2021)

5 An index that depicts periods characterised by several days of very warm temperatures compared to local or regional averages.

IV- CLIMATE CHANGE RESPONSE: NATIONAL AND INTERATIONAL

➔ Some of the national responses to climate change include (Qatar Updated First NDC, 2021).

- Qatar's National Vision 2030 (QNV 2030) and Qatar's National Development Strategy (NDS-1 & NDS-2) that lay a strong emphasis on economic diversification and sustainable development.
- The National Program for Conservative & Efficient use of Water & Electricity (Tarsheed).
- The Qatar Research, Development, and Innovation Council (QRDI) which focuses on key topics of sustainability in Qatar's energy sector and in management of environmental, food and water resources.
- The Qatar National Research Fund (QNRF) is funding research for an efficient carbon management system at the national scale.

National Laws and Policies (IEA, 2022):

Law No. 30 of 2002 – Environmental Protection Law: This law establishes general provisions for the protection of the environment in Qatar. Its objectives include maintaining environmental quality and natural balance; avoiding damage and adverse effects resulting from plans and programs of construction, industrial, agricultural, or economic development, and raising environmental awareness; sustainable development of natural resources; protection of the society and public health, fauna, and flora from harmful environmental actions.

➔ The different international documents submitted as part of the UNFCCC are seen in table 1:

Table 1: Timeline of UNFCCC Document Submission (ClimateWatch, 2022)

Date	Document Submitted
2011	First National Communication
2015	INDC
2017	First NDC
2021	*Updated First NDC

* Qatar intends to reduce 25% of its GHG emissions by the year 2030, relative to baseline scenario {Business-As-Usual (BAU)}.

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