TUNISIA Climate Fact Sheet

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I- GENERAL CLIMATE OVERVIEW

Tunisia is divided into three main climatic zones: a northern Mediterranean climate zone (humid to sub-humid), a central steppe climate zone (semi-arid to arid) which also experiences the greatest temperature range, and a southern desert climate zone (figure 1).

In general, topography and distance from the coast influence the temperature and amount of precipitation. In the North, the rainfall is over 400 mm/year reaching 1500 mm in the extreme Northeast in the Atlas Mountains. In the central areas, rainfall is in a range between 150 and 300 mm/year, while in the south, rainfall decreases as moving southward, falling from 150 mm/year to 50 mm/year in the extreme south. Tunisia's temperatures range from an average monthly high of 30.5°C in mid-summer (July and August) to an average monthly low of 10°C in mid-winter (January) (Ministry of Foreign Affairs of the Netherlands, 2018).

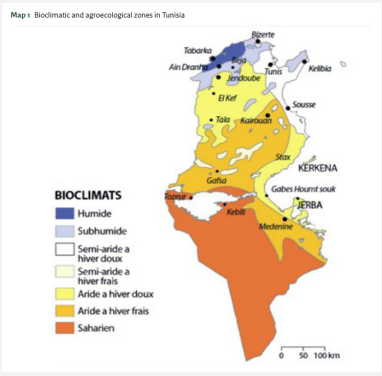


Figure-1: Tunisia's Climatic Zones (Ministry of Foreign Affairs of the Netherlands, 2018)

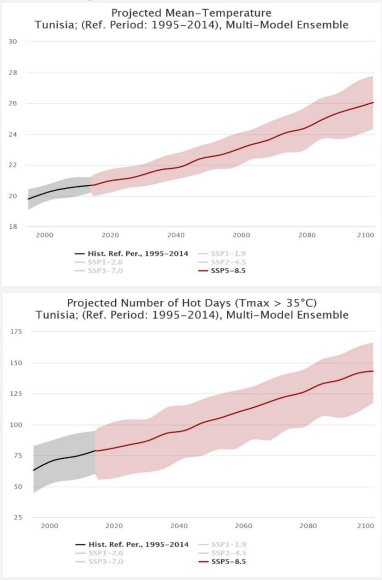


Figure-2: Projected Mean Temperature (Top) and Projected Number of Hot Days [Tmax greater than 35 °C] (Bottom) (WB CCKP, 2021)

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. Tunisia's ND-GAIN Index rank is 67. It is the 122nd most vulnerable country and the 81st most ready country. The low vulnerability score and high readiness score of Tunisia places it in the lower-right quadrant of the ND-GAIN Matrix, which means that adaptation challenges still exist, but Tunisia is well positioned to adapt (University of Notre Dame, 2023).

From Past to Present:

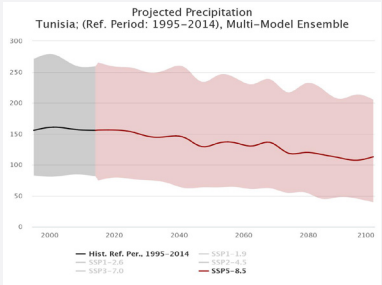


Figure-3: Projected Precipitation (WB CCKP, 2021)

- **Temperature:** Tunisia's mean annual temperatures rose by about 1.4°C in the 20th century, well above current global warming trends, with the most rapid warming taking place in the summer (1.8°C) and

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.

the least in the spring (1.2°C). Most of the warming has occurred since the 1970s, though summer mean maximum temperatures have risen since the 1960s. The number of warm days per year has also increased (Ministry of Foreign Affairs of the Netherlands, 2018).

- **Precipitation:** Annual rainfall has decreased 5% per decade in the northern part of Tunisia since 1950, while heavy rainfall events have become more frequent. Western areas have experienced stable or declining rainfall while the east has experienced increasing winter totals since the 1950s. Spring rainfall, however, had decreased in most areas, particularly in the eastern half of the country. Autumn rainfall has declined mostly in the south (Ministry of Foreign Affairs of the Netherlands, 2018).

Projected:

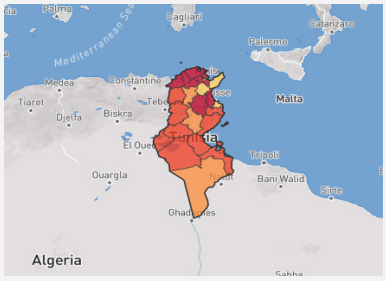
- **Temperature:** While mean temperature for the reference period 1995-2014 was between 19.78 and 20.67 ºC, it is expected to increase and reach 22.51 ºC by mid-century under a high-emission scenario(3), and 26.04 ºC by end the end of the century under a high-emission scenario (figure 2, Top). In addition, the number of hot days where the maximum temperature (Tmax) is greater than 35 ºC is expected to rise from 78.77 days (2014 reference) to reach 103.45 days by mid-century and 143.07 days by end of century under a high-emission scenario (figure 2, Bottom).

- **Precipitation:** While the average precipitation for the reference period 2014 was 155.62 mm, it is projected to decrease by mid-century under a high-emissions scenario to reach 131.42 mm and by end of century under a high-emissions scenario to reach 112.93 mm (figure 3).

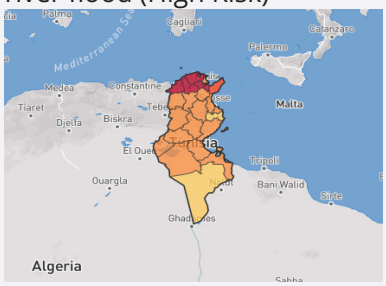
III- CLIMATE CHANGE IMPACTS

a- Natural Hazards

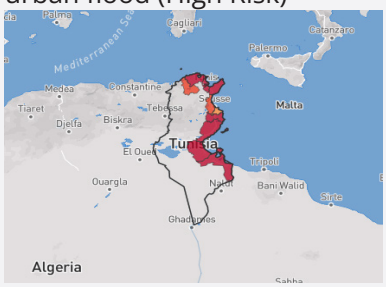
One of the main impacts of the change in temperature and rainfall patterns is the occurrence of natural hazards. Figure 4 summarizes the risk level of natural hazards in Tunisia. It shows that the country has a



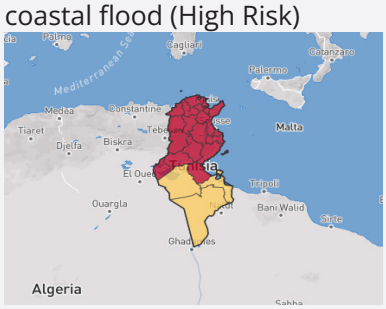
river flood (High Risk)



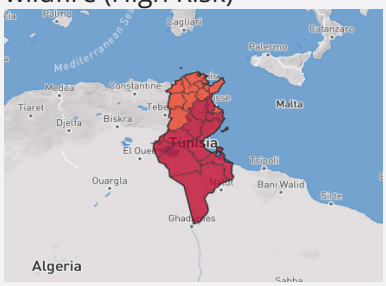
urban flood (High Risk)



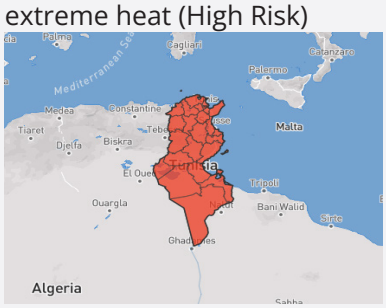
coastal flood (High Risk)



wildfire (High Risk)



extreme heat (High Risk)



water scarcity (Medium 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.

high risk of floods, extreme heat, and wildfires that will increase due to climate change.

The main climate-related natural hazards that have occurred from 1900 till 2023 in Tunisia are seen in table 1:

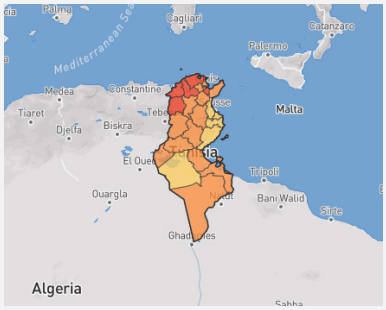
Table 1: Climate-related Natural Hazards (from 1900 till 2023) (WB CCKP, 2021)

Disaster Type	(Occurrence (1900-2023
Flood	(of which 7 recorded flash floods, 4 recorded riverine floods) 20
Forest Fire	2
Drought	2
	Total deaths: 985 **Total damages ('000 US$): 1 717 784**

Specific recent examples of such hazards include the July 2021 wildfires, which affected the pine forests of Ain Mazer, Sakiet Sidi Youssef district, Kef governorate in the middle-western region of Tunisia, where locals make their living through forestry, livestock, and crop farming. Simultaneously, another fire has erupted in Ghar Dimaa delegation, Jendouba Governorate, damaging over 1,500 hectares of forests (ReliefWeb, 2021). In addition, a flash flood event occurred in March 2022 caused by torrential rain that hit the northwest of Tunisia, where floodwater surged through many different districts, damaging infrastructure, houses, properties, and fruit trees and crops, and affecting more than 4 000 people. Some of them fled their homes seeking shelter in neighbouring high-ground houses and villages, while others chose to stay in their damaged houses and move to rooftops rather than risk crossing flooded areas to reach evacuation points (ReliefWeb, 2022).

Sea levels have risen across the Mediterranean by an average of more than 3.1 mm each year since 1992, although records from further back indicate considerable local variability. In addition, since 1990, Mediterranean Sea levels have risen at a rate 5–10% faster than the 20th century mean rate (USAID, 2015). Figure 5 shows that under a high-emissions scenario, sea level rise is projected to increase in Tunisia and reach 0.24 m by mid-century and 0.71 m by the end of the century.

In fact, more than 3,000 ha of urban areas in the country are considered vulnerable and threatened by submersion, and more than half of these potentially submersible lands are residential urban areas located mainly in the city of Tunis and in the city of Sfax. Vulnerable zones also include 781 ha of industrial zones located mainly in Tunis and Sfax, and 560 ha of tourist zones largely located on the eastern side of the island of Djerba (Tunisia's Third National Communication, 2019).



landslide (Medium Risk)

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

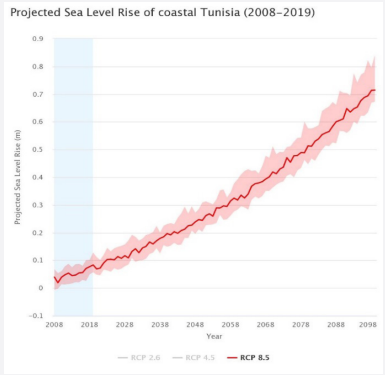


Figure-5: Projected Sea Level Rise of Coastal Tunisia (WB CCKP, 2021)

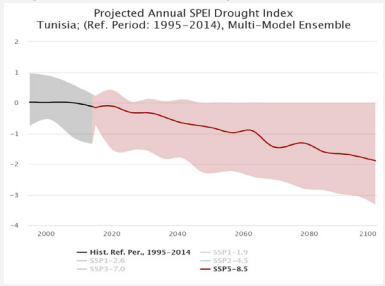


Figure-6: Projected Annual SPEI Drought Index (WB CCKP, 2021)

b- Water

Nowadays there is an intensive exploitation of underground resources in Tunisia which provide around 81% of the water needs of the irrigated sector. The decrease in available stocks would be more pronounced in the north of the country which concentrates 80% of the resources already mobilized, and in the centre of the country where groundwater is the main resource for agriculture and drinking water. By 2050, the overall decrease of water resources due to climate change could be significant as the country could assist in a drying up of water sources, which constitute the main resources in some rural areas of Tunisia. Among a set of about 215 water tables in the country, almost a quarter is in the coastal area. These coastal aquifers store about 290 Mm3 (40% of the groundwater potential and almost 6% of the total water resources that can be mobilized in the country). Sea water intrusion into the coastal water tables will contribute to their progressive salinization, especially since many of these aquifers already show signs of degradation. Sea level rise could be responsible for the loss of 220 Mm3 of water resources (about 30% of the total groundwater potential and 75% of the phreatic resources) (Tunisia's Third National Communication, 2019).

The increasing high pressure on water resources is further represented in figure 6, which displays the projected annual Standardized Precipitation Evapotranspiration Index (SPEI)(4) in Tunisia. The projected maximum annual SPEI drought index under a high-emissions scenario will score a value of -2.31 by 2050 and will reach -3.32 by the end of the century. Such negative values imply an increasing high pressure on water resources, which could lead 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).

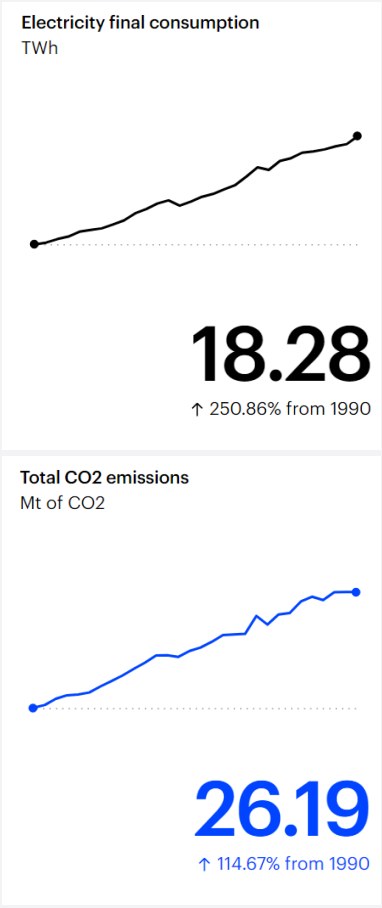


Figure-7: Electricity Final Consumption (Top) and Total CO2 Emissions (Bottom) (IEA, 2019)

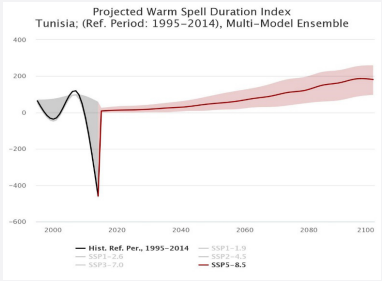


Figure 8: Projected Warm Spell Duration Index (WB CCKP, 2021)

c- Agriculture

Tunisia has more than 10 million hectares of agricultural lands representing 62% of the country's total area. Rising temperatures, decreasing precipitation, increasing evapotranspiration, and decreasing availability of water resources will all threaten the yields of irrigated and rainfed crops in the country by the end of the century. Therefore, this will negatively impact the economic sustainability of the agricultural sector. According to 2007 estimations, the area of non-irrigated orchards could be reduced by about 800,000 ha (almost 50% of the current area) especially in the centre and the south of the country, in

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.

response to successive extreme droughts expected by the end of the century. The olive sector is the main activity of more than two thirds of Tunisian farmers (390,000 out of 560,000). Climate change will also threaten this crop; however, the extent of the impact is still uncertain. Some modelling studies indicate that under the effect of drought, areas of irrigated cereals would decrease by 20% by 2020, affecting mainly the central and southern regions of Tunisia. Droughts are also expected to affect rainfed cereal crops which could decrease from an average of 1.5 million hectares to an average of one million hectares in 2030 (a drop of about 30%) (Tunisia's Third National Communication, 2019). On another note, the Tunisian diet relies heavily on grains, and the country imports around 50% of its wheat from Ukraine and Russia. The undergoing conflict in these countries is causing a disruption in regular imports hence accelerating food insecurity in Tunisia (Zientek, 2022).

d- Energy

Figure 7 (Top) shows that electricity consumption in Tunisia increased from 1990 (5.21 TWh) to 2019 (18.28 TWh). This rise in consumption also increased the total CO2 emissions from the energy sector by 114.67% 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: In 2021, only 3% of Tunisia's electricity was generated from renewables, including hydroelectric, solar, and wind energy. Although hydrocarbon-based generation will continue to dominate the country's overall energy mix in the near future, the potential for growth in wind and solar power generation is important. The renewable energy law adopted in 2015 for instance encourages private businesses to generate and use clean energy. Through March 2022, Tunisia had about 472MW of installed renewable energy capacity of which 244 MW was wind power, 166 MW solar power, and 62 MW of hydroelectric power, representing a combined 8% of national energy production capacity. Tunisia aims to raise the usage of renewable energy resources to 35% of total power capacity by 2030 (International Trade Administration, 2022)

e- Health

Since the 20th century, several major vector-borne diseases have gained attention in Tunisia such as leishmaniasis, malaria, schistosomiasis, and West Nile viral fever. Some of them have been eliminated from the country such as schistosomiasis and malaria. However, changes

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

in rainfall patterns and temperatures may change the geographical distribution of insect vectors of these diseases, such as mosquitoes or sandflies. In addition, increasing water scarcity and the deterioration of water quality will have tangible drawbacks on human and animal health. The increase in waterborne diseases has already been felt in all governorates in response to lack of water. Access to drinking water, sanitation and hygiene may become more difficult, resulting in new break outs of pathogenic microorganisms and potential bacteriological contamination. These diseases are expected to affect rural areas, mainly in the centre and north-west part of Tunisia, where access to drinking water and sanitation is already limited. The increase of heat waves and heat islands could strongly increase respiratory diseases. Increase in the CO2 content of the atmosphere, degrading the air quality, would also contribute to increased risks of heart attacks, strokes, and respiratory infections. People living in urban areas should be more affected because of greater pollution by fine particles and higher CO2 content in the air, caused by a concentration of human activities. The increase in droughts and floods would destabilize the agricultural sector, with insufficient water resources which will have a big impact on food security in the country, causing an increase in malnutrition (Tunisia's Third National Communication, 2019).

IV- CLIMATE CHANGE RESPONSE: NATIONAL AND INTERNATIONAL

- ➔ Tunisia was one of the first countries to integrate climate change within its Constitution, however it has yet to officially designate an institution to coordinate climate change related public policy and action. Currently, the primary institutions that support the coordination of climate change agendas and adaptation efforts are the Ministry of Local Affairs and Environment, the National Agency for Energy Management, the Ministry of Agriculture, and the Ministry of Water Resources and Fisheries. These agencies also serve as the Designated National Authority for the Clean Development Mechanism of the Kyoto Protocol. Sectoral specific agencies also contribute to the development of policies and measures to fight climate change (Tunisia's Third National Communication, 2019).

The different international documents submitted as part of the UNFCCC are seen in table 2:

Table 2: Timeline of UNFCCC Document Submission (ClimateWatch, 2022)

Date	Document Submitted
2001	First National Communication
2014	Second National Communication
2015	INDC
2017	First NDC
2019	Third National Communication
2021	*Updated First NDC

*The updated NDC raises emissions mitigation ambitions to greenhouse effect of Tunisia, through an increase in the reduction target national carbon intensity to 45% by 2030, compared to its 2010 level.

➔ National Laws and Policies (Ministry of Foreign Affairs of the Netherlands, 2018):

- Following the political changes triggered by the Jasmin Revolution, a new constitution was adopted in 2014 which incorporated climate change as a permanent feature. Under Article 44 of the new constitution, the State shall "provide the means necessary to guarantee a healthy and balanced environment and contribute to the climate's integrity".

- Tunisia's National Climate Change Strategy (NCCS), developed by the Ministry of Environment, was launched in October 2012. The Strategy proposes an anticipatory approach to adaptation and a proactive mitigation policy to reduce the economy's carbon emissions.

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