# **LIBYA** Climate Fact Sheet

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# Libya Climate Fact Sheet

## I- GENERAL CLIMATE OVERVIEW

Libya's climate is influenced by the Mediterranean Sea to the north and the Sahara Desert to the south and, as a result, abrupt transitions of weather conditions are experienced across the country (WB CCKP, 2021).

Along the coast, the Mediterranean climate is characterized by a cool rainy winter season and a hot dry summer. The warmest months are July and August, when average temperatures in Benghazi and Tripoli, in the Mediterranean zone, reach between the low to upper 20s C, and the upper 10s and low 30s C, respectively. The coolest months are January and February. Winter monthly temperatures in Benghazi range from the low to mid 10s C, while those in Tripoli range from the low to mid 10s C (Britannica, 2022).

The Mediterranean coastal strip experiences dry summers and relatively wet winters. The northern Tripoli regions of Jabal Nafusah and Jifarah Plain and the northern Benghazi region of Jabal al Akhdar receive the highest average annual rainfall, exceeding the minimum value of 250-300 mm. Pre-desert and desert conditions with scorching temperatures of daily thermal variations are experienced in the southern part of the interior where rain is rare and irregular. Rainfall in Libya occurs during the winter months, with average annual rainfall of 26 mm and great variations from place to place and from year to year. Approximately 93% of the land surface receives less than 100 mm of rain per year (WB CCKP, 2021).

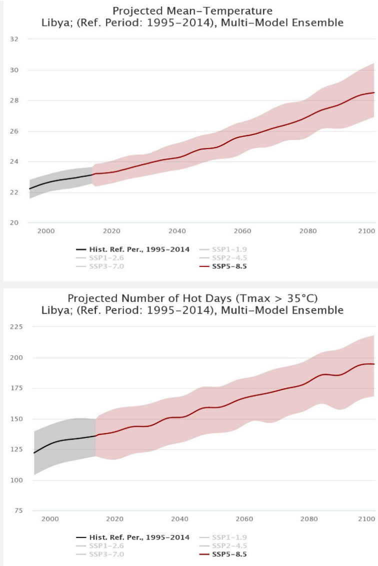


**Figure 1:** Projected Mean Temperature (top) and Projected Number of Hot Days [Tmax greater than 35 ºC] (bottom) (WB CCKP, 2021)

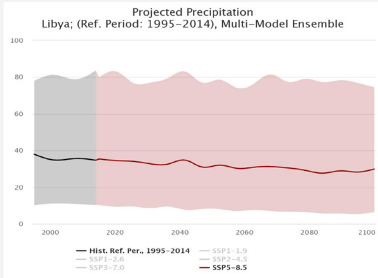


**Figure 2:**Projected Precipitation (WB CCKP, 2021)

## 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. Libya's ND-GAIN Index rank is 125. It is the 89th most vulnerable country and the 170th most ready country. The low vulnerability score and low readiness score of Libya places it in the lower-top quadrant of the ND-GAIN Matrix, which means that relative to other countries, its current vulnerabilities are manageable but improvements in readiness will help it better adapt to future challenges

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.

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(University of Notre Dame, 2023).

## From Past to Present:

- **Temperature:** Increase in annual minimum temperatures of between 0.03 and 0.55°C per decade since the 1940s, depending on the weather station; extreme minimum temperatures have also shown significant increases, while extreme maximum temperatures have not (USAID, 2017).

- **Precipitation:** Decrease in rainfall of 20.9 mm/month, per century since 1950s (USAID, 2017).

## Projected:

- **Temperature:** While mean temperature for the reference period 1995-2014 was between 22.22 and 23.12 °C, it is expected to increase and reach 24.85 °C by mid-century under high-emission scenario[3], and 28.50 °C by end the end of the century under high-emission scenario (figure 1, top). In addition, the number of hot days where the maximum temperature (Tmax) is greater than 35 °C is expected to rise from 135.84 days (2014 reference) to reach 159.01 days by mid-century and 194.51 days by end of century under a high-emission scenario (figure 1, bottom).

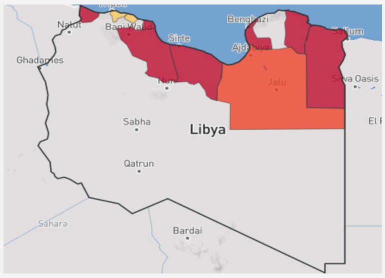
- **Precipitation:** While the average precipitation for the reference period 2014 was 34.69 mm, it is projected to decrease by mid-century under a high-emissions scenario to reach 31.42 mm and by end of century under a high-emissions scenario to reach 29.88 mm (figure 2).

# III- CLIMATE CHANGE IMPACTS

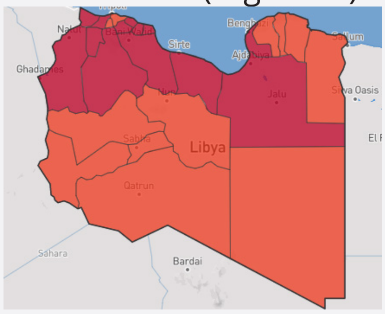
## a- Natural Hazards

One of the main impacts of the change in temperature and rainfall

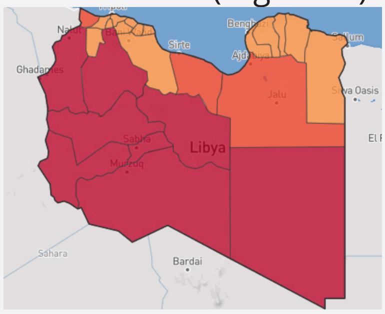
3 SSP5\RCP8.5-The highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century, depicting a world of rapid and unconstrained growth in economic output and energy use.



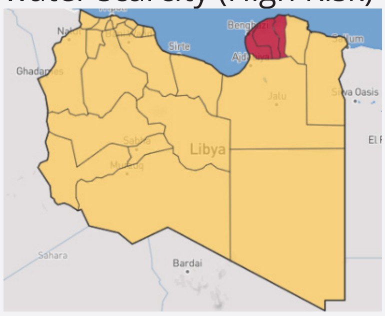
coastal flood (High Risk)



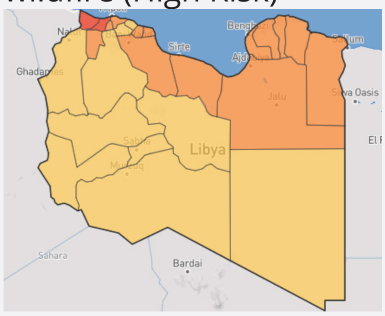
extreme heat (High Risk)



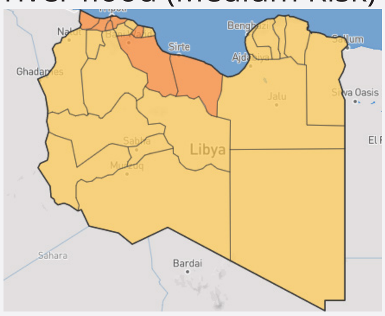
water scarcity (High Risk)



wildfire (High Risk)



river flood (Medium Risk)



urban flood (Low Risk)

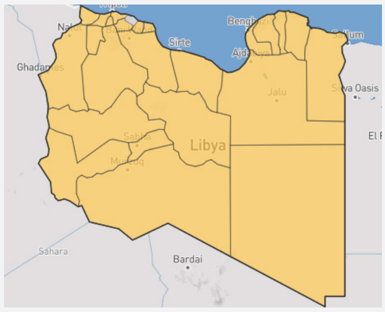
patterns is the occurrence of natural hazards. Figure 3 summarizes the risk level of natural hazards in Libya. It shows that the country has a high risk of coastal floods, water scarcity, extreme heat, and wildfires that will increase due to climate change.

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

**Table 1:** Climate-related Natural Hazards (from 1900 till 2023) (EM-DAT, 2023)

| Disaster Type | Occurrence (1900-2023) |
|---|---|
| Flood | (of which 1 recorded riverine flood) 3 |
| | **Total deaths: 20**<br>**Total damages ('000 US$): 89 173** |

- **Floods:** Heavy rainfall during winter often causes flooding in roads and streets within city centres. Occasionally, floods cause loss of life, significant economic damage, and loss of crops. Flood damage is aggravated by Libya's poor drainage infrastructure (WB CCKP, 2021). A recent example are the May 2019 floods which affected over 20,000 people with an estimated 2,500 displaced to nearby areas (ReliefWeb, 2019).
- **Drought and Desertification:** Yields of rainfed agriculture are severely low due to droughts. Libya is also faced with desertification mainly in the Jifara Plain located in the north-western part of the country. Drought aggravates soil damage resulting from vegetation cover loss from overgrazing, groundwater depletion, over-cultivation, and population growth (WB CCKP, 2021).
- **Sandstorms and Dust Storms:** Strong dry wind blowing over the desert raises and carries along clouds of sand and dust that is often so dense that it obscures the sun and reduces visibility to almost zero. Wind speeds are high, often moving dunes and sometimes wiping out roads in flat, dry regions and halting air and road transportation. Sand and dust storms are also responsible for health-related illnesses resulting from the inhalation of dust and chemical contaminants (WB CCKP, 2021).
- **Sea Level Rise:** With most of the country living in coastal cities (86 percent of the population), many Libyans are vulnerable to sea level rise. Benghazi could face considerable damage with only 0.2 m of sea level rise. An estimated 5.4 percent of the total Libyan urban area could be lost with one meter of sea level rise. Flooding from sea level rise and storms could also salinize soils and renewable aquifers along the coast. The sea level rise




landslide (Very Low Risk)

**Figure 3:** Climate-Related Natural Hazards Risk Level (ThinkHazard, 2020)

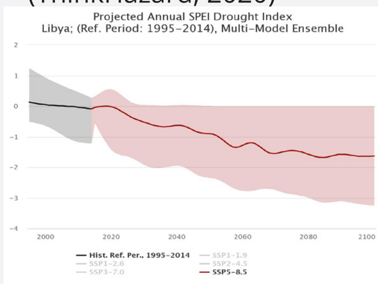



**Figure 4:** Projected Annual SPEI Drought Index (WB CCKP, 2021)

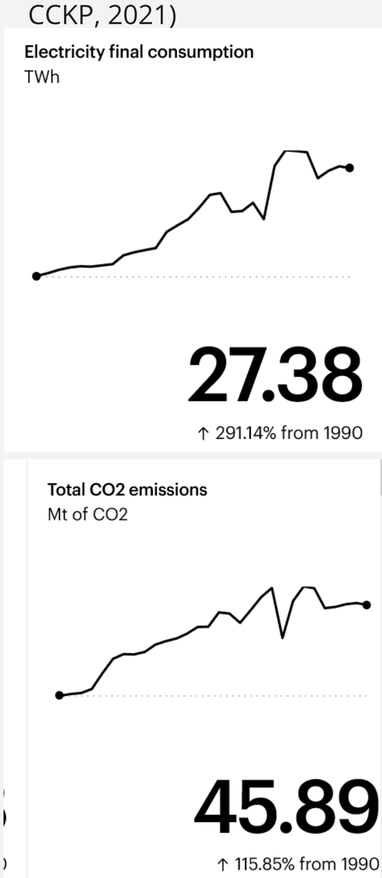



**Figure 5:** Electricity Final Consumption (top) and Total $CO_2$ Emissions (bottom) (IEA, 2019)

projected to result from 2.6°C warming by 2100 would cost the country an estimated $1.7 billion (USAID, 2017).

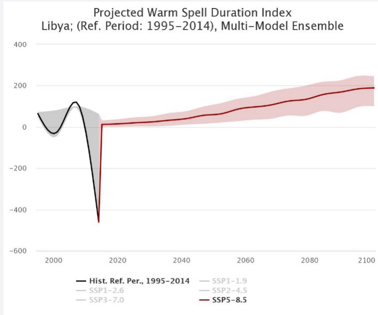



**Figure 6:** Projected Warm Spell Duration Index (WB CCKP, 2021)

## b- Water

Libya experiences critical water stress and is ranked in the top six most water stressed countries globally. If there is no change in the future situation, water stress is projected to worsen by 2040 (UNICEF, 2022). Libya's water demand is far greater than its renewable supply. With only a narrow zone along the coast receiving more than 100 mm of rain per year, and frequent salt intrusion into aquifers, the renewable water supply is relatively small and of poor quality. The anticipated increase in annual drought days on the coast from the current 101 to as many as 224 within the next four decades is expected to also increase stress significantly on water sources (USAID, 2017).

Increasing pressure on water resources is also shown in figure 4, which displays the projected annual Standardized Precipitation Evapotranspiration Index (SPEI)(4) in Libya. The projected maximum annual SPEI drought index under a high-emissions scenario will score a value of -2.35 by 2050 and will reach -3.25 by the end of the century. Such negative values imply a high pressure on water resources which as a result would become scarcer. 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

The agricultural sector in Libya insures about 1.9 % of GDP and 17% of employment. Agricultural productivity in the country is hampered by the limited renewable water resources, harsh climatic conditions, and poor soil quality. Only 3.8 million hectares (1-2% of the country's area) can support crop growth. As a result, Libya imports around 75% of its food. While rain-fed cultivation is dominant in lightly populated semiarid areas, larger-scale agriculture in the Mediterranean region is dependent on irrigation from non-renewable aquifers. Projected annual temperature increases of around 1.5-2°C are estimated to reduce crop yields by up to 30% by 2060. With an expected increase in both temperatures and number of drought days, the intake of water from aquifers for agricultural irrigation are likely to increase. Rain-fed agriculture and pastoralism may also no longer be viable for the rural

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.

populations of semiarid Libya. Projected increases in the frequency of extreme weather events such as floods, sandstorms, and dust storms will likely damage fields and irrigation infrastructure and further reduce crop yields. Salinization of soils due to sea level rise and floods is also expected to affect agricultural production by reducing soils productivity (USAID, 2017).

On another note, conflict in Libya is forcing local farmers to abandon their lands and homes to seek safety in other areas. This is happening for instance in the village of Awiniya southwest of Tripoli, a region where agriculture is the main source of income for most of the population. After years of displacement, some of the farmers returned to the village to find their lands destroyed. In addition, more farmers are abandoning their farms due to the scarcity of water resources, while yields of rainfed agriculture are becoming severely low due to droughts. Conflict has also top the country vulnerable to climate variability because of low adaptive capacity which could increase the impacts of natural hazards on agricultural production (ReliefWeb, 2022).

## d- Energy

Figure 5 (top) shows that electricity consumption increased from 1990 (7 TWh) to 2019 (27.38 TWh). This rise in consumption also increased the total CO2 emissions from the energy sector by 115.85% from 1990 to 2019 (figure 5, bottom). It is expected that electricity consumption will keep on augmenting especially with the expected increase in the warm spell duration index(5) until the end of the century under a high emission scenario (figure 6).

**Renewable Energy:** Currently, much of the renewable source of energy in Libya is not being used. The country uses 42% of heavy fuel, 20 % light fuel, 38% natural gas and less than 1% of renewable energy. One of the potential renewable sources that the country could invest in is solar energy, where projects could be practiced on both small- and large-scale level. Solar energy is almost totally untapped except for the solar bond created in 1994 whose purpose has been to desalinate water. Libya could also tap energy from wind: the average speed of wind studied in 2004 was 12-14 mph at 40m altitude, however this is lower than the wind speed of other countries that generate energy from wind. Photovoltaic energy (PV) is the most popular and has been used since 1976. Currently there are over 100 PV stations all over the country, as beside the installation costs it involves no further costs. These have been used more in electrifying the rural areas. Libya had a plan to increase the current use of renewable resources from 1% to 10% by the year 2020 (Mohamed & Masood, 2018).

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

### e- Health

Damage to essential water infrastructure along with a rise in overall temperatures will likely increase cases of water-borne illness. Increases in frequency and duration of heat waves could also lead to heat-related deaths especially in cities, again putting further strain on the already handicapped health infrastructure. The combination of warming and the existing pollution challenges in the cities in coastal Libya could result in an increase in respiratory illness. More dust storms and sandstorms could not only damage the built environment, but also increase the prevalence of illnesses resulting from an increased exposure to sand, chemical contaminants, or related particulates, as well as further aggravate existing respiratory conditions. On another note, although Libya is reliant on imports for much of its food, the collapse in domestic agriculture could result in increased food insecurity and malnutrition among the population (USAID, 2017).

## IV- CLIMATE CHANGE RESPONSE: NATIONAL AND INTERNATIONAL

➔ **International Response**

While Libya signed and ratified the UNFCCC in 1999, it has not yet submitted a national communication nor proposed a prospective policy framework (USAID, 2017).

➔ **National Laws and Policies:**

Climate issues fall under the authority of the General Government Authority; the Ministry of Agriculture, Animal and Marine Wealth; the General Water Authority; and the Ministry of Electricity and Renewable Energy. Libya coordinates its climate change projects through its National Committee for Climate Change, which is headed by the Energy Secretary. Libya has no climate legislation as of 2016 (USAID, 2017).

**Law No.7 of 1982:** Protection of the environment - This Law provides for the protection of the environment from pollution including air, water, soil and food (art. 2). All concerned authorities shall adopt all best ways and methods for the protection of the environment (art. 6). Article 7 establishes the Technical Centre for the Protection of the Environment with the competence to lay down plans and programmes related to environment, environment protection, cooperation with international organizations in removing the causes of pollution, issuing permits, updating international agreements and treaties concerning environment, and to EIA. The Centre shall have the bottom to inspect concerned agencies and offices (art. 8). Article 17 provides for the control on the emission of smog generated by vehicles. Fishing gear and fishing methods, definition of meshes, and protected species are specified in articles 19-21. Provisions on pollution caused by ships and by oil are defined in articles 22 and 23. Concerned authorities shall define the list of ports for receiving waste disposal (art. 28). The Control Guide shall have the bottom to inspect ships (art. 32). It shall be prohibited to throw or drain waste and radioactivity materials in the sea (arts. 34-37) (ILO, 2014).

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