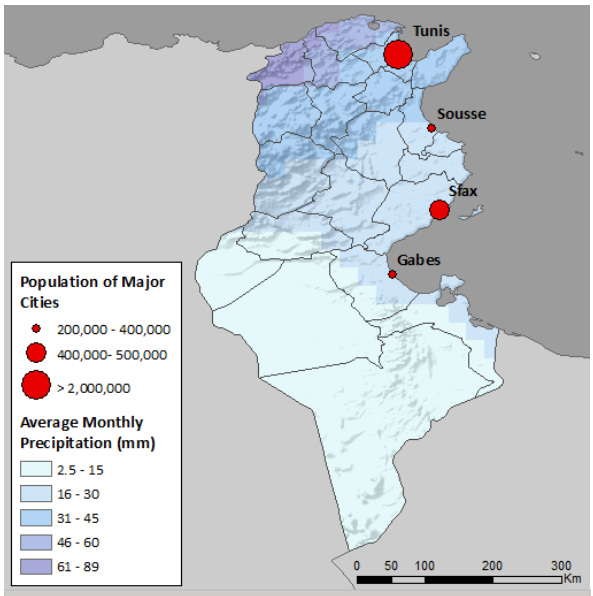
USAID
FROM THE AMERICAN PEOPLE

FACT SHEET

CLIMATE RISK PROFILE
TUNISIA

COUNTRY OVERVIEW

Tunisia, a lower-middle income country located in North Africa on the southern Mediterranean, is vulnerable to climate variability and change in numerous ways. Stressors such as rising temperatures and varied precipitation levels coupled with potential increased frequency of extreme events, such as floods and droughts, could threaten agriculture, economic development, and availability of water resources throughout the country. Tunisia's susceptibility to climate variability and change is also tied to its reliance on agriculture and tourism; agriculture accounts for 10 to 14 percent of the country's gross domestic product (GDP) and employs approximately 16 percent of the workforce, while tourism accounts for 6.5 percent of GDP and directly supports 6 percent of Tunisia's workforce. The southern and western parts of the country have the highest poverty rates, as much as four times higher than the resource rich coastal region. Tunisia's coastal region, by contrast, harbors 80 percent of the country's economic activity and is home to two-thirds of the country's 11.6 million people. However, the nearly 1150 kilometers of coast is significantly threatened by sea level rise. Without adaptation measures, and under a high emissions scenario, 78,700 Tunisians would be affected annually between 2070 and 2100 by sea level rise and flooding. Sea level rise also threatens the water scarce low-lying islands off Tunisia's coast, where climate change will likely exacerbate existing water security challenges and may also result in coastal erosion and increased evapotranspiration due to rising temperatures. The Government of Tunisia recognizes the threat that climate change poses, with climate change explicitly discussed in the country's constitution. However, the country still faces numerous technical, financial, and institutional challenges in effectively responding and adapting to the impacts of climate variability and change (2,3,5,6,15,18,21,24,25).



MONTHLY PRECIPITATION IN TUNISIA

CLIMATE PROJECTIONS

- 0.7°C - 2.6°C increase in temperatures by 2050
- -4.1% to -6.7% decrease in precipitation by 2050
- More frequent and longer-lasting droughts
- 3 cm to 61 cm rise in sea levels this century

Agriculture
Reduced crop yields
Reduced revenue from exports
Food shortages

Infrastructure
Damage to roads and transport
Damage to tourism industry
Increased isolation of interior from coast

Tourism
Decrease in tourism revenue
Increased energy and transportation costs

Health
Increased risk of waterborne and vector-borne diseases
Increased food insecurity
Increased mortality from heat

Governance
Increased competition for natural resources, such as freshwater
Increased difficulty in gaining access to natural resources

October 2018
This document was prepared under the Climate Integration Support Facility Blanket Purchase Agreement AID-OAA-E-17-0008, Order Number AID-OAA-BC-17-00042, and is meant to provide a brief overview of climate risk issues. The key resources at the end of the document provide more in-depth country and sectoral analysis. The contents of this report do not necessarily reflect the views of USAID.

CLIMATE SUMMARY

Tunisia's climate varies due to the country's diverse geography, which can be divided into three regions. The northern mountainous region has a Mediterranean climate with mild, rainy winters and hot, dry summers. The south has a hot, dry, and semiarid climate as it enters the Sahara Desert, while the eastern coastal border has an arid steppe climate. Rainfall also varies by region, with average annual rainfall at 158 millimeters (mm) per year for the whole country, but less than 100 mm annually in the south and over 700 mm annually in the north. Historically, average temperatures likewise vary seasonally and regionally; in the northern coastal region temperature ranges from a low of 10°C in the winter months (December to February) to a high of 27°C in the summer months (June-August), while in the central western and southern regions temperature ranges from a winter low of 11°C to a summer high of 32°C. In the southern semiarid to arid areas, drought can be frequent, while the coastal region experiences floods. Although information on the rate of sea level rise varies, coastal areas are already experiencing salinization from sea level rise (1,15,19,20,23).

HISTORICAL CLIMATE

Observations include:

- During the last 30 years temperature increased by an average of 0.4°C per decade; the mean average temperature rose by 1.4°C in the 20th century.
- While *in aggregate* no significant change in annual precipitation was observed from 1901 to 2013, over the past 30 years average annual precipitation has decreased by about 3%.
- Sea level rise across the Mediterranean Basin[1] averaged roughly 3.1 mm per year between 1992 and 2011, while sea levels in the western Mediterranean averaged an increase of approximately 1 mm per year between 1945 and 2000.

FUTURE CLIMATE

Projected changes include:

- Annual maximum temperature is likely to increase by 1.5°C to 2.5°C by 2030 and 1.9°C to 3.8°C by 2050, while annual minimum temperature is likely to rise from 0.9°C to 1.5°C by 2030 and from 1.2°C to 2.3°C by 2050.
- The number of hot days[2] is projected to increase by about 1.3 days per year between 2020 and 2039 and the duration of heatwaves[3] is likely to increase by 4 to 9 days by 2030 and by 6 to 18 days by 2050.
- All models project a likely decrease in overall precipitation by 2050, with most projecting a minimum decrease of around 4% and maximum decrease varying from 7% to as much as 22%, and the duration of dry spells is likely to increase by 1 to 21 days by 2030 and by 1 to 30 days by 2050.[4]
- The decrease in precipitation is accompanied by an anticipated increase in the frequency and intensity and droughts and flooding.
- By 2090, sea level near Tunis is likely to rise between .2 meters (m) to .5 m under a low emission scenario, and .4 m to .8 m under a high emission scenario.
- The duration of cold spells is likely to decrease by 1 to 3 days by 2030 and by 2 to 4 days by 2050.[5]

---

[1] Tidal data for Tunisia are not currently available publicly

[2] A "hot" day or night is defined as days where maximum temperature, or nights where minimum temperature, exceed the 90th percentile current climate of that region or season.

[3] A "heatwave" is defined as an unusually high (95th percentile) number of consecutive days with a daily mean temperature above the 95th percentile of the daily mean temperatures within the control period of 1971 to 2000.

[4] A "dry spell" is defined as an unusually high (95th percentile) number of consecutive days with total precipitation below the 5th percentile of daily precipitation, within the control period of 2971 to 2000.

[5] A "cold spell" is defined as an unusually high (95th percentile) number of consecutive days with a daily mean temperature below the 5th percentile of the daily mean temperatures within the control period of 1971 to 2000.

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

Tunisia's agriculture sector, which accounts for approximately 14 percent of the country's exports, is highly vulnerable to climate change. Tunisia's top agricultural commodities are typical Mediterranean foods, including olive oil, dates, citrus, grain, meat, and poultry products. Agricultural production is endangered by sea level rise and variability in temperatures and precipitation, which may lead to decreased crop yields, increased water scarcity, reduced water quality, and changes in growing season. The majority of Tunisia's agricultural production occurs in coastal zones, which are expected to experience significant sea level rise by the end of the century. This can increase the possibility of saline intrusion into coastal aquifers, making this region particularly vulnerable to a decrease in the quality of water available to irrigate crops in coastal areas. Soil salinity may also occur due to increased evaporation in response to higher temperatures and reduced rainfall. Increasing temperatures can prevent crops from reaching maturity due to lack of adequate moisture in the soil. Higher temperatures can also negatively impact crops by bringing about an increase in weeds and diseases. Increased temperature, sea level rise, and decreased precipitation will also exacerbate existing water resources challenges, directly impacting the agricultural sector, which utilizes approximately 80 percent of the country's water supply. Changes in land use could also lead to migration, although the most vulnerable people, including those with limited resources and childcare responsibility, usually women, will be less likely to migrate away from unsuitable agricultural land. Increased demand to feed rapidly growing urban populations in combination with climate change effects are forecasted to reduce Tunisia's water supply by 28 percent by 2030. Floods and droughts are expected to occur more frequently in coastal, desert, and urban areas, which may result in crop losses and food insecurity. These climate risks will likely have a negative impact on crop yields, mainly wheat, barley, and irrigated potatoes. Dryness and impaired soil health will also negatively impact fruit and olive oil production. Overall, Tunisia's economy is projected to suffer a reduced output of $2 billion to $2.7 billion between 2000 and 2030 (equivalent to 4.7 percent to 6.4 percent of Tunisia's GDP in 2016) due to the combined effects of increasing global food prices and decreased crop yields, while farmer households are projected to suffer a decrease in farm income between 2 and 7 percent annually over the same period (2,3,4,11,16,20,22).

Climate Stressors and Climate Risks AGRICULTURE

Stressors	Risks
Rising temperatures **Sea level rise leading to saline intrusion** **Change in precipitation patterns**	Decrease in crop yields
	Shifts in growing seasons
	Degradation of soil quality and productivity
	Increased salinization of aquifers and decreased availability of water for irrigation
	Increase in food prices/food shortages
	Economic losses (both national and household incomes)

INFRASTRUCTURE

Although Tunisia's energy infrastructure is considered one of the best-developed in the region, its transportation infrastructure ranks low and has dropped further in recent years, while it's water distribution infrastructure is prone to losses in both household and agricultural use. The majority of transport and tourist-related infrastructure is in the country's coastal zone, while the national highway connects the less-developed interior regions to the north. Improvement in interior roads is necessary, as inner areas are isolated from most of the main highways. Any damage to infrastructure from sea level rise or flooding may increase the socioeconomic gap between the coast and the interior regions due to reduced rural access to goods and services. As roads are used to transport 80% of goods in Tunisia, any degradation

Climate Stressors and Climate Risks Infrastructure

Stressors	Risks
Sea level rise and coastal flooding **Erosion**	Damage to roads and transportation infrastructure
	Damage to coastal structures, such as homes and hotels
	Damage to water supply and distribution infrastructure
	Reduced tourism revenue

from climate stressors would be detrimental to the economy. Meanwhile impacts to or mismanagement of water distribution or supply infrastructure, including water and wastewater treatment and reuse facilities, would pose significant challenges; Tunisia increasingly relies on such facilities to meet rising water demand, a trend expected to continue in the face of projected increases in temperatures, decreases in precipitation, and modest population growth. Coastal infrastructure is at the greatest risk due to projected erosion, extreme weather events, and sea level rise. The bulk of Tunisia's economic and tourism activities occur in the coastal region; sea level rise will endanger hotels, businesses, and the roads that provide access to services, impacting the population's economic security and livelihoods. One opportunity in the face of climate change is to improve infrastructure to collect climate and weather data. The currently insufficient climate and weather data increase the country's vulnerability to climate change, as this information is vital in informing adaptation strategies. Weather stations, and therefore climate data, are particularly scarce in the less-developed and highly vulnerable southwest and central regions, underscoring the need and opportunity to prioritize weather data collection in these areas (9,11,19).

HEALTH

The annual probability of heat waves in Tunisia is projected to increase from 1% to 19% between 2020 and 2099. Increase in temperatures is known to be a direct cause of death, especially in the elderly community who may suffer from strokes or heart attacks in extreme heat. A warmer climate in Tunisia may also contribute to the spread of vector-borne diseases, such as dengue. A rise in temperature, and potential decreased water quantity and quality, can affect crop yields and contribute to food shortages and undernutrition, especially in children. Although undernutrition levels in the country declined markedly in recent years, with the prevalence of underweight children decreasing from 8.1% in 1994 to 2.3% in 2012 and stunting levels declining from 30.9% to 10.1% over the same period, climate change has the potential to slow or reverse this progress. Impoverished communities are likely to be more vulnerable to the effects of climate change, as they lack access to a varied diet as well as sufficient health care and the financial means to address health concerns. Other climate risks to health include higher mortality rates from extreme events, such as floods and droughts. In addition, flooding from sea level rise and higher storm surge may contribute to outbreaks of waterborne diseases, such as typhoid, hepatitis, and cholera; flooding can also bring harmful pathogens from sewage into drinking-water facilities. Water pollution in Tunisia already serves as a significant threat to human health with improper wastewater disposal prevalent in the country, and industrial expansion is likely to exacerbate sanitation issues, with over 40% of polluting industries disconnected from sewerage networks and dumping untreated loads into natural bodies of water (3,7,8,18,19,23).

Climate Stressors and Climate Risks HEALTH

Stressors	Risks
Rising temperatures	Higher mortality rates from extreme heat
Increase in extreme events	Increased malnutrition due to crop failure
Increased coastal flooding	Potential increased spread of disease
	Lack of access to clean water

TOURISM

With its diverse natural environment, Tunisia relies heavily on the tourism industry, which comprises 6.5% of GDP and creates around 206,000 jobs. With 90% of tourist activity occurring along the coast, sea level rise may lead to decreased water quality, a reduced number of beaches, and loss of coastal ecosystems. Increased temperatures may lead to water scarcity, and in summer months and during heat waves, may contribute to decreased tourism for those seeking cooler temperatures. Further, sea level

Climate Stressors and Climate Risks TOURISM

Stressors	Risks
Rising temperatures	Decrease in tourism revenue
	Loss of biodiversity
Sea level rise	Beach erosion
Water scarcity	Increase in tourism costs

rise poses a threat to key tourism infrastructure, which is predominantly coastal, and erosion and higher sea levels may threaten beaches dissuading tourists from visiting. Tunisia likewise may face other indirect impacts of climate change on tourism, such as increased need for electric cooling systems and backup generators due to higher temperatures and a rise in the cost of transportation and infrastructure due to water scarcity. Tourists, hotels, and other tourism facilities and venues will be affected by any price increases in energy, transportation, or food (2,13,16,19,25).

GOVERNANCE

Climate Stressors and Climate Risks GOVERNANCE

Stressors	Risks
Increased temperatures and reduced rainfall	Increased pressure on existing government institutions
Increased dry spells	Damage to essential transportation infrastructure
Sea level rise and coastal flooding	Reduced economic resources

As a country that has recently emerged from a revolution, some areas of governance, such as organizing a democratic process and addressing security threats, may make climate change challenges difficult to address because of competing priorities. At the same time the post-revolution political climate presents opportunities to integrate climate resilience in a cross-sectoral and cross-cutting manner. For example, as increased temperature, decreased precipitation, and sea level rise exacerbate issues related to poor water quality and water scarcity, Tunisia has an opportunity to address water challenges through integrated water management plans, and increased investment or application of innovative techniques such as desalination and wastewater treatment, some of which is already occurring. There is likewise opportunity to empower local communities and civil society to address climate-related challenges, with civil society organizations already working with the government to effectively transition to more renewable energy. Opportunities further exist to improve public access to climate-oriented information or otherwise integrate climate awareness into democracy-oriented practices, such as surveys tracking issues of importance among the electorate; this could encourage the election of officials who prioritize climate change mitigation and adaptation, in turn strengthening Tunisia's ability to appropriately address climate risks. The government has already made progress since its new constitution was adopted in January 2014, which established a stable democratic system and allows for increased citizen participation in decision-making. Further, Tunisia's parliament passed a law addressing climate change in 2014, a progressive piece of legislation that also touches on women's rights and healthcare and ultimately aims to address climate security. However, there remain significant institutional challenges for the government to address climate change. National and local governance must be strengthened to manage potential loss of resources as well as strengthen Tunisia's ability to adapt to and mitigate climate change. The potential for damage to transportation infrastructure may place further strain on existing governance resources. Finally, extreme events, such as floods and droughts, may lead to temporary changes of location, though it is important to note that there is no consensus that climate change is directly correlated to migration. (4,16,17,20)

POLICY CONTEXT

The government of Tunisia has been progressive in addressing climate change issues compared to its neighboring countries, however, there are additional opportunities to improve resilience. The government took steps to address environmental issues in its new constitution that was adopted in January 2014, which allows for increased citizen participation in decision making for social, economic, and environmental issues (3,4,8,12).

INSTITUTIONAL FRAMEWORK

The Tunisian Ministry of Environment has adapted various plans to address climate change impacts. For example, the Ministry has participated in the Organization for Economic Co-operation and Development (OECD) Program for International Student Assessments, which aims to promote environmental education through curriculum and clubs in schools. The Tunisia National Determined Contributions, submitted to the UNFCCC in 2015, address mitigation, vulnerability, and adaptation challenges. The Government of Tunisia has also worked with organizations such as FAO, the World Bank, and the United Nations to conduct analyses of Tunisia's climate as well as to identify adaptation measures and objectives to reduce its carbon footprint. One of the government's strategic objectives is to reduce the economy's 2012 carbon intensity by 60 percent by 2050. The government has also prioritized wastewater management to combat existing and projected water scarcity, establishing the National Water Council in 2013 to update national water policies and strategies. Clean Development Mechanisms (CDM) projects have also been put in place to achieve emissions reduction. (3,7,8,10,14,20)

NATIONAL STRATEGIES AND PLANS

- United Nations Framework Convention on Climate Change (2015)
- National Water Code (Code Des EAUX) (1975)
- The 11th five-year Plan for Agricultural Policy (2014-2015)
- Economic and Social Development Strategy (2012-2016)
- TUNISIA 2020 (2016)
- Climate Clause under Article 45 in 2014 Constitution (2014)

KEY RESOURCES[6]

1. Climate Service Center Germany. 2015. Climate Fact Sheet- Tunisia.
2. Fanack. 2017. Economy in Crisis in Tunisia.
3. FAO. 2017. COUNTRY FACT SHEET ON FOOD AND AGRICULTURE POLICY TRENDS.
4. GIZ. Tunisia.
5. Gulf News. 2016. Poverty in central Tunisia a ticking time bomb.
6. International Trade Administration. 2017. Tunisia - Agricultural Sector.
7. KFW. 2014. Ex post evaluation report- Tunisia.
8. METAP. Water Quality Management- Tunisia.
9. Oxford Business Group. 2016. Building on its reputation for stability, Tunisia is in the midst of upgrading its infrastructure.
10. Republic of Tunisia, Ministry of the Environment. 2018. Strategic Objectives.
11. SECO. 2013. Tunisia Country Strategy 2013-2016.
12. Time-Kharunya Paramaguru. 2014. Tunisia Recognizes Climate Change In Its Constitution.
13. UNDP. 2018. Addressing Climate Change Vulnerabilities and Risks in Vulnerable Coastal Areas of Tunisia.
14. UNFCCC. 2015. Intended Nationally Determined Contribution of Tunisia.
15. USAID. 2015. Climate Change Information Fact Sheet TUNISIA.
16. USAID. 2016. Tunisia Country Development Cooperation Strategy.
17. USAID. 2016. Tunisia Tropical Forest
18. WeAdapat. 2017. Migration, development and climate change in Egypt, Morocco and Tunisia.
19. WHO. 2015. CLIMATE AND HEALTH COUNTRY PROFILE – 2015: TUNISIA.
20. World Bank. 2012. Adaptation to a Changing Climate in the Arab Countries.

[6] This "Key Resources" section lists works cited in preparing the Climate Risk Profile. In addition to the "Key Resources" list, data in the report was guided by information provided by USAID/Tunisia.

21. World Bank. 2013. Tunisia in a Changing Climate: Assessment and Actions for Increased Resilience and Development.
22. World Bank. 2014. The Unfinished Revolution. Bringing Opportunity, Good Jobs and greater Wealth to all Tunisians
23. World Bank. 2014. Water: Tunisia's Other Development Challenge.
24. World Bank. 2018. Climate Change Knowledge Portal-Tunisia.
25. World Bank. 2018. World Bank national accounts data, and OECD National Accounts data files.
26. World Travel & Tourism Council. 2017. Travel & Tourism Economic Impact 2017 Tunisia.

Map resources. Global Precipitation Climatology Centre (GPCC). 2015. GPCC Normal Version 2015 0.25 degrees. https://kunden.dwd.de/GPCC/Visualizer; Esri. 2015. World Hillshade. http://goto.arcgisonline.com/maps/Elevation/World_Hillshade

SELECTED ONGOING EXPERIENCES[7]

Projects below represent current or recently completed development efforts related to climate change in Tunisia. Projects were selected through review of USAID, other donors, and implementing partner project databases.

Selected Program	Amount	Donor	Year	Implementer
Urban Water Supply additional financing	$20 million	World Bank	2014/N/A	SONEDE
Tunisia Northern Tunis Wastewater Project	$60.6 million	World Bank	2010-2019	ONAS
Tunisia Urban Water Supply	$47.2 million	World Bank	2006-2019	SONEDE
Support to Preparation of the Second National Biosafety Reports to the Cartagena Protocol on Biosafety	$1 million	UNEP	Unspecified	Department of Environment, Ministry of Environment
Assessment of Capacity-building Needs for Biodiversity and Participation in the Establishment of a Clearing House Mechanism (CHM)	$186,900	UNEP	2004-N/A	MEDD
Energy Efficiency in Tunisian Industry	N/A	GIZ	2016-2017	Ministère de l'Energie, des Mines et des Energies Renouvelables
Capacity Development For Greenhouse Gas Inventories And MRV Systems In Tunisia	N/A	GIZ	2012-2016	Ministère de l'Industrie

[7] This "Selected Ongoing Projects" section lists a selection of ongoing development projects and interventions directly or indirectly relevant to climate risk management and adaptation in Tunisia. Projects were identified primarily via desk review of USAID, multi-lateral development bank, and other international donor programming. Projects listed are not meant to be comprehensive.