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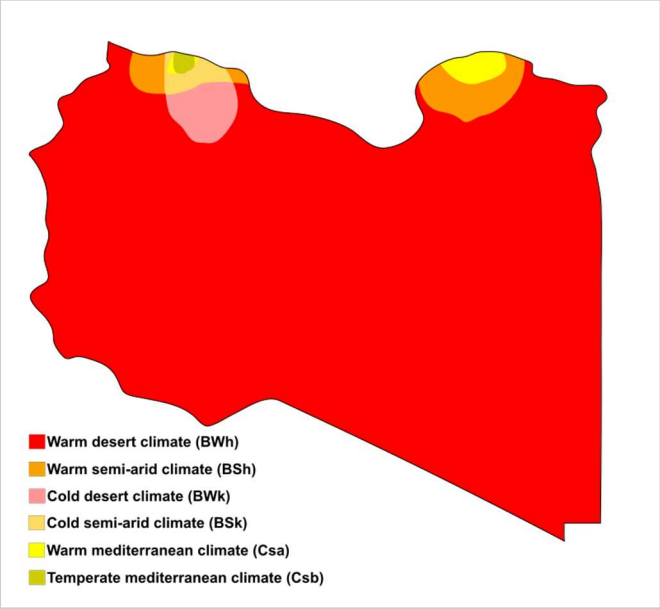
FACT SHEET

CLIMATE CHANGE RISK PROFILE
Libya

COUNTRY OVERVIEW

As a country with more than 90 percent desert and with limited governance capabilities since the overthrow of the Gaddafi government in 2011, Libya faces considerable obstacles in adapting to global climate change. The economy is almost entirely dependent on hydrocarbon production and exports, which have decreased in quantity due to the conflict of the past five years and decreased in value due to the drop in oil prices. While exact data are unavailable, it is estimated that one third of the population lives below the poverty line, and thus has limited resources to adapt to projected increases in temperature and extreme weather events. Over 85 percent of the population lives in urban areas, mostly near the coast, where water is more accessible. Water access has long been a concern for Libyans, and is expected to remain highly constrained. Annual water demand is around one billion cubic meters, compared to annual groundwater recharge estimated at only 250 million cubic meters. The Gaddaffi government attempted to address water scarcity through the Great Man-Made River project, which taps into non-renewable fossil aquifers in the Sahara desert. These aquifers are now responsible for nearly 80 percent of the country's water use. (3, 6, 10, 11)



MAP OF LIBYA CLIMATE ZONES

CLIMATE PROJECTIONS

Increase in average annual temperatures of 2°C by 2050

More extreme weather, with increased and more severe sand and dust storms, floods and droughts

Rising sea level

KEY CLIMATE IMPACTS

Agriculture
Reduced agricultural productivity
Degradation of arable land
Desertification

Water Resources
Increased water scarcity
Reduced water quality

Human Health
Increased transmission of climate-sensitive diseases
Increased food insecurity

Coastal Zones
Increased coastal erosion
Displacement of coastal population centers
Intensification of storm surges

February 2017
This document was prepared under the Global Environmental Management Support Project (GEMS) 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 or the United States government.

CLIMATE SUMMARY

Libya is one of the driest countries in the world; less than 2 percent of the country receives enough rain to support agriculture, and only 5 percent of the country receives more than 100 mm of rainfall per year. Libya's climate ranges from a temperate Mediterranean climate in isolated areas on the Mediterranean coast to a tropical desert climate in the vast majority of the country's interior. Because Libya does not have any major inland bodies of water, the Mediterranean Sea and the Sahara Desert are the most important features of Libya's geography in determining climatic conditions, which include abrupt weather changes and sudden weather events across the country. The northern Mediterranean areas of Libya have dry summers and mild winters, with the majority of the precipitation falling in the winter. The highlands near Tripoli and Benghazi experience cooler temperatures and receive the most rain of any region in Libya. The interior desert experiences hot, scorching temperatures with extreme variation within a day. Rain is rare and irregular in these areas. Data for annual temperatures, rainfall, and humidity are presented in the table below. (4, 6, 11)

REGION	MEDITERRANEAN COAST	ARID INTERIOR
Annual Average Temp	13°C to 25°C	14°C to 31°C with wide range between daily low and high temps
Average Max / Min Temp Range	Max: 19°C to 36°C Min: 8°C to 21°C	Max: 22°C to 39°C Min: 4°C to 20°C
Annual Average Rainfall (mm/yr)	250 to 500	0 to 50
Annual Average Humidity	65% to 75%	< 35%

HISTORICAL CLIMATE

Key climate changes include:

- Decrease in mean annual temperature by 0.89°C from 1901 to 2000.
- 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.
- Decrease in rainfall of 20.9 mm/month, per century since 1950s. (4, 11)

FUTURE CLIMATE

Projected changes include:

- Mean annual temperature increasing by 2°C by 2050, resulting in more frequent heat waves and fewer frost days.
- Increases in frequency of droughts, dust storms, sandstorms, and floods, along with increased desertification.
- An expected 7 percent decrease in mean annual precipitation by 2050, with an increase in intensity of rainfall events. (11)

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

Agricultural productivity is hindered by the limited renewable water resources, harsh climatic conditions, and poor soil quality. Only 3.8 million hectares, 1-2 percent of the country's area, can support crop growth. As a result of these constrained conditions, Libya imports around 75 percent of its food. About 1.9 percent of gross domestic product (GDP) and 17 percent of employment comes from the agricultural sector. While rain-fed cultivation is dominant in sparsely 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 percent by 2060. With an expected increase in both temperatures and number of drought days, agricultural draws from these aquifers are likely to increase as well, and rain-fed agriculture and pastoralism may no longer be viable for the rural populations of semiarid Libya. Projected increases in the frequency of extreme weather events such as floods, sandstorms, and dust storms are likely to 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. (2, 3, 4, 5, 7, 11, 12)

Climate Stressors and Climate Risks AGRICULTURE

Stressors	Risks
Increased temperatures	Overall decreased agricultural productivity
Increased drought	Loss of arable land due to desertification
	Decreased winter rains negatively affecting rain-fed agriculture
Increased floods	Increased salinization of soils resulting from floods
Increased dust and sand storms	Increase in flood damage to irrigation infrastructure
	Damage to crops as a result of floods and dust / sand storms

WATER RESOURCES

Libya's water demand is far greater than its renewable supply. With only a narrow ribbon along the coast receiving more than 100 mm of rain per year, and frequent salt incursion into renewable 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 put significant stress on all water sources. The water from the Great Man-Made River project, which feeds Libya's agriculture, cities, and industry, is from non-renewable aquifers that cannot be recharged by rain. These aquifers are likely to be even more important as drought increases and rainfall decreases. However, the aquifers extend over multiple borders, the most notable being the Nubian Sandstone Aquifer extending into Egypt, Chad, and Sudan. All of these countries face their own water security issues, and Libyan overdrawing from these aquifers could result in regional conflict over the resource. (1, 6, 7, 9)

Climate Stressors and Climate Risks WATER RESOURCES

Stressors	Risks
Increased temperatures	Reduced groundwater recharge rates and increased rate of depletion
Increased drought	Decreased access to safe drinking water
	Increased conflict over water
Sea level rise	Saltwater intrusion into groundwater sources

COASTAL ZONES

With the vast majority of the country living in coastal cities (86 percent of the population), many Libyans are vulnerable to even slight sea level rise. Benghazi, the country's second largest city, 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 projected to result from 2.6°C warming by 2100 would cost the country an estimated $1.7 billion. As the majority of the population, agriculture, and industrial activity is centered on the coast, salinization of soils, fresh water contamination, and infrastructure damage pose a great risk to the economy. Floods due to increased rain intensity on the coast may increase the rate of coastal erosion and damage drainage and piping infrastructure. (10, 11, 12)

Climate Stressors and Climate Risks
COASTAL ZONES

Stressors	Risks
Sea level rise **Increased floods**	Accelerated coastal erosion
	Displacement of coastal communities
	Saltwater intrusion into groundwater sources
	Damage to or destruction of key infrastructure

HUMAN HEALTH

Due to the ongoing conflict in Libya, human health and health service capacity has suffered. Health services have several deficiencies, including dependence on foreign health workers, flight of foreign health workers, an insufficient primary care network, neglected services in rural areas (e.g., underfunded or ignored), and damage to and inaccessibility of existing health facilities. The strain of the conflict has led to the collapse of the emergency medical system in many urban areas. Damage to critical water infrastructure along with an increase 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. Increases in dust storms and sandstorms could not only damage the built environment, but also increase prevalence of illnesses resulting from increased exposure to sand, chemical contaminants, or related particulates, as well as further aggravate existing respiratory conditions. The sum total of sand and dust storms, droughts, floods, and desertification present a larger-scale threat to Libya's development and to its agricultural productivity. Although Libya is reliant on imports for much of its food, an increase in poverty due to damage to health and key infrastructure along the coast, combined with a collapse in domestic agriculture, could result in increased food insecurity and malnutrition. (4, 10)

Climate Stressors and Climate Risks
HUMAN HEALTH

Stressors	Risks
Increased temperatures **Increased drought**	Reduced quality and quantity of safe drinking water, leading to increased risk of waterborne illnesses
	Spread and growth of vector-borne diseases
Increased floods **Increased dust and sand storms**	Heightened food insecurity leading to increased malnutrition (particularly in children)
	Increased respiratory illness

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

While Libya signed and ratified the UNFCCC in 1999, it has not yet submitted a national communication nor proposed a prospective policy framework. 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. (8)

NATIONAL STRATEGIES AND PLANS

Libya has no climate legislation as of 2016.

KEY RESOURCES

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SELECTED ONGOING EXPERIENCES

SELECTED PROGRAM	AMOUNT	DONOR	YEAR	IMPLEMENTER
Support for the Implementation of the National Biosafety Framework for Libya	$1.9 million	Global Environment Facility (GEF) Trust Fund	2010 (Cancelled)	UNDP, Environment General Authority
MENA- Desert Ecosystems and Livelihoods Knowledge Sharing and Coordination Project	$1 million	GEF	2013-2017	N/A
Humanitarian Response in Libya Post 2015	$5.1 million	UK Department for International Development (DFID)	2015-2017	Red Crescent

**Note: international aid interventions in Libya are focused on democracy capacity building, economic growth, humanitarian aid, and counterterrorism assistance. To date, international aid in Libya has not significantly addressed environmental and climate sectors.*