CLIMATE RISK COUNTRY PROFILE

MOROCCO

WORLD BANK GROUP

COPYRIGHT

1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

RIGHTS AND PERMISSIONS

Please cite the work as follows: Climate Risk Profile: Morocco (2021): The World Bank Group.

Cover Photos: © Arne Hoel/World Bank, "Ouarzate" March 19, 20212 via Flickr, Creative Commons CC BY-NC-ND 2.0. © Arne Hoel/World Bank, "View of Salé" March 14, 2012 via Flickr, Creative Commons CC BY-NCND 2.0.

Graphic Design: Circle Graphics, Reisterstown, MD.

ACKNOWLEDGEMENTS

This profile is part of a series of Climate Risk Country Profiles developed by the World Bank Group (WBG). The country profile synthesizes most relevant data and information on climate change, disaster risk reduction, and adaptation actions and policies at the country level. The country profile series are designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and policy making. This effort is managed and led by Veronique Morin (Senior Climate Change Specialist, WBG) and Ana E. Bucher (Senior Climate Change Specialist, WBG).

This profile was written by MacKenzie Dove (Senior Climate Change Consultant, WBG). Additional support was provided by Jason Johnston (Operations Analyst, WBG).

Climate and climate-related information is largely drawn from the Climate Change Knowledge Portal (CCKP), a WBG online platform with available global climate data and analysis based on the latest Intergovernmental Panel on Climate Change (IPCC) reports and datasets. The team is grateful for all comments and suggestions received from the sector, regional, and country development specialists, as well as climate research scientists and institutions for their advice and guidance on use of climate related datasets.

CONTENTS

FOREWORD

Climate change is a major risk to good development outcomes, and the World Bank Group is committed to playing an important role in helping countries integrate climate action into their core development agendas. The World Bank Group is committed to supporting client countries to invest in and build a low-carbon, climate-resilient future, helping them to be better prepared to adapt to current and future climate impacts.

The World Bank Group is investing in incorporating and systematically managing climate risks in development operations through its individual corporate commitments.

A key aspect of the World Bank Group's Action Plan on Adaptation and Resilience (2019) is to help countries shift from addressing adaptation as an incremental cost and isolated investment to systematically incorporating climate risks and opportunities at every phase of policy planning, investment design, implementation and evaluation of development outcomes. For all International Development Association and International Bank for Reconstruction and Development operations, climate and disaster risk screening is one of the mandatory corporate climate commitments. This is supported by the Bank Group's Climate and Disaster Risk Screening Tool which enables all Bank staff to assess short- and long-term climate and disaster risks in operations and national or sectoral planning processes. This screening tool draws up-to-date and relevant information from the World Bank's Climate Change Knowledge Portal, a comprehensive online 'one stop shop' for global, regional, and country data related to climate change and development.

Recognizing the value of consistent, easy-to-use technical resources for client countries as well as to support respective internal climate risk assessment and adaptation planning processes, the World Bank Group's Climate Change Group has developed this content. Standardizing and pooling expertise facilitates the World Bank Group in conducting initial assessments of climate risks and opportunities across sectors within a country, within institutional portfolios across regions, and acts as a global resource for development practitioners.

For developing countries, the climate risk profiles are intended to serve as public goods to facilitate upstream country diagnostics, policy dialogue, and strategic planning by providing comprehensive overviews of trends and projected changes in key climate parameters, sector-specific implications, relevant policies and programs, adaptation priorities and opportunities for further actions.

It is my hope that these efforts will spur deepening of long-term risk management in developing countries and our engagement in supporting climate change adaptation planning at operational levels.

Bernice Van Bronkhorst
Global Director
Climate Change Group (CCG)
The World Bank Group (WBG)

COUNTRY OVERVIEW

Morocco is located in the northwest corner of the African continent. It is bordered by the Atlantic Ocean and the Alboran Sea to the west, Algeria to the east and Western Sahara to the south. The country's land areas is approximately 710,850 kilometers (km^2), with a coastline extending 2,900 km along the Atlantic Ocean and 512 km along the Alboran Sea.[1] Morocco's climate is varied with its topography, which includes the Rif Mountains in the north, the Atlas Mountains in the center, plateaus in the east, plains and coast in the west, and desert in the south. Most of Morocco, particularly along the coast, experiences a typical Mediterranean climate, with mild, wet winters and hot, dry summers.[2] The Atlas Mountains run through the center of Morocco forming a natural divide between the Mediterranean northern coastal zone and the southern interior regions, which lie on the edge of the Sahara Desert.[3]

Morocco is a lower middle-income country and is ruled through a constitutional democracy, with a democratic parliament and separation of powers. Since its appointment in April 2017, Morocco's government coalition led by the Justice and Development Party (PJD) moved to roll-out the pro-poor reforms, focusing primarily on social protection programs, job creation and reducing economic disparities across the country. The government is currently working to develop a new development model for the country based on enhanced education and vocational training programs and policies to boost job creation and promote inclusive growth through modernized social protection system.[4] Morocco has a population of 35.7 million people (2018) with an annual population growth rate of 1.3% (2017), and is projected to reach 66.4 million people by 2030 and 72.8 million people by 2050. 61.9% of the population currently resides in urban areas[5], which is expected to increase to 69% and 77% by 2030 and 2050, respectively.[6] The country has a Gross Domestic Product (GDP) of $109.7 billion (2017), experiencing an annual growth rate of 4.1% in 2017 (**Table 1**).[7]

TABLE 1. Data snapshot: Key development indicators

Indicator	2018
Life expectancy at birth, total (years)	76.5
Adult Literacy Rate (+15)	73.8%
Population density (people per sq. km land area)	80.7
% of Population with access to electricity	100%
GDP per capita (current US$)	$3,222.20

[1] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

[2] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[3] McSweeney, C., New, M. and Lizcano, G. (2010). UNDP Climate Change Country Profiles – Morocco. URL: https://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Morocco/Morocco.hires.report.pdf

[4] World Bank (2019). Morocco Overview. URL: https://www.worldbank.org/en/country/morocco/overview#1

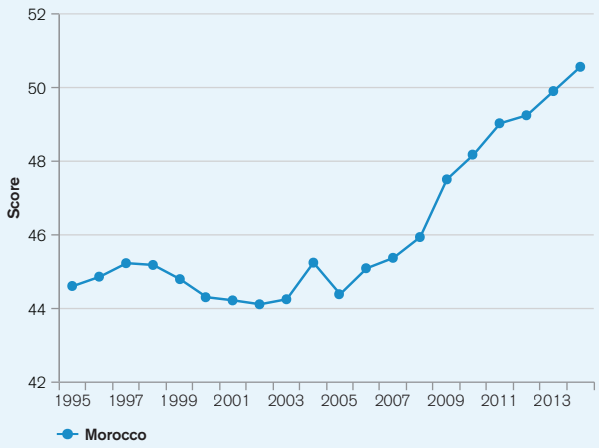
[5] World Bank Open Data (2019). Data Retrieved May 2019. Data Bank: World Development Indicators, Morocco. URL: https://databank.worldbank.org/data/source/world-development-indicators

[6] World Bank Open Data (2019). Data Retrieved May 2019. Data Bank: Population Estimates and Projections, Morocco. URL: https://databank.worldbank.org/data/reports.aspx?source=health-nutrition-and-population-statistics:-population-estimates-and-projections

[7] World Bank Open Data (2019). Data Retrieved May 2019. Data Bank: World Development Indicators, Morocco. URL: https://databank.worldbank.org/data/source/world-development-indicators

The ND-GAIN Index[8] ranks 181 countries using a score which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience. This Index aims to help businesses and the public sector better identify vulnerability and readiness in order to better prioritize investment for more efficient responses to global challenges. Due to a combination of political, geographic, and social factors, Morocco is recognized as vulnerable to climate change impacts, ranked 64th out of 181 countries in the 2019 ND-GAIN Index. The more vulnerable a country is the lower their score, while the more ready a country is to improve its resilience the higher it will be. Norway has the highest score and is ranked 1st. **Figure 1** is a time-series plot of the ND-GAIN Index showing Morocco's progress.

FIGURE 1. ND-GAIN Index for Morocco



Morocco submitted its Nationally-Determined Contribution to the UNFCCC in 2016 and its Third National Communication in 2016 in support of global efforts to combat climate change, which is already having a significant impact on Morocco's' economic and social development. Climate change trends have already put pressure on the country's natural resources, affecting the resilience of forest ecosystems and the agriculture sector, particularly due to water scarcity. Morocco is also working to improve its resilience to climate change and make progress towards a green economy. Key priority is paid to the country's water resources, agriculture and forestry, energy and health sectors.[9]

CLIMATOLOGY

Climate Baseline

Overview

Morocco's climate varies considerably across the country's northern to southern areas. Both rainfall and temperature are strongly influenced by the Atlantic Ocean to the west, the Mediterranean Sea to the north, and the Sahara Desert to the south and southeast. Most of the country's rainfall occurs between October and May. The incursion of extratropical weather systems from Europe and the Atlantic Ocean, brings colder air and cloudiness, which results

[8] University of Notre Dame (2020). Notre Dame Global Adaptation Initiative. URL: https://gain.nd.edu/our-work/country-index/
[9] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

in a declining rainfall gradient from north to south that is also influenced by the Atlas Mountains. Temperatures in the arid and semi-arid southern and southeastern parts of the country are generally high, while rainfall and snow can occur in the northern mountainous areas between November and April.[10] Most of Morocco, particularly along the coast, experiences a typical Mediterranean climate, with mild, wet winters and hot, dry summers. The rainy season extends from November to March, with average annual rainfall of 1,200 millimeters (mm). The south is much drier and receives approximately 100 mm of rainfall on average each year. In the summer, temperatures along the coast range from 18°C to 28°C and can reach up to 35°C in the interior. In the winter, temperatures along the coast range from 8°C to 17°C and can drop below 0°C in the interior mountain areas.[11]

Morocco is highly vulnerable to climate variability and change. Expectations of increasing frequency and intensity of droughts for the country are particularly alarming for the agricultural sector and will affect both rural livelihoods and the national economy as a whole. Increased temperatures and changing rainfall patterns will create additional risks for water resource availability, agriculture and livestock productivity, and increasing population demands. Climate and socio-economic environments in semi-arid areas in Morocco makes communities vulnerable to food insecurity and unstable livelihoods as well as leads to unsustainable agroecological systems, crop failure, and unproductive rangelands.[12]

Data from the World Bank Group's Climate Change Knowledge Portal (CCKP) (**Table 2**) shows historical information for 1901–2019. Mean annual temperature for Morocco is 17.5°C, with average monthly temperatures ranging between 9.4°C (December, January) and 26°C (July, August). Mean annual precipitation is 318.8 mm, with highest rainfall occurring October to April, with extremely low precipitation occurring between June to August (**Figure 2**).[13] **Figure 3** shows the spatial variation of observed average annual precipitation and temperature across Morocco.

TABLE 2. Data snapshot: Summary statistics

Climate Variables	1901–2019
Mean Annual Temperature (°C)	17.5°C
Mean Annual Precipitation (mm)	318.8 mm
Mean Maximum Annual Temperature (°C)	23.7°C
Mean Minimum Annual Temperature (°C)	11.4°C

Key Trends

Temperature

Morocco has experienced considerable warming trends since the 1960s, with mean annual temperature increasing 0.9°C since the 1960s, with observed average increases of 0.2°C per decade; exceeding the global average

[10] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[11] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[12] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[13] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco. URL: https://climateknowledgeportal.worldbank.org/country/morocco/climate-data-historical

FIGURE 2. Average monthly temperature and rainfall for Morocco, 1991–2019[14]

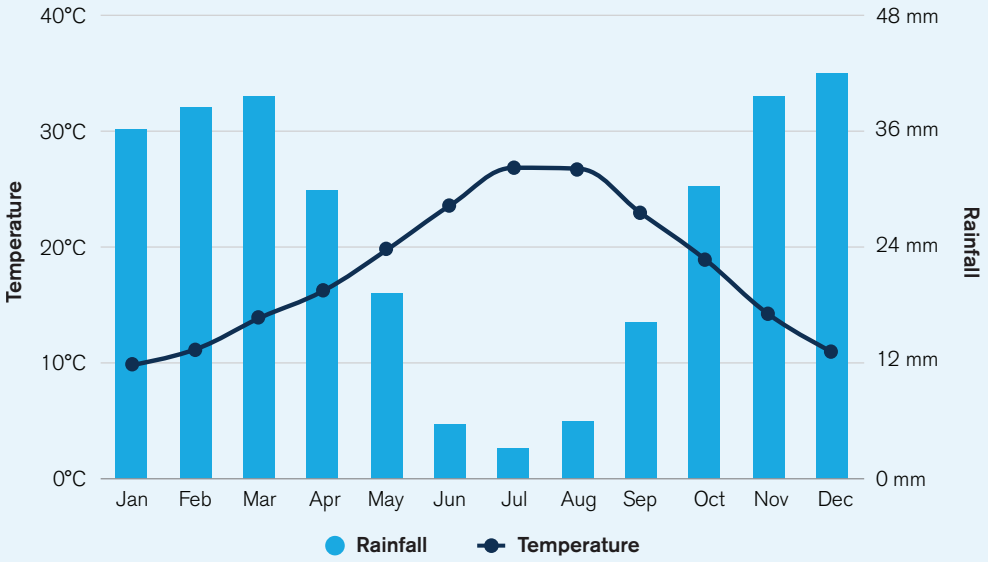
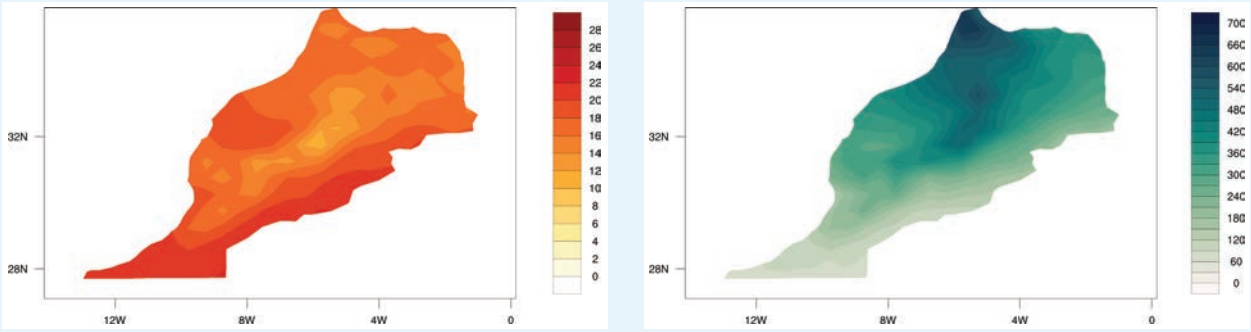


FIGURE 3. Map of average annual temperature (left); annual precipitation (right) of Morocco, 1901–2019[15]



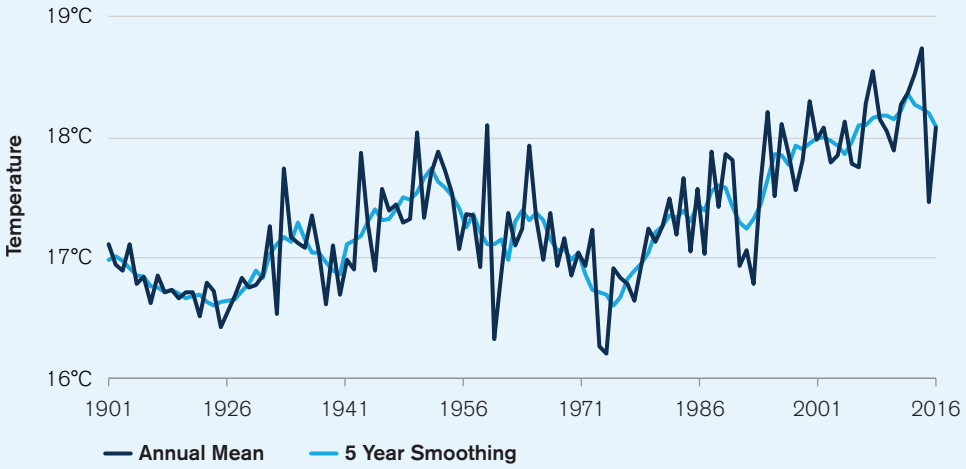
(**Figure 4**). While temperature increases vary considerably by season, in Morocco, increases have been most pronounced in the April, May, June and September, October, November seasons. The hot and dry April, to June season has observed the most rapid rate of temperature increases at 0.34°C per decade. Additionally, the frequency of days considered as 'hot' has significantly increased across all seasons. Hot nights have increased most notably by an additional 20% per month from September to November. The frequency of cold days and nights have also decreased significantly in all seasons, primarily in June, July, August.[16]

[14] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco URL: https://climateknowledgeportal.worldbank.org/country/morocco/climate-data-historical

[15] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco. URL: https://climateknowledgeportal.worldbank.org/country/morocco

[16] McSweeney, C., New, M., and Lizcano, G. (2012). UNDP Climate Change Country Profiles – Morocco. URL: https://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Morocco/Morocco.hires.report.pdf

FIGURE 4. Observed temperature for Morocco, 1901–2019[17]



Precipitation

Precipitation trends have a high degree of variability in Morocco.[18] However through the past several decades, observed trends have shown more erratic rainfall and an overall decline in precipitation. Additionally, seasonal rainfall patterns have shifted to longer and more intense rain events in October and November, which often cause flooding, but with substantial reductions in rainfall during the rest of the year. An increase in the frequency and intensity of extreme events such as heavy rainfall resulting in flooding in some areas as well as droughts and heat waves in other areas have also been experienced.[19] The increasing frequency, significance and duration of drought continues to be a major concern for the country.[20]

Climate Future

Overview

The main data source for the World Bank Group's Climate Change Knowledge Portal (CCKP) is the CMIP5 (Coupled Inter-comparison Project Phase 5) data ensemble, which builds the database for the global climate change projections presented in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHG emissions from all sources) pathway and level by 2100. The RCP2.6 for example represents a very strong mitigation scenario, whereas the RCP8.5

[17] WB Climate Change Knowledge Portal (CCKP, 2020). Botswana URL: https://climateknowledgeportal.worldbank.org/country/botswana/climate-data-historical

[18] McSweeney, C., New, M., and Lizcano, G. (2012). UNDP Climate Change Country Profiles – Morocco. URL: https://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Morocco/Morocco.hires.report.pdf

[19] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[20] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

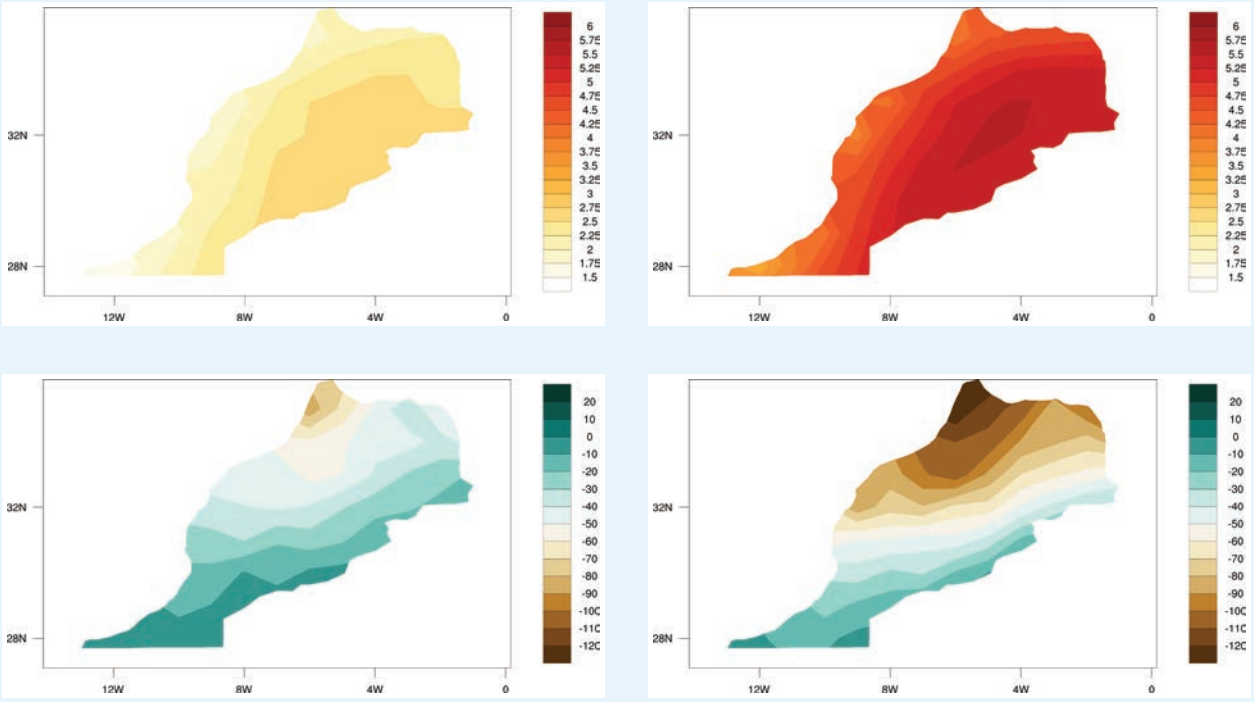
assumes business-as-usual scenario. For more information, please refer to the RCP Database. For simplification, these scenarios are referred to as a low (RCP2.6); a medium (RCP4.5) and a high (RCP8.5) emission scenario in this profile. **Table 3** provides CMIP5 projections for essential climate variables under high emission scenario (RCP 8.5) over 4 different time horizons. **Figure 5** presents the multi-model (CMIP5) ensemble of 32 Global Circulation Models (GCMs) showing the projected changes in annual precipitation and temperature for the periods 2040–2059 and 2080–2099.

TABLE 3. Data snapshot: CMIP5 ensemble projections

CMIP5 Ensemble Projection	2020–2039	2040–2059	2060–2079	2080–2099
Monthly Temperature Anomaly (°C)	**+0.6 to +2.3** (+1.4°C)	**+1.5 to +3.7** (+2.4°C)	**+2.6 to +5.3** (+3.7°C)	**+3.6 to +7.0** (+4.9°C)
Monthly Precipitation Anomaly (mm)	**–8.9 to +7.0** (–1.4 mm)	**–10.5 to +7.0** (–1.8 mm)	**–12.4 to +4.7** (–3.2 mm)	**–13.9 to +5.3** (–4.0 mm)

Note: The table shows CMIP5 ensemble projection under RCP8.5. Bold value is the range (10th–90th Percentile) and values in parentheses show the median (or 50th Percentile).

FIGURE 5. CMIP5 ensemble projected change (32 GCMs) in annual temperature (top) and precipitation (bottom) by 2040–2059 (left) and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8.5[21]



[21] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco Projected Future Climate. URL: https://climateknowledgeportal.worldbank.org/country/morocco/climate-data-projections

Key Trends

Temperature

Increased temperatures are expected across the Northern Africa region. Mean annual temperature is projected to increase by 1.5°C to 3.5°C by mid-century and possibly by more than 5°C by end of the century. Warming rates are projected to be faster in the country's interior. The number of 'hot days' and 'nights' will also increase, with increase most significant in the July, August, September season. The number of 'cold days' and 'nights' are expected to occur on less than 4% of days and nights by end of the century.[22] Increased temperatures are also likely to result in reduced snowpack in the Atlas Mountains, impacting the country's water reserves and storage.[23]

Temperature rise are projected to increase across all emission scenarios throughout the end of the century. As seen in **Figure 6**, under high-emission scenario RCP8.5, average temperatures are expected to increase rapidly by mid-century. An increase is also expected for the change in the number of very hot days (Tmax >35°C). The change in number of days across the seasonal cycle is also presented below. Temperature increase spikes will be felt from May to October (**Figure 7**). Increased heat and extreme heat conditions will result in significant implications for human and animal health, agriculture, ecosystems as well as energy generation.

FIGURE 6. Historical and projected average temperature for Morocco from 1986 to 2099[24]

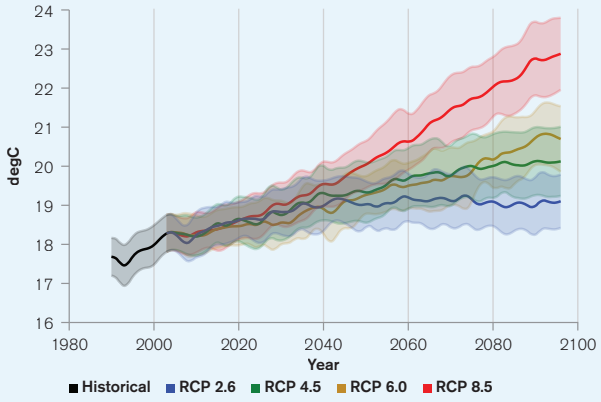
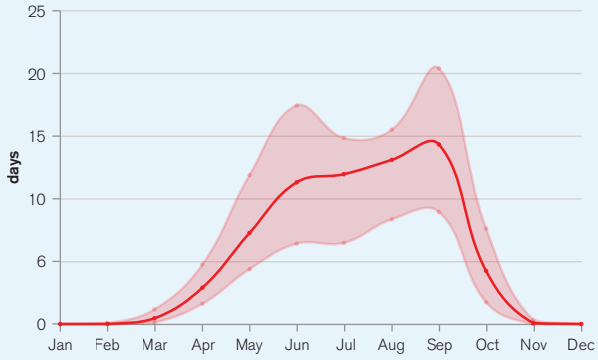


FIGURE 7. Projected change in very hot days (TMax >35°C) (R)[25]



[22] McSweeney, C., New, M., and Lizcano, G. (2012). UNDP Climate Change Country Profiles – Morocco. URL: https://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Morocco/Morocco.hires.report.pdf

[23] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

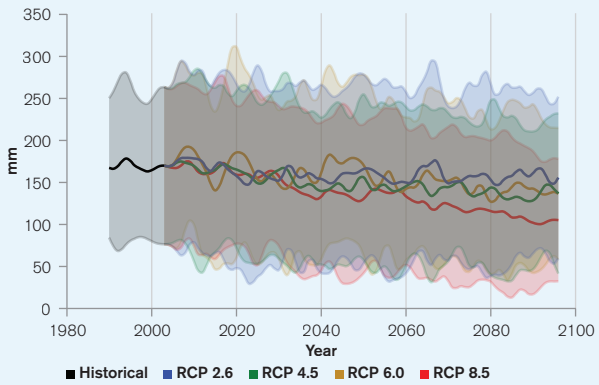
[24] WB Climate Change Knowledge Portal (CCKP, 2020). Interactive Climate Indicator Dashboard - Agriculture. Morocco. URL: https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=MAR&period=2080-2099

[25] WB Climate Change Knowledge Portal (CCKP, 2020). Climate Data – Projections, Morocco. URL: https://climateknowledgeportal.worldbank.org/country/morocco/climate-data-projections

Precipitation

Precipitation trends in Morocco are highly variable, however the projections indicate significant reduction in average annual rainfall across the country from 10%–20% to as much as 30% decrease for the Saharan region.[26] In Morocco, water resources are projected to decline due to increased arid periods and drought conditions Additionally, projections indicate that winter precipitation will be reduced as warming increases (**Figure 8**). Even with no change in precipitation, evaporation will increase due to rising temperatures and thus surface soil moisture will decrease. Thus, the availability of water for irrigation from mountain streams and reservoirs will continue to be stressed at an increasing rate, with severe water shortages for the arid southern regions.[27]

FIGURE 8. Annual average precipitation in Morocco for 1986 to 2099[28]



CLIMATE RELATED NATURAL HAZARDS

Overview

Morocco has a high degree of risk to natural hazards and disasters. Impacts from natural hazards are estimated to cost the country $800 million annually.[29] Morocco is expected to become hotter and drier in the future. An increase in temperature and decrease in average precipitation by 10% to 20% is expected, with the potential of a 30% reduction for the Saharan region by the 2090s. Morocco is also likely to experience an increase of drought and flooding in some areas as well as other climate related hazards. Water resources are expected to be increasingly strained across the country with warmer temperatures expected to accelerate the rate of evapotranspiration. With more frequent and severe droughts, the region will likely experience negative impacts on water supply, biodiversity, and agriculture and the potentially simultaneous increase in flooding poses a serious water pollution threat.[30]

In Morocco, flooding and drought combine for the most significant impacts, however earthquakes have also resulted in significant destruction to infrastructure and death. Climate change is expected to increase the frequency and severity of weather-related events in Morocco. The increasing shortage of available water is a significant constraint

[26] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[27] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[28] WB Climate Change Knowledge Portal (CCKP, 2020). Climate Data-Projections. Morocco. URL: https://climateknowledgeportal.worldbank.org/country/morocco/climate-data-projections

[29] GFDRR (2018). Integrated Disaster Risk Management in Morocco, Managing risk by rewarding results. URL: https://www.gfdrr.org/sites/default/files/publication/FINAL%20-%20Results%20in%20Resilience%20-%20Integrated%20Disaster%20Risk%20Management%20in%20Morocco%20-%204.24.18.pdf

[30] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

for economic and social development in the country. This is a result both of natural conditions (aridity and drought) and poor water management practices and decision-making (water scarcity and desertification), leading to increased water insecurity. Key impacted sectors include agriculture, water, tourism, and health. Impacts of extreme rainfall events on public and private infrastructure has resulted in costly repairs, road closures, limited or no access to electricity, and failure of sewage and storm water systems. Temperature anomalies are affecting infrastructure sensitive to temperature extremes, such as roads. Rainfall and temperature impacts on agriculture production and food security and extreme weather events are affecting tourism and livelihoods that depend on the sector.[31]

Decreased rainfall and higher temperatures (including heat waves) have resulted in water scarcity as well as increased demand for water and energy for cooling in domestic, commercial and industrial sectors. Extreme rainfall has resulted in soil erosion, land degradation, loss of ecosystems and ecosystem services, alien species invasion, salinization of groundwater and flood trails containing pesticides and fertilizer. Impacts of sedimentation on the storage capacity of dams due to changes in climate will differ across the country and are most likely to impact on smaller capacity dams.[32] Additionally, rising sea levels pose a high risk to coastal areas and specifically coastal urban zones as 60% of the Moroccan population and the majority of the country's economic activities are along its coast. An estimated 42% of the coastline will be at high risk of erosion and floods by 2030.[33] Key sectors such as, agriculture and livestock, health, water resources, and tourism are vulnerable.

Data from the Emergency Event Database: EM-Dat, presented in **Table 4**, shows the country has endured various natural hazards, including floods, landslides, epidemic diseases, and storms.

TABLE 4. Natural Disasters in Morocco, 1900–2020[34]

Natural Hazard 1900–2020	Subtype	Events Count	Total Deaths	Total Affected	Total Damage ('000 USD)
Drought	Drought	5	0	412,000	900,100
Earthquake	Ground Movement	3	12,728	38,465	520,000
Epidemic	Bacterial Disease	1	200	2,942	0
Extreme Temperatures	Cold Wave	5	0	2,477,500	0
	Heat Wave	1	0	0	809
Flood	Flash Flood	7	205	112,823	29,000
	Riverine Flood	11	921	116,423	266,200
Insect Infestation	Locust	4	0	0	0
Mass Movement (dry)	Rockfall	1	31	0	0
Landslide	Landslide	1	1	12,216	0
Storm	Convective Storm	2	49	117,000	300,000
	Tropical Storm	1	1	0	50

[31] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[32] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

[33] UNDP (2017). National Adaptation Plans in focus: Lessons from Morocco. URL: https://www.globalsupportprogramme.org/sites/default/files/resources/morocco_nap_country_briefing_final.pdf

[34] EM-DAT: The Emergency Events Database - Universite catholique de Louvain (UCL) - CRED, D. Guha-Sapir, Brussels, Belgium. URL: http://emdat.be/emdat_db/

Key Trends

Current impacts of climate change in Morocco encompass both sudden and slow-onset events, as well as slow-onset processes; this is likely to continue in the future. The rise in mean annual temperature and reduced precipitation, leading to drought and desertification are among the most disruptive climate impacts. Extreme weather events, such as storms and flash floods, are also increasingly becoming more common.[35] The increasing incidence, severity and duration of drought in Morocco remain the most significant concerns for the country's long-term climate resilience and natural disaster management capabilities. Decreases in precipitation, increasing aridity and higher temperatures, coupled with pressures of population growth and rapid urbanization is increasing Morocco's vulnerability. The country's natural water availability is increasingly affected by aridity and droughts, particularly in the more humid and semi-arid areas where agriculture is predominantly rain-fed. In addition, parts of coastal Morocco have experienced increasing salinity of both groundwater and soils in recent decades. Morocco is also projected to experience an increased risk of summer drought. Drylands (i.e., arid and semi-arid areas) are particularly prone to drought, because their rainfall amounts critically depend on a few events and there is often little stored renewable water available to offset resource deficits. These regions typically show strong spatial and temporal variability in rainfall. Droughts have remained one of the key drivers of food insecurity for the country, as increased aridity and drought has resulted in crop damage, loss of pasture and water sources, loss of animals, hunger, disease outbreaks, asset depletions, malnutrition and migration. Increased temperatures and degraded agricultural conditions are expected to adversely affect 'working days', additionally impacting livelihoods and economic resilience of vulnerable groups.[36]

Disaster risk from increased temperatures is expected to (i)exacerbate existing tensions between agricultural and livestock needs as well as human population needs for water, especially during the dry season, (ii) alter the quality of available water from surface water and groundwater, and (iii) increase pressure on urban zones due to increased urbanization.[37] Changing rainfall patterns are expected to play a significant role in agricultural production and harvest seasons, with later onsets expected to impact crop productivity as well as livestock health. **Figure 9** presents the risk of extreme heat and water scarcity for Morocco.

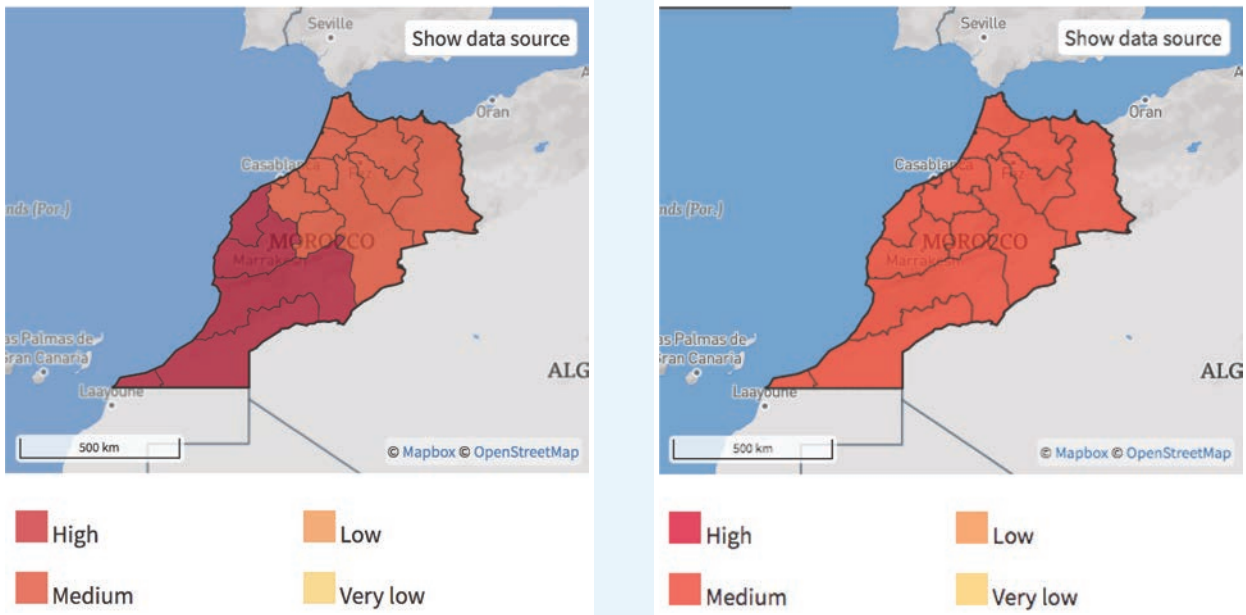
The increased risk and intensity of water scarcity and drought throughout the country is expected to impact primary sectors such as water, agriculture, and human health. Additionally, increased frequency of intense rainfall events will lead to a heightened risk of flooding, river bank over flow and flash flooding. Intense rainfall and flooding may also result in soil erosion and water logging of crops, thus decreasing yields, with the potential to increase food insecurity; particularly for subsistence-scale farmers. Higher temperatures with increased aridity may also lead to livestock stress and reduced crop yields. This is likely to result in economic losses, damage to agricultural lands and infrastructure as well as human casualties. Furthermore, land degradation and soil erosion, exacerbated by

[35] IOM (2016). Environmental migration in Morocco: Stocktaking, challenges and opportunities. Migration, Environment and Climate Change: Policy Brief Series. 3(2), ISSN 2410-4930. URL: https://publications.iom.int/system/files/policy_brief_vol2_issue3.pdf

[36] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[37] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

FIGURE 9. Risk of Extreme heat (left)[38]; Risk of Water Scarcity (right)[39]



recurrent flood and drought adversely impact agricultural production, further affecting the livelihoods of the rural poor. Small rural farmers are more sensitive to impacts of disasters (floods, dry periods) because they have limited resources with which to influence and increase adaptive capacity.[40]

Implications for DRM

Recognizing the intensifying disaster and climate risk in the country, the Moroccan government has made Disaster Risk Management (DRM) a top priority and has developed several overarching policies and high-level documents aimed to promote and enable climate resilient development.[41] Morocco is committed to integrating systematic DRM processes to be implemented at national to local levels. This includes risk management finance initiatives, insurance programs, and adaptation research assessments to support implementation and strengthen vulnerable sectors. As Morocco is working to finalize its National Adaptation Plans, it is guided by the National Climate Change Policy (2014) to respond to climate change and disaster risks and promote more pro-active risk reduction and adaptation planning.[42]

---

[38] ThinkHazard! (2020). Morocco – Extreme Heat. URL: http://thinkhazard.org/en/report/169-morocco/EH
[39] ThinkHazard! (2020). Morocco – Water Scarcity. URL: http://thinkhazard.org/en/report/169-morocco/DG
[40] FAO (2018). Drought characteristics and management in North Africa and the Near East. URL: http://www.fao.org/3/CA0034EN/ca0034en.pdf
[41] GFDRR (2018). Integrated Disaster Risk Management in Morocco; Managing risk by rewarding results. URL: https://www.gfdrr.org/sites/default/files/publication/FINAL%20-%20Results%20in%20Resilience%20-%20Integrated%20Disaster%20Risk%20Management%20in%20Morocco%20-%204.24.18.pdf
[42] UNDP (2017). National Adaptation Plans in focus: Lessons from Morocco. URL: https://www.globalsupportprogramme.org/sites/default/files/resources/morocco_nap_country_briefing_final.pdf

Morocco remains highly vulnerable to climate variability and change, particularly for the country's water, agriculture, and health sectors. Impacts of climate change are already being experienced across the region. Water scarcity and drought conditions are expected to increase risks of food insecurity and may exacerbate conflict situations over scarce resources and population movements. Additionally, sea level rise may impact much of the country's coastline. Environmental degradation and deforestation, impacted water resources, and loss of biodiversity and ecosystem services constitute serious obstacles to the country's continued development and poverty reduction efforts, increases vulnerability to risks and hazards as well as increases the importance for sustainable adaptation and resilience measures.[43]

Agriculture

Overview

The agriculture sector (including livestock) accounts for approximately 15% of Morocco's GDP, 23% of its exports, and nearly to 30% of its total employment. The sector is valued at approximately MAD 30 billion (US$ 3 billion). Agribusiness employs nearly 143,000 people and is comprised of 2,050 industrial units (mainly small and medium-sized companies). Agribusiness output is mostly destined for the domestic market, with exported goods accounting for only 12% of total industrial exports. While the country's economic growth has overall become more resilient, agriculture remains dependent on the climate and thus remains highly vulnerable. Primary crops in Morocco are cereals, which are planted on nearly 43% of all agricultural areas. Key agricultural exports include citrus fruit (especially oranges), vegetables (e.g., pepper, tomato, green bean), almonds, table olives and olive oil, dairy products, and, more recently, blueberries, cherries and asparagus. Early season vegetables and specialty crops such as Argan, have the highest value for export.

While Morocco has made significant progress in recent years to expand irrigation for commercial agriculture, many farmers still lack access to irrigated, arable land and thus produce poorer quality goods and have lower yield rates. The main irrigated areas are the Rharb and Loukkos in the northwest, the Tadla in the center-north of the Atlas Mountain region, Al Haouz in the Marrakech region, the Souss-Massa (SM) in the Agadir region, the Ouarzazate and Tafilalet south of the Atlas Mountains, and the Low Moulouya in the northeast. Moroccan agriculture and livestock also remain vulnerable to droughts. Additional challenges for the sector result from farmer's inability to formally own land or are unable to provide notarized land titles, making it difficult to obtain credit or permits (e.g., for digging wells), and thereby limiting investment for irrigation and other needed inputs.[44]

[43] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

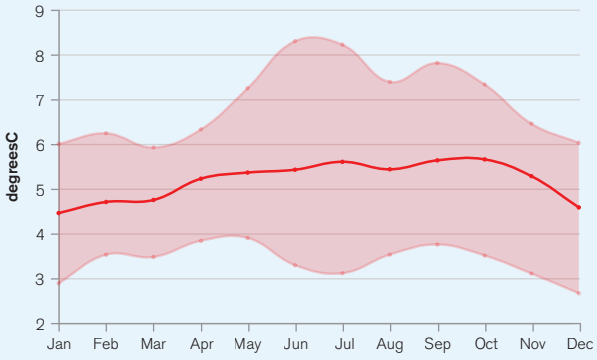
[44] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

Climate Change Impacts

Faced with increasing climate variability, Moroccan agriculture has adapted through diversification and rising yields. Although cereal production remains dominant, there is an increasing trend towards horticulture and livestock production.[45] Agriculture remains a key sector for Morocco's economy, food security and rural livelihoods. However, the sector has suffered due to population pressures and increasingly erratic rainfall, which have pushed production to fragile and degraded land. 87% of the country's crop production is primarily rainfed and thus highly vulnerable to increased rainfall variability (particularly barley and wheat). For example, the 2016 winter grain harvest saw harvested yields 70% lower than in 2015 due to widespread drought. Hotter, drier conditions are expected to increase crops' water requirements by up to 12%, increasing demand for irrigation and further stressing limited water resources. Drought also promotes proliferation of the Hessian fly, increasing risk of damage to wheat yields. Rising temperatures are expected to reduced yields by 50%–75% of rainfed drops during dry years. Erratic precipitation and increased aridity and drought conditions will result in shortened growing seasons, reduced yields and lower productivity. Decreased water availability will impact irrigation potential and in turn, reduce profitability of irrigated agriculture as alternatives require the pumping of groundwater.[46]

Increased heat will increase stress on crops and also impact productivity and length of the growing season. Decreased water availability is likely to reduce yields and the reduction in soil moisture may alter suitable areas for agriculture or the production of specific crops. Increased heat and water scarcity conditions are likely to increase evapotranspiration, expected to contribute to crop failures and overall yield reductions. **Figure 10** shows the average daily max temperature across seasonal cycles. These higher temperatures have implications for impacts to soil moisture and crop growth and as seen in the graph below, the overall increase in temperature will impact soil moisture and thus crop growth. This is an important indicator for agriculture and especially for Morocco as the majority of the country's agriculture production is reliant upon rain-fed agriculture. Increased temperatures, with an increased likelihood of droughts and prolonged dry periods will increase soil erosion and exacerbate land degradation. Increased temperatures are likely to increase the presence of pests.

FIGURE 10. Average daily max temperature for Morocco[47]



[45] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[46] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[47] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco Agriculture Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=MAR&period=2080-2099

Adaptation Options

Agriculture is a strategic mechanism for socio-economic development in Morocco. As the sector remains highly dependent on rainfall, specific resilience programming has begun to be implemented to strengthen the sector. A National Irrigation Water Saving Program is targeting the alleviation of water stress and a protective and the sustainable management of water resources for irrigated agriculture with the goal of establishing drip irrigation over 555,000 hectares (ha); saving approximately 1.4billion m^3 per year. The promotion of climate change resilient technologies can also further support the agricultural sector.[48] Monitoring and early warning systems can also be established to improve drought decision support systems and preparedness efforts. Emergency operational planning should be expanded to develop networks and awareness across areas experiencing significant and new changes in aridity and drought conditions.[49] The country has committed to switch away from its current irrigation systems to localized irrigation systems over an area of 550,000 ha to improve water efficiency and availability. The sector will increase multi-risk insurance for cereals and legumes covering farming areas of 1 million ha. Finally, the government is working on the extension of irrigation to new agricultural areas over 260,000 ha.[50]

Water

Overview

Morocco's water resources are unevenly distributed across the country; the coastal plains are flooded consistently while the south suffers from water shortages year-round. Renewable water resources per person have declined by almost 60% since 1960 due to non-climate stressors such as population growth in the north, irrigation expansion, as well as urban, industrial and tourism development. At the same time, rising temperatures and more erratic rainfall have reduced river flows and increased evaporation and siltation of storage dams, leading to a 20% reduction in overall water resources in the last 30 years. Reservoirs of the Hassan Addahkhil and Idriss I, both critical water sources, are projected to decrease between 7%–40% by the 2080s. Climate change will increase demand for irrigation, which already consumes 90% of available water, even though only 13% of farmed land is irrigated. Increased water stress will inevitably lead to over exploitation of groundwater resources, and is already happening in Souss, Haouz, and Saïss. Additionally, Morocco's Mediterranean coast and low-lying Moulouya River delta, with their economic and ecological importance are threatened by sea-level rise and subsequent shoreline erosion and saline intrusion.[51]

[48] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

[49] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[50] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[51] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

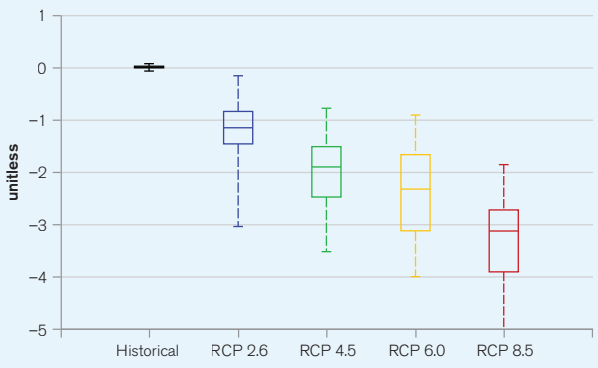
Climate Change Impacts

Changing precipitation patterns and reduced water availability are expected to significantly alter some fertile regions, which may shift from semi-arid to arid and in the extreme northern part of the country it will shift from a sub-humid to a semi-arid one. The humid, sub-humid, and semi-arid zones have all been shrinking since 1970s, and the climate projections are showing that these zones will continue to decrease and move toward the north.[52] Rising temperatures are expected to reduce stream flows and overall water availability; water shortages (particularly in the south) are likely as early as 2020. The reductions in mountain snowpack will result in a shift in seasonal water availability and an increased likelihood of flooding in October and November, but with less water availability the rest of the year. More erratic precipitation and increased drought conditions can expect more rapid springtime melt and thus reduce supplies of seasonal snowmelt for lowland areas. This is likely to result in increased demand for irrigation as well as the acceleration of siltation of dams due to heavy rainfall and river bank erosion. Finally, an increased frequency of intense rainfall events is expected to lead to an increased resilience on groundwater resources and risks of overexploitation leading to insufficient recharge. The quality of surface water is also likely to reduce due to an increased concertation of pollutants.[53]

Rainfall and evaporation changes also impact degrees of surface water infiltration and recharge rates for groundwater and low-water storage capacity increases the country's dependence on unreliable rainfall patterns. Changes in rainfall and evaporation translate directly to changes in surface water infiltration and groundwater re-charge. This has the potential for further decreased reliability of unimproved groundwater sources and surface water sources during droughts or prolonged dry seasons. Increased strain on pump mechanisms leading to breakdowns if maintenance is neglected and the potential for falling water levels in the immediate vicinity of wells or boreholes, particularly in areas of high demand. Additionally, temperature increases have the potential to result in increased soil moisture deficits even under conditions of increasing rainfall.

Figure 11 shows the projected annual Standardized Precipitation Evapotranspiration Index (SPEI) through the end of the century. The SPEI is 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. This is an important understanding for the water sector in regards to quantity and quality of supply for human consumption and agriculture use as well as

FIGURE 11. Annual SPEI Drought Index in Morocco for the period, 1986 to 2099[54]



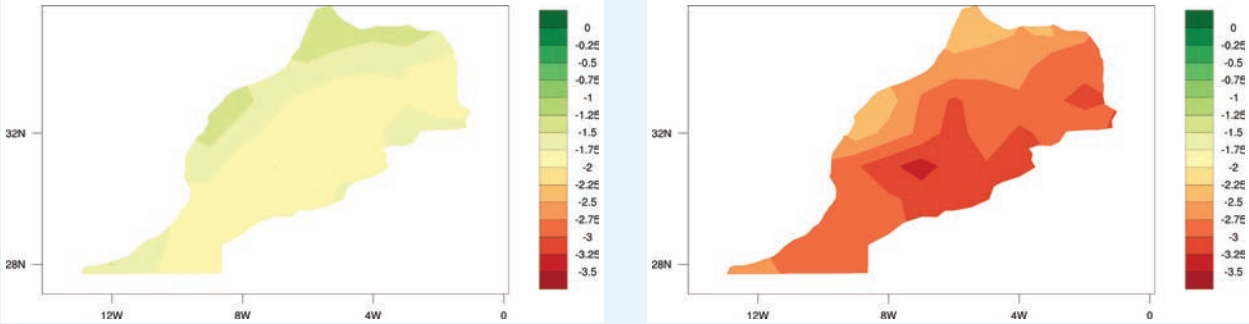
[52] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[53] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[54] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco Water Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/water/land-use-/-watershed-management?country=MAR&period=2080-2099

for the energy sector as reductions in water availability impacts river flow and the hydropower generating capabilities. As seen in the chart below, Morocco (median SPEI of –3.13 by end of the century, under RCP8.5) is projected to experience significant and extreme dry conditions and increased and prolonged pressure on water resources by mid-century and by end of the century is likely to be experience severe drought conditions and water scarcity. While Figure 11 shows nationally aggregated trends, **Figure 12** shows the spatial representation of SPEI across Morocco for the periods 2040–2059 and 2080–2099, against the baseline of 1986–2005. As shown, the entire country will be under significant water stress, most acutely occurring in the central and northwestern areas in the 2050s and 2090s, respectively.

FIGURE 12. Spatial representation of SPEI across Morocco for the period 2040–2059 (left) and 2080–2099 (right), under RCP8.5



Adaptation Options

Climate change significantly impacts the availability of water resources in Morocco. Sustainable and reliable development, storage and proper use of the water resources is a high priority and is managed through a water resources management policy, which promotes national efforts towards the efficient, equitable and optimum utilization of available water resources. To meet the needs of its population and avoid failures that may worsen in the coming decades, Morocco has implemented its National Water Strategy to improve water resource demand management and efficiency by irrigation programs, both across agriculture, industrial and touristic water saving scales. Morocco is in the process of constructing 60 large damns which would mobilize 1.7 billion m^3 per year and support the more efficient transfer from the northern basins to the south. The increased preservation and protection of water resources and natural habitats can support biodiversity and conservation for key water resources.[55] The government has committed to improve the country's water adaptation efforts through improving its wastewater treatment at a rate of 50% by 2016 to 60% by 2020, construct three dams per year on average in order to reach 25 billion cubic meters (m^3) in stocking capacity in 2030, and invest in the desalinization of seawater in order to reach a capacity of 500 million m^3 per year.[56]

[55] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

[56] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

Energy

Overview

Morocco has identified limited fossil fuel resources (oil, gas, coal) and depends heavily upon imports and fossil fuels, which account for approximately 68% of installed capacity in Morocco, with the remaining 32% from renewable energy sources: hydro, wind, solar. The development of its energy sector is a key priority for the country's development agendas, its GHG reduction plans, economic growth and sustained energy independence. Furthermore, the development of renewables is helping to improve energy security as well as deliver on Morocco's clean energy and climate change commitments. Morocco's electricity grid now covers more than 98% of households. Over the past decade, the sector is being progressively liberalized, with foreign investment in both renewables and coal-fired power stations. The energy mix is diversified further by imports of gas from Algeria and electricity from Spain.[57] Morocco's topography and climate are favorable to wind, solar and additional hydropower. By 2020, Morocco has made a goal to derive more than 40% of its electrical capacity from these sources, strengthening both energy security and sustainability. At the same time, the government aims to maximize attractive investment conditions for oil and gas exploration. To reduce the burden of energy subsidies, transport fuels have progressively been brought up towards full market prices, and electricity tariffs are also being adjusted upward. Energy efficiency has been elevated to a national priority, with a range of measures on lighting, building standards, appliances and vehicles.[58]

Morocco's electricity sector has developed significantly since 1990, by diversifying generation, improving security of supply and attaining almost universal access to electricity, despite sustained electricity demand growth (6% to 7% per year) fostered by the country's economic development.[59] Nevertheless, the sector is continuing to develop to face the current and future challenges of constantly growing demand, rising fuel prices and the heavy investments needed to increase generating capacity, particularly in renewable energies. Recent market and financial reforms, to support and strengthen the deployment of renewables, has enabled Morocco to emerge as leader in the region's electricity sector and benefit the country's entire economy.[60]

Climate Change Impacts

Morocco's energy sector has suffered increasingly regular droughts, colliding with growing demand for water resources every year. Despite the country's significant investments in renewable energy, increased temperatures and decreased precipitation have serious implications for the country's energy sector. Increased temperatures are likely to threaten cooling capacities of power generating stations with potential to impact generation and transmission. Increased temperatures resulting in seasonal changes are also likely to alter demand for electricity with increased demand for peak loads during hotter summers. These increased production costs are likely to coincide with a period of increased demand; increasing prices for consumers. Projected trends are also expected to increase costs of maintenance and repairing of power and energy infrastructure as well as disrupt power supply. Reduced runoff and surface water availability will also reduce hydropower generation.[61]

---

[57] RCREEE (2019). Morocco Renewable Energy Profile. URL: http://www.rcreee.org/content/morocco
[58] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf
[59] RCREEE (2019). Morocco Renewable Energy Profile. URL: http://www.rcreee.org/content/morocco
[60] IEA (2014). Morocco. URL: https://www.iea.org/publications/freepublications/publication/Morocco2014.pdf
[61] IEA (2014). Morocco. URL: https://www.iea.org/publications/freepublications/publication/Morocco2014.pdf

Cooling Degree Days show the relationship between daily heat and cooling demand, typically sourced through a form of active cooling or an evaporative process. The change in cooling degree days provides insight into the potential for extended seasons of power demand or periods in which cooling demand (power demands) might increase. As seen in **Figure 13**, seasonal increases for cooling demands are expected to increase over an extended summer period (April to October). The Warm Spell Duration Index represents the number of days in a sequence of at least six days in which the daily maximum temperature is greater than the 90th percentile of daily maximum temperature. As shown **Figure 14**, warm spells are expected to sharply increase in the second half of the century.

FIGURE 13. Change in Cooling Degree Days (65°F) in Morocco for the period 2040–2059[62]

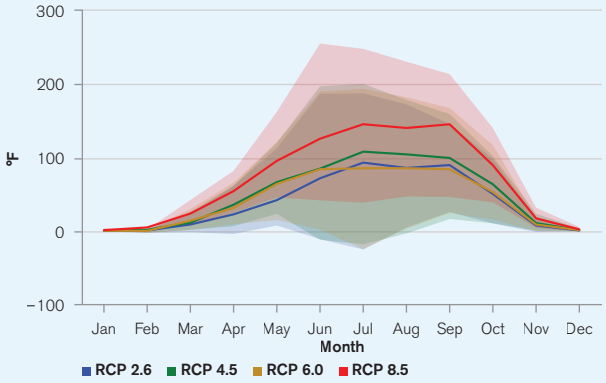
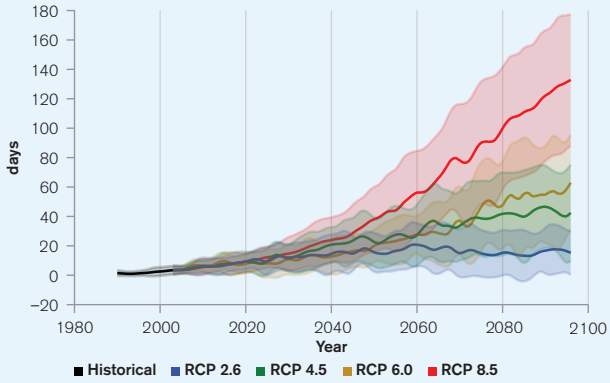


FIGURE 14. Warm Spell Duration Index in Morocco for the period 1986 to 2099[63]



Adaptation Options

Effective energy generation, transmission and expanded use is critical to the country's overall development agenda and economic growth for the country and the establishment of energy efficiency is a national priority. Through its National Energy Strategy (2009), Morocco is committed to continuing to expand electricity access and affordability across the country, but also to increase its share of renewable energy generation and supply. Efforts to optimize the electricity fuel mix is paired with the acceleration of renewables, particularly wind and solar power, as Morocco enjoys considerable natural advantages and has considerable potential. This will help reduce import dependency and diversify the nation's industrial base. The expansion of solar and wind power can help to mitigate losses from hydropower generation due to altered rainfall patterns and reduced river flows.[64] Morocco continues to invest heavily in transforming its energy sector through a transition to a low-carbon energy sector, including a complete transformation of the future energy mix, which is designed to phase out the need to import fossil fuels with clean and high efficiency technology going forward.[65] In addition, programs to increase efficiency and reduce emission intensity across the economy are being rolled out.[66]

[62] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco – Energy. URL: https://climateknowledgeportal.worldbank.org/country/morocco/climate-sector-energy
[63] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco Energy Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/energy/oil-gas-and-coal-mining?country=MAR&period=2080-2099
[64] IEA (2014). Morocco. URL: https://www.iea.org/publications/freepublications/publication/Morocco2014.pdf
[65] RCREEE (2019). Morocco Renewable Energy Profile. URL: http://www.rcreee.org/content/morocco
[66] IEA (2014). Morocco. URL: https://www.iea.org/publications/freepublications/publication/Morocco2014.pdf

Health

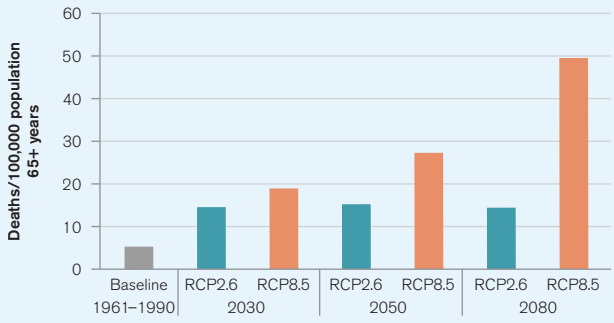
Overview

Morocco is currently experiencing a major shift in its epidemiologic profile with increasing burdens of noncommunicable diseases (NCDs), which account for approximately 75% of all deaths in Morocco. Morocco has accelerated reducing its maternal and under-five mortality and between 1990 and 2015 with a 78.1% reduction in maternal mortality and a 65% reduction in under-five mortality. The country's intensive immunization and disease control programs have facilitated the elimination of major communicable diseases, including polio, malaria, trachoma and schistosomiasis. However, TB still remains a challenge in specific geographical areas and rural areas. A multi-sectorial program has been launched in 2013 to respond to this public health issue. As of 2016, the Moroccan government spends approximately 5% of GDP on the healthcare sector.[67]

Climate Change Impacts

Morocco's population health is vulnerable to climate variability and projected climate change trends. Agriculture, is endangered by decreases in annual rainfall, increasing the risk of crop failures, food insecurity, and malnutrition. The country is also likely to face an increased incidence of dengue fever, malaria and schistosomiasis. Climate change is expected to increase mean annual temperature and the intensity and frequency of heat waves resulting in a greater number of people at risk of heat-related medical conditions. The elderly, children, the chronically ill, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions. Under a high emissions scenario, heat-related deaths in the elderly (65+ years) are projected to increase to almost 50 deaths per 100,000 by the 2080s compared to the estimated baseline of just under 5 deaths per 100,000 annually between 1961 and 1990, as shown in **Figure 15** below.[68]

FIGURE 15. Heat related mortality in population 65 or over in Morocco[69]



[67] WHO (2018). Country Cooperation Strategy, at a glance. Morocco. URL: https://apps.who.int/iris/bitstream/handle/10665/136949/ccsbrief_mar_en.pdf?sequence=1

[68] WHO (2015). Climate and Health Country Profile – Morocco. URL: https://apps.who.int/iris/bitstream/handle/10665/208864/WHO_FWC_PHE_EPE_15.10_eng.pdf?sequence=1

[69] WHO (2015). Climate and Health Country Profile – Morocco. P. 4. URL: https://apps.who.int/iris/bitstream/handle/10665/208864/WHO_FWC_PHE_EPE_15.10_eng.pdf?sequence=1

In Morocco, the annual distribution of days with a high-heat index provides insight into the health hazard of heat. **Figure 16** shows the expected Number of Days with a Heat Index >35°C for the 2090s; showing an increase by mid-century and continuing to sharply increase under a high-emission scenario by end of the century. Night temperatures are also increasing for Morocco, resulting in decreased opportunity for natural cooling, *Tropical Nights* (>20°C) represents the projected increase in tropical nights for different emission scenarios to demonstrate the difference in expected numbers of tropical nights. (**Figure 17**).

FIGURE 16. Days with a Heat Index >35°C[70]

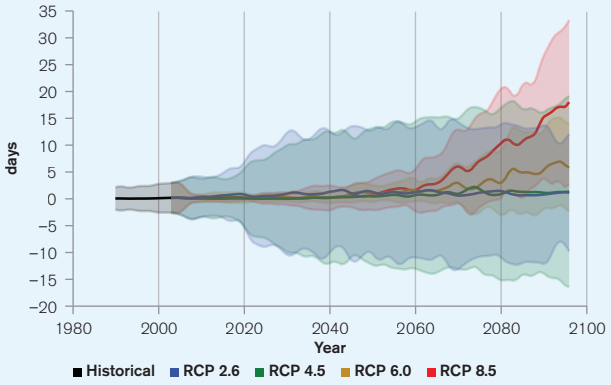
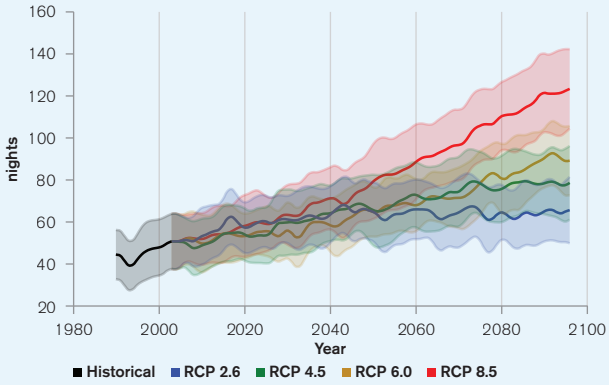


FIGURE 17. Number of Tropical Nights (Tmin >20°C)



Adaptation Options

In 2010, Morocco launched an adaptation strategy for its health sector to address its climate change challenges. This focuses on the protection of population health with specific emphasis towards the reduction of health risk inequalities; an improved epidemiological surveillance system; strengthening health facilities resilience towards extreme events; improved emergency and response plans preparation; and the promotion of research focused on the impacts of climate change on health.[71] Furthermore, Morocco's health-care infrastructure can be upgraded to support more systemic climate change resilience. Additional capacity can be built to support the adaptation to extreme weather events and support the necessary response capacities. Health care system personnel are not fully aware of the relationship between climate change, seasonal variability and health impacts. Increases in training and capacity can improve the level of knowledge and skills to prevent diseases connected with climatic factors, however this knowledge remains relatively limited among the general population.

[70] WB Climate Change Knowledge Portal (CCKP, 2020). Morocco Health Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/health/systems-and-service?country=MAR&period=2080-2099

[71] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

Fisheries

Overview

Morocco has a thriving fisheries sector, which produces an estimated one million tons annually (primarily sardine and mackerel). The sector also makes up an important source of foreign currency inflows and is valued at $1 billion and is a key employer for coastal and rural communities. The maritime fisheries sector contributes up to 2.3 % of Morocco's GDP and directly or indirectly employs over 660,000 people. Overall the sector sustains 3 million people and makes up 15% of total Moroccan exports, or 59% of agri-food exports.[72] Fishing grounds in the Canary Current, off Morocco's west coast, are exceptionally rich in sardines, bonito, and tuna, but the country lacks the modern fleets and processing facilities to benefit fully from these marine resources. In 2007, a trade agreement was renewed, by which the EU pays Morocco an annual fee to allow vessels (mainly Spanish) to fish Moroccan waters. A new four-year fishery agreement established in 2018 with the European Union will allow European vessels, mostly from Spain, to operate in Moroccan and Western Saharan waters in exchange for an economic compensation program, which the National Fishery Office of Morocco intends to use to boost modernization of its domestic fishery sector. The sector remains under growing threat from non-climate stressors such as illegal and unregulated fishing practices and pollution.[73]

Climate Change Impacts

Climate change trends are expected to further aggravate these issues as increased temperatures induce migration of fish species, particularly plankton, and open the way for invasive species to out-compete those upon which the industry relies. Increased sea surface temperatures may impact plankton migration habits or change the composition and hatching of area marine life. It is also expected to reduce the productivity of crustaceans, corals, and echinoderms. Fish habitats are also impacted by rising sea levels and by toxic algae blooms caused by warmer Mediterranean waters. The increased acidification of the ocean may result in an increased upswelling and changes to ocean circulation, also likely to reduce productivity, increase toxic algae blooms, which will impact shellfish and overall result in a loss of livelihoods for coastal populations.[74]

Adaptation Options

Morocco has worked to strengthen its management of the fisheries sector and to improve its protection of key ecosystems. The country has also developed strategies to increase the resilience of the fisheries sector and to reduce its vulnerability to impacts from increasing sea surface temperatures, sea level rise and increased ocean acidification. Policy options and adaptation activities include improved ecosystem integration and adaptive fisheries management; strengthen research efforts to better identify expected impacts on fish stock, coastal communities and foreign earnings potential; develop and implement an improved observation and monitoring

[72] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[73] European Commission (2018). Bilateral Agreements with Countries Outside the EU. Morocco- fisheries Partnership Agreement. URL: https://ec.europa.eu/fisheries/cfp/international/agreements/morocco_en

[74] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

network to increase scientific data and understanding of the countries fisheries impacts; and strengthen the National Strategy for Integrated Coastal Zone (ICZM) Management.[75] To improve its adaptation efforts for the sector, the government has committed to establish a coastal observation network, equipped with four oceanographic and meteorological buoys, and expansion of the environmental and sanitary surveillance and warning system along the coastline to 40 observation zones and to reduce by 50% of the quantity of fish meal created from fresh fish. By 2030, the government has also committed to establishing marine protected areas representing 10% of the Exclusive Economic Zone and developing two hatcheries dedicated to restock five endangered coastal species.[76]

Coastal Zone and Sea Level Rise

Overview

Morocco's 3,500 km coast crosses temperate, semi-arid and desert climatic zones. The coast in many locations is physically and socio-economically vulnerable to accelerated sea-level rise, mainly due to its low topography and high economic, touristic and ecological values. Population growth is rapid in urban coastal zones. It is projected that between 1985 and 2025, the urbanized area will increase six-fold. Thus, the coast is under pressure from housing and development, tourism, mining, and over-fishing as well as sea level rise.[77] Morocco has an extensive coastline, on which 60% of the population, 90% of industrial activity, and significant natural reserves are located.[78]

Climate Change Impacts

Coastal erosion from sea level rise is already become a critical issue in Saidia (due to its low altitude and sandy beaches) and Tangier, where erosion is already estimated to be 2 m–3 m per year. Additional low-lying coastal lands at risk from flooding due to sea level rise include the Nador Lagoon, the Moulouya River and its delta (a biologically important estuary), and the low-lying coastal plains of Oued Nekkor and Oued Laou. If sea levels rise 0.86 m by 2100, Tangier Bay is projected to lose 99.9% of its port infrastructure and 63% of the city's industrial zone. These climate risks are worrisome as the Moroccan coast continues to draw people from the drought-ridden interior. Additionally, tourism and other industries along the coast continue to be a development priority for the country. Rising sea levels are expected to exacerbate flooding risk of low-lying coastal zones, which will also result in the lost habitat and spawning grounds for coastal animals and marine life. Approximately 2/3 of Morocco's beaches are at risk of

[75] World Bank (2013). Morocco - Climate change and fisheries: impacts and recommendations. URL: http://documents.worldbank.org/curated/en/638931468275132100/Royaume-du-Maroc-Changement-climatique-et-secteur-halieutique-impacts-et-recommandations

[76] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[77] Brown, S. et al. (2011). Sea Level Rise and Impacts in Africa. URL: https://www.weadapt.org/sites/weadapt.org/files/legacy-new/placemarks/files/536cec204b2ea50585fbd9967d9-sea-level-rise-report-jan-2010.pdf

[78] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

coastal erosion. More erratic rainfall increases the risk of flooding from tidal storms and mini tsunamis (as occurred in Casablanca in 2014). Additionally, salinization of coastal aquifers, which will lead to water shortages, is expected to occur in the central and eastern Moroccan coasts due to sea level rise.[79] Culturally, climate change would threaten the historic city of Essaouria through saltwater intrusion, coastal erosion and land substance as further pressure is out on water resources due to rising temperatures.[80] **Figure 18** shows the risk of coastal flooding and **Figure 19** shows the change in sea level rise since 1993.

FIGURE 18. Risk of coastal flooding, Morocco[81]

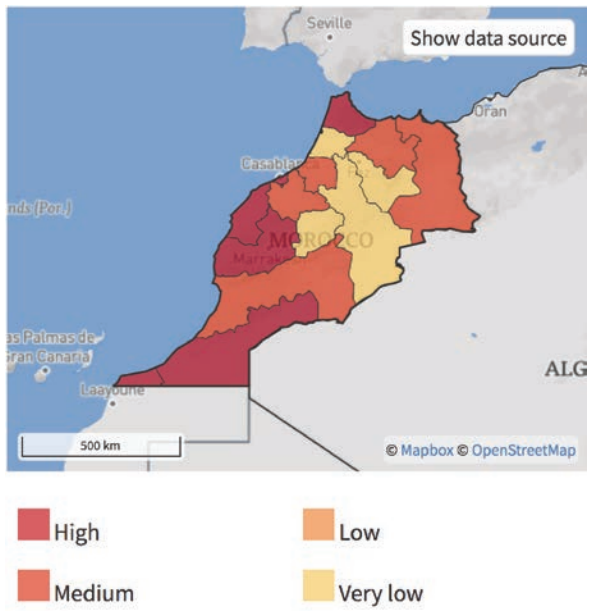
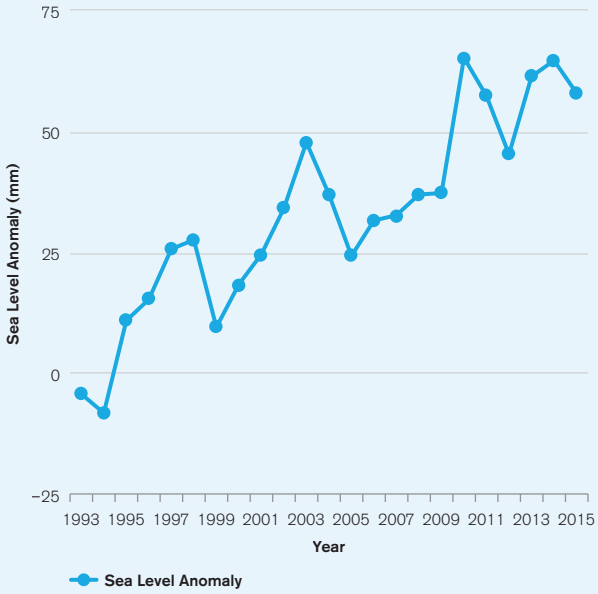


FIGURE 19. Sea level anomaly of Morocco, 1993–2015[82]



Adaptation Options

Without adaptation action to enhance the resilience of its coastal areas, the physical, human and financial impacts are expected to be significant for Morocco. While coastal protection to sea level rise is often costly, adaptation and mitigation efforts undertaken now are expected to reduce damage and loss in the long-term.[83] As such, Morocco has instituted its Integrated Coastal Zone Management Project (ICZM) which promotes sustainable development in the coastal area as a way of enhancing protection of bio-diversity, ecologically sensitive areas, and ensuring that coastal resources are managed both for the benefit of the country and for the overall good of the countries bordering the Mediterranean. The ICZM is specifically focused on the Mediterranean coast in order to enhance

[79] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[80] Brown, S. et al. (2011). Sea Level Rise and Impacts in Africa. URL: https://www.weadapt.org/sites/weadapt.org/files/legacy-new/placemarks/files/536cec204b2ea50585fbd9967d9-sea-level-rise-report-jan-2010.pdf

[81] ThinkHazard! (2020). Morocco – Coastal Flood. URL: http://thinkhazard.org/en/report/169-morocco/CF

[82] WBG Climate Change Knowledge Portal (CCKP, 2020). Morocco Impacts – Sea Level Rise. URL: https://climateknowledgeportal.worldbank.org/country/morocco/impacts-sea-level-rise

[83] Brown, S. et al. (2011). Sea Level Rise and Impacts in Africa. URL: https://www.weadapt.org/sites/weadapt.org/files/legacy-new/placemarks/files/536cec204b2ea50585fbd9967d9-sea-level-rise-report-jan-2010.pdf

and accelerate the implementation of trans-boundary pollution reduction, improved water resources management, and biodiversity conservation measures in priority hotspots and sensitive areas of selected countries of the Mediterranean basin. ICZM was also designed and implemented to compliment ongoing adaptation efforts from other sectors such as water, tourism, waste management, coastal zone development and housing, and agriculture. Efforts should also be made to increase community awareness about the risks of coastal zone erosion, aquifer salinization and sea level rise.[84]

Forestry

Overview

In Morocco, natural forests cover over 5 million ha, and planted forests cover nearly 500,000 ha and are expanding at an average annual rate of 8%, however this is below the optimal rate of the 15% to 20% needed to maintain the ecological and environmental balance. Forests play an important social and economic role in Morocco, and contribute approximately 5% to the Gross National Agricultural Product and 1% the total Gross National Product. Additionally, rural populations depend to a large extent on the material benefits drawn from forests: 17% of national fodder production and nearly 6 million tons of fuelwood (equivalent to about 4 million tons of petroleum) are used for domestic cooking and heating. Forests in Morocco also provide important contribution and protection to the country's unique ecosystems, bio-diversity and its environment, as well as protection from soil erosion, particularly for areas at risk of flooding or river bank erosion.

Climate Change Impacts

Morocco's forests suffer from a high degree of degradation and deforestation, with annual losses of approximately 30,000 ha (**Figure 20**). Deforestation, soil erosion and industrial waste also damage forested areas and impact the quality of water resources. Additionally, population pressures continue to adversely impact forested areas through land clearing and use of forest products for domestic heating and cooking purposes. In general, forest stands are degraded and often sparse and fragmented. The undergrowth is overgrazed and soils have become more vulnerable to water erosion, a phenomenon particularly marked in forests on slopes and in semi-arid bioclimates.[85] Other imminent risks for the sector also include an increase of more frequent and more severe wildfires and the emergence of new pests, which is expected to also impact forest biodiversity (both fauna and flora). This may induce catastrophic impacts on current key ecological balances knowing that extremely crucial orographic ranges make up parts of the country's geography. Climate change will increase the risk that the surface area of some forest ecosystems (cedar trees, cork oak, cypress trees, argan trees, and others) shrinks and makes way for pre-forest, steppes, and desert ecosystems, which will have concomitant impacts both in terms of socioeconomic dynamics and in terms losses of ecosystem services.[86]

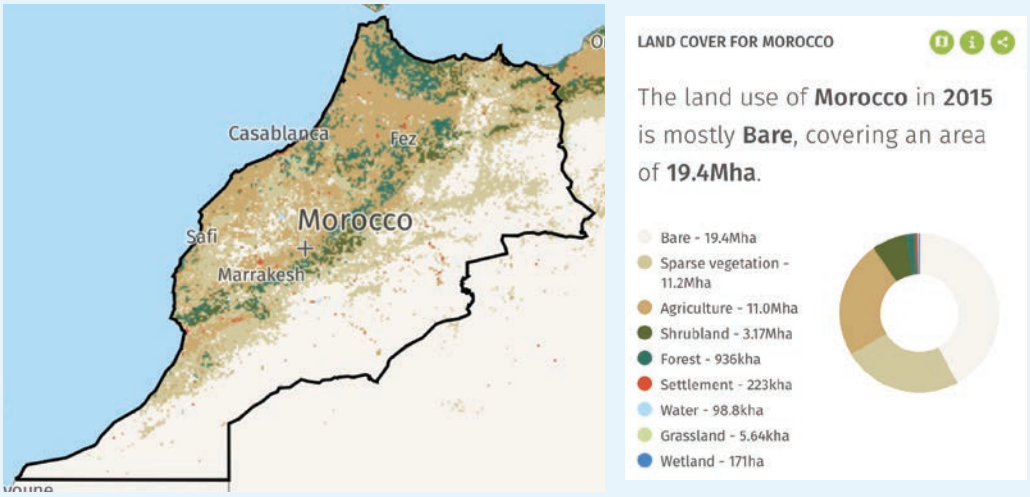
---

[84] World Bank (2012). Project Appraisal Document for an Integrated Coastal Zone Management Project; Middle East and North Africa Region. URL: http://documents.worldbank.org/curated/en/808171468062107931/pdf/664130PAD0P1210Official0Use0Only090.pdf

[85] FAO (2019). Forests and the Forestry Sector – Morocco. URL: http://www.fao.org/forestry/country/57478/en/mar/

[86] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

FIGURE 20. Land cover in Morocco (2015)[87]



In arid and semi-arid areas, drought has increased tree mortality and resulted in degradation and reduced distribution of entire forest ecosystems, such as Morocco's Atlas cedar (Cedrus atlantica).[88] Effects of drought in these areas impact the country's economy and some of its most vulnerable sectors and sub-sectors (agriculture, livestock farming, forestry), however increased water stress further increases pressures on water resource needs for the environment, humans as well as livestock and agricultural irrigation.[89]

Adaptation Options

In Morocco's forestry sector, traditional methods of meeting the basic wood requirements among communities living in the vicinity of the forests and the new policy promoting improved furnaces and renewable sources of energy, the use of gas, and participatory management of natural resources are some of the main features of the new national strategy for adaptation to climate change. The Agriculture and Forestry Vulnerability Assessment suggested that, by the 2030s, the humid agro-climatic zones will shift southwards, rendering areas of the north increasingly unsuitable for agriculture as well as some forest products. Resilience to the country's forestry sector can be gained through strengthened land ecosystems through reforestation efforts. These can include tree lots used for energy purposes, expanded agro-forestry projects, production wind-breaks, and assisted plantation of trees manual or aerial sowing of seed and hoeing. Greater management over this sector can support strategic expansion of the country's forests and valuable ecosystems and biodiversity.[90]

[87] Global Forest Watch (2019). Morocco Forestry Land Cover. URL: https://www.globalforestwatch.org/dashboards/country/MAR?category=land-cover&map
[88] FAO (2007). Adapting forests and their management to climate change: an overview. URL: http://www.fao.org/3/i0670e02.htm
[89] FAO (2018). Drought characteristics and management in North Africa and the Near East. URL: http://www.fao.org/3/CA0034EN/ca0034en.pdf
[90] FAO (2018). Drought characteristics and management in North Africa and the Near East. URL: http://www.fao.org/3/CA0034EN/ca0034en.pdf

Morocco has developed and implemented a long-term development strategy under the Water, Forests and Soil Conservation Directorate, which stresses the regeneration of natural forests, the promotion of pasture management and the management of hunting and inland fisheries. Quantifiable objectives include the regeneration of 18,000 ha of natural forest per year, stabilization of 31,000 ha of coastal dunes and conservation of ecosystems covering 1.42 million ha in protected areas. With regard to protecting forests against wildfire, the Ministry of Water and Forests gave top priority to forest fire prevention and protection, and the country now has implemented a comprehensive monitoring and warning system, equipped with radio links and backed up by fire-breaks and forest tracks. Combating desertification has also become a priority, and is overseen by the new National Forestry Program Mechanism. Morocco has an excellent reputation with regard to training, due in large part to the Salé Forestry College, whose graduates lead forestry regeneration efforts for Morocco as well as for other African countries.[91] The government has also committed to the replenishment of 200,000 ha of forests by 2020. Efforts are also underway towards the protection of 1,500,000 ha against erosion, which includes the prioritization of 22 basins as well as the afforesting of 600,000 ha.[92]

ADAPTATION

Institutional Framework for Adaptation

Morocco's National Committee for Climate Change (established in 2007) oversees all climate-related activities. The committee is chaired by the Department for the Environment, which is also the national focal point for the UNFCCC. Morocco's National Climate Change Strategy focuses on investing in renewable energy and energy efficiency A range of sectoral strategies, including *Plan Maroc Vert*, complement the National Climate Change Strategy.[93] Morocco recognizes climate change as a multisectoral and cross-cutting issue and critical sector attention is paid to water, agriculture, fisheries, shorelines, forestry and health.[94]

Policy Framework for Adaptation

Morocco submitted its Third National Communication in 2016, its Second Biennial Update Report in 2016, and its Nationally-Determined Contributions to the UNFCCC in 2016. These documents, in conjunction with Morocco's National Climate Change Strategy (2014) provide the guidance and platform to integrate responsible environmental management with climate change adaptation strategies, in line with the country's social and economic development

[91] FAO (2019). Forests and the Forestry Sector – Morocco. URL: http://www.fao.org/forestry/country/57478/en/mar/
[92] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf
[93] USAID (2016). Climate Change Risk Profile – Morocco. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf
[94] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

targets. Morocco implements a sectoral approach, adapted to the circumstances and specific features of the territorial entities: mountain regions, the coast, oases, agricultural areas and urban areas when adapting to climate change in order to protect populations, natural heritage and climate-sensitive production systems. Between 2020 and 2030, the country plans to invest at least $35 billion in adaptation related efforts for the country's most vulnerable sectors: water, forestry, and agriculture.[95]

National Frameworks and Plans

- Third National Communication to the UNFCCC French (2016)
- Second Biennial Update Report French (2016)
- Nationally-Determined Contribution (2016)
- National Climate Change Strategy (2014)
- Second National Communication to the UNFCCC French (2010)
- National Energy Act (2008)
- First National Communication to the UNFCCC French (2001)

Recommendations

Research Gaps

- Improve understanding of the impact and magnitude of climate change events across the country and how projected trends relate to key vulnerabilities in Egypt
- Increase participation of the public, scientific institutions, women and local communities in planning and management, accounting for approaches and methods of gender equity
- Strengthen environmental monitoring capabilities for more effective environmental management
- Increase investment in weather stations and expanding the country's national hydro-meteorological monitoring system can further advance networking for the measurement of climate parameters and further development of early warning systems[96]
- Strengthen the technical capacity to integrate climate-smart agriculture techniques, improved water resource efficiency and climate change risk management across identified key sectors[97]
- Introduce academic curricula, which specializes in climate risk and climate change in training and learning institutions[98]

[95] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[96] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

[97] World Bank (2018). Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector. URL: http://documents.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf

[98] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

Data and Information Gaps

- Develop early warning systems about hydrometeorological phenomena and climate risk management[99]
- Ensure that nation-wide climate change and atmosphere monitoring systems are maintained and enhanced where necessary, including through monitoring networks at appropriate spatial density and frequency
- Enhance data collection methods for emissions for the agriculture and forestry sectors
- Expand the *Morocco Green Plan* to include a greater degree of agroforestry, agricultural products and rangelands into emission calculations

Institutional Gaps

- Ensure integration of Morocco's National Environmental Strategy goals are developed within sectoral and regional plans[100]
- Implement cross-sectoral climate-smart solutions at national and subnational levels
- Integrate climate change concerns into relevant policies and planning processes at the state and national levels
- Finalize land demarcation and the registry of forested areas to support adaptation and mitigation planning
- Improve institutional and regulatory governance frameworks which specifically address climate change to ensure policies are consistent across sectors
- Build capacity with regards to developing, financing, implementing and monitoring climate change adaptation projects at institutional and local levels, inclusive of public, private and partnerships
- Strengthen adaptation of infrastructure against bad weather and future weather conditions
- Develop and implement a monitoring and evaluation system to assess Morocco's vulnerability and adaptation progress to climate change[101]

[99] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[100] Ministry Delegate of the Minister of Energy, Mines, Water and Environment (2014). Moroccan Climate Change Policy. URL: https://www.4c.ma/medias/MCCP%20-%20Moroccan%20Climate%20Change%20Policy.pdf

[101] Morocco (2016). Nationally Determined Contribution under the UNFCCC – Morocco. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

CLIMATE RISK COUNTRY PROFILE

MOROCCO

WORLD BANK GROUP