Climate Change Knowledge Portal

The Climate Change Knowledge Portal (CCKP) provides global data on historical and future climate, vulnerabilities, and impacts. Explore them via Country, Region, and Watershed views. Access synthesized Country Profiles to gain deeper insights into climate risks and adaptation actions.

GEF & WBG Climate Risk Screening & the Climate Change Knowledge Portal (CCKP)

https://climateknowledgeportal.worldbank.org
Objectives

To share WBG approaches and tools to aide project teams in collecting best available information that can be used to perform climate screenings.

Agenda

1. WBG Risk Screening Process
2. GEF Screening Process
3. Project Example
4. Walk-through of the CCKP
5. Additional Resources
World Bank Group Risk Screening: 4-Logic Steps

Step 1: Hazard Exposure
Step 2: Potential Impact
Step 3: Adaptive Capacity
Step 4: Project Risk
After screening, the task team considered moderate to high exposure risks associated with extreme heat, droughts, floods, landslides, storm surge and strong winds.

Excerpts from the PAD:

“...exposure is rated High. The districts under this project are in the dry zone, and some are coastal. They are vulnerable to the impacts of floods, drought, high winds/cyclones, and storm surge. Droughts hit these districts every 3–4 years and create significant livelihood impacts. ... The rehabilitated irrigation infrastructure will follow improved designs taking account of the increased rainfall intensities. The rehabilitation of small tank systems will consider to the extent possible the potential impact of floods and droughts, and the designs will be undertaken accordingly. Climate-resilient farming practices, such as drought/flood-tolerant crop varieties, improved water management practices, catchment management, crop diversification, and so on, will reduce the impact of extreme events.”
GEF Climate Risk Assessment

Steps in climate risk assessment

- Hazard Identification
- Evaluation of Vulnerability and Exposure
- Risk Rating
- Risk Management

IPCC definitions

- **Risk**: potential for adverse consequences where something of value is at stake and associated with uncertainties.

- **Vulnerability**: propensity to be adversely affected encompassing sensitivity to harm and inability to cope.
Assessing Climate Vulnerability

- **Exposure Assessment**
  - Of the project location and proposed interventions or project components.
  - Historical and projected climatic conditions (climate variability).

- **Vulnerability Identification**
  - How resilient are the resources at the project location?
  - Is resilient built into the proposed project interventions/components?

- **Adaptive Capacity**
  - Sensitivity of project location and proposed interventions to identified climate exposure and ability to cope.

- **Overall Climate Risk**
  - Taken together, to what is the project location and proposed interventions or project component vulnerable, and to what extent?
Stap’s Climate Risk Screening Question

• Has the sensitivity to climate change, and its impacts, been assessed?

• How will the project be affected by climate risks over the period 2020 to 2050, and have the impacts been addressed adequately?

• Have measures to address the risks been considered? How will these risks be dealt with?

• What technical and institutional capacity, and information is needed?
Integrated Coastal Watershed Conservation

Cross-sectoral and participatory conservation, and monitoring in the context of climate change in Mexico

<table>
<thead>
<tr>
<th>Project Full Name</th>
<th>Country &amp; Region</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation of Coastal Watersheds to Achieve Multiple Global Environmental Benefits in the Context of Changing Environments</td>
<td>Mexico, Latin America</td>
<td>World Bank</td>
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<table>
<thead>
<tr>
<th>Executing Agencies</th>
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<tbody>
<tr>
<td>National Commission for Protected Areas (CONANP), National Forestry Commission (CONAFOR), National Institute of Ecology and Climate Change (INCC), and a private institution, the Mexican Fund for the Conservation of Nature (FNCON)</td>
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<table>
<thead>
<tr>
<th>GEF Project ID: 4782</th>
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<tbody>
<tr>
<td>Project Type: FSP</td>
</tr>
<tr>
<td>GEF Period: GEF-5</td>
</tr>
</tbody>
</table>

**FOCAL AREAS**
- Biodiversity
- Climate Change Mitigation
- Land Degradation
- Sustainable Forest Management

**Summary**

The project promotes integrated management of coastal watersheds to conserve biodiversity, contribute to climate change mitigation, and enhance sustainable land use in the Gulf of Mexico and Gulf of California, where impacts from climate change are significant and habitats of globally significant biodiversity are provided. Collaborating with three federal agencies and a private foundation, the project focused on improving sustainable management of protected areas and surrounding watersheds, including the areas where local communities manage agroforestry systems. In addition, local communities were engaged through sub-projects that supported sustainable cattle ranching, honey production, adventure tourism, and others. These same stakeholders were involved in project monitoring and development of the Integrated Watershed Action Plans. The project achieved improvement of protected areas management covering 7,462,204.473 hectares, improved management of productive landscapes in the watersheds covering 335.764 hectares, and due to the emphasis on community participation, strengthened socio-ecological resilience of the watersheds to climate change and other potential future environmental and social perturbations. Community pride and ownership in the sustainable management of watersheds was a key outcome. Based on all these outcomes, an integrated watershed management approach is being scaled up at the local and national level.
Project Objectives:
To promote integrated environmental management of selected coastal watersheds as a means to conserve biodiversity, contribute to climate change mitigation, and enhance sustainable land use.

Key Sectors:
Water Resources, Biodiversity, Forestry, Agroforestry, Environment Services
Using the CCKP for Climate Risk and Disaster Screening
The World Bank created the Climate Change Knowledge Portal to solve a need.

In an effort to serve as a 'one stop shop' for climate-related information, data, and tools, the World Bank created the Climate Change Knowledge Portal (or CCKP). The Portal provides an online tool for access to comprehensive global, regional, and country data related to climate change and development.

http://climateknowledgeportal.worldbank.org
Key Features of CCKP

- Climate Information
- Country Development Context
- Hazard Exposures
- Vulnerability
- Sectoral Impacts
- Adaptation Framework
STAP’s Question 1

Has the sensitivity to climate change, and its impacts, been assessed?

*are the current and projected climate vulnerabilities at the project location identified?*

Information that would be useful includes:

- Historical and projected climatic conditions
- Information on vulnerability to project climatic conditions
- Is climate change a driver of the targeted problem?
- Interactions between climate and non-climate stressors
Climate Data: Historical

The climate in Mexico varies, largely by altitude, with some areas experiencing desert-like conditions and others experiencing a more tropical climate. The northern part of the country experiences cooler temperatures and peak rainfall during the winter months. The southeast of the country experiences a tropical rainy climate that ranges from no dry season to a short dry season. El Nino events typically bring cool, wet conditions to northern Mexico (in winter), and La Nina bring warmer, drier conditions during this same period.

**Temperature**
- Mean annual temperature has increased by 0.6°C since 1960, at a rate of approximately 0.13°C per decade.
- The rate of increase is most rapid in the dry seasons (March-May and December-February) at a rate of 0.18-0.2°C per decade and slower in the wet seasons (June-August and September-November).

**Precipitation**
- Mean rainfall over Mexico does not show any consistent increase or decrease since 1960.
- A particularly wet autumn in 2004 caused an apparent increasing trend in

**Data Snapshots**
- Mean annual temperature is 20.57°C (1901-2016)
- Mean annual precipitation is 724.64mm (1901-2016)

**General Resources**
- Tool: Climate Analysis, Monitoring and Forecasts (IRI)
- Tool: Climatic Research Unit Climate Data (URC)
- Tool: Historical Climate Variability Tool (WBG)

**Different Time Periods**
- 1901-1930
- 1931-1960
- 1961-1990
- 1991-2016

- 1901-2016

**Tailored Narratives**

**Aggregated Country Statistics**
It is important to evaluate how climate has varied and changed in the past. The monthly mean historical rainfall and temperature data can be mapped to show the baseline climate and seasonality by month, for specific years, and for rainfall and temperature. The chart above shows mean historical monthly temperature and rainfall for Mexico during the time period 1991-2016. The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).
Climate Data: Historical

ANNUAL PRECIPITATION (MM)

<table>
<thead>
<tr>
<th>Year</th>
<th>Precipitation (mm)</th>
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<tbody>
<tr>
<td>1900</td>
<td>1000</td>
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<tr>
<td>2000</td>
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<td>6000</td>
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</tbody>
</table>

METADATA

Historical data is derived from four sources, all quality controlled by leading institutions in the field.

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Climate Data: Projections

The climate science community sources a suite of global climate models to help decision makers understand the projections of future climate change and related impacts, among the most widely used are the Coupled Model Intercomparison Project, Phase 5 (CMIP5) models included in the IPCC’s Fifth Assessment Report (AR5). Climate projections can be presented via individual models or through multi-model ensembles. The Climate Change Knowledge Portal (CCKP) supports the analysis of climate impacts using multi-model ensembles, as they represent the range and distribution of the most plausible projected outcomes when representing expected changes.

Temperature

- Mean temperature is projected to increase by 1.1 to 3°C by the 2060’s and by 1.3 to 4.8°C by the 2090’s.
- The projected rate of warming is similar in all seasons, but more rapid in the north and central regions of the country.
- Annually, projections indicate that 18%-34% of days will be "hot" by the 2060’s, and on 22%-54% of days by the 2090’s.
- All projections indicate decreases in the frequency of days and nights that are considered "cold" in the current climate.

Precipitation

- Mean annual temperature will rise by 1.99°C (1.34°C to 2.89°C) in 2040-2059 (RCP 8.5, Ensemble)
- Annual precipitation will decrease by -49.57mm (-344.39mm to 226.98mm) in 2040-2059 (RCP 8.5, Ensemble)
- Annual Cooling Degree Days will rise by 1004.67mm (711.25mm to 667.82mm) in 2040-2059 (RCP 8.5, Ensemble)
- Annual Maximum 5-day Rainfall (25-yr RL) will rise by 11.87mm (-33.01mm to 137.95mm) in 2040-2059 (RCP 8.5, Ensemble)
### Climate Data: Projections

**Change in Monthly Temperatures:**
- Projections for increasing temperatures expected to occur most significantly and rapidly in northern arid zones, central and coastal regions.
- Higher rates of evapotranspiration, impacts to aridity and drought and water supply.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>TIME PERIOD</th>
<th>STATISTIC</th>
<th>SCENARIO</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Temperature</td>
<td>2080-2099</td>
<td>Change (anomaly)</td>
<td>RCP 8.5 (high emission)</td>
<td>ensemble</td>
</tr>
</tbody>
</table>

**Projected Change in Monthly Temperature of Mexico for 2080-2099 (Compared to 1986-2005):**

- Projections for increasing temperatures expected to occur most significantly and rapidly in northern arid zones, central and coastal regions.
- Higher rates of evapotranspiration, impacts to aridity and drought and water supply.

**Historical Observed Monthly Temperature for Mexico for 1986-2005:**

- Mean or change in monthly temperature compared to the reference period (1986-2005). In general, value of monthly temperature change varies between 0 and 4 degrees. Zero value indicates there is no change in projected monthly temperature compared to historical mean.
Change in Maximum Daily Rainfall (10yr RL):

- Implications of changing precipitation patterns will impact the rates of surface water infiltration and the recharge rates for groundwater.
- Low-water storage capacity increases dependence on unreliable rainfall patterns.
Climate Data: Projections

Change in Consecutive Dry Days:

- Implications for surface water and aquifer recharge
- Water quality and water quantity expected to reduce; impacts to humans, ecosystems, habitats
Climate Data: Projections

Change in Mean Drought Index:
- Increasing aridity for Mexico’s central and southern regions and southern coast, exacerbates existing issues around water scarcity and drought periods
- Consecutive dry days are expected to increase, while extreme rainfall events may also increase, which will impact surface water runoff
Climate by Sector: Water

The supply of water is directly affected by weather and climate. Next to the critical water input through precipitation at daily, monthly and seasonal scales, also the loss through evapotranspiration should be taken into consideration. Particularly high temperatures, low humidity and high winds can efficiently remove water from the land surface. Equally, the demand for water is expected to evolve under climate change, particularly as they relate to often rapidly changing demographic and economic settings. These changes generally increase the operational challenges and risk for the water sector.

This section provides the visualization of four climate indices that are most relevant for water sector.
Climate by Sector: Water

**Sector specific indicators** present a high-level summary of potential future climate change impacts.

Climate variability and change impose different problems for different sectors. While general trends can be used to outline emerging challenges, the dominant factors affecting ecosystems and people vary strongly on a case-by-case basis.

The selection and visualization of key climate indicators per sector was conducted through a participatory consultation process with sector specialists and development project leaders.
Interactive Sector Dashboards: Water

Climate by Sector  ▶  Water

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GENERAL RESOURCES

- Tool: Interactive Climate indicator Dashboard - Water (WBG)
- Tool: Global Forecast Drought Tool (WBG)
- Working Paper: Physical Impacts of Climate Change on Water Resources (WBG)
Interactive Sector Dashboards: Water

Pre-loaded variables most suited for identifying and understanding sector and sub-sector contexts

Use sub-sector dashboards to gather tailored information
Interactive Sector Dashboards: Water

Example:
Standardized Precipitation Evapotranspiration Index (SPEI)

Compare spatial variation to nationally aggregated projection trends
Interactive Sector Dashboards: Water

Example:
Average Precipitation

Compare change across the seasonal cycle
STAP’s Question 2

How will the project be affected by climate risks over the period 2020 to 2050, and have the impacts been addressed adequately?

*have drivers of the climate vulnerabilities been analyzed for the project and planned interventions?*

**Information that would be useful includes:**

- **Expected climate impacts and level of severity** on targeted components at project location.
- Impacts on the efficacy of proposed interventions.
- Will proposed intervention reduce or decrease climate vulnerability?
- Potential for maladaptation.
Vulnerability: Natural Hazards

Vulnerability

Overall risks from climate-related impacts are evaluated based on the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability of communities (susceptibility to harm and lack of capacity to adapt), and exposure of human and natural systems. Changes in both the climate system and socioeconomic processes—including adaptation and mitigation actions—are drivers of hazards, exposure, and vulnerability (IPCC Fifth Assessment Report, 2014).

This section provides a summary of key natural hazards and their associated socioeconomic impacts in a given country. It allows quick evaluation of most vulnerable areas through the spatial comparison of natural hazard data with development data, thereby identifying exposed livelihoods and natural systems.
Vulnerability: Natural Hazards

Overview

• Over 40% of the country’s territory and nearly one-third of the population is exposed to hurricanes, storms, floods, earthquakes, and volcanic eruptions.
• Mexico’s coastlines are vulnerable to tropical cyclones and hurricanes from both the Atlantic and Pacific Oceans.

Climate Change Impacts

• Extreme rainfall events may result in soil erosion, mudslides and watershed degradation
• Higher temperatures and drought threatens to reduce water storage capacity
• Urbanization and increasing population pressures exacerbated competing demands of natural environment, consumption needs and other water uses such as crop irrigation
Impacts: Mexico’s Coastal Zones

Impacts → Sea Level Rise

Sea level rise (SLR) is the sum of oceanic thermal expansion, ice melt from glaciers and small ice sheets, and sea level loss from Greenland and Antarctica, and changes in terrestrial water storage. SLR is accelerating in response to climate change and is producing significant impacts already being felt by coastal ecosystems and communities. SLR and other oceanic climate change will result in salinization, flooding and erosion and affect human and ecological systems, including health, heritage, freshwater, biodiversity, agriculture, fisheries and other services. Increased heat in the upper layers of the ocean is also driving more intense storms and greater rates of inundation, which, together with SLR, are already driving significant impacts to sensitive coastal and low-lying areas. By the end of the 21st century, it is very likely that sea level will rise in more than about 95% of the ocean area and about 70% of the coasts worldwide are projected to experience a sea level change within ±20% of the global mean (IPCC Global Warming of 1.5 °C Report, 2018).

The section facilitates the exploration of spatial variability and trends in historical sea level anomaly and sea surface temperature.
Impacts: Mexico’s Coastal Zones

Overview

• Coastal zone is vulnerable to a range of climate stressors, including rising sea surface temperatures, ocean acidification, changes in ocean circulation and changes in patterns of extreme weather, including hurricanes.

Climate Change Impacts

• Fishing and port activities are also disrupted by coastal storms that bring heavy rainfall, storm surge and strong winds.
• The states of Veracruz, Tabasco, Campeche and Quintana Roo in the south are major tourist destinations but also are some of the most vulnerable states to severe weather
• An increase in the frequency and intensity of extreme storms will damage coastal infrastructure and ecosystem services and erode beaches.
• Sea level rise will increase salinity, damaging coastal aquifers, agricultural land, wetlands, and ecosystems
Impacts: Mexico’s Water Sector

Explore historical and projected climate data, climate data by sector, impacts, key vulnerabilities and what adaptation measures are being taken. Explore the overview for a general context of how climate change is affecting Mexico.

Impacts > Water

Over the past century, substantial growth in population, industrial and agricultural activities, and living standards have exacerbated water stress in many parts of the world, especially in semi-arid and arid regions. Climate change, however, will regionally exacerbate or offset the effects of population pressure for the next decades. It is projected to reduce renewable surface water and groundwater resources significantly in most dry subtropical regions. In contrast, water resources are projected to increase at high latitudes. Proportional changes are typically one to three times greater for runoff than for precipitation. Furthermore, Climate change is projected to reduce raw water quality, posing risks to drinking water quality even with conventional treatment (IPCC Fifth Assessment, 2014).

This section provides insights into projected climate change impacts on various hydrological indicators.
Impacts: Mexico’s Water Sector

Overview
• Rainfall decline will affect runoff in rivers, water stored in dams and aquifer recharge. Saltwater intrusion into coastal aquifers from rising seas will further deplete freshwater supplies.

Climate Change Impacts
• Projections suggest reductions in surface water and groundwater supplies as well as decreased groundwater recharge from reduced precipitation.
• Increased periods of drought and the reduction in rainfall will reduce the country’s hydro-power potential and may lead to disruption in energy supplies; especially in the increasing heat of the summer periods at times of peak demand.
Impacts: Mexico’s Water Sector

Overview
• The majority of inland Mexico is projected to experience reduced rainfall, including an increase in consecutive dry days, particularly in the country’s northern areas; likely lead to reductions in surface waters and the supply of freshwater.

Climate Change Impacts
• By the 2050s, Mexico City is projected to experience a reduction of between 10% to 17% in its per capita water supply.
• Increased periods of drought and the reduction in rainfall will reduce the country’s hydro-power potential and may lead to disruption in energy supplies; especially in the increasing heat of the summer periods at times of peak demand.
Impact on Livelihoods and internal Migration

Groundswell Report
Additional Tools and Resources

ThinkHazard!
Identify natural hazards in your project area and understand how to reduce their impact

https://thinkhazard.org/en/
STAP’s Question 3

Have measures to address the risks been considered? How will these risks be dealt with?

have options for adaptive management to ensure durability of outcomes been considered?

Information that would be useful includes:

• What are the climate risk management measures?
• How will the measure address the identified vulnerabilities?
• Evaluation of how to manage adaptively
• Feasibility, effectiveness, economic cost, tradeoffs, and co-benefits.

STAP’s Question 4

What technical and institutional capacity, and information is needed?

*Is there a monitoring, evaluation and learning strategy for the selected climate vulnerability management options?*

**Information that would be useful includes:**

- What are the needed technical and institutional capacities?
- Financial implications of climate vulnerability management options.
- Mechanisms for monitoring, evaluation and learning.
Adaptation and Key National Policies

- **First Nationally-Determined Contributions** (2016)
- **Climate Change Mid-Century Strategy** (2016)
- **Sixth National Communication on Climate Change** (2019)
- **Fifth National Communication on Climate Change** (2012)
- **Fourth National Communication on Climate Change** (2009)
- **Third National Communication on Climate Change** (2006)
Additional Tools and Resources

- Mexico Climate Smart Agriculture Profile
- Technical Note: Information Resources for Climate Risk Assessment (ADB)
- Report: Groundswell (WBG)
- Book: Climate Smart Agriculture (FAO)
- Sourcebook: Climate-Smart Agriculture (FAO)
- Tool: Crop Explorer (USDA)
- Report: Shock Waves (WBG)
- Report: Unbreakable (WBG)
For more information on CCKP:

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