



CLIMATE CHANGE RISK PROFILE GUATEMALA

COUNTRY OVERVIEW

Guatemala has made significant economic and political strides over the last decade, but the country still struggles with high exposure to natural hazards and high rates of poverty (59 percent), malnutrition (54 percent) and maternal-child mortality. It also has one of the highest rates of violent crime and of inequality in Latin America. Climate change poses even greater challenges to long-term development goals. About one-third of Guatemalans depend on natural resources for their livelihoods, and that natural resource base is already degraded by overexploitation, deforestation, and slash-and-burn agricultural practices, leading to low productivity. Higher temperatures and more variable rainfall will further hamper productivity, increasing the risk of food and water insecurity among the most vulnerable, particularly indigenous groups, mainly subsistence farmers in remote geographic areas who represent at least 40 percent of the population. The 2015/2016 El Niño phenomenon led to one of the worst droughts in 35 years in Central America. Guatemala’s southeast region (known as the dry corridor) was especially affected, leading to widespread crop failure and food insecurity. In addition to potentially exacerbating these adverse impacts, climate change will increase disaster risks in rapidly urbanizing areas with highly unstable physical infrastructure, such as in the highlands (vulnerable to landslides) and Pacific coastal regions (vulnerable to flooding and storm surge from severe weather). (1, 4, 10, 11, 15)



CLIMATE PROJECTIONS



2.5°–4°C increase in temperature by 2050



Increased incidence and intensity of extreme rainfall events, droughts, floods



More frequent and prolonged heat waves, droughts and *canículas*

KEY CLIMATE IMPACTS

Agriculture

Crop loss/failure
Shifting production zones
Increased food prices & food imports



Water Resources

Water shortages
Reduced quantity and quality of water supplies, especially during dry season



Human Health

Increased risk of vector- and waterborne diseases, malnutrition and disaster events



Energy

Disruption in service provision
Reduced energy production potential



Ecosystems

Loss of critical ecosystems, coastal defense & carbon sinks
Expansion of arid areas



April 2017

This document was prepared under the Climate Change Adaptation, Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013 and is meant to provide a brief overview of climate risk issues. The key resources at the end of the document provide more in-depth country and sectoral analysis. The contents of this report do not necessarily reflect the views of USAID.

CLIMATE SUMMARY

Guatemala has a warm, tropical climate that varies with the country’s topography, including humid coastal areas, cool highlands, tropical jungles in the northern Petén region, and dry scrub in the eastern dry corridor. Average annual temperatures range from 25°–30°C along the coast, to 20°C in the highlands, to 15°C at higher altitudes. Two distinct seasons exist: a dry season from November–April and a rainy season from May–October. The rainy season includes a 5- to 15-day break with little or no rain in July or August called the *canícula*. Average annual rainfall varies between 600 mm in the eastern dry zone and 5,000 mm in coastal areas, with the majority of the country receiving around 1,100 mm. The climate is affected by the El Niño Southern Oscillation. El Niño events increase temperatures, decrease rainfall and prolong the *canícula*, while La Niña events decrease temperatures and increase rainfall. Cyclone season is June–November for the Atlantic coast and May–October for the Pacific coast. (2, 4, 10, 15)

HISTORICAL CLIMATE

Historical trends since the 1970s:

- Increases in maximum temperatures by 0.2°C and minimum temperatures by 0.3°C per decade, with greatest increases observed in the western highlands.
- Longer and warmer dry period, as number of cold days and nights decreased by 2.2 and 2.4 percent per decade, and number of hot days and nights increased by 2.5 and 1.7 percent.
- Average annual rainfall increased 13–27 percent across the country, with the greatest increase in the north and Pacific coast.
- Irregular start of rainy season and more intense rain across shorter periods of time.
- Increased frequency and intensity of El Niño/La Niña cycles, causing frequent and severe drought in the eastern dry corridor.

FUTURE CLIMATE

Projected changes in climate include:

- Temperature increase between 2.5°–4°C by 2050, with greatest increases in the north, the Caribbean coast, the east, and the southern coast.
- Annual increases in rainfall until 2030, then a 9.5–12.4 percent decrease in rainfall by 2050.
- Decreases in precipitation appear to be greatest in beginning of rainy season and in the central highlands, and west and eastern regions.
- Expansion of semi-arid climate regions.
- Prolonged duration of the *canícula* (+18 days).
- Increased variable rainfall with heavy rainfall events followed by dry days, triggering more drought and flood events.
- Rise in sea levels by 9–13 cm by 2050.

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

The majority of agricultural production in Guatemala is rainfed (71 percent) and takes place on steep mountainous terrain, making it highly vulnerable to drought, excess rainfall and soil erosion. Higher temperatures and more variable rainfall are projected to adversely affect yields of major food crops, with the most dramatic decreases of up to 66 percent for beans and 34 percent for rice in the eastern dry corridor. Higher temperatures will restrict the area viable for coffee production (a major export), pushing production to higher altitudes, potentially leading to land conflicts, deforestation, erosion and loss of biodiversity. A prolonged *canícula* will impact corn and bean harvests, as well as timing of the second planting season. Agriculture contributes significantly to the economy (14 percent of GDP, 31 percent of total employment, and 50 percent of export earnings), so climate change will

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Increased temperatures and evaporation	Reduced yields of major food crops due to altered onset of the rainy season and longer <i>canícula</i>
Increased frequency of intense rainfall	Increased risk of pest infestation/crop disease, such as coffee rust
	Loss of agricultural land and crop suitability (especially for coffee)
Drought and rainfall variability	Damage to crops from floods, droughts and erratic rains
	Increased food prices, food insecurity and migration flows

negatively impact both economic and food security. For example, the El Niño-intensified drought since 2014 reduced maize and beans harvests by more than 50 percent in the western highlands and eastern dry corridor, resulting in food insecurity for one in five households. (1, 2, 3, 4, 5, 13)

WATER RESOURCES

Guatemala has abundant water resources, but water shortages occur throughout the country, especially in the dry season; the eastern and west-central highlands, south coast and northern Petén region are most affected. Surface water is the main water source for rural and urban areas; however, reduced rainfall and higher temperatures are expected to reduce surface water flows by 10–50 percent by 2030 and total water availability by 5–30 percent by 2050. Moreover, heavy rainfall events increase runoff, reduce groundwater recharge and reduce water quality through contaminated floodwaters and increased sedimentation. Water quality is poor throughout the country, with every body of water in Guatemala considered biologically and/or chemically contaminated due to extremely low levels of wastewater treatment and lack of regulation for wastewater discharge. Groundwater from deeper wells is considered potable and provides around 30 percent of urban water supply. Saltwater intrusion,

ECOSYSTEMS

Important ecosystems, such as mangroves, rainforest and coniferous forests already stressed by deforestation (Guatemala lost half its forest cover between 1950–2002), will face increasing stress due to climate change. Coniferous forests mitigate landslides, protect watersheds and contribute nearly 80 percent of forest-related domestic and export goods. Increased temperatures and variable rainfall are expected to replace large areas of coniferous forests with dry forest ecosystems. Dry forests cover 20 percent of the country but are projected to cover 40 percent by 2050 and 65 percent by 2080. This will increase the risk of forest fires, reduce watershed health, negatively impact agroforestry-based livelihoods and aggravate drought severity. Along the coasts, rising sea levels cause flooding and erosion that damage valuable wetlands and estuaries that support coastal livelihoods and

ENERGY

Hydropower currently generates 34 percent of Guatemala’s electricity, and is expected to increase to 46 percent by 2027. Rising temperatures, more variable rainfall and prolonged droughts already negatively impact hydropower production. For example, droughts in 2009 led to a 34 percent reduction in hydroelectric generation compared with the previous year. Increased temperatures and variable rainfall will stress the country’s energy supply in the face of growing demand. (1, 10)

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Reduced river flows and groundwater recharge, reducing water quality and seasonal supply
Decreased precipitation	Reduced water for ecosystems, human consumption, hydropower production and irrigation
Increased incidence of extreme rainfall	Reduced water quality Increased groundwater dependency, possibly inducing saltwater intrusion of coastal aquifers
Sea level rise	

while currently not a problem for coastal areas, may occur in the future if wells are overpumped due to increased demand and reduced surface flows. Population growth, which is expected to increase water demand by 300 percent by 2050, coupled with reduced surface flows and heavy rainfall events will increase water scarcity and further reduce quality. (4, 11, 12, 15)

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Increased temperatures	Loss of critical ecosystems, agroforestry livelihoods, coastal defense and carbon sinks
Reduced/variable rainfall	Loss of coniferous forests and expansion of dry forests; increased risk of forest fires Loss of biodiversity
Increased severe weather events	Increased coastal erosion and coastal flooding, degrading wetlands and estuaries
Sea level rise	Damage to mangroves from sedimentation and low water flows

fisheries. Mangroves are sensitive to low water flows during the dry season and increased sedimentation during heavy rainfall events, both of which are exacerbated by climate change. (4, 9, 10)

Climate Stressors and Climate Risks ENERGY	
Stressors	Risks
Increased temperatures and extreme weather events	Increased energy demand, decreased hydropower production Disruption of energy supply
Reduced annual precipitation and water quality	Adverse effects on turbines and other equipment via contaminated water, increasing operating costs of hydropower

HUMAN HEALTH

Climate change will increase risk of many diseases and health issues that are already leading causes of morbidity and mortality in Guatemala, such as respiratory and intestinal infections. During times of drought, risk of Leishmaniasis, Hantavirus and respiratory infections increases. Handwashing/hygiene may be discouraged to conserve water, increasing the spread of infectious diseases like gastrointestinal illness. During the wet season, waterborne diseases such as cholera increase due to the spread of bacteria via contaminated water sources. The risk of vector-borne diseases like malaria and dengue is likely to increase due to higher temperatures, which enhance the range, breeding and pathogen maturation period, allowing mosquitoes to become infectious more quickly. For example, the 2014–2015 El Niño was identified as an amplifying force to the Zika outbreak in the Americas. Decreased agricultural production will also aggravate widespread malnourishment and

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Higher incidence of vector-transmitted diseases due to favorable conditions for breeding and survival
Decreased precipitation	Higher incidence of waterborne illness and disease such as diarrhea and leptospirosis
Increased incidence of droughts and floods	Increased food insecurity and malnutrition
	Increased weather-related mortality and exposure to disaster risk
	Reduced water availability and quality due to reduced rainfall

food insecurity. The lack of water treatment and sanitation, coupled with poor access to health care and education, chronic malnutrition and low government spending on public health, compounds human health vulnerability, with the indigenous population disproportionately affected. (4, 7, 10, 14)

POLICY CONTEXT

Since becoming party to the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratifying the Convention in 1995, Guatemala has taken actions to fulfill its commitments under the Convention, including signing (1998) and ratifying (1999) the Kyoto Protocol, establishing a Climate Change Unit (2001) within the Ministry for the Environment and Natural Resources (MARN), submitting two UNFCCC Communications, drafting a National Climate Change Policy, pledging its INDC to reduce greenhouse gas emissions (2015), and signing (2016) and ratifying (2017) the Paris Agreement. (6, 8)

INSTITUTIONAL FRAMEWORK

The 2009 Climate Change National Policy outlines the legal and political basis and sets up the guidelines for development of national adaptation and mitigation. In 2013, Congress passed the Climate Change Framework Law, which established the National Climate Change Fund (FONCC) and the National Climate Change Council (CNCC) to lead national policies on climate change and oversee the new FONCC. The CNCC is a collegial advisory body with public and private participation, chaired by the President.

NATIONAL STRATEGIES AND PLANS

- [Initial National Communication](#) (2001)
- [Second National Communication](#) (2016)
- [Climate Change National Policy](#) (2009)
- The National Biodiversity Policy and [National Biodiversity Strategy and Action Plan 2012–2022](#) (2011)
- [Climate Change Framework Law](#) (2013)
- [Energy Policy 2013–2027](#) (2013)
- [National Development Plan](#) (2014)

KEY RESOURCES

1. CIA. 2016. [World Factbook Guatemala](#).
2. FAO. 2015. [Guatemala Aquastat Profile](#).
3. FAO. 2014. [Guatemala Country Factsheet](#).
4. GFDRR. 2011. [Guatemala Country Profile](#).
5. Hagggar, J. 2011. [Coffee and Climate Change](#).
6. Nachmany et. al. 2015. [Climate Change Legislation](#).
7. PAHO. 2012. [Health in the Americas](#).
8. REDDdesk. 2013. [REDD in Guatemala](#).
9. The REDD Desk. 2013. [REDD in Guatemala](#).
10. UNFCCC. 2016. [Second National Communication](#).
11. UNFCCC. 2001. [First National Communication](#).
12. Uytewaal, E. 2016. [An Assessment of Business Development Opportunities in the Water Sector](#).
13. WFP. 2016. [Humanitarian Response Plan](#).
14. WHO. 2015. [Guatemala Country Profile](#).
15. World Bank. 2016. [Climate Change Knowledge Portal](#).
16. GWP. 2014. [El Agua Se Nos Va de Las Manos](#).

Map Source: [United Nations](#).

SELECTED ONGOING EXPERIENCES

Selected Program	Amount	Donor	Year	Implementer
MásRiego	\$3.4 million	USAID	2016–?	The Horticulture Innovation Lab, UC Davis
Climate, Nature and Communities in Guatemala (CNCG)	\$25 million	USAID	2013–2018	Rainforest Alliance
Rural Development and Adaptation to Climate Change	~\$0.85 million	GIZ	2013–2018	Ministry of Environment and Natural Resources of the Republic of Guatemala (MARN)
Climate Change Resilient Productive Landscapes in Guatemala	\$5.4 million	UNDP Adaptation Fund	2015–2019	Ministry of Environment and Natural Resources (MARN)
Nexos Locales Project	\$16.2 million	USAID	2014–2019	DAI
Yo Me Adapto	\$0.5 million	USAID/OFDA	2015–2017	Pan American Development Foundation (PADF)
Sustainable Forest Management and Multiple Benefits	\$4.4 million	GEF	2013–2017	UNDP and Ministry of Environment and Natural Resources (MARN)
Central America Regional Climate Change Program (RCCP)	\$23.5 million	USAID	2013–2018	Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), International Union for Conservation of Nature, CARE, Terra Global Capital LLC, and DAI
Empowering Guatemala's Indigenous Communities to Cope with Climate Change	\$0.2 million	World Bank	2011–2013	ASOCIACION SOTZ'IL
Program to Support the Climate Change Agenda of Guatemala	\$250 million	IDB	2010–2030	Ministry of Finance (MINFIN)