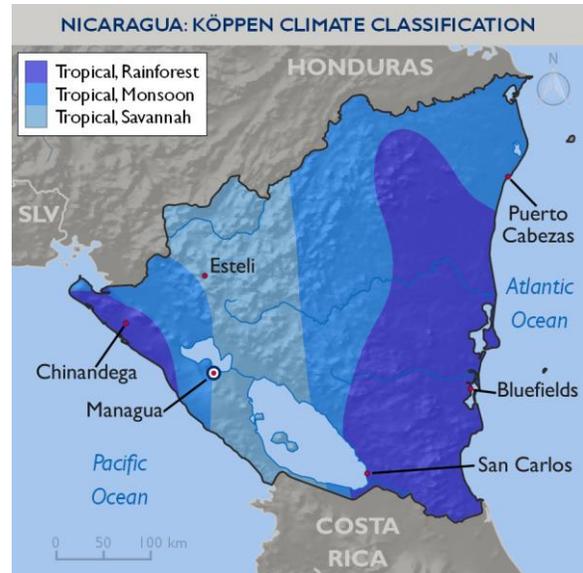




CLIMATE CHANGE RISK PROFILE NICARAGUA

COUNTRY OVERVIEW

Nicaragua is the poorest country in Central America and is highly vulnerable to climate change due to several factors, including its geographic positioning along the path of Atlantic hurricanes, high poverty levels and production systems heavily dependent on natural resources. Roughly one-third of GDP is closely linked to the country's natural resource base through the agriculture, timber and fishery sectors. Cash crops, in particular coffee, peanuts, banana, sugar and sesame, account for 67 percent of Nicaragua's export earnings. More than 50 percent of rural incomes are generated through traditional rainfed agriculture. Food insecurity and poverty are at critical levels, with 25 percent of rural farming households classified as extremely poor and experiencing chronic or temporary food insecurity. Two million people (more than 30 percent of the population) were impacted by the heavy rains and landslides caused by Hurricane Mitch in 1998, which destroyed much of the country's vital infrastructure. Nicaragua is susceptible to other natural disasters including floods, droughts and landslides, events whose frequency, severity and impacts will be amplified by increased climate variability. Recovery and rebuilding costs after natural disasters compound existing challenges, and the frequent recurrence of these events severely hampers the economic foundation necessary to meet development goals. (9, 10, 13, 14)



CLIMATE PROJECTIONS



0.6°C to 2.7°C increase in temperatures by the 2060s



Decreased overall rainfall and increased unpredictability of rainfall patterns



Increased frequency and severity of natural disasters, particularly hurricanes and floods

KEY CLIMATE IMPACTS

Agriculture Production

Crop loss and yield reductions
Shifting production zones
Increased food insecurity

Water Resources

Reduced water supplies
Degradation of water quality

Ecosystems

Damage to mangroves
Drying of wetlands
Shifting distribution of forest types

Human Health

Destruction of infrastructure
Increased risk from water- and vector-borne illness

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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

Nicaragua has a tropical climate with little seasonal variation in temperature, which ranges between 21-27°C, and two distinct rainfall seasons: a ‘wet’ season (May-October) and a ‘dry’ season (November-April). A dry period called the ‘Canícula’ regularly interrupts the wet season during late July and early August. From July to October the country is subject to increased rainfall intensity and strong winds resulting from its geographic location in the path of Pacific cyclones and Atlantic hurricanes. El Niño Southern Oscillation fluctuations during June and August bring relatively warmer and drier or colder and wetter conditions, respectively.

HISTORICAL CLIMATE

Climate variability since the 1960s includes:

- Increased mean annual temperatures by 0.9°C (a rate of 0.2-0.4°C per decade).
- Increasing year to year variations in temperature.
- More variable onset and duration of the Canícula.
- Decreased total rainfall by 5-6 percent per decade, mainly due to lower wet season rainfalls.
- Increased proportion of rainfall occurring in heavy events (by 2.2 events per decade).
- Increased intensity of hurricanes. (10)

FUTURE CLIMATE

Future climate projections include:

- Increases in mean annual temperature by 0.6-2.7°C by the 2060s and 1.2-4.5°C degrees by the 2090s, with more rapid increases in the northeastern part of the country.
- Projections of mean annual rainfall do not show a consistent direction of change, but median values across emissions scenarios are negative.
- Increased frequency and intensity of hurricanes.
- Rising sea levels along both coastlines, with projections of a 0.13-0.51 m rise in the Pacific Ocean and a 0.18-0.46 m rise in the Atlantic Ocean. (6, 9)

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE PRODUCTION

Poor soil quality, water scarcity, uncertain land tenure and recurring natural disasters, together with increased climate variability, are all factors that pose challenges to the agriculture sector, which contributes 17 percent to GDP. Coffee alone comprises 15 percent of export revenues. Climate variability and change, including increased temperatures, humidity and changing rainfall patterns, pose a significant threat to the sector’s productivity. Coffee zones are already shifting, with increasing temperatures forcing farmers to cultivate land at higher altitudes with cooler climates that favor high-quality coffee. This trend forces producers to cultivate forested areas, leading to deforestation, increased runoff and lower water quality for farmers downstream.

Staple crops are also affected by climate variability: one study projects drops in production of maize by 34,000 metric tons and of beans by 9,000 metric tons by 2020 if temperatures continue to rise. Prolonged droughts followed by flash flooding in recent years have wreaked havoc on smallholder production systems. Hurricane Mitch alone caused \$250 million in damages to crops and livestock in

Climate Stressors and Climate Risks AGRICULTURE PRODUCTION	
Stressors	Risks
Increased temperatures and humidity	Shift in coffee production to higher altitudes, resulting in deforestation and land degradation
	Declining yields of major staple crops such as maize and beans
Increased intensity of extreme events, particularly hurricanes	Increased costs to production due to damaged infrastructure, increased use of inputs and altered harvesting cycles
	Increased crop vulnerability to, and incidence of, pests and diseases (e.g., coffee rust, brown rot, black pod) resulting from changes to precipitation and temperatures
Reduced overall rainfall	Spread of coffee rust to higher altitudes

1998. Rebuilding and recovery are hampered by the frequency of these events; for example, many established banana plantations damaged by hurricanes are not being rebuilt. (3, 14, 17)

WATER RESOURCES

Climate change, manifested through higher temperatures and more variable rainfall, is expected to exacerbate Nicaragua’s water resource challenges, with the sector already stressed by years of drought and high rates of deforestation. Increased rainfall variability – particularly in heavily deforested watersheds – leaves many rural communities without water for half the year. Water availability will likely decrease in most basins by as much as 36–64 percent of current levels, particularly those located in the dry corridor (west and southwest of the country). Yet as supplies decrease and given limited storage, demand is increasing from the country’s rapidly growing population and the industrial sector. Demand for hydropower generation, accounting for 16 percent of the country’s energy supply, will also increase, putting pressure on already reduced river flows. (1, 5, 16)

HUMAN HEALTH

Climate change could intensify the existing challenges in Nicaragua’s public health sector, which include limited access to clean water and sanitation and high rates of malnutrition and food insecurity. Vector-borne diseases such as malaria and dengue already pose a risk to the country’s population and their distribution and impacts may expand due to increasing temperatures and more frequent droughts and floods. Other leading health risks include respiratory diseases (3,839 cases per 10,000 people in 2010) and diarrheal disease, whose prevalence can be heightened by increased temperatures and flooding. (7, 15)

ECOSYSTEMS

Many of Nicaragua’s important ecosystems are threatened by climate change. Mangroves in the Gulf of Fonseca protect the coastline from erosion and storm surge and are a nursery for commercially important shrimp, but they face increased frequency of damaging hurricanes and other storms. Nicaragua’s nine wetlands of international importance, which provide wildlife habitat and sustain fishing and agricultural activities, are already under pressure from overfishing and water extraction. Rainfall variability and rising temperatures further threaten their resilience. Climate variability also affects growing conditions for forests and shifting forest distribution can directly impact biodiversity and livelihoods dependent on those forest systems. (2, 11)

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Reduced water availability (both surface flows and groundwater table) for agricultural and household use
	Increased runoff and sedimentation
Increased intensity of extreme events, including hurricanes	Increased cost of accessing groundwater (deeper wells needed)
	Reduced water quality
	Damaged water infrastructure
Reduced overall rainfall	Reduced hydropower potential
	Social instability
	Increased demand for irrigation

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased minimum temperatures	Increased range and prevalence of malaria, dengue and other vector-borne diseases
	Destruction of health infrastructure and service facilities
Increased intensity of extreme events	Increased prevalence of respiratory disease, mainly from increased air contamination from dust
	Increased incidence of water-borne illnesses due to reduced water quality and flooding
Reduced overall rainfall and increased drought	

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Increased minimum temperatures	Storm damage to mangroves, negatively impacting the mangrove ecosystem and the shrimp industry
	Reduction in water resources available to wetlands due to reduced rainfall and/or evapotranspiration
Increased intensity of extreme events	
	Changes in type and distribution of forest systems, which affects flora and fauna dependent on them
Reduced overall rainfall and increased drought	

POLICY CONTEXT

Nicaragua has developed various policies and strategies to address sectors vulnerable to climate change, and many national initiatives aim to promote the management and conservation of natural resources. These include reforestation programs and adaptation work with coffee growers in the country's northern region. At a regional level, Nicaragua is a member of the Central American Integration System (SICA), the institutional framework integrating Central American countries, and of the Central American Commission for Environment and Development (CCAD), which brings together environmental ministries of SICA member states. A regional climate change strategy was developed in 2010 by SICA and CCAD, with adaptation as one of six strategic areas. (6, 12)

INSTITUTIONAL FRAMEWORK

Nicaragua's Ministry of the Environment and Natural Resources (MARENA), through the General Directorate for Climate Change, is the country's focal point representative to the UN Framework Convention on Climate Change. The 2003 National Climate Action Plan highlights the vulnerability of several sectors, but prioritizes adaptation in the water and agriculture sectors. The plan does not appear to have been implemented to date.

The 2010 National Strategy on Environment and Climate Change (ENACC), led by MARENA, highlighted priorities for climate change response and identified ministries and partners responsible for implementation. Priority adaptation measures are also noted in the Ministry of Agriculture and Forestry's action plan. The majority of funding for adaptation is tied to ENACC and channeled through

MARENA and multilateral development partners. Adaptation actions are supported through community basin plans, combining adaptation with payment for ecosystem services. (6, 17)

NATIONAL STRATEGIES AND PLANS

- [Initial National Communication](#) (2001) and [Second National Communication](#) (2011)
- National Climate Change Action Plan (2003)
- [National Strategy on Environment and Climate Change: Action Plan for 2010–2015](#) (2010)
- [Plan for adaptation to climate change and variability in the agricultural, forestry, and fisheries sectors](#) (2013)
- National Water Resources Policy and the Water Act focuses on the relationship between climate change and the occurrence of floods and droughts. (6, 17)

KEY RESOURCES

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10. MARENA. n.d. [Costs and Benefits of Adaptation Options to Climate Change.](#)
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16. World Bank. 2013. [Climate Change Impacts on Water Resources and Adaptation in the Rural Water Supply and Sanitation Sector in Nicaragua.](#)
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Map Source: Adapted from Peel, M.C., et al. 2007. [Updated world map of the Köppen-Geiger climate classification](#); data accessed from [SDAT](#)

SELECTED ONGOING EXPERIENCES

Adaptation activities in Nicaragua have focused to date on national and sub-national capacity building and on research, especially in the priority sectors of water and agriculture.

Selected Program	Amount	Donor	Year	Implementer
Adaptation of Nicaragua's Water Supply to Climate Change	\$37.2 million	World Bank, GEF	2012–2017	Ministry of the Environment and Natural Resources (MARENA)
Adapting to Markets and Climate Change Project	\$37.1 million	IFAD	2013–2019	Ministry of Agriculture
Reduction of Risks and Vulnerability Based on Flooding and Droughts in the Estero Real River Watershed	\$5.5 million	Adaptation Fund	2011–2015	UNDP, MARENA
Environmental Program for Disaster Risk and Climate Change Management	\$13.6 million	IADB	2010–2015	MARENA
Road Sector Support Program: Developing Adaptive Capacity for Climate Change	€4.4 million	Nordic Development Fund, IDB	2011–2016	Ministry of Transport and Infrastructure