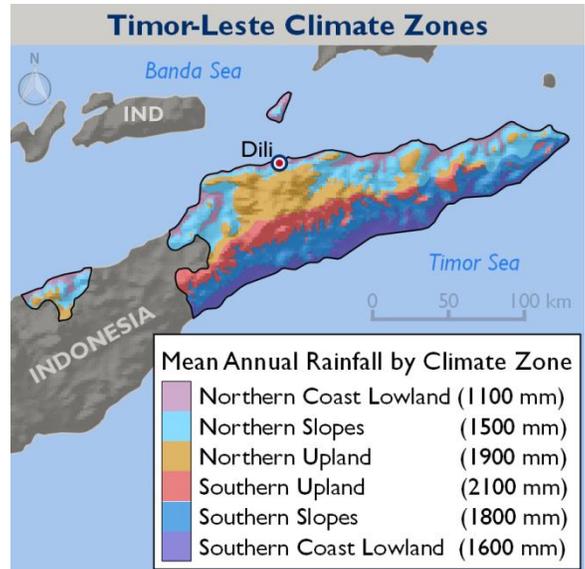




CLIMATE RISK PROFILE TIMOR-LESTE

COUNTRY OVERVIEW

Variable climate and weather patterns threaten the small, mountainous Asian Pacific nation of Timor-Leste. While one of the poorest countries in the region, Timor-Leste saw impressive development gains over the last decade as political stability and oil revenues led to investment in public services and infrastructure. Many people remain vulnerable, however, with around 42 percent of the population living below the national poverty line. The country's mainly rural population of 1.2 million people faces increasing temperatures, extreme rainfall events and rising sea levels that threaten to exacerbate flood, storm and landslide risk, negatively impacting food security. The country is one of the world's most vulnerable to natural disasters due to high risk of earthquakes, tsunamis, cyclones and heavy rainfall, combined with limited infrastructure and inadequate social safety net programs. Timor-Leste is predominantly agrarian – more than 70 percent of the population relies on climate-sensitive, rainfed agriculture as its main source of income. Food security is a primary challenge due to low yields and post-harvest losses, likely to be compounded by increasing temperatures, rainfall intensity and sea level rise. The growing population along the country's north coast increases the number of people and amount of infrastructure vulnerable to flooding and storm surges associated with sea level rise. Overall risk depends on how climate change will influence the El Niño Southern Oscillation (ENSO), which leads to significant drought and flooding around the country. (4, 5, 10, 13, 15)



CLIMATE PROJECTIONS



1.25°–1.75°C increase in temperatures by 2050



Increased intensity of heavy rainfall events; increased risk of flooding



150–340 mm rise in sea levels by 2050

KEY CLIMATE IMPACTS

Agriculture

Increased crop loss/failure
Reduced land suitable for farming
Reduced productivity of livestock



Water Resources

Reduced water supply (lower water table)
Decline in water quality
Increased risk of floods and landslides



Human Health

Increased risk of malnutrition
Increased risk of vector-/waterborne diseases



Coastal

Saltwater intrusion into coastal aquifers and agricultural lands
Loss of biodiversity and fishing livelihoods



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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

In Timor-Leste’s tropical climate, the West Pacific Monsoon and mountainous topography drive temperature and rainfall patterns. The monsoon brings a marked wet season from December to May followed by a dry season from June to November. The wet season is longer in the south (seven to nine months). Annual rainfall varies across the country, from 565 mm in Manatuto on the north coast to 2,837 mm in the mountains of the central west. Rainfall levels are highest in the south and decrease to the north, with some northern areas receiving little to no rainfall for eight months of the year. High levels of interannual rainfall variability, heavy rainfall events and drought are characteristic of the country’s climate. Annual average temperature ranges from 27°C at sea level to 15°C in the mountains. Little seasonal temperature variation occurs, but July is the coolest month and October the warmest. The ENSO strongly influences the climate, with El Niño years bringing drier weather and a shorter wet season and La Niña years bringing higher rainfall, even during the dry season. (3, 8, 9, 12, 14)

HISTORICAL CLIMATE

A sporadic meteorological data record makes establishing accurate historical trends difficult, but estimates include:

- Increased temperature of 0.16°C per decade since 1950.
- Overall increased average annual rainfall by 6.4 mm per decade from 1901 to 2009; however, rainfall trends have decreased in much of the country since 1990.
- Increased sea surface temperatures by 0.15°–0.2°C per decade from 1950 to 2009.
- Rise in sea levels by 9 mm per year since 1993.

FUTURE CLIMATE

Climate projections for mid-century suggest:

- Increased temperature of 1.25°–1.75°C by 2050.
- Increased duration of heatwaves.
- Increased rainfall of 4–10 percent by 2050 with an increase of up to 100–120 mm in coastal areas and 260–300 mm in the mountains.
- Increased intensity of heavy rainfall events, but decreased frequency.
- Increased sea surface temperatures of 0.6°–0.8°C by 2030.
- Rise in sea level by 150–340 mm by 2050.
- Increased cyclone intensity (higher wind speeds) but decreased frequency.

SECTOR IMPACTS AND VULNERABILITIES

WATER RESOURCES

Limited access to potable water is and will continue to be a major challenge in Timor-Leste.

Groundwater resources are replenished by rainfall in the wet season, providing storage for use throughout the year. Increased demand for domestic, industrial and agricultural use is straining this resource. Projected changes in rainfall patterns and saltwater intrusion are likely to compound the issue, leading to reduced quality and quantity of groundwater resources. Additionally, increased temperatures and evaporation are negatively impacting the country’s 12 river systems, which are generally short, fast-flowing and intermittent. Changes in surface water flow have significant impacts on people and livelihoods, especially those reliant on agriculture (which accounts for more than 90 percent of freshwater withdrawals). Extreme rainfall, which is projected to increase, has already led to landslides and large-scale flooding, damaging water

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Rising temperatures	Increased evaporation of surface water (streams, rivers and lakes)
	Reduced access to water for agriculture, industry and household use
Increased variability and intensity of rainfall	Increased rates of runoff due to increased intensity of heavy rainfall, leading to reduced groundwater recharge
Sea level rise	Salinization of groundwater sources near coasts
Greater cyclone intensity	Infrastructure damage to bridges, roads, irrigation and sewage systems

infrastructure and polluting surface water sources. (2, 6, 8, 10)

AGRICULTURE

Timor-Leste's agriculture sector faces increasing pressure from heat stress, heavy rainfall events and sea level rise. Production of maize and rice, the country's main staple crops, is already insufficient to meet current domestic demand, forcing the government to rely on imports. These staple crops, in addition to peanuts, are sensitive to rising temperatures and the impacts associated with extreme rainfall, seawater inundation and salinization of coastal aquifers. For example, maize production fell by 40 percent and rice production by 57 percent during the 2016 El Niño, one of the worst cycles on record. Higher temperatures also decrease yields by limiting germination rates; recent estimates suggest that yields will fall by as much as 10 percent for every 1°C increase in minimum temperature during the growing season. With 80 percent of crop production dependent solely on rainfall, most farmers are restricted to only one planting season, leaving them vulnerable to any increase in rainfall variability. Furthermore, rising seas threaten the viability of low-lying fields (where most of the country's rice is grown) as a result of coastal flooding and soil salinization. Coffee, Timor-Leste's most profitable cash crop, faces production

COASTAL ECOSYSTEMS

Climate and weather variability threatens Timor-Leste's terrestrial and aquatic ecosystems, which are part of the Coral Triangle, a marine area in the western Pacific Ocean home to nearly 600 different species of reef-building corals and 2,000 species of reef fish. Damage to mangrove forests, which some reports suggest decreased from 90 km² in the early 1900s to 18 km² in 2008, has accelerated the impacts of climate change on coastal landscapes. Without a mangrove buffer, coral reefs, beaches, and the coastal population and infrastructure are increasingly exposed to storm surges. Rising sea surface temperatures cause reef fish and other species to migrate to areas farther offshore with more suitable environmental conditions. Changing migration patterns would have a significant impact on artisanal fishing, important for supplementing local diets and incomes, as much of it takes place in a narrow area along the coast. Timor-Leste's fisheries are already stressed by illegal fishing, which accelerates during crop failures. While sea surface temperatures are projected to rise, reefs may be protected from coral bleaching by the cooling influence of the Indonesia ThroughFlow

Climate Stressors and Climate Risks AGRICULTURE

Stressors	Risks
Rising temperatures	Altered patterns of crop/livestock pests and diseases
	Altered or shortened growing season
Increased variability and intensity of rainfall	Reduced livestock productivity, fertility and reproduction
	Saltwater intrusion and seawater flooding of coastal agricultural lands
Sea level rise	Increased crop loss from floods and droughts
	Rise in food imports to compensate for insufficient domestic production
	Increased soil erosion, runoff and landslides

challenges resulting from rising temperatures and higher intensity rainfall that can constrain development or damage blossoms and fruit. Livestock, including cattle, pigs and chickens, are an important asset for 75 percent of the population. Animal health, however, is at risk from increased heat stress and changes in water and feed availability. (5, 8, 11, 12, 17)

Climate Stressors and Climate Risks COASTAL ECOSYSTEMS

Stressors	Risks
Greater cyclone intensity, stronger storm surges	Damage to coral reefs and infrastructure; increased loss of life from storm surges
	Increased erosion of beaches, shorelines and coastal land; loss of breeding and nesting habitats
Rise in sea surface temperatures	Biodiversity loss of fisheries and other marine species (i.e., sea turtles) due to habitat damage
Increased ocean acidification	Temperature-induced migration of fish to cooler waters; loss of fish as a source of protein for coastal communities
	Reduced health and survival of many marine species due to increased acidity of seawater

(an ocean current). If this cooling remains consistent, waters around Timor-Leste may provide a cool water buffer and refuge against further temperature increases. (3, 18)

HUMAN HEALTH

Climate and weather variability pose a number of risks to human health in Timor-Leste. More than 450,000 households suffer annually from displacement, diminished water quality, injury and mortality due to floods and landslides— a number likely to rise with increased rainfall intensity. Dengue and malaria are leading public health concerns, with 75 percent of the population at risk, primarily those living along the coast. As temperatures increase, the range of these and other vector-borne diseases is likely to expand and spread into the central highlands. Malaria remains a leading cause of death in children under five. The districts of Viqueque and Lautem have the highest malaria rates and greatest risk of future increases, while Manatuto is most exposed to dengue. Flooding and other natural disasters often compromise the quality of potable water sources, leading to outbreaks of waterborne diseases such as diarrhea and typhoid. More

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

The Ministry of Agriculture and Fisheries and the Ministry of Commerce, Industry and Environment are primarily responsible for managing and coordinating environmental policies and implementation. Another key agency is the Department for Climate Change and Energy Efficiency. Timor-Leste is a member of the Coral Triangle Initiative for Coral Reefs, Fisheries and Food Security, a consortium of six partner countries formed in 2007 to address threats facing coastal and marine ecosystems in the Asia-Pacific region. While Timor-Leste has established a policy context for climate change response, implementation remains a challenge due to lack of clear institutional mandates and resources.

KEY RESOURCES

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14. Stockholm Environment Institute. 2011. [Climate Overview: Timor-Leste \(East Timor\)](#).
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17. University of Melbourne. 2003. [Vulnerability and Adaptation to Climate Change in Timor-Leste](#).
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Climate Stressors and Climate Risks HUMAN HEALTH

Stressors	Risks
Rising temperatures	Increased incidence of respiratory diseases
	Increased incidence of waterborne diseases such as diarrhea and typhoid
Increased variability and intensity of rainfall	Increased landslide and flood-related injury and mortality
	Increased incidence of vector-borne diseases such as malaria and dengue
Greater cyclone intensity	Crop/livestock loss, leading to food insecurity and malnutrition

variable and extreme humidity and temperature levels have been linked to heat stress and more severe respiratory infections, such as pneumonia, asthma, and other lung and nasal diseases. Indirect impacts include an increased risk of crop failure and livestock mortality, potentially undermining food security and increasing malnutrition rates. (1, 7, 16)

NATIONAL STRATEGIES AND PLANS

Timor-Leste's Strategic Development Plan 2011–2030 provides high-level guidance for national climate change response. The country is formulating a National Adaptation Plan and developing its Second National Communication to the UNFCCC.

- [Intended Nationally Determined Contribution \(INDC\)](#) (2016)
- [Initial National Communication](#) (2014)
- [Timor-Leste Strategic Development Plan 2011–2030](#) (2011)
- [National Biodiversity Strategy and Action Plan 2011–2020](#) (2011)
- [National Adaptation Programme of Action \(NAPA\) on Climate Change](#) (2010)

SELECTED ONGOING EXPERIENCES

Significant donor support exists for agricultural development and climate change adaptation projects in the country, although more resources should be dedicated toward building capacity around weather monitoring systems and disaster preparedness and response.

Selected Program	Amount	Donor	Year	Implementer
Building Climate/Disaster Resilience along the Dili-Ainaro and Linked Road Corridors in Timor-Leste	\$2.7 million	GEF, JICA, World Bank	2014–2018	National Disaster Management Directorate
Managing Agro-Biodiversity for Sustainable Livelihoods in Timor-Leste	€3.97 million	GIZ	2012–2016	Ministry of Agriculture and Fisheries; Ministry of Commerce, Industry and Environment; National University of Timor-Leste
Strengthening Disaster Risk Management (DRM) Programme	\$0.65 million	UNDP	2011–2018	UNDP Timor-Leste
Strengthening the Resilience of Small-Scale Rural Infrastructure (SRRRI) and Local Government Systems to Climate Risk	\$5 million	GEF	2012–2015	Government of Timor-Leste, Ministry of State Administration, UNDP/UNCDF
Project for Community-based Sustainable Natural Resource Management	N/A	JICA	2010–2015	National Directorate of Forestry, Ministry of Agriculture and Fishery
Strengthening Community Resilience to Natural Disasters	\$0.57 million	CIDA	2013–present	Canadian Red Cross
Avansa Agrikultura Project	\$19.2 million	USAID	2015–2020	Cardno Emerging Markets
Ecosystems Approach to Fisheries Management	\$0.75 million	USAID, NOAA	2013–2017	NOAA
Enhancing Food and Nutrition Security and Reducing Disaster Risk through the Promotion of Conservation Agriculture	\$5.1 million	USAID	2013–2017	FAO
Disaster Risk Reduction: Building Community Resilience	\$1.5 million	USAID, OFDA	2014–2017	IOM
TOMAK (To'os ba Moris Diak – Farming for Prosperity)	\$18.2 million	Australia DFAT	2016–2021	DFAT