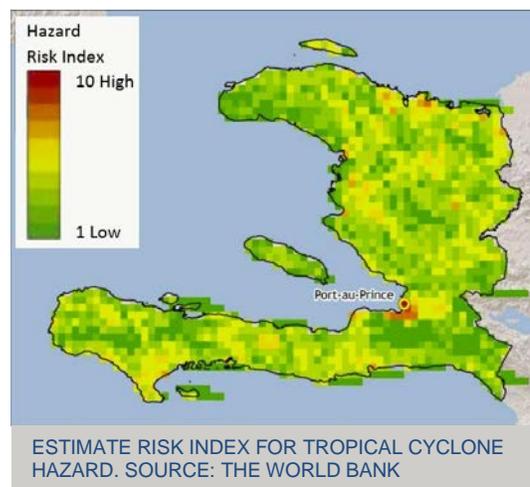


CLIMATE RISK PROFILE

HAITI

COUNTRY OVERVIEW

Haiti is the most vulnerable country in Latin America and the Caribbean to climate change, though modest investments and improved policy (such as superior building standards and better land-use planning) offer the potential to substantially reduce the human and financial impact of future disaster events. Sitting in the center of the “hurricane belt,” Haiti has experienced six major storms in the past 30 years, including Hurricane Jeanne, which killed thousands in Gonaives in 2004. More recently, Hurricane Matthew devastated the Southwestern part of the country in 2016, leaving 1.5 million in need of humanitarian relief. Other factors contributing to Haiti’s vulnerability include topography, land use practices, low per capita income, high population density, and limited infrastructure and services. Ranking 163rd out of 188 countries on the Human Development Index, Haiti occupies the western one-third of the Caribbean island of Hispaniola, and nearly 60 percent of its 10.8 million people live in dense coastal cities, nearby floodplains, and in areas with steep slopes susceptible to landslides. Over half the country’s \$19.4 billion GDP is generated by the service sector, particularly services related to travel and communications, with agriculture and the textile industry principally comprising the remainder. Personal remittances equal nearly 30 percent of GDP, and serve as a primary source of income for many households. Demand for fuel and agricultural land continues to threaten Haiti’s environment, with some estimating only 30 percent remaining tree cover, much of which is agroforestry. Widespread deforestation and unmaintained drainage infrastructure increase Haiti’s vulnerability to hurricanes, storm surge, and flooding, while increased temperatures during dry months (November–January and June–August), strengthening tropical storms, and unpredictable rainfall patterns will likely exacerbate climate impacts to already sensitive sectors and limit Haiti’s economic growth (1,3,4,12,14,15,16,).



CLIMATE PROJECTIONS



0.78–2.16° C increase in temperatures by 2050



Decrease in dry season precipitation and lengthening of drought season



5%–10% increase in storm surge strength by 2050

KEY CLIMATE IMPACTS

Agriculture

Soil erosion and waterlogging
Saltwater intrusion into aquifers
Increase in pest prevalence



Health

Decreased food security
Decreased water quantity and quality
Shifts in vector- and waterborne diseases



Economic Growth

Decreased economic output
Damaged transportation infrastructure
Damaged electricity transmission infrastructure



Governance

Increased stress on institutions
Increased difficulty delivering services



Education

Food insecurity leading to lower attendance
Difficulty accessing schools during and after floods



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CLIMATE SUMMARY

Haiti's diverse topography consists of steep, rugged mountains, fertile river valleys, and coastal flatlands, supporting Haiti's extensive biodiversity and creating distinct climate zones, as mountains in the east largely cut off trade winds. Rainfall varies greatly throughout the country, with monthly averages ranging from 395 millimeters (October) to 72 millimeters (January) in the western part of the Tiburon Peninsula, 290 millimeters (May) to 46 millimeters (January) in the Sud-Est Department¹ near Pic la Salle, and 0 millimeters (December) to 128 millimeters (June) in parts of the Artibonite Department. This variability is anticipated to become more exaggerated, serving as a main climate risk for both wet and dry regions. Nearly two-thirds of all land in Haiti is sloped at more than 20 percent, contributing significantly to erosion and landslide risk. The wet season is long, lasting from April to October in most regions, and often longer (November or December) in the northern mountains. Similar to the neighboring Dominican Republic, daily temperatures range from 23° to 33° C during the summer (May–October) and from 19° to 28° C in winter (November–April), with daily average temperature ranges varying with altitude. Inter-annual precipitation patterns are strongly affected by El Niño and La Niña events, the former bringing hotter and drier conditions; the latter colder and wetter. The Plaine du Gonaïves and the eastern part of the Plaine du Cul-de-Sac are the driest regions in the country, with high evaporation rates that will likely increase with increased temperatures. (1,11,12,14,17).

HISTORICAL CLIMATE

Climate trends since 1960 include:

- Average annual temperatures have increased 0.45° C, mostly due to temperature increases during the warmest months (June–November).
- Monthly average rainfall has decreased by 5 millimeters per decade.
- Between 1960 and 2003, the number of hot days per year increased by 63 days.²
- Substantial increase in the intensity of Atlantic hurricanes since 1980.
- Low plains (Ouest and Artibonite Departments), and coastal zones (Sud, Sud-Est, Grande Anse, and Nippes Departments) particularly vulnerable to flooding events. (14,18)

FUTURE CLIMATE

Projected changes include³:

- Increase of between 0.78° and 2.16° C in average annual temperature by 2050.⁴
- A decrease in average annual precipitation of up to 43 millimeters by 2050.
- Uncertain changes in extreme rainfall.
- Increased hurricane intensity by 5-10 percent and related precipitation by 2 percent by 2050.
- Increase in sea levels of 0.13 to 0.4 meter by 2030.
- Increased frequency of drought in Nord-Est, Nord-Ouest, Artibonite, and Centre Departments. (18)

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

Agriculture accounts for approximately 21.5 percent of the country's GDP, with 40 percent of Haitians dependent on the sector (crops, livestock, and fisheries) for their income and livelihood. Most of the agricultural sector in the country consists of subsistence farming, which is particularly vulnerable to climate change. Soil erosion and flooding due to extreme rainfall events, combined with drought, have already reduced soil fertility and crop yields. Commitments from the Government of Haiti, including to strengthen agricultural policies and increase availability of funding, seek to reverse Haiti's long-term decline in the agriculture sector and ensure better nutrition nationwide. In some cases, farmer adoption of improved agricultural practices is doubling or tripling production, leading to increased incomes and greater nutrition. Further, the USAID supported Demographic Health Survey (dhsprogram.com) shows that Haiti has made significant recent gains in nutrition. Stunting rates among children have declined to 21.9 percent in 2017 and 2012, down from 29.4 percent in 2005 and 2006; rates of wasting have steadily declined from 10.2 percent in

¹ Departments are the largest of four levels of administrative divisions within Haiti.

² A "hot" day or night is defined as days where maximum temperature, or nights where minimum temperature, exceed the 90th percentile current climate of that region or season

³ Ranges are based on low projections of Representative Concentration Pathway (RCP)4.5 and high projections of RCP8.5 scenarios

⁴ With respect to 1986–2005 baseline

2005 and 2006 to 5.1 percent in 2012 and 3.7 percent in 2017; and the percent of children moderately or severely underweight sits at 9.5 in 2017, a marked reduction from the 18.5 percent in 2005 and 2006. Even with these improved practices, policies, and gains in nutrition, future climate change will likely impact both small-scale subsistence farming and larger agriculture export operations that contribute significantly to Haiti's overall GDP. If overall rainfall declines (during both rainy and dry seasons) as predicted, and as temperatures continue to rise and storms intensify, the yields of subsistence farmers will likely decrease, adversely affecting nutrition, limiting the ability of families to earn a living, and potentially impacting children's ability to attend school. Climate change could additionally impact the economic viability of export agriculture, decreasing Haiti's competitive advantage in export crops such as coffee and cacao, as well as the amount of land available for growing them. Some crops, such as mangoes, offer potential as a more prominent cash crop in Haiti, as the land is suitable for its cultivation and yields may not be compromised as much as other cash crops by long-term climate patterns. Ultimately, climate impacts across the agriculture sector, particularly on already vulnerable populations reliant on subsistence farming, could devastate Haiti's overall food and economic security without adoption of appropriate adaptation measures. (1, 2,12,17)

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Rising temperatures	Soil erosion and soil fertility loss
	Reduced crop yields
Saltwater intrusion into aquifers and cropland	Crop failure
	Storm damage to crops and livestock
Increased evapotranspiration and drought	Increased pests and pathogens
	Unpredictable growing seasons
Increased flood and storm intensity and frequency	Increased flooding and waterlogging of crops
	Decreased nutrition

DEMOCRACY, RIGHTS, AND GOVERNANCE

Numerous institutional challenges face Haiti's government at both the national and local levels, including technical capacity, financial resources, political stability, and reliable energy infrastructure, contributing to Haiti's vulnerability to climate change and extreme weather. Simultaneously, the considerable resources required for disaster recovery are often diverted from the finite resources available to support sustainable growth and development, impacting the government's capacity and focus to provide basic services, particularly in rural areas. Only 1,011 of Haiti's 4,160 kilometers of roads are paved, and though improvements have been made in recent years, only around 38 percent of the

Climate Stressors and Climate Risks DEMOCRACY, RIGHTS, AND GOVERNANCE	
Stressors	Risks
Increased temperatures and reduced rainfall	Reduced institutional capacity
	Reduced economic resources
Increased drought	Increased difficulty in enforcing land tenure regulations
Increased storm frequency, intensity, and surge	Increased pressure on basic services systems
	Damage to infrastructure

population has access to electricity. Haiti's mountainous topography also results in much of the country's agricultural production, and population centers, being located on or adjacent to fertile floodplains that are particularly susceptible to flood risk, especially when inadequate urban drainage systems are a factor. Urban populations face additional risks such as accumulated urban waste, reduced infiltration due to urbanization, and limited urban planning. Greater intensity of storms, sea level rise, and storm surge further increase the vulnerability of both those living in floodplains and urban areas. However, climate related challenges also provide opportunities to strengthen institutions. For example, in 2011 Haiti launched a program to create a network of more than 100 hydro-meteorological gauges and warning stations to reduce flooding risks by providing relevant data to inform decision making. Concentrated in the 13 catchments with the highest flood risk, these stations transmit radio signals to a central location for collection and analysis of early response information. The effectiveness of these stations is limited by government capacity for rapid response, highlighting the need for cross-cutting capacity to address climate change. Continuing to strengthen Haiti's institutions will enhance the country's ability to mobilize greater resources domestically and to manage them

transparently to provide relief to citizens during natural disaster events, as well as increase government capacity and focus on basic services, in turn decreasing overall vulnerability to the impacts of climate change. (12,13,17,18)

HEALTH

Long term changes to climate, such as increased temperatures, and shorter-term changes in variability, such as increased intensity of storms, can shift disease burdens, impact health infrastructure, and exacerbate already existing health issues in Haiti. The healthcare system currently requires significant support from international donors and will continue to be highly stressed during extreme weather events and health crises. Haiti has the lowest rates for access to clean drinking water and improved sanitation in the Western Hemisphere, and Port-au-Prince is the largest city in the world without a functioning sewage system. Flooding increases the risk of outbreaks of vector- and waterborne diseases, such as dengue fever, malaria, Zika, and cholera. Flooding also damages road infrastructure, making it difficult for much of the population to seek treatment. Furthermore, as climate and weather impact agriculture, Haiti's poor may also suffer from increased malnutrition. Strengthening both preventative and reactive healthcare systems will help improve the health sector's resilience to climate impacts (3,12).

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Potential shifts in water- and vector-borne diseases
Increased drought	Decreased nutrition and food security
Increased storm frequency and intensity	Inability for the population to access health services
Increased flood frequency and intensity	Reduced availability or increased disruption of health services
	Reduced water quality and availability

ECONOMIC GROWTH

Due to its location, fragile infrastructure and economy, and constrained—but potentially growing—institutional capacity to adapt to climate change, Haiti is highly vulnerable to climate variability and change. Frequent power outages and surges can cause serious damage to industrial equipment. Local, regional, and national government actors can face challenges launching effective relief programs or to enforce more sustainable and responsible land use policies that would reduce the impacts of flooding and storm surges on livelihoods. Additionally, economic growth activities are affected by sectoral risks resulting from climate change vulnerability. For example, underdeveloped infrastructure is vulnerable

Climate Stressors and Climate Risks ECONOMIC GROWTH	
Stressors	Risks
Increased storm frequency and intensity	Reduced export revenues from agricultural sector
Increased drought	Damage to transportation infrastructure
Increased temperatures	Damage to export infrastructure
Increased flood frequency and intensity	Decreased investor interest
	Diversion of funds to cover costs incurred during extreme weather

to damage by hurricanes; flooding often reduces access to education, increases health risks, and reduces access to basic services; and increased temperatures threaten food security. Women are especially vulnerable, as they are 20 percent more likely to be unemployed than their male counterparts in Haiti, and face additional economic barriers. At the same time, investor perception of Haitian business activities as high-risk continues to prevent critical volume of foreign direct investment from being reached. Despite these risks, important gains are being realized by the Government of Haiti. Competitive wages and tariff-free access to U.S. markets offered by the Caribbean Basin Trade Partnership Act and the 2008 Haitian Hemispheric Opportunity through Partnership Encouragement Act have had an overall positive impact on export of goods from Haiti and steadily increasing apparel exports now account for over 90 percent of Haiti's exports and 10 percent of the country's overall GDP. Haiti is also making or facilitating targeted investments in energy infrastructure, electricity transmission, agricultural productivity, small and medium enterprises, and port infrastructure. Continued pursuit and implementation of policies, initiatives, and targeted investments to

simultaneously build investor confidence and reduce vulnerability to climate risks will be essential to strengthening both Haiti’s resilience and adaptive capacity to respond to climate change. (1,12,15,17)

EDUCATION

A changing climate will place both direct and indirect stressors on Haiti’s education system. Storms and floods impact all aspects of life in Haiti and limit the ability of both students and teachers to travel to schools. As a result, school closures are common both during and after storms and flooding events, as the schools themselves may be unsafe or may serve as emergency shelters. During times of drought and economic hardship, food security issues may adversely impact student performance or attendance, and families may be unable to pay fees for school enrollment or supplies. The same can be said of heat stress in high-temperature conditions. School closures and poor attendance inhibit student engagement in activities that require a long-term

commitment, such as literacy programs. The effects of interruptions in attendance may also be felt more strongly by women, who already average two fewer years of school attendance than men and can therefore afford fewer absences. Improvements to Haiti’s education system have been identified by many parties as being necessary for success in other sectors, but the effects of economic hardship, poor infrastructure, and frequent climatic events have all slowed progress in improving the education system in Haiti (1,15,19).

Climate Stressors and Climate Risks EDUCATION	
Stressors	Risks
Increased temperatures	Health-related school absence and/or decreased performance
	Transportation-related school absence
Increased flood frequency and severity	Food security-related school absence and/or decreased performance
Increased storm frequency and severity	School closure
	Heat stress-related decreased school performance

POLICY CONTEXT

Haiti continues to struggle with developing and maintaining the institutional mechanisms and policy fundamentals required for effective adaptation to climate change. The instability and socioeconomic situation have made environmental management difficult, and Haiti’s efforts to adapt to climate change are in their infancy.

INSTITUTIONAL FRAMEWORK

In 2009, Haiti’s Prime Minister mandated the creation of the Interdepartmental Committee on Land Planning (Comité Interministériel D’aménagement Du Territoire—CIAT), to focus on government-wide coordination of land use planning, with a specific focus on climate resilience. The Ministry of the Environment (Ministère De L’environnement) manages the country’s international climate change obligations and has produced various documents for the United Nations Framework Convention on Climate Change compliance.

NATIONAL STRATEGIES AND PLANS

- [First National Communication on Climate Change](#) (2002) (French)
- [National Adaptation Plan of Action](#) (2006)
- [Strategic Program for Climate Resilience](#) (2012)
- [Second National Communication on Climate Change](#) (2013) (French)
- [Haiti – \(Intended\) Nationally Determined Contribution \(\(I\)NDC\)](#) (2016)
- [Feuille de route du Ministre de Environnement](#) (2017)

KEY RESOURCES⁵

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2. Centro Internacional de Agricultura Tropical. 2013. [Prediction of the impact of climate change on coffee and mango growing areas in Haiti.](#)
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14. The World Bank Group. 2017. [Climate Change Knowledge Portal \(Haiti\)](#)
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17. USAID. 2012. [Haiti: Climate Vulnerability Profile](#)
18. USAID. 2015. [Climate Change Information Fact Sheet: Haiti](#)
19. Singh, R.J., and M. Barton-Dock. 2015. [Haiti: Toward a New Narrative. Systematic Country Diagnostic.](#)

Map from the World Bank:

http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb_gfdr climate_change_country_profile_for_HTI.pdf

SELECTED ONGOING PROJECTS⁶

Projects below represent current or recently completed development efforts related to climate change in Haiti. Projects were selected through review of USAID, other donors, and implementing partner project databases.

Selected Program	Amount	Donor	Year	Implementer
Feed the Future	\$177 million	USAID	2009–ongoing	Chemonics
	\$88 million	USAID	2013-ongoing	DAI
Kore Lavi Program	\$80 million	USAID	2013–ongoing	CARE International

⁵ This “Key Resources” section lists works cited in preparing the Climate Risk Profile. In addition to the “Key Resources” list, data in the report was guided by information provided by USAID/Haiti.

⁶ This “Selected Ongoing Projects” section lists a selection of ongoing development projects and interventions directly or indirectly relevant to climate risk management and adaptation in Haiti. Projects were identified primarily via desk review of USAID, multi-lateral development bank, and other international donor programming. Projects listed are not meant to be comprehensive.

Pilot Project for Sustainable Electricity Distribution	\$24 million	USAID	2014–ongoing	NRECA International
HT Center and Artibonite Regional Development	\$58 million	The World Bank	2014–ongoing	International Development Association
HT Sustainable Rural and Small Towns Water and Sanitation Project	\$50 million	The World Bank	2015–ongoing	International Development Association
HT Strengthening Hydro-Met Services	\$5 million	The World Bank	2015–ongoing	International Development Association
Municipal Development and Urban Resilience Project	\$55.4 million	The World Bank	2017–ongoing	International Development Association
Rural Community-Driven Development	\$16.2 million	The World Bank	2010–ongoing	International Development Association
Résilience Aux Désastres Département Nord (Disaster Resilience North Department) (French)	\$2.4 million	UNDP	2015–ongoing	The Ministry of the Environment
Climate-Proofing of Agriculture in the Center-Artibonite Loop Area	\$4.5 million	Inter-American Development Bank	2016–ongoing	Ministry of Agriculture, Natural Resources and Rural Development
Natural Disaster Mitigation Program	\$42.8 million	Inter-American Development Bank	2016–ongoing	Ministry of Agriculture, Natural Resources and Rural Development
USAID Reforestation Project	\$40 million	USAID	2017-ongoing	Chemonics