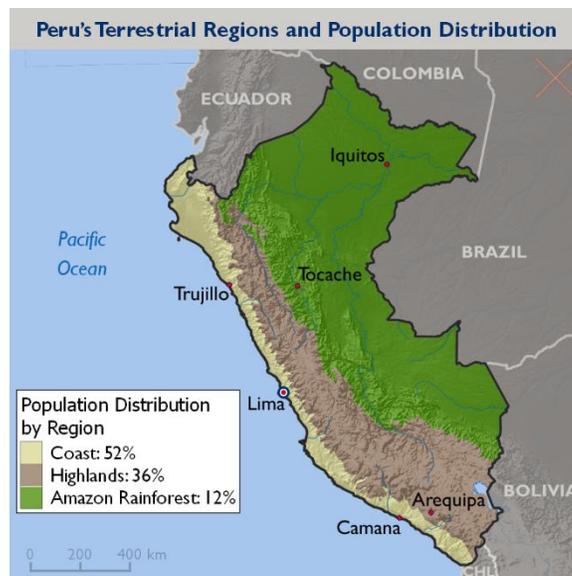


# CLIMATE CHANGE RISK PROFILE PERU

## COUNTRY OVERVIEW

Home to a wealth of natural resources, Peru has benefited from strong economic growth in recent years, managing to reduce poverty from 56 percent to 22 percent between 2005 and 2015. However, climate change will challenge Peru's development efforts, particularly among vulnerable populations and ecosystems. While Peru is considered an upper-middle-income economy, inequality is high and poverty is concentrated among rural, indigenous populations, whose food security depends upon climate conditions. More than 80 percent of farmers practice subsistence, rainfed agriculture, and changes in precipitation are increasing competition over water resources for consumption, agriculture and industry. Coastal urban populations are at risk due to sea level rise and extreme storms. The large urban poor populations of Lima, Trujillo and Arequipa are especially vulnerable because of poor-quality housing and infrastructure. Glaciers, a main water source, are melting at accelerating rates due to increasing temperatures. Peru is one of the most biodiverse countries in the world, with rich marine coastal, Andean highlands and Amazonian ecosystems, but this diversity is at risk due to changes in temperature and precipitation. Peru is susceptible to natural disasters including floods, droughts and landslides, whose frequency, severity and impacts are compounded by the El Niño Southern Oscillation and will be amplified by increased climate change and variability. Combined with ongoing problems such as agricultural expansion, deforestation, illegal mining and air and water pollution, these climate risks threaten recent advancements in Peru's development. (6, 15, 16)



## CLIMATE PROJECTIONS



2°–3°C increase in average maximum temperatures by 2065



50 cm rise in sea levels by 2100



Increased incidence of extreme weather, including droughts and floods

## KEY CLIMATE IMPACTS

### Ecosystems

Desertification and soil degradation  
Forest density loss and wildfires  
Changes in fish population/distribution



### Agriculture

Crop loss/failure  
Shifting production zones  
Reduced water and feed resources



### Water

Glacial melt; reducing storage capacity and increasing risk of flash floods  
Degradation of water quality



### Infrastructure

Damage to buildings, homes and transportation networks  
Reduced mobility of goods and services



### Human Health

Aggravation of respiratory diseases  
Increased risk from waterborne disease  
Increased range of vector-borne disease



February 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

Peru is a diverse country defined by the Andean mountain range, which runs north-south, dividing the country into three broad climatic regions:

- *Coast:* Semi-arid, subtropical desert climate along the Pacific Ocean with average annual rainfall of 150 mm. Along the southern and central coast, temperatures vary from 13°–26°C, with colder months in May and October. The north has a more semi-tropical climate and temperatures average 24°C.
- *Andean highlands:* Climate varies with elevation; traditionally, a rainy season occurs from September–March (although it can start as late as December) and a dry, cold season from May–August. Average temperatures range from 11°–18°C, and annual rainfall from 50–1000 mm, with drier conditions along the southwest and wetter conditions along the east. The northern Andes are subject to frosts, while the southern Andes are drought-prone.
- *Eastern lowlands and Amazon rainforest:* A tropical climate, with high temperatures and rainfall throughout the year. Average temperatures range from 22°C in the eastern Andes to 31°C in the Amazon, with annual rainfall from 1,000–3,000 mm. (6)

### HISTORICAL CLIMATE

Key climate changes since the 1960s include:

- Increase in average temperatures of 1°C.
- Decreased number of cold days and nights; increased number of warm days and nights.
- Increased precipitation along the coast and northern mountains, coupled with increased intensity and frequency of rainfall events.
- Decreased rainfall in the northern rainforests, and decreased intensity and frequency of rainfall events in the central highlands.
- Greater recurrence of dry spells and droughts in central and southern highlands and rainforest.
- Number of intense rainstorms, mudflows and forest fires more than doubled in the past 10 years and floods have increased by 60 percent since 1970. (4, 5, 8, 13, 14)

### FUTURE CLIMATE

Projected changes in climate include:

- Increases in average maximum temperatures of 2°–3°C and of average minimum temperatures by 4°–6°C by 2065, with warming occurring more rapidly along the coast and in the southeastern highlands.
- Rainfall is expected to increase along the coast, but projected changes in rainfall in the highlands and Amazon vary, with some models suggesting increases and others decreases.
- Sea level rise of more than 0.5 meters by 2100.
- Increase in the frequency and intensity of natural disasters such as floods and droughts. (5, 6)

## SECTOR IMPACTS AND VULNERABILITIES

### WATER RESOURCES

Peru is home to 71 percent of the world’s tropical glaciers, which supply water to local (mainly rural) populations. However, since 1970 glacial volume has diminished by 40 percent, reducing freshwater in water-scarce coastal zones. Glaciers play an important role in the hydrology of the Andes by storing water in the rainy season and releasing it throughout the year. For example, in the Santa River, glaciers contribute 80 percent to river flows during the dry season (up from 4–8 percent during the rainy season). However, when rising temperatures accelerate glacial retreat, too much water is released during the rainy season (causing flooding) and not enough during the dry season (limiting water availability for irrigation and consumption). Energy production is at risk from

changing hydrological dynamics, as 52 percent of the country’s energy is currently generated by hydropower from the Cañon del Pato, Mantaro and Urubamba river basins, which are all fed to some degree by retreating glaciers.

(3, 11, 12, 14)

Climate Stressors and Climate Risks	
WATER RESOURCES	
Stressors	Risks
Increased temperatures	Accelerated glacial melt and reduced long-term access to water for irrigation, drinking and sanitation, agriculture and industry
	Increased water loss from evaporation, especially along coast
Increased frequency of intense precipitation	Damage to water storage and distribution systems
	Reduced hydropower potential

## ECOSYSTEMS

Peru's mountainous, rainforest and coastal ecosystems are extremely vulnerable to climate change as they are highly adapted to specific climatic conditions that vary little from year to year. Temperature increases are forcing lower-elevation ecosystems to move higher, encroaching upon endemic species and ecosystems and increasing risk of extinction of high-mountain species, such as the Andean mountain cat and Andean condor. Upward migration of forests is estimated to be more than 9 meters in altitude per year. Peru's rainforest covers 74 million hectares, and in addition to its high biodiversity is a rich resource for rubber, cashew and timber. Wide fluctuations in rainfall leave forests more susceptible to disease and fires, while higher temperatures shift agriculture into forested areas. Along the coast, fish populations are highly sensitive

## AGRICULTURE AND PASTORALISM

Agricultural production in the highlands and along the coast is sensitive to changes in temperature and precipitation. Sixty-four percent of farmers live in the Andean region, implementing subsistence, rainfed methods to grow traditional crops like potatoes, quinoa and maize. Increased temperatures have introduced pests such as the Andean potato weevil. In response, over the past 30 years farmers have cultivated at increasingly higher elevations, exposing crops to shorter growing seasons and more snowstorms, floods and droughts. Agriculture along the coast consists of intensively grown export crops that are threatened by increased water scarcity, drought and salinization. The majority of pastoralism occurs in the mountain and high-elevation jungle areas and is a key food and income source for rural communities. Already inhibited by low productivity, livestock production is further

## INFRASTRUCTURE

Peru's infrastructure is highly vulnerable to climate variability. Floods and resulting mudslides weaken transportation infrastructure (only 13 percent of roads are paved) and can devastate the urban poor population's housing, which is constructed on unstable slopes. Natural disasters also affect tourism infrastructure: road closures impede access to isolated heritage sites such as Machu Picchu, and heavy rains destroy cultural sites, including Chan Chan and other pyramidal structures along the coast. Sea level rise damages coastal infrastructure and can limit access to ports. (1, 7, 14)

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Increased temperatures	Forced migration to higher elevations, threatening endemic species
Higher rainfall variability	Reduction of rainforest density and diversity; increased incidence of wildfires and disease
Increased frequency of extreme events	Changes in fish population and distribution, especially anchovies
	Increased desertification and erosion along coast and in rainforest

to fluctuations in currents and sea surface temperatures. In strong El Niño years, warm surface waters decimate marine populations – especially anchovy, upon which 75 percent of Peru's fishing industry is based. (2, 6, 11)

Climate Stressors and Climate Risks AGRICULTURE and PASTORALISM	
Stressors	Risks
Increased temperatures	Reduced yields and increased incidence of diseases and pests
Rising sea level	Reduced soil moisture; increased desertification and salinization along coast (degrading soil)
Higher rainfall variability; increased drought conditions	Expansion of cultivation to highlands; deforestation and increased risks to farmers
	Scarce water resources for rainfed and irrigated crops
Increased frequency of intense precipitation	Loss of pasture lands and water resources for livestock
	Increased incidence of floods and landslides, damaging crops and increasing soil erosion

threatened by climate variability that limits fodder and water resources and expands agriculture production into high-altitude areas. (6, 8, 10, 13)

Climate Stressors and Climate Risks INFRASTRUCTURE	
Stressors	Risks
Increased frequency of intense precipitation	Increased damage to physical infrastructure along mountain and coastal regions
	Decreased mobility of people and goods due to road closures
Increased frequency of extreme events	Reduced tourism potential due to limited access and damage to heritage sites
	Damage to coastal infrastructure and reduced access to ports

## HUMAN HEALTH

As temperatures rise, vector-borne diseases such as malaria, yellow fever and dengue spread across tropical zones in the Amazon and along the northern coast. Dengue, originally found in only 3 departments in 1990, spread to 18 by 2013. By 2070 approximately 25 million people are projected to be at risk of malaria. Greater frequency of severe storms and floods increases the likelihood of the spread of cholera and other diseases caused by poor sanitation. One study showed a 47.5 percent increase in acute diarrhea cases in Lima during the 1997–98 El Niño event. Andean populations are also prone to respiratory infections, which are the principle cause of death for children under five years and are exacerbated by higher temperatures. (6, 9, 14)

## POLICY CONTEXT

### INSTITUTIONAL FRAMEWORK

The Ministry of the Environment, created in 2008, defines national objectives, priorities and standards through the National Environment Policy. The Director General of Climate Change, Desertification and Water Resources (DGCCDRH) sits under the Vice Ministry of Strategic Development of Natural Resources; it is in charge of guiding climate change management, drafting the National Climate Change Strategy, implementing carbon management policies, and presiding over the National Committee on Climate Change. (6)

Other key institutions include the Secretariat of Disaster Risk Management and the National Meteorology and Hydrology Service, which manages climate stations. The Ministry of Economy and Finance mobilizes funds for mitigation and adaptation. (6, 12)

### KEY RESOURCES

1. CIA World Factbook. n.d. [Peru](#).
2. Convention on Biological Diversity. n.d. [Peru Profile](#).
3. Fraser, A. 2006. [The Cost of Climate Change: Peru feels the heat of global warming](#).
4. Gloor et al. 2013. [Intensification of the Amazon hydrological cycle over the last two decades](#).
5. Government of the Republic of Peru. 2010. [Segunda Comunicación Nacional del Perú](#).
6. Government of the Republic of Peru. 2016. [Tercera Comunicación Nacional del Perú](#).
7. Hathaway, B. 2009. [Endangered Site: Chan Chan](#).
8. Inter-American Development Bank. 2014. [La Economía del Cambio Climático en el Perú](#).
9. Lozada, L.I. 2016. [Peru adapts to dangerous levels of UV radiation brought on by Climate Change](#).

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Expansion of range of vector-borne diseases (e.g., malaria, dengue, chikungunya, Zika, chagas and leishmaniasis)
Increased rainfall variability and frequency of intense rainfall	Increased incidence of waterborne diseases such as diarrhea, cholera and dysentery
	Aggravation of respiratory diseases caused by air pollution (indoor in rural areas and outdoor in urban areas)

### NATIONAL STRATEGIES AND PLANS

- Peru has three United Nations Framework Convention on Climate Change (UNFCCC) communications: [Initial National Communication](#) (2001); [Second National Communication](#) (2010); and [Third National Communication](#) (2016)
- [Mitigation and Adaptation Action Plan on Climate Change](#) (2010)
- [National Climate Change Strategy](#) (2014)
- Other sectoral strategies include: [National Risk and Adaptation Management Plan on Climate Change in the Agricultural Sector 2012–2021](#) (2012); [National Energy Policy 2014–2025](#) (2014); and [National Plan for Risk and Disaster Management 2014–2021](#) (2014)
- [Law 27867](#) requires that each regional government develop a regional climate change strategy

10. Ortiz, F. 2014. [Climate Change Threatens Quechua and their Crops in Peru's Andes](#).
11. UNEP. n.d. [Outlook on climate change adaptation in the Tropical Andes mountains](#).
12. UNDP. 2013. [Cambio Climático puede poner en riesgo el progreso en el desarrollo humano del Perú](#).
13. UNDP. 2014. [Cambio Climático y Territorio: En Busca de Sostenibilidad para el Desarrollo Humano en el Perú](#).
14. USAID. 2011. [Peru Climate Change Vulnerability and Adaptation Desktop Study](#).
15. World Bank. n.d. [Data: Peru](#).
16. World Food Programme. n.d. [Country Page: Peru](#).

Map: Data from [Second National Communication](#) and the Government of Peru. 2015. [Climate and Geography](#).

## SELECTED ONGOING EXPERIENCES

Selected Program	Amount	Donor	Year	Implementer
Support for Decentralization for the Conservation of Community Forests	\$5.5 million	GIZ	2014–2018	Ministry of the Environment
Co-Management Amazonas Peru	\$5.5 million	GIZ	2013–2017	Ministry of the Environment
Integrated financial management of climate risks in agricultural sector	\$5.5 million	GIZ	2014–2019	Ministry of Agriculture and Irrigation
Climate change adaptation and disaster risk management in Ica and Huancavelica	\$5.6 million	GIZ	2011–2016	National Center for Disaster Risk Estimation, Prevention and Reduction
Public Investment and Climate Change Adaptation (IPACC)	\$5.5 million	GIZ	2015–2019	Ministry of Economy and Finance
Sustainable use and protection of natural resources in Peru	\$22.3 million	GIZ	2013–2017	Peruvian Agency of International Cooperation
Adaptation of water resource management in urban areas to climate change	\$4.8 million	GIZ	2014–2019	National Water Authority
Forest Investment Program	\$55.5 million	World Bank, IDB	2015–2021	Ministry of the Environment
Second Disaster Risk Management Development Policy Loan	\$400 million (loan)	World Bank	2015–2018	Ministry of Economy and Finance
Strengthening Sustainable Management of the Guano Islands, Isles and Capes National Reserve System Project	\$15.9 million	World Bank	2013–2019	Peruvian Trust Fund for Protected Areas
Andean Forest Program	\$6.4 million	SDC	2014–2018	Helvetas Peru
Climate Services and Decision Support in the Andes	\$4.6 million	SDC	2016–2018	Meteorological and Hydrological Service of Peru
Risk management and productive use of water from melting glaciers	\$5.1 million	SDC	2015–2018	Care International
Climate Change Adaptation Program	\$5.6 million	SDC	2013–2016	Helvetas Peru
Strengthening Coordination of National Climate Change Program	\$2.9 million	SDC	2011–2017	Ministry of the Environment
Adaptation to Impacts of Climate Change on Peru's Coastal Marine Ecosystem and Fisheries	\$10 million	Adaptation Fund, IDB	2016–2020	Ministry of Production
Sustainable Economic Development and Strategic Management of Natural Resources	\$21.1 million	BTC	2012–2018	Ministry of the Environment
REDD+ Programme	\$37 million	World Bank, FCPF, IDB, GIZ, among others	Ongoing	Ministry of the Environment
Peru Environmental Management and Forest Governance Support Activity	\$27.7 million	USAID	2011–2016	Chemonics International