

# CLIMATE RISK PROFILE GEORGIA

## COUNTRY OVERVIEW

Located in the South Caucasus region, Georgia is a lower-middle-income country rich in natural resources and highly dependent on tourism, both of which are threatened by climate variability and change. Tourism is one of the fastest growing economic sectors (contributing 23 percent of GDP and 20 percent of employment), and the country's popular skiing, hiking and beach destinations are under increasing threat from natural disasters. The latest large-scale natural disaster occurred in Tbilisi in June 2015, when heavy rainfall triggered landslides, resulting in economic losses of approximately \$100 million. Droughts occur less frequently than floods, but induce greater economic losses, such as the 2000 drought that inflicted \$460 million worth of damage on the agriculture sector. Climate change is expected to exacerbate the frequency, intensity and severity of such events. Rising temperatures and unpredictable seasonal rains have negative implications for Georgia's agriculture sector, which employs 50 percent of the population and is a livelihood source for the majority of the country's poor. Advances in energy production are at risk from climate impacts such as reduced river flows that impede hydropower productivity and landslides that disrupt supply. Georgia has the largest glaciated area and greatest number of glaciers in the Caucasus region, several of which have retreated dramatically since 1974. Glaciers are an important source of water, and rising temperatures threaten the country's water security. (1, 4, 10, 12)



## CLIMATE PROJECTIONS



0.8°–1.4°C increase in temperatures by 2050



Increased unpredictability and intensity of seasonal rains



Increased incidence of natural disasters such as landslides, mudslides, floods and droughts

## KEY CLIMATE IMPACTS

### Agriculture

Shifts in production zones  
Crop loss in extreme events  
Introduction of new pests/diseases



### Water

Accelerated glacial melt, altering river flows and water availability  
Damage to water infrastructure



### Human Health

Increased incidence of heat-related issues  
Exacerbation of existing diseases  
Risk of spreading vector-borne disease



### Energy

Decreased hydropower potential  
Damage to energy infrastructure, interrupting services



### Tourism

Losses to key tourist centers, particularly ski resorts, beaches, and hiking and birdwatching destinations



### Ecosystems

Displacement/migration of species  
Shift/reduction in forest cover  
Introduction of new pests/diseases



May 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

Georgia encompasses a variety of climate zones (around 20 are identified in the literature), from humid subtropical to permafrost, distributed along an east/west axis separated by the Likhi Mountains in the center of the country. Generally speaking, the climate in the west, modulated by the Black Sea, is characterized by mild winters, hot summers and heavy precipitation; average annual temperatures are between 9°–14°C, with precipitation ranging from 900–2300 mm. The Alpine mountain regions are generally colder: average temperatures are between 2°–10°C and annual precipitation ranges between 1200–2000 mm. The climate in the east includes the eastern plains, with a dry subtropical climate in the lowlands, where 400–600 mm of rain fall per year and annual temperatures range between 11°–13°C. (4, 6, 8, 9, 10)

### HISTORICAL CLIMATE

Climate trends observed since the 1960s include:

- Increased temperatures in the west by 0.3°C, and by 0.4°–0.5°C in the east.
- Increase in the number of hot days, particularly in the lowlands. Number of dangerously hot days in Tbilisi increased 14 days (1986–2010).
- Increased precipitation in the west (the mountain areas of Svaneti and Adjara both saw increases of 14 percent); decreased precipitation along the Likhi Ridge and to the east.
- Decrease in glacier mass by 30 percent.
- Increased number of extreme events such as extreme precipitation, which cause landslides, mudflows and droughts; as well as more frequent floods in the west.

### FUTURE CLIMATE

Projected climate changes include:

- Increased average annual temperatures by 0.8°–1.4°C by 2050 and 2.2°–3.8°C toward 2100; greatest increase in northwest mountains.
- Precipitation data less certain, but general increase expected up to 2050, and potential decreases of up to 24 percent by 2100.
- Increased amount and intensity of daily rainfall, leading to increased risk of flash floods, mudflows and landslides.
- Increase in the number of hot days (which may double in some mountain areas) and more frequent heat waves June–August.
- Decrease in both days and nights with frost.
- Complete loss of Georgia’s 637 glaciers projected by 2160 due to higher temperatures.

## SECTOR IMPACTS AND VULNERABILITIES

### AGRICULTURE

While the contribution of agriculture to GDP declined over the past decade (currently at 9 percent), Georgia is still largely dependent on this climate-sensitive sector for employment and livelihoods. Over 50 percent of the population is employed in agriculture, concentrated in poor and rural communities. Climate dynamics already exacerbate soil erosion and damage crops through heavy precipitation events, flooding and land- and mudslides. Additionally, periodic droughts wreak havoc on yields; the severe drought of 2000 caused wheat yields to decline by 56 percent compared to the previous year. Changes in evaporation and runoff are projected to reduce maize and wheat yields by 5 percent by 2050. Temperature increases will have varying impacts: higher altitudes will be able to support a wider range of crops and enjoy a longer growing season (as is the case for potential yield increases in corn, tomato and wheat in the eastern mountain region); however, higher

temperatures may translate into decreased yields in the rest of Georgia. Higher temperatures can also increase the spread of crop diseases, particularly for citrus crops. As climate change shifts agroclimatic zones to higher elevations, production can increase, but this also leads to increased deforestation and land degradation. (4, 7, 9, 10)

Climate Stressors and Climate risks AGRICULTURE	
Stressors	Risks
Increased temperatures	Increased risk to crops from rains that bring floods, landslides and mudslides
Changes in precipitation patterns	Reduced yields (except in eastern mountain regions where yields may increase)
Increased incidence of extreme weather events	Increase in variety and range of pests and diseases, especially in citrus plantations
	Shifts in production zones
	Increased erosion and degradation of limited arable land

## WATER RESOURCES

Georgia is rich in water resources and unlikely to face shortages under a changing climate, although changes in glacial melt and precipitation will affect water availability, while higher temperatures will increase water demand, particularly for irrigation. Flows of glacier-/snow-fed river basins such as Khrami-Debed and Alazani are projected to decrease about 30 and 55 percent respectively by 2100, while higher temperatures will alter the seasonality of river flows. For example, the Acharistskali River will see decreased March–August flows, limiting water for irrigation. (5, 9)

## HUMAN HEALTH

The frequency of extreme daily temperatures and heat waves has increased in Georgia, leading to immediate health concerns such as heat stroke and exacerbating existing health issues among people with cardiovascular or chronic respiratory diseases. Higher temperatures increase the incidence of vector- and waterborne diseases. For example, the number of cases of malaria in Georgia increased 30-fold from 1998–2002, and the incidence of diarrheal diseases in Adjara (vulnerable to flooding) rose 211 percent from 1990–2010. (4, 5, 9, 13)

## ENERGY

Over 80 percent of Georgia’s electricity comes from hydropower, which can be vulnerable to climate variability and change. Hydropower generation is partially driven by glacier-fed rivers (Inguri and Rioni) originating in the Greater Caucasus Mountains, runoff from which is projected to decrease 13 percent by 2100. Periodic droughts also negatively impact hydropower generation – the 2000 drought reduced energy generation by 20 percent and caused power shortages throughout the country. Additional stress factors include extreme events, such as the landslide on the Georgia-Russia border that caused major damage to the critical North-South gas pipeline in 2014. (1, 2, 4, 9, 11)

## TOURISM

Tourism, one of the fastest growing economic sectors in Georgia (contributing 23 percent to GDP), is dominated by climate-dependent activities. Shorter winter seasons and declining snow cover already affect popular alpine ski resorts like Bakuriani and Gudauri. Popular hiking and trekking destinations in the Upper Svaneti frequently experience avalanches due to intense rainfall, while Adjara, a popular beach destination, suffers from mudslides and landslides that disrupt transport and other services. (4, 9)

Climate Stressors and Climate risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Accelerated glacial melt, altering river flows and water availability
Increased rainfall variability	Changes in the distribution of flows, decreasing irrigation water available in the spring/summer
	Increased water requirements for crops (winter wheat and pasture)
Increased incidence of extreme events	Extensive damage to water infrastructure from flash floods and land- and mudslides

Climate Stressors and Climate risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Increased incidence of heat stroke, heat exhaustion, heat cramps and skin rash
Increased incidence of heat waves	Aggravation of cardiovascular and respiratory diseases, especially among the elderly
	Increase in incidence of vector- and waterborne diseases

Climate Stressors and Climate risks ENERGY	
Stressors	Risks
Increased temperatures	Increased energy demand in summer months
Changes in precipitation patterns	Altered river flows, increasing hydro production in winter due to increased temperatures/higher flows
	Decreased hydropower potential overall due to rainfall variability and higher evaporation rates
Increased incidence of extreme weather events	Damage to energy infrastructure, which reduces and disrupts production and can prevent energy delivery

Climate Stressors and Climate risks TOURISM	
Stressors	Risks
Increased temperatures	Altered bird migration patterns, affecting birdwatching tourism
	Decreased snow cover in mountains and ski resorts
Increased incidence of extreme weather events	Increased risk of avalanches, mudslides and landslides in popular tourist attractions

## ECOSYSTEMS

Georgia's unique ecosystems and biodiversity, including many rare and endemic species, are under threat from climate change. Georgia has the highest forest cover in South Caucasus, at almost 40 percent. Rising temperatures have increased the spread of endemic diseases (such as bark beetle) and introduced new diseases, such as box-fungal disease, which is present in up to 60 percent of forests in some protected areas and national parks. Higher temperatures have also increased the risk of wildfires in some areas. Long-term changes could include a decline in current birch forests and a gradual conversion to more open-arid forest ecosystems such as spruce and pine. (4, 8, 9)

Climate Stressors and Climate risks ECOSYSTEMS	
Stressors	Risks
Increased temperatures	Shift in forests to higher altitudes; reduced forest cover, increasing erosion and risk of landslides
Changes in precipitation patterns	Introduction of new diseases and pests in Adjara and Borjomi
Increased incidence of extreme weather events	Increased incidence of wildfires and droughts in Borjomi
	Displacement and migration of species, especially in Mestia

## POLICY CONTEXT

### INSTITUTIONAL FRAMEWORK

After disintegration of the Soviet Union, Georgia restored political independence and charted a course toward European integration that included reforms in many areas, including climate change. Today, the Ministry of Environmental Protection and Natural Resources of Georgia is responsible for climate change, environmental protection and sustainable use of natural resources. The Service for Climate Change within the Ministry is responsible for the assessment of impacts and risks of climate change, and coordinates the preparation of adaptation strategies and action plans and their implementation. The role of departmental ministries (Energy, Agriculture, Labor, Health and Social Affairs) is key for the assessment of various sectors' vulnerability to climate change for the process of preparation of adaptation measures.

Georgia actively cooperates at a regional level with Azerbaijan, Moldova and Armenia on climate change issues, and is involved in EU ClimaEast project implementation together with Azerbaijan, Belarus, Moldova, Russia, Armenia and Ukraine. (3, 5, 10)

### NATIONAL STRATEGIES AND PLANS

- [Georgia's Third National Communication to the UN Framework Convention on Climate Change](#)
- [National Climate Vulnerability Assessment](#) – produced with EU assistance, provides recommendations to civil society and decision makers on possible approaches to take toward climate change adaptation
- [Strategy for Agriculture Development for 2015–2020](#)

## KEY RESOURCES

1. CIA World Factbook. n.d. [Georgia Country Profile](#).
2. European Bank for Reconstruction and Development. 2009. [Georgia Country Profile](#).
3. European Union. 2015. ClimaEast. [Georgia Work Programme](#).
4. Ministry of Environment and Natural Resources. 2015. [Georgia's Third National Communication to the UNFCCC](#)
5. Rukhadze, Anna, et al. n.d. [National Climate Vulnerability Assessment](#).
6. UNDP. 2011. Regional Climate Change Impacts Study for the South Caucasus Region.
7. UNDP. 2014. [Climate Change and Agriculture in Kakheti Region](#).
8. UNDP. 2014. [Upper Svaneti Adaptation Strategy to the Climate Change](#).
9. UNEP. 2015. [Outlook on climate change adaptation in the South Caucasus mountains](#).
10. University of Gothenburg. 2009. [Georgia Environmental and Climate Change Policy Brief](#).
11. USAID. 2016. [The Georgian Roadmap on Climate Change Adaptation](#).
12. World Bank. 2006. [Drought: Management and Mitigation Assessment for Central Asia and the Caucasus](#).
13. WWF. 2008. [Climate Change in Southern Caucasus](#). Map adapted from Ministry of Environment and Natural Resources. 2015. [Georgia's Third National Communication to the UNFCCC](#).

## SELECTED ONGOING EXPERIENCES

Georgia is mostly dependent upon donor support for its climate actions, with the majority of activities focused on climate mitigation measures, such as lowering greenhouse gas emissions, developing renewable energy sources, and increasing energy efficiency.

Selected Program	Amount	Donor	Year	Implementer
Developing Climate Resilient Flood and Flash Flood Management Practices to Protect Vulnerable Communities of Georgia	\$5.3 million	The Adaptation Fund	2012–2016	UNDP
Institutionalization of Climate Change Adaptation and Mitigation in Georgian regions	\$1.2 million	USAID	2012–2016	NALAG (National Association of Local Authorities of Georgia)
Enhancing Capacity – Low Emission Development Strategy	\$6 million	USAID	2013–2017	Winrock International
Waste Management Technologies in Regions (WMTR)	\$5 million	USAID	2014–2018	International City/county Management Association (ICMA)
Promotion of Biomass Production and Utilization in Georgia	\$5.3 million	GEF	2013–2016	Ministry of Environmental Protection and Natural Resources of Georgia
Climate Policy as an Impetus for Modernizations in East and Southeast Europe	N/A	European Green Party	2014–2018	Heinrich Boll Foundation