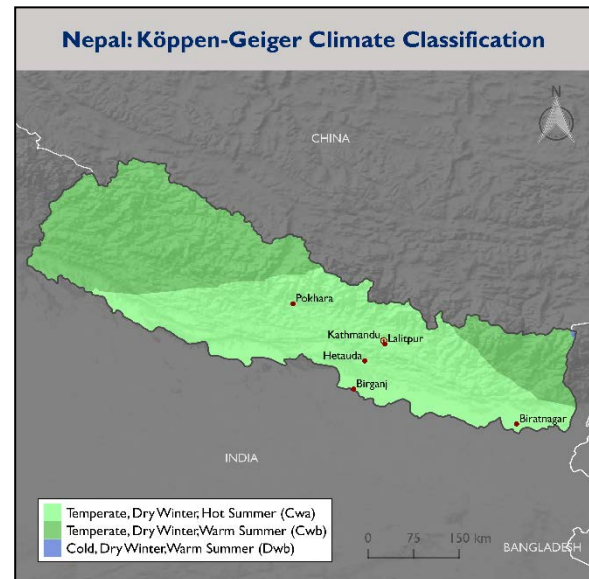




CLIMATE RISK PROFILE NEPAL

COUNTRY OVERVIEW

A landlocked country located in the Himalayan mountain range, Nepal is one of the world's poorest developing countries, with a quarter of its population living in poverty. It is highly vulnerable to climate change and has already experienced changes in temperature and precipitation at a faster rate than the global average. Impacts from these changes will have wide-ranging consequences. Nepal is exposed to a range of water-related hazards, including floods and landslides. These hazards are often triggered by rapid snow- and ice-melt in the mountains and extreme, torrential rainfall episodes in the foothills during the monsoon season. The estimated costs of such events have been large, equivalent to approximately 1.5 percent of current GDP per year. Despite growing urbanization, 83 percent of Nepal's population of 28 million live in rural areas. Agriculture provides a livelihood for almost two-thirds of the population and accounts for 33 percent of Nepal's GDP (\$21 billion). Millions of Nepalese are estimated to be at risk from the impacts of climate change including reductions in agricultural production, food insecurity, strained water resources, loss of forests and biodiversity as well as damaged infrastructure. (Citations: 8, 10, 11, 12, 14, 15, 21, 22, 27, 28)



CLIMATE PROJECTIONS



1.6 - 2.2° C increase in temperatures by 2050



3.9 - 5.1% increase in annual precipitation by 2050; Increase in consecutive dry days



35 - 52% increase in extreme rainfall events by 2050

KEY CLIMATE IMPACTS

Infrastructure

Damage to water and energy facilities
Damage to roads and bridges

Ecosystems

Loss of forest habitats and biodiversity
Reduced wetlands
Increased erosion of hillslopes

Agriculture

Reduced crop yields
Increased food insecurity
Damage to crops and livestock

Human Health

Increased risk of injury/death
Increased incidence of diseases
Increased risk of heat stroke

Water Resources

Reduced water supply
Decline in water quality
Reduced hydropower potential

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CLIMATE SUMMARY

Nepal's climate is influenced by its varied topography, with high elevation Himalayan Mountains in the north, low-lying Gangetic plains in the south and the east west progression of the summer monsoon. The average annual temperature is 12.4°C (1960-2015), ranging from 25°C in the lowlands to -1°C at high altitudes. Precipitation is driven by the monsoons between June and September, when 75 - 80 percent of rainfall occurs. There is a high degree of spatial rainfall variability across the country; the annual precipitation varies from less than 200 mm for the driest regions (Mustang, Manang and Dolpa) to above 5,000 mm near the Lumle region. Average annual precipitation is 1,311 mm (1960-2015), peaking around 330 mm in July and falling to below 50 mm per month from November through April. (2, 3, 6, 16, 17, 18, 20, 27, 28)

HISTORICAL CLIMATE

Climate trends since 1960 include:

- Average annual temperature from 1960-2015 exhibits an increasing trend of 0.12°C per decade.
- Between 1960-2003, a 2.5 percent increase in the number of “hot”¹ nights and an 8.7 percent decrease in “cold” nights occurred.²
- Droughts are becoming more frequent, particularly during the dry season.
- More precipitation falling as rain rather than snow.
- Between 2003-2009, the Himalayan glaciers lost around 174 gigatons of water.
- Increased incidence of Glacier Lake Outburst Floods (GLOFs).

FUTURE CLIMATE

Projected changes by 2050 include:³

- Average annual temperature projected to increase by between 1.6 and 2.2°C.
- All projections indicate increased frequency of “hot” days and nights; decreases in “cold” days and nights.
- Average annual rainfall projected to increase 3.9 to 5.1 percent; largest increases July-September.
- Number of consecutive “dry” days projected to increase by 3 to 7 percent.⁴
- Extreme rainfall projected to increase by 35 to 52 percent.⁵
- Dry season projected to be drier and monsoon season wetter.
- Glacial melt projected to increase.

SECTOR IMPACTS AND VULNERABILITES

INFRASTRUCTURE

In recent years, Nepal has experienced an increase in soil erosion, landslides and flash floods across the country. Extreme weather events are projected to increase in intensity and frequency, damaging homes and infrastructure, including roads, bridges, hydropower plants and public buildings, including schools. Impacts are expected to be concentrated around urban settlements, water resources and energy infrastructure. Rising temperatures in the Himalayas can also result in GLOFs, which can trigger flash floods of debris and water from high elevations to downstream communities, damaging infrastructure and causing property loss. (1, 27, 28)

Climate Stressors and Climate Risks INFRASTRUCTURE	
Stressors	Risks
Increased frequency of extreme storms	Damage to human settlements
	Increased risk of injury or death
	Displacement of populations
Increased temperatures	Damage to buildings and schools
	Damage to roads, bridges and transportation
Increased GLOFs	Damage to water and energy supply systems

¹ “Hot” day or night is defined by the temperature exceeded on 10% of days or nights in current climate of that region or season (for further reference, see McSweeney, C. under Key Resources).

² “Cold” day or night is defined by the temperature below which 10% of days or nights are recorded in current climate of that region or season (for further reference, see McSweeney, C. under Key Resources).

³ Relative to data from 1986-2015.

⁴ Maximum number of consecutive days per year with less than 1 mm of precipitation.

⁵ Annual total precipitation when daily precipitation exceeds the 99th percentile of wet days (calculated from days when it precipitated at least 1 mm).

ECOSYSTEMS

Nepal's changing climate impacts the country's main ecosystems (forests, grasslands, rangelands, wetlands, mountains and agro-ecosystems). Increasing temperatures and rainfall variability have resulted in shifts in agro-ecological zones, prolonged dry spells and higher incidence of pests and diseases. An increase in the frequency and intensity of droughts can lead to forest fires; in 2016, fires impacted 50 districts and damaged 12,000 community forests. Due to increasing drought, wetlands (especially in the Terai) have been depleted, resulting in destruction of aquatic plants and fish. Many species are at risk of losing habitat and water sources; some species may migrate

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Rising temperatures	Increased incidence of pests and diseases
Reduced rainfall	Increase in forest fires
	Increased erosion of hillslopes
Increased drought conditions	Depletion of wetlands and reduced fish stocks

through fragmented landscapes, while others will be unable to do so. (5, 9, 10, 13)

AGRICULTURE

Agriculture is a source of both income and food security, and yet due to Nepal's topography, only 17 percent of total land area is suitable for agriculture. The most productive agricultural areas are in the floodplains of the Terai, which are vulnerable to floods and river bank cutting. Most agricultural area is rainfed (75 percent) and is affected by droughts, floods and monsoon rainfall, which reduce crop and livestock production. Droughts are becoming more frequent, particularly during the winter months and in the western Terai plains due to the late arrival of monsoons. Rice yields are particularly sensitive to climatic conditions and may decline in this region, threatening food security. (9, 13, 15, 19, 27, 28, 29)

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Increased temperature	Increase in soil erosion
	Increase in pests and disease
Changes in seasonality of precipitation	Reduced crop yields
	Damage to crops and livestock
Increased drought	Increase in food insecurity
Increased storms	Loss of employment

HUMAN HEALTH

Health risks from climate change range from heat stress to increases in vector-borne and waterborne diseases. Increasing temperatures can result in more frequent and intense heat waves, affecting vulnerable groups such as the elderly. Water-related hazards from extreme weather can cause injury or death; on average, floods and landslides claim the lives of 200 Nepalese every year. As the rate of glacier melting increases, GLOFs pose a high risk to mountain settlements, often destroying entire communities. Increased temperatures and altered rain patterns can lead to waterborne infectious diseases such as cholera. Outbreaks of vector-borne diseases such as Japanese encephalitis and malaria in Nepal have been specifically linked to rainfall. Distributions of vector-borne diseases are

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Increased incidence of heat stress
Reduced rainfall and increased drought	Increased incidence of vector-borne diseases (malaria, Japanese encephalitis, kala-azar)
	Increased incidence of waterborne diseases (cholera, diarrhea)
Increased storms	Increased incidence of injury from flooding

expected to shift into highland areas, putting more people at risk. (10, 15, 24, 25, 26)

WATER RESOURCES

While the impact of climate change on water resources is unclear due to the uncertain behavior of glaciers, projected reductions in winter snow could reduce snowmelt levels during the spring and summer; increasing temperature could also result in greater winter runoff, thereby affecting water resources. The hydrology of Nepal is primarily monsoon-driven, with most rainfall occurring during the months of June - September. This variability of rainfall and runoff can lead to excess water during the monsoon season and water scarcity during the dry season. Droughts are becoming more frequent, which can impact agricultural productivity and

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Increased water stress for agriculture and households
Changes in seasonality of precipitation	Decreased surface water and groundwater recharge
	Reduced water quality
Increased drought	Reduced hydropower potential

hydropower potential, and lead to water shortages for domestic supply. (3, 9, 10, 27, 28)

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

Climate change adaptation is at the center of Nepal's development plans and policies. The Ministry of Population and the Environment (MOPE) is the country's climate change focal point. In 2011, Nepal created a Climate Change Policy, the centerpiece of Nepal's response to climate change; several related efforts complement it, including Nepal's National Adaptation Programme of Action (NAPA), focused on addressing the most urgent and immediate adaptation needs. To help implement its NAPA, Nepal has also developed Local Adaptation Plans for Action (LAPAs), focused on municipal and village adaptation plans, as well as Community Adaptation Plans of Action (CAPAs). In 2016, Nepal submitted its Intended Nationally Determined Contributions (INDC) to the UNFCCC. (8, 12, 23)

NATIONAL STRATEGIES AND PLANS

- [INDC \(2016\)](#)
- [Second National Communication \(2014\)](#)
- [Biodiversity Strategy and Action Plan \(2014-2020\)](#)
- [National Framework on LAPAs \(2011\)](#)
- [Climate Change Policy \(2011\)](#)
- [NAPA \(2010\)](#)
- [Initial National Communication \(2004\)](#)

KEY RESOURCES

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26. WHO. 2015. [Climate and Health Country Profile: 2015 Nepal](#).
27. World Bank. 2011. [Climate Risk and Adaptation Country Profile](#).
28. [World Bank Climate Change Knowledge Portal \(CCKP\)](#).
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- Map source: Adapted from [Koppen-Geiger Classification information](#)

SELECTED ONGOING EXPERIENCES

Selected Program	Amount	Donor	Year	Implementer
Building Resilience of Health Systems in Asian LDCs to Climate Change (Regional project)	\$44 million	GEF	2017-2021	UNDP/WHO
Reducing Vulnerability and Increasing Adaptive Capacity to Respond to Impacts of Climate Change and Variability for Sustainable Livelihoods in Agriculture Sector	\$15.8 million	GEF/FAO	2015-2019	Ministry of Agriculture and Cooperatives
Building Climate Resilience of Watersheds in Mountain Eco-Regions	\$28.2 million	ADB	2014-2020	Ministry of Forests and Soil Conservation (MOFSC)
Building Resilience to Climate Related Hazards	\$31 million	WB	2013-2018	Department of Hydrology and Meteorology
Building Climate Resilient Communities through Private Sector Participation	\$34 million	WB	2013-2017	MOPE
Building Resilience and Adaption to Climate Extremes and Disasters Anukulan	\$6.3 million	DFID	2015-2017	iDE Inc
Mainstreaming Climate Change Risk Management in Development	\$7.8 million	ADB	2011-2017	MOPE
Development and Dissemination of Climate-Resilient Rice Varieties for Water-Short Areas of South Asia and Southeast Asia (Regional project)	\$1.4 million	ADB	2013-2016	International Rice Research Institute
Hariyo Ban (Green Forests) Project	\$39 million	USAID	2011-2016	World Wildlife Fund, with CARE, FECOFUN, NTNC
Nepal—Program for Aquatic Natural Resources Improvement (PANI)	\$25 million	USAID	2016-2021	DAI
Digo Jal Bikas (Sustainable, just and productive water resources development in western Nepal)	\$2.5 million	USAID	2016-2019	International Water Management Institute (IWMI)
SERVIR Hindu Kush-Himalaya	\$7 million	USAID/NASA	2015-2020	International Centre for Integrated Mountain Development (ICIMOD)