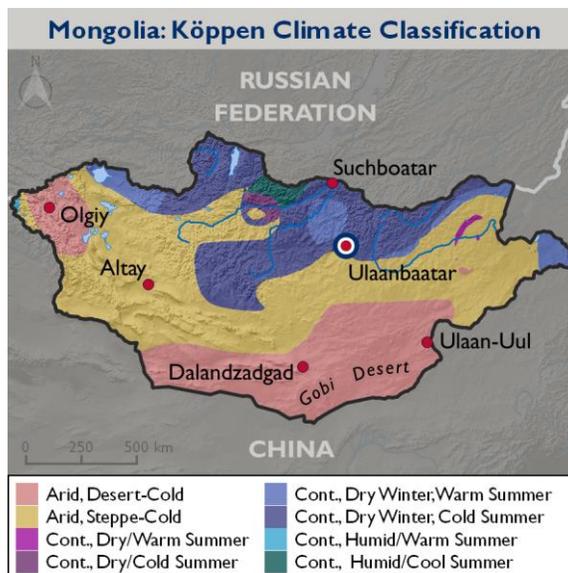




# CLIMATE RISK PROFILE MONGOLIA

## COUNTRY OVERVIEW

Mongolia has six ecological zones spanning high mountain alpine systems in the north and east to the vast Gobi Desert in the south. Mongolia is steeped in nomadic tradition, with almost 40 percent of the population dependent on animal husbandry and rainfed agriculture for its livelihood. Decreased precipitation during the summer months led to a significant drought in 2015, which was followed by a devastating *dzud* -- a unique multi-causal disaster resulting from summer drought followed by heavy snowfall and lower-than-normal winter temperatures. These events caused widespread loss of livestock and crops. Mongolia's economy saw unprecedented growth in the past 20 years due in large part to increased exploitation of the country's mineral wealth. However, since 2012 the economy has declined due to weakening exports; GDP growth was only 1 percent in 2016. Economic growth is constrained by limited water availability and low agricultural productivity. In addition, the country's diverse climate, high dependence on coal-based energy, and growing urban population contribute to Mongolia's ranking on the 2014 climate risk index as the eighth most vulnerable country to the impacts of extreme weather. Although evidence of climate change is growing in Mongolia, specific climate impact studies are limited. This analysis synthesizes the research available. (1, 6, 7, 8, 12, 13)



## CLIMATE PROJECTIONS



2°–3°C increase in annual average temperatures by 2050



More variable rainfall; decreases in summer and increases in winter



Increased incidence of extreme events, including droughts, flash floods and *dzuds*

## KEY CLIMATE IMPACTS

### Agriculture & Pastoralism

Reduced livestock productivity  
Reduced crop yields  
Forced migration and loss of livelihoods



### Human Health

Increased incidence of cardiovascular disease and foodborne illnesses



### Water

Increased water scarcity  
Changes in water quality and access  
Melting permafrost



### Ecosystems

Reduced pasture biomass  
Increased risk from invasive species  
Increased frequency of forest fires



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## CLIMATE SUMMARY

Mongolia’s climate is characterized by extreme fluctuations in both temperature and precipitation, differences accentuated by the country’s expanse and topographical diversity. In the northern mountainous regions, and around the capital city Ulaanbaatar, annual average temperatures range from -22°C to 17°C, with limited precipitation (300–400 mm annually). Across the central steppes and in the south into the Gobi Desert, temperatures are somewhat warmer, ranging from -15°C to 21°C. Precipitation in the steppe zones ranges from 150–250 mm annually, while the Gobi Desert receives only 50–100 mm. This diversity lends itself to a wide range of extreme events, often occurring within a single year, such as *dzuds*, as well as dust storms, flash floods, and steppe and forest fires. The number of extreme weather events doubled in the last 20 years, and is expected to continue to increase over the coming decades. (2, 3, 7, 8, 11, 12)

### HISTORICAL CLIMATE

Climate trends observed since the 1940s include:

- Increased average annual temperature of 2.1°C (more than double the global average), leading to high rates of evaporation and drying effects.
- Decrease in mean annual precipitation, with amount varying by climate zone.
- Lengthening of the warm season (mid-May–September) by 8–13 days.
- Shortening of the cold season (late November–February) by 7–11 days.
- Increase in the number of days with dust storms from 18 to 57 in the period 1960–2007.

### FUTURE CLIMATE

Projected changes by 2050 will vary by zone and scenario, but generally include:

- A 2°–3°C increase in average annual temperatures.
- Overall increase in precipitation, with changing seasonal rainfall patterns (increased precipitation in the winter and decreased precipitation in the summer).
- Projected melting of the permafrost throughout the 21<sup>st</sup> century.
- Increase in the frequency of extreme events (heatwaves, wind storms, snow storms, heavy precipitation) by 23–60 percent.

## SECTOR IMPACTS AND VULNERABILITIES

### WATER RESOURCES

Mongolia’s approximately 4,000 rivers are supplied by rainfall, snow and glacial runoff, the last of which contributes 15–20 percent of total annual water supply. Groundwater is an important source of water for agricultural, industrial and domestic use, but population pressure and increased withdrawals for agriculture and industry (accounting for 76 percent of all water use in Mongolia) are already driving unsustainable use of limited aquifers. Increasing temperatures and changing rainfall patterns worsen low groundwater recharge rates and reduce surface flows of rivers, negatively impacting the quantity and quality of Mongolia’s water supply. With 70 percent of the population residing in urban areas, access to clean water is critical; however, only 30 percent of Mongolians are connected to the water supply network, while the remainder access private or public wells, buy trucked water, or collect water directly from rivers and springs. While agriculture was traditionally rainfed, projected increased seasonal variability of rainfall and higher evaporation rates translate into increased needs for irrigation schemes to support improved crop production.

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Decreased reliability of water quantity and quality
	Increased competition over scarce water resources
Changing precipitation patterns	Reduced surface water resources (lakes and rivers) due to increased temperatures and evaporation

Industry, including mining and quarry operations, manufacturing and energy, accounts for one-third of Mongolia’s GDP, and requires significant water resources to support production and operations. Mining of gold, copper and coal represents the leading industrial activity, and requires water in all phases of production, including exploration, extraction and processing. As the mining industry continues to grow, so too will the need for increased water withdrawals. Extreme events, namely flooding and heavy winter precipitation (*dzuds*), are increasingly contributing to decreased reliability of the water supply. (5, 7, 9, 11)

## AGRICULTURE & PASTORALISM

Changing rainfall patterns pose significant challenges to traditional livelihoods in Mongolia. Agriculture is the primary source of income for 40 percent of Mongolians, both in rural and peri-urban areas. Primarily rainfed, agriculture is becoming more unsustainable as precipitation patterns change, and increasing investments in irrigation are further stressing already limited water supplies. Staple crops include cereals, vegetables and potatoes for domestic consumption. Rainfed wheat production, both for domestic use and for export, is projected to decline by 15 percent by 2030 due to climate change. Domestic food demand, with the exception of meat and derived dairy products, already relies on imports subject to global price volatility, and this challenge will continue and likely grow as the available arable land is reduced.

Livestock production accounts for almost 80 percent of the food sector, with meat, dairy, wool, cashmere and leather goods playing a critical role in the country's economy. Animals depend on the summer and autumn months for grazing, breeding and growth to build sufficient weight and energy to survive the harsh winters. Increases in temperatures and reduced summer precipitation limit regeneration of pasturelands and reduce feed quality. These conditions translate into reduced weight and productivity of herds, making them vulnerable to severe winter conditions.

## HUMAN HEALTH

Almost one-half of Mongolia's population lives in the capital of Ulaanbaatar, while the rest continue to lead a traditional nomadic lifestyle. Rapid urbanization is leading to large populations settling in peri-urban areas without access to basic services, increasing vulnerability to climate risks. With only 30 percent of the population connected to water and wastewater networks, there is an increased risk of disease outbreaks as higher temperatures and variable rainfall reduce water supplies, concentrating contaminants. Rising temperatures can increase the incidence of heat stress and cardiovascular diseases, which already represent the greatest burden of disease in Mongolia. During the harsh winters, Mongolians rely on the burning of raw coal as their primary source of heat in both rural and urban areas, a practice that contributes to asthma and other respiratory illnesses. These health risks will continue as coal-derived heat is used to buffer

Climate Stressors and Climate Risks AGRICULTURE & PASTORALISM	
Stressors	Risks
Increased temperatures	Reduced quantity and quality of pasture biomass
	Reduced productivity of livestock and increased susceptibility to weather extremes and disease; higher mortality rates
More variable rainfall	Pasture degradation; increased prevalence of invasive insects and rodents; desertification
Increased frequency of extreme events, such as <i>dzuds</i> and droughts	Decreased yields; shortened development stages
	Increased incidence of malnutrition and food insecurity
	Loss of livestock
	Forced migration and loss of traditional livelihoods and social structures; shift to negative alternative livelihoods (i.e., illegal small-scale mining)

More frequent *dzuds* make already limited pastures inaccessible to livestock by damaging critical migratory routes. During the 2009 and 2010 *dzuds* alone, an estimated 8.5 million livestock animals died, and in 2016 the government spent about \$4.4 million in emergency response to provide food, shelter, vehicles and vaccinations for both people and livestock in pasture areas. (2, 4, 7, 9, 11)

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased temperatures	Degraded water quality, increasing risk of waterborne diseases
Increased frequency of extreme events, such as <i>dzuds</i>	Increased incidence of heat stress, exacerbating many cardiovascular diseases
	Increased/continued use of coal for heating, aggravating respiratory illnesses
Increase in snowfall	

against more frequent *dzuds* and projected snowfall increases. Highly dispersed populations in rural areas hinder the proper delivery of health services, especially during the winter months and when extreme events disrupt transport routes. (7, 9, 11, 14)

## ECOSYSTEMS

Climate change and human activity are altering the health of Mongolia's ecosystems. Mongolia's forests cover 8 percent of the country and lie mostly in the permafrost area. They store carbon, protect soil from erosion and regulate runoff. Evidence is emerging on the role of increasing temperatures in exacerbating desertification, which in turn increases the risk of forest fires. In the central steppes, increasing temperatures and reduced summer precipitation, coupled with overgrazing, contribute to degradation of pasturelands. Shifting seasonal patterns have also given rise to increased and extended insect outbreaks across many of

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Increased temperatures	Forest and pasture degradation
	Increase in frequency of fires
Changing precipitation patterns	Expanded range of forest insects and pests
	Shifts in ecosystems; encroaching Gobi Desert in south and melting of permafrost in north

Mongolia's ecological zones. The continued melting of the permafrost will likely lead to shifts in forest and species composition. In the south, the steppe is decreasing and being replaced by desert. (7, 8, 11)

## POLICY CONTEXT

Mongolia has been engaged in international climate change efforts since ratification of the Kyoto Protocol in 1999. The vulnerability of the animal husbandry, agriculture, forestry, and human health sectors continues to shape the country's national adaptation agenda.

### INSTITUTIONAL FRAMEWORK

In 2010, the Government of Mongolia created the interagency National Climate Committee (NCC), led by the Minister for Nature, Environment and Tourism (now the Ministry of Environment, Green Development and Tourism), to coordinate and guide activities aimed at climate change adaptation. The NCC is responsible for implementing the National Action Programme on Climate Change, endorsed by Parliament in 2011. Within the NCC, the Climate Change Coordination Office is responsible for commitments and duties under the United Nations Framework Convention on Climate Change and for improving climate policy coordination efforts at a national level. (7, 8, 10)

### NATIONAL STRATEGIES AND PLANS

- [Intended Nationally Determined Contributions](#) (INDC) 2015
- [Initial National Communication](#) (2001)
- [Second National Communication](#) (2010)
- [MDGs Based Comprehensive National Development Programme](#) (2008-2021) (2009)
- [Mongolia Assessment Report on Climate Change](#) (2009)
- Other related policies are the National Agriculture Development Policy and National Plan of Action to Combat Desertification.

## KEY RESOURCES

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  6. Germanwatch. 2014. [Global Climate Risk Index 2014: Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2012 and 1993 to 2012](#).
  7. Government of Mongolia. 2010. [Mongolia 2<sup>nd</sup> National Climate Communication – UNFCCC](#).
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  11. United Nations Environment Programme. 2009. [Mongolia Assessment Report on Climate Change](#).
  12. World Bank. 2016. [Climate Change Knowledge Portal, Mongolia Dashboard](#).
  13. World Bank. 2016. [Mongolia Country Overview](#).
  14. World Health Organization. 2010. [Country Cooperation Strategy 2010-2015](#).
- Map Source: Adapted from Peel, M.C. et al. 2007. [Updated world map of the Köppen-Geiger climate classification](#); data accessed from [SDAT](#).

## SELECTED ONGOING EXPERIENCES

As Mongolia's democracy and economy continue to thrive, the country is transitioning away from being a traditional donor-recipient to an engaged mutual partner.

Selected Program	Amount	Donor	Year	Implementer
Risk Reduction and Resilience in Mongolia Schools	\$300,000	USAID/ OFDA	2015	World Vision
Logistics Support and Material Distribution for Dzud Humanitarian Response	\$278,000	USAID/ OFDA	2016	Mercy Corps
Mongolia Improved Governance of Extractives Project (MIGEP)	\$450,000	World Bank	2016–2018	World Bank
Biodiversity and adaptation of key forest ecosystems to climate change 2	€3,500,000	GIZ	2015–2018	Ministry of Environment, Green Development and Tourism
REDD - National Forest Inventory in Mongolia	€2,550,000	GIZ	2014–2016	Ministry of Environment, Green Development and Tourism
Public Investment in Energy Efficiency	CHF 10,000,000	GIZ, Swiss Cooperation	2014–2016	Cabinet Secretariat, Ministry of Energy, Ministry of Environment, Green Development and Tourism, Ministry of Finance, Governor's Office of Khovd and Zavkhan aimags, vocational education and training schools
Ecosystem-based Adaptation Approach to Maintaining Water Security in Critical Water Catchments in Mongolia	\$10,569,124	Adaptation Fund/UNDP	2012–2017	UNDP
Strengthening Local Level Capacities for Disaster Risk Reduction, Management and Coordination in Mongolia	\$1,500,000	TRAC, Government of Luxembourg	2013–2016	Deputy Prime Minister's Office/National Emergency Management Agency
UN-REDD Mongolia National Programme	\$3,996,450	International	2015–2018	Ministry of Environment, Green Development and Tourism
Dzud Disaster Response	\$2,500,000	Asian Development Bank	2010–2014	ADB, Ministry of Finance