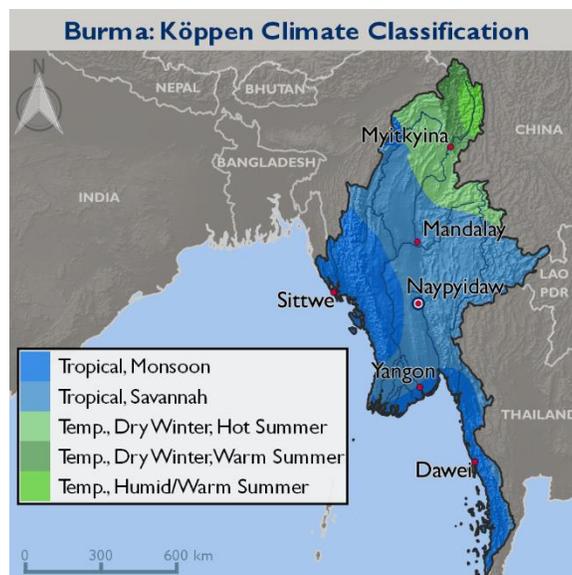


CLIMATE CHANGE RISK PROFILE

BURMA

COUNTRY OVERVIEW

Burma, also called Myanmar, is a mountainous country in Southeast Asia with an extensive coastline and an estimated population of 51.4 million people. The country is inherently prone to extreme weather events, including floods, cyclones, tsunamis, heavy monsoon rains, floods, storm surges and drought. For example, the 2008 Cyclone Nargis resulted in 138,000 fatalities. Climate change increases the frequency and severity of extreme weather events and poses new threats from rising seas, food and water insecurity, and public health outbreaks. The majority of Burma's population and principal economic activities are concentrated in coastal and low-lying zones vulnerable to sea level rise and increased storm surge. For example, if sea level were to rise by a half meter, the shoreline of the Ayeyarwaddy Delta – the country's main rice producer – would recede by 10 km. Burma's economy, largely dependent on natural resources (mining, forestry, fishing) and rice production, would also be at risk from higher temperatures and increased precipitation variability. After 50 years of military rule, Burma transitioned to a civilian government in 2011 and is at a historic stage in its development, pursuing political and economic reforms. Climate change, compounded by high levels of poverty, high exposure to natural hazards, and low capacity to respond to those hazards, could undermine the country's development efforts and economic progress if not addressed. (5, 10, 11)



CLIMATE PROJECTIONS



0.5°–5.5°C increase in temperatures by 2100



Reduced duration and increased variability of southwest monsoon



Increased frequency and intensity of extreme weather events



0.2–0.6 m rise in sea levels by 2100

KEY CLIMATE IMPACTS

Agriculture

Crop loss/failure
Loss of pasture lands and water resources for livestock



Water Resources

Degradation of water quality
Reduced access to water supplies
Water shortages



Human Health

Increased risk of vector- and waterborne diseases
Increased food insecurity, loss of life



Fisheries

Risk of fishery collapse
Severe degradation and loss of biodiversity and habitat



Ecosystems

Loss of biodiversity, ecosystem services and coastal defenses (mangroves)



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CLIMATE SUMMARY

Burma has a tropical monsoon climate with three distinct seasons: a hot, humid rainy season (May–October) that brings southwest monsoon winds and almost three-quarters of the country’s annual rainfall; a relatively cool, dry winter (November–February); and a hot, dry summer (March–April). Mean annual rainfall ranges between 2,500–5,500 mm and is highest in the coastal mountains and in the north and east. It is lowest in the dry central region, which is sheltered from the direct effect of the southwest monsoon and usually receives 500–1,000 mm/year. Average temperatures range from 32°C in the coastal and delta areas to 21°C in the northern lowlands, with cooler temperatures in the mountains. Temperatures are hottest from March to April before the onset of the monsoon rains. The coast is subject to frequent tropical storms from October through December, with a secondary peak in storm activity between April and May. (10, 11, 12, 17)

HISTORICAL CLIMATE

Historical climate trends since 1980 include:

- Increase in temperature of 0.14°C per decade along the coast and 0.35°C per decade in the interior, with greatest temperatures increases in the central dry zone.
- Increase in annual total precipitation by 157 mm per decade along the coast and 37 mm per decade inland.
- Late onset and early termination of the southwest monsoon has reduced its average duration from 144 to 125 days.
- Increase in frequency and intensity of extreme weather events, like cyclones, that make landfall every year compared to once every three years during the 20th century.

FUTURE CLIMATE

Projections indicate that by 2100:

- Mean annual temperature increase of 0.5°C (low emission scenario) to 5.5°C (high emission scenario), with highest projected increases in the center and north.
- A weakened monsoon climate and decreased cloud coverage, leading to increased drought periods.
- An increase in rainfall variability - during the wettest months (May–October) rainfall ranges from a decrease of 45 mm/month to an increase of 200 mm/month.
- Increase in frequency and severity of extreme weather events, including cyclones/strong winds, flood/storm surge, intense rains, extreme high temperatures and drought.
- Sea level rise of 0.2–0.6 m or more by 2100.

SECTOR IMPACTS AND VULNERABILITIES

WATER RESOURCES

Burma’s freshwater resources are abundant but unevenly distributed and costly to access in some areas. This is particularly acute in the densely populated central Dry Zone, one of the most food insecure and water-stressed regions. Even in normal years, rainfall there only exceeds evaporation rates (and hence meets only basic crop water requirements) two months out of the year. In the Ayeyarwaddy Delta, inhabitants rely on communal ponds and tube and open wells for water – all of which can be easily contaminated or damaged by tidal surges. Because the majority of the population is concentrated in either the Dry Zone or the Delta area, reduced fresh water availability, contamination and water shortages are expected to occur regularly. Additionally, reduced river flows, especially in the dry season, combined with sea level rise will increase salt water intrusion in Burma’s deltas and groundwater supplies. The late onset and early

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Reduced river flows and aquifer recharge, reducing water supply
Shorter duration of rainy period	Reduced water for irrigation and hydropower production
Increased tropical cyclone activity	Damaged or contaminated water sources (i.e., communal water ponds, wells, etc.)
Sea level rise	Inundated land and infrastructure; saltwater intrusion of freshwater supplies

termination of the monsoon will result in increased drought occurrence and bring large quantities of rainfall over shorter periods, causing flooding and contamination of water resources, erosion and sedimentation of waterways. Climate change may also impact Burma’s hydropower production, which currently generates 72 percent of the country’s electricity. (1, 9, 4, 10, 13, 14)

AGRICULTURE PRODUCTION

Burma's agriculture sector contributes 25 percent to export earnings and is dominated by small-scale landholders growing rainfed rice on two-thirds of the country's cultivated land. Climate change, such as variable precipitation, rising temperatures and growing frequency of extreme weather events, poses risks for food security by reducing agricultural productivity and increasing food commodity prices. For example, Cyclone Nargis destroyed rice paddies in the Ayeyarwaddy Delta in 2008, reducing production by 50 percent. Yield impacts on rice are projected to be highly negative, with a 10 percent yield decrease for every 1°C increase. The highly productive deltaic and low-lying coastal rice/local crop cultivation areas will also be exposed to increased salinity, coastal erosion and inundation as a result of rising seas. (2, 5, 7, 8, 10)

FISHERIES

Fisheries, particularly small-scale fisheries, are an essential source of food, livelihoods and national income in Burma, contributing 10 percent to GDP and employing 5 percent of the population. Marine and freshwater fisheries produce shrimp, mud crab and grouper. Pollution, habitat degradation and overfishing already stress fish populations, and climate change introduces new threats. Inland and marine fisheries and aquaculture are all threatened by changes in temperature (and in precipitation in freshwater ecosystems) as surface temperatures and current flows shift distributions of food sources, predators and fish stocks. Storms have become more frequent and extreme, damaging critical delta habitats, stocks, infrastructure and livelihoods. (2, 6, 11, 15)

ECOSYSTEMS

Burma is ecologically diverse and rich in natural resources including minerals, mangrove forests, estuaries, delta systems, numerous islands, mudflats and beaches, and coral reefs in the Myeik Archipelago. Climate change threatens ecosystems and the services they provide through increased drought, temperatures, floods, sea level rise/salt water intrusion and rainfall variability. Hotter and drier conditions, especially toward the end of the dry season, will increase evapotranspiration from vegetation, likely causing increased moisture stress, more frequent forest fires, and the drying out of small floodplain water bodies and/or shallow-water zones in lakes such as Inle Lake. (10, 11, 12)

Climate Stressors and Climate Risks AGRICULTURE PRODUCTION	
Stressors	Risks
Increased temperatures and precipitation extremes	Crop loss and destruction; increased food prices and imports
	Reduced yields, especially for rainfed rice and maize crops
Shorter duration of rainy period	Increased drought (especially in dry zone), flooding (especially in delta/coastal zones), soil erosion and need for irrigation
Increased tropical cyclone activity	Reduced water quality from increased agricultural runoff
	Increased incidence of crop diseases and pests
Sea level rise	Inundation and/or salinization of rice fields

Climate Stressors and Climate Risks FISHERIES	
Stressors	Risks
Increased temperatures and rainfall variability	Reduced fish stocks and fishery productivity
	Reduced income, employment, and protein intake
Increased severe weather events	Degradation of key habitat, breeding grounds and nurseries
Sea level rise	Fishing boats and infrastructure destroyed by storms and floods; increased risk of fishers losing lives and catches from capsizing

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Increased temperatures	Decline in density of trees/mangroves leading to increased erosion and land degradation
Drought and variable rainfall	Loss of key ecosystems, ecosystem services and biodiversity
Increased frequency and intensity of extreme events	Loss of tourism potential
	Increased risk of wildfires
	Saltwater intrusion of freshwater ecosystems

HUMAN HEALTH

Major health risks in Burma include limited access to clean drinking water, poor sanitation services and widespread food insecurity. Poor living standards aid the spread of vector- and waterborne diseases (e.g., diarrhea, cholera, malaria, dengue and yellow fever). Climate change will create favorable conditions for increased spread of these diseases. Higher temperatures allow mosquitoes to survive and breed in mountainous areas (e.g., Shan and Rakhine States) that were once too cold, potentially increasing the risk from diseases such as malaria and dengue fever in these areas. An increased incidence of extreme weather events, floods and rain-induced landslides would bring loss of life and livelihoods and contaminate water sources, increasing the risk of waterborne diseases such as cholera and diarrhea. In 2015, the double impact of monsoon rains and Cyclone Komen triggered the

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Increased minimum temperatures	Increase in vector-borne diseases (malaria, dengue, Japanese encephalitis and other pathogens carried by mosquitoes, ticks and other vectors) due to expanded breeding grounds
Drought and reduced rainfall	Increase in waterborne diseases (diarrhea, Hepatitis A, typhoid fever and cholera) from reduced water levels (concentrating contaminants) and/or flooding
Increased frequency and intensity of precipitation and extreme weather events	Food insecurity, loss of life and damage to public health infrastructure due to floods, storms and cyclones

largest floods in the country's recent history, affecting over 20 million people. (2, 10, 13)

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

Since ratifying the UNFCCC in 1994 and the Kyoto Protocol in 2003, Burma has taken actions to fulfil its commitments. In 2011, the National Environmental Conservation Committee (NECC) was reformed to guide national climate change efforts and develop related policy. The NECC works in conjunction with the Department of Environmental Conservation of the Ministry of Environmental Conservation and Forestry (MOECAF), established in 2012 as the focal point for climate change at the international level. In April 2016, MOECAF merged with the Ministry of Mining to become the Ministry of National Resources and Environmental Conservation and is responsible for all national environmental policy. (10, 11)

NATIONAL STRATEGIES AND PLANS

- [First National Communication](#) (2012)
- [Myanmar Action Plan on Disaster Risk Reduction](#) (2012)
- [National Adaptation Programme of Action](#) (2012)
- [Intended Nationally Determined Contribution](#) (2015)
- [National Climate-Smart Agriculture Strategy](#) (2015)
- [National Climate Change Strategy and Action Plan 2016-2030](#) (2016)

KEY RESOURCES

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 9. IRIN. 2010. [Coping with water scarcity in the Ayeyarwaddy Delta](#).
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- 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

Implementation of adaptation projects in Burma has been limited. However, the country is participating in a number of regional projects in the agriculture and natural resources management sectors focused on knowledge sharing, capacity building and policy development.

Selected Program	Amount	Donor	Year	Implementer
Flood and Landslide Emergency Recovery Project	\$200 million	World Bank	2016–2021	N/A
FishAdapt: Strengthening the Adaptive Capacity and Resilience of Fisheries and Aquaculture-Dependent Livelihoods in Myanmar	\$19 million	GEF	2016–2020	Food and Agriculture Organization
Adapting agricultural value chains to climate change in Shan State, Myanmar	€2.5 million	GIZ	2015–2017	Ministry of National Planning and Economic Development
Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar	\$8.5 million	UNDP	2014–2018	UNDP
Building disaster resilient communities through strengthening disaster risk management institutions, systems, networks and mainstreaming DRR into development planning	\$8.5 million	UNDP, UN-Habitat, Government of Finland	2013–2017	UNDP
Myanmar Climate Change Alliance	\$5 million	EU/Global Climate Change Alliance	2013–2017	UN-Habitat, UNEP
Knowledge Center on Climate Change: Adaptation in Agriculture and Natural Resource Management in Southeast Asia	N/A	N/A	N/A	Southeast Asian Regional Center for Graduate Study and Research in Agriculture
Environment, Climate Change, Energy and DRR Programme	\$46.6 million	UNDP	2013 – 2015	Ministry of Environmental Conservation and Forestry