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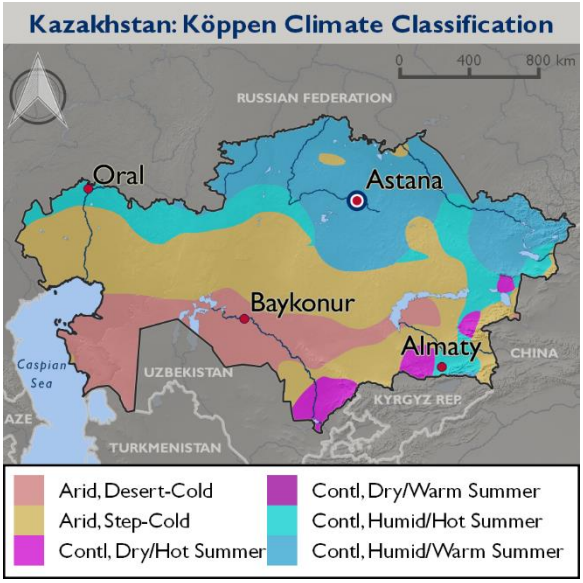
FACT SHEET

CLIMATE RISK PROFILE
KAZAKHSTAN

COUNTRY OVERVIEW



Kazakhstan, an upper-middle-income country, holds vast natural resources and is Central Asia's largest economy. As the region's leading wheat producer and exporter, Kazakhstan's wheat production plays a central role in Central Asian food security. Sustaining agricultural productivity is increasingly challenged by climate change trends of altered precipitation patterns and growing seasons and increased risk from pests and diseases. Wheat production is primarily rainfed and vulnerable to increasing weather variability, as demonstrated by losses due to both drought and unseasonable rainfall in recent years. Agriculture accounts for 5 percent of GDP and employs 25 percent of the population. The country is subject to natural disasters, including droughts, heat waves, floods, mudflows and landslides that are already responsible for land degradation, infrastructure damage and loss of life. Climate trends are expected to exacerbate these impacts; for example, a 2–3°C temperature increase will diminish vegetation cover, which combined with increasing heavy precipitation events and glacial melt is estimated to increase mudflow occurrence tenfold. Mudflows already threaten 156 towns and cities, including Almaty (Kazakhstan's largest city). Central Asia's water resources are expected to decline after mid-century, amplifying the challenge of accommodating competing water demands among the region's countries and water-intensive sectors (agriculture, hydropower, etc.). (7, 9, 10, 11)

CLIMATE PROJECTIONS

- 2.1–2.6°C temperature increase by 2050
- Increased drought and longer heatwaves
- Increased incidence of heavy precipitation events, leading to floods and mudflow

KEY CLIMATE IMPACTS

Agriculture
Increased variability of wheat production
Land degradation and crop loss

Water
Increased glacial melt
Altered seasonal river flow
Diminished water availability after 2050s

Human Health
Increased extreme weather event-related mortality and morbidity
Vector-borne disease expansion

Ecosystems
Altered hydrology
Land and habitat degradation

Energy
Disruption of energy services
Reduced hydropower potential

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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

Kazakhstan is characterized by a continental climate with hot summers, harsh winters (strong blizzards and high winds) and limited precipitation. The northern steppe experiences high winds and long, cold winters; the cold desert and semi-arid central and west regions (about 45 percent of land area) have long, hot summers, cold winters and high aridity; the mountains in the south and southeast receive the country's highest precipitation. Average temperatures in the coldest month (January) vary from -20°C in the north to -5°C in the extreme south, while average temperatures in the warmest month (July) vary from 18°C in the north to 29°C in the south. Precipitation patterns are associated with the various geographies: the north and central steppe and desert regions see average annual rainfall of 100–300 mm, while the southern foothills and mountains receive 500–1600 mm. (2, 7, 10)

HISTORICAL CLIMATE

Historic climate trends include:

- Increased average annual temperature of 0.28°C every 10 years from 1941–2011, with higher rates of warming in the winter.
- Increased number of "hot" days (daily maximum exceeds 35°C) of +1–3 days in south and west regions each decade (1941–2011).
- No definitive trend in countrywide precipitation; decreased annual precipitation in the Lake Zaisan and Moinkum regions and increased annual precipitation in the Ural Mountains.
- Rapid glacial melt (loss of 14–30 percent of Tien Shan glaciers since 1950).

FUTURE CLIMATE

Projections by 2050 indicate:

- Increased average annual temperature by 2.1–2.6°C.
- Expansion of drought zone to north and center.
- Decrease in number of frost and "cold" days.
- Increase in annual average precipitation by 0.8–15.0 percent; greatest increases December–March and a decrease July–September.
- Increase in precipitation intensity and storm severity.
- Increase in extreme events (heat waves, droughts, floods, landslides, mudflows).
- Reduced glacier mass; potential loss of half of the total current glacier volume of the Tien Shan.

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

Kazakhstan is a global leader in wheat production, which accounts for 65 percent of all cultivated area in the country. Most wheat production occurs in the northern steppe zone, a low-rainfall region with limited scope for irrigation, leading to the dominance of rainfed agriculture in areas at high risk for drought. This has led to high year-to-year variability in production (up to 27 percent difference in production between good and poor years), with detrimental livelihood impacts on the 25 percent of the population engaged in agriculture; in fact Kazakhstan has the highest variation in annual yields of any major wheat-growing country in the world. Rising temperatures and increased pest and disease outbreaks will impact yields and likely amplify this variability. Already, Kazakhstan's steppe regions experience drought two of every five years and research shows that nearly 80 percent of yield variability is due to weather. In the south, thousands of small household farms are dependent on the seasonal melt of snowpack and glaciers in the Tien Shan, which are retreating rapidly. Livestock, mainly cattle and sheep, account for nearly half of the country's agriculture production. Warming is expected to increase spring pasture productivity but decrease summer and autumn productivity, particularly in the south, where sheep pasture year-round. (5, 6, 7, 9, 11)

Climate Stressors and Climate Risks AGRICULTURE

Stressors	Risks
Increased temperatures **Decreased summer precipitation**	Reduced wheat yields due to shifting agriculture zones and crop land degradation related to reduced soil moisture, heat stress and drought
Increased incidence of drought	Increased variability of wheat production due to drought
Increased frequency of intense precipitation	Increased incidence of pests and diseases, such as Hessian fly and wheat rust
	Reduced pasture productivity related to heat stress and increased flood and mudflow

WATER RESOURCES

Water resources are critical for agriculture and power generation in Kazakhstan; irrigation accounts for 90 percent of national water consumption while hydropower produces 13 percent of the country's electricity. Glacial melt is an important contributor to river flow during summer months, particularly in the south. Higher temperatures will increase glacial melt in the medium term, changing river flows and increasing flood risk. Glacial loss will diminish the flow of mountain rivers by mid-century, threatening a water supply important for irrigation and food security. Heavy precipitation leading to increased flooding threatens to wash industrial, agricultural and mining pollutants into water sources, diminishing water quality. Domestic water resources, mainly surface water, are susceptible to warming and drying, trends particularly significant for the rivers flowing into the Lake Balkhash basin, one of the largest and most densely populated areas of Kazakhstan. As about half of Kazakhstan's river volume originates outside the country, reduced water availability combined with increasing demand could heighten regional political tensions. (2, 3, 7, 11)

Climate Stressors and Climate Risks WATER RESOURCES

Stressors	Risks
Increased temperatures	Increased glacial melt, leading to flooding and waterlogging
Decreased summer precipitation and increased incidence of drought	Diminished glacial contribution to rivers, altering seasonal flows and increasing variability in intra- and interannual water availability
	Drying of surface water sources, reducing overall water availability
Increased frequency of intense precipitation	Increased flooding and mudflow, threatening water quality, crops and infrastructure
	Water stress exacerbates regional political tension

HUMAN HEALTH

Climate trends are likely to exacerbate health issues related to heat waves, natural disasters, clean water availability and infectious disease transmission. Fifty-three percent of the population lives in urban areas, where heat waves are more severe due to the urban heat island effect. Increased heavy precipitation events combined with land degradation related to drying are likely to increase injury and mortality related to floods, mudflows and landslides, particularly in the south. Flooding combined with increased temperatures may decrease water quality in the country, where gastrointestinal disease is already the fifth most common cause of death. Increased temperatures are providing conditions for the expansion of infectious disease vectors (ticks, mites, rodents), raising concerns about increased disease occurrence, including the tickborne Crimean–Congo Haemorrhagic Fever. (7, 8)

Climate Stressors and Climate Risks HUMAN HEALTH

Stressors	Risks
Increased temperatures	Increased heat wave-related mortality and morbidity, particularly in urban areas
Increased incidence of drought	Expansion of infectious disease vectors such as ticks and mites
	Degraded water quality, leading to increase in gastrointestinal disease
Increased frequency of intense precipitation	Increased mortality and morbidity related to extreme weather events, especially mudflows

ECOSYSTEMS

Kazakhstan has vast and diverse forest, steppe, mountain and desert ecosystems, including over 48,000 lakes and five major mountain ranges that contain unique biodiversity. Glacial melt is already beginning to alter the hydrology in and around mountains, a trend with subsequent impacts for river and riparian species. Drying trends are decreasing plant cover density in some altitudinal belts and risk diminishing the country's wetlands. The frequency and extent of forest and steppe fires are expected to increase, risking further land degradation. These changes have implications for livelihoods, as drying and land degradation affect water and pasture availability. Climate stressors to ecosystems come on top of a myriad of non-climate stressors such as habitat fragmentation, land degradation and pollution. (1, 7, 11)

Climate Stressors and Climate Risks ECOSYSTEMS

Stressors	Risks
Increased temperatures	Drying and glacial melt, changing hydrological function of wetlands
Decreased summer precipitation	Increased water and heat stress, leading to decreased plant cover density and land degradation
	Increased incidence of forest and steppe fires
Increased incidence of drought	Negative impact on livelihoods dependent on natural resources

ENERGY

Kazakhstan's steady economic growth since 2000 has led to 100 percent electrification as well as increased energy demand. With an extensive electric and fossil fuel network, Kazakhstan's energy supply is vulnerable to the effects of extreme weather on energy infrastructure. A 2015 flood and mudflow in Almaty, for example, caused extensive damage to powerlines. Climate stress comes in addition to the strains from rising demand, low efficiency transmission and distribution networks, and aging facilities. Although the country relies heavily on fossil fuels, hydropower accounts for 13 percent of Kazakhstan's electricity production and 3 percent of total energy. While the country is planning to expand renewable energy in coming years (50 percent by 2050), its hydropower potential is threatened by decreasing glacial contributions to river volume and increased withdrawals by neighboring countries along transboundary rivers important for hydropower, such as the Irtysh, Ili and Syr Darya. (3, 4, 7, 11)

Climate Stressors and Climate Risks ENERGY

Stressors	Risks
Increased frequency of extreme events	Increased damage to energy distribution networks, including transmission lines, pipelines and railways
Increased temperatures	Increased reservoir drying and reduced river flows, reducing hydropower potential
Increased incidence of drought	Long-term diminished glacial contribution increases intra- and interannual variability in water availability for hydropower

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

In 2014, government restructuring eliminated the Ministry of Environment and Water Resources, previously responsible for environmental policy and climate change. Climate change is now under the purview of the Ministry of Energy, which has added departments of green economy and climate change. The Ministry of Emergency Situations and Kazhydromet play important roles in disaster management and weather monitoring and forecasting. In 2016, the Central Asia Centre for Emergency Situations and Disaster Risk Reduction, designed to improve regional cooperation, was officially inaugurated in Kazakhstan.

NATIONAL STRATEGIES AND PLANS

In July 2016, the Government of Kazakhstan requested UNDP support to develop a national adaptation plan.

- Initial National Communication (1998), Second National Communication (2009) and III–VI National Communication (2013) to United Nations Framework Convention on Climate Change (UNFCCC)
- Concept for Kazakhstan's Transition to Green Economy (2013), Green Economy Law (2016)
- Kazakhstan Strategy 2050
- Draft national concept on adaptation to climate change (2010, never adopted)

KEY RESOURCES

1. Dimeyeva, L.G. et. al.. 2015. High altitude flora of Kazakhstan and climate change impacts.
2. Eurasian Development Bank. 2009. The Impact of Climate Change on Water Resources in Central Asia.
3. Helm, T. and N. Scholz. 2016. At the Crossroads: The Role of Renewable Energies in Kazakhstan's Macroeconomic Development.
4. Karatayev, M. and M. Clarke. 2016. Current energy resources in Kazakhstan and the future potential of renewables.
5. Lioubimtseva, E. et. al. 2015. Chapter 7: Grain production trends in the Russian Federation, Ukraine and Kazakhstan in the context of climate change and international trade.
6. Pawlowski. 2012. Climate risk management in Central Asian agriculture: A situation analysis.
7. Third-Sixth National Communication. 2013. Kazakhstan's III–VI National Communication to the UNFCCC.
8. WHO and Ministry of Health. 2012. Protecting Health from Climate Change in Kazakhstan.
9. World Bank. 2016. Kazakhstan: Agricultural Sector Risk Assessment.
10. World Bank. 2016. Kazakhstan Climate Risk and Adaptation Profile. Climate Change Knowledge Portal.
11. World Bank. 2015. Kazakhstan: Nationwide assessment of climate-change related risks and formulation of mitigation strategy.

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

Selected Program	Amount	Donor	Year	Implementer
Southeast Europe and Central Asia (SEECA) Catastrophe Risk Insurance Facility (CRIF) Project for Kazakhstan	$5 million	World Bank	2016–2019	Europa reinsurance facility (Europa RE)
Sixth Operational Phase of the GEF Small Grants Programme in Kazakhstan	$5.7 million	GEF	2016–ongoing	UNDP
Development of Kazakhstan's National communication to the UNFCCC and Biennial Report	$1.7 million	GEF	2014–ongoing	UNDP
Ecosystem-based adaptation to climate change in high mountainous regions of Central Asia	€4 million	Germany	2015–2019	GIZ
DIPECHO Central Asia and Southern Caucasus	Ongoing	European Commission ECHO	Ongoing	Various
Improving the Climate Resiliency of Kazakhstan Wheat and Central Asian Food Security (CRW)	$2.2 million	USAID/CAR	2012–2016	UNDP with support from USAID CCRD project
Supporting water management and strengthening transboundary river basin administrations in Central Asia	€1.3 million	EU	2011–2014	GIZ
Second Irrigation and Drainage Project (IDIP-2)	$343 million	IBRD	2014–2021	Government of Kazakhstan
Central Asian Multi-Country Programme on Climate Risk Management. Climate Risk Management in Kazakhstan	$2 million	UNDP	2010–2014	UNDP with government and NGO partners
Community-based Adaptation (CBA) Programme	$0.872 million	GEF (SPA)	2009–2011	UNDP, GEF, Government of Switzerland
Supporting Kazakhstan's Transition to a Green Economy Model	€7.1 million	EU	2015–2018	UNDP