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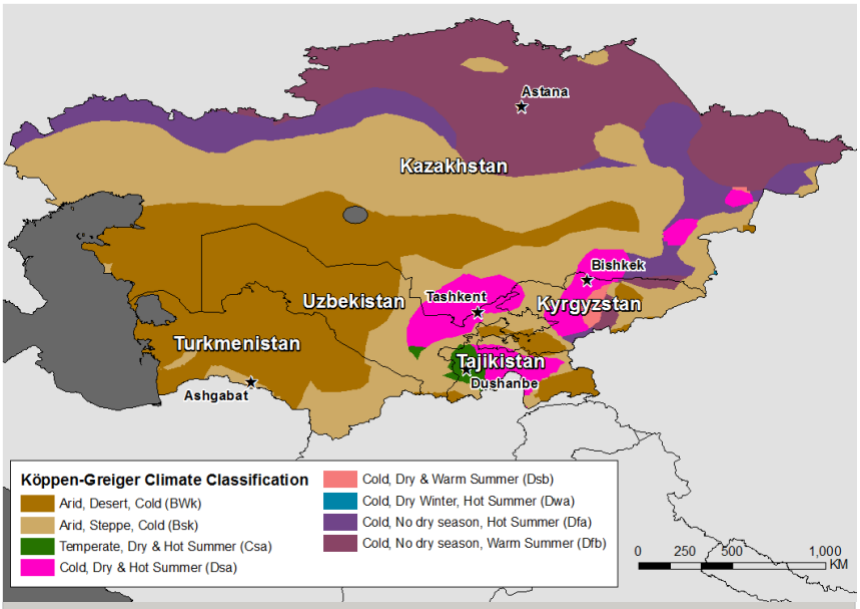
FACT SHEET

CLIMATE RISK PROFILE
CENTRAL ASIA

REGION OVERVIEW

The Central Asia region includes: Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan, and the Kyrgyz Republic. Stretching from Afghanistan in the south to Russia in the north, the landlocked region boasts an ethnically and linguistically diverse population of 65 million people, and already suffers from significant climate change. Economic conditions and poverty rates range widely across the region. Fewer than 5% of the population in Kazakhstan, the Kyrgyz Republic, and Tajikistan live on under the internationally agreed poverty threshold of $1.90 per day, while more than 40% live below this poverty threshold in Turkmenistan and Uzbekistan. Most of Central Asia falls within arid and semi-arid zones and is covered by grasslands, rangelands, deserts, and woodlands, with a dramatic physical landscape, ranging from grassy steppes and high mountains to deserts and large rivers, lakes, and seas. Expected climate change stressors include increases in temperature, extreme weather events, and glacial melt, while likely impacts include continued expansion of deserts and arid areas. Such stressors and impacts will add pressure to already stressed and exploited natural resources, such as pasture, forests and wildlife, and could increase the spread of transboundary pests. The exacerbated degradation of biodiversity, natural habitats, and ecosystems due to climate stressors increases vulnerability of impoverished and rural areas, which largely lack the financial or political capacity to overcome these growing challenges. Additionally, changes in climate will likely affect local and regional economies, as overexploitation and lack of resources are projected to impact key industries such as agriculture, energy, and other water-dependent activities. (10,11,14,31,40)



CENTRAL ASIA KÖPPEN-GREIGER CLIMATE CLASSIFICATIONS

CLIMATE PROJECTIONS

- 2.0 to 5.7°C increase in annual mean temperatures by 2085
- Changing rainfall patterns and increased storm intensity and frequency
- Increased drought

KEY CLIMATE IMPACTS

Agriculture & Livestock
Decreased crop productivity
Increased storm and flood damage
Decreased water availability

Water Resources
Melting glaciers and permafrost
Changing water availability
Increased competition over water

Health
Increased malnutrition
Shifting infectious disease burden
Damage to health infrastructure

Biodiversity
Melting glaciers and permafrost
Increased forest fires
Shifting distribution & loss of species

Energy
Increased energy demand
Decreased energy production
Damage to energy infrastructure

March 2018
This document was prepared under the Climate Integration Support Facility Blanket Purchase Agreement AID-OAA-E-17-0008, Order Number AID-OAA-BC-17-00042, 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

Central Asia is a land-locked region with wide-ranging climate regimes, from arid deserts to mountains with heavy precipitation, contrasts observed both within and across the region's individual countries. For example, while much of the Kyrgyz Republic is considered a moderate climate zone, with 70 percent of land above 2000 meters (m) in elevation receiving heavy rainfall, the country overall is also highly drought-prone. By contrast, Tajikistan is mostly subtropical and semi-arid, with half of the country sitting at elevations above 3000 m, while 80 percent of Turkmenistan is flat desert. Generally, across the region the summers are warm to hot, with mean temperatures ranging from 20°C to 40°C, and winters are moderate to cool, with mean temperatures ranging from -3°C to 20°C. Summer daily maximum temperatures can be as high as 50°C in the deserts, while winter daily minimum temperatures can drop as low as -45°C in some mountainous areas and as low as -18°C in northern parts of the region. Annual average precipitation across highly mountainous Tajikistan is around 500 millimeters (mm), largely during spring and early summer, while Uzbekistan receives less than half as much. Heavy winds are at times prevalent across the region, leading to dust storms in many areas, especially during the months of September and October. Floods and mudflows occur frequently across the region, and droughts are also relatively common. (7,12,17,18,25,27,38)

HISTORICAL CLIMATE

Climate trends from the 20th to early 21st century:

- Reported average annual temperature increases since the 1950s vary widely, for example, 0.3°C-1.2°C in Tajikistan and 1.1°C-2.4°C in Turkmenistan.
- The per-decade increase in average annual temperatures increased significantly in recent decades, for example, from an overall 0.1°C per decade increase from 1901 to 2013 to 0.4°C per decade over the past 30 years in Tajikistan, and from an overall 0.17°C per decade increase from 1901 to 2013 to around 0.5°C per decade over the past 30 years for the Kyrgyz Republic.
- As a result of increasing temperatures nearly one-third of the glacial area in the region has disappeared since 1930.
- Across the region, temperature increases are strongest at low altitudes, becoming less pronounced with increasing elevation.[1]
- Temperature increases are highest in winter months, particularly November and December; spring months typically show slightly decreasing temperatures.
- There are significant variations in precipitation trends across the region, with increased total annual precipitation of about 4 to 7 percent over the past 30 years in Uzbekistan and the Kyrgyz Republic, slight decreases in Turkmenistan, and no clear trend in Kazakhstan or Tajikistan. (4,5,6,17,18,35,36,37,38)

FUTURE CLIMATE

Projected changes include the following:

- Increases in average annual temperature of about 2°C across the region by 2050 are likely.[2] Example ranges for 2085 are 2°C-5.5°C for the Kyrgyz Republic and 2.2°C-5.7°C for Tajikistan.
- Projected changes in precipitation are variable across the region and highly uncertain. There is no agreement on overall annual trends, except for likely increases for Uzbekistan of around 12 to 20 percent by 2085 and slight decreases for Turkmenistan by 2085.
- Precipitation specifically for the November-to-April period is broadly expected to increase, for example, with projected increases up to 50 percent for the Kyrgyz Republic and up to 30 percent for Uzbekistan by 2085. Other months are likely to experience no overall change or decrease slightly.
- Along with the increased concentration of rainfall in winter months, a higher frequency of heavy rain events is expected for the region.
- The region is likely to experience increased incidence of drought and lengthened dry spells. Higher temperatures will increase evapotranspiration, leading to drier conditions, even if precipitation does not change. (4,5,6,25,35,36,37,38)

[1] The German Climate Service Center sources for this data do not specify whether the increase is for mean, maximum, or minimum temperatures.

[2] The disparate reference period ranges are due to inconsistency among periods used by cited data sources.

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE AND LIVESTOCK

Climate Stressors and Climate Risks AGRICULTURE & LIVESTOCK	
Stressors	Risks
Increased drought **Changes in precipitation patterns** **Increases in extreme events** **Increased temperatures**	Reduced crop yields and livestock productivity
	Worsening desertification
	Increased demand on irrigation water
	Increased food insecurity
	Decreased precipitation and water availability during vegetation period
	Changing patterns of and increases in pest outbreaks
	Storm damage to crops and livestock
	Increased spread of infectious disease among livestock
	Increased soil salinity

Central Asia's agriculture largely relies on irrigation[3] and plays a central role in the region's economy, with cereals, cotton, fruits and vegetables the primary crops. Generally, climate-stressors are expected to bring about agricultural losses in the region. In 2014, agriculture's contribution to the economy as a percentage of gross domestic product ranged from 5 percent in Kazakhstan to 27 percent in Tajikistan, with Turkmenistan, Uzbekistan and the Kyrgyz Republic all falling in the high teens. Uzbekistan is one of the world's largest producers and exporters of cotton. Kazakhstan is a major supplier of wheat for the region. Impacts to cotton and wheat production could endanger economic growth and food security in the region, though efforts are under way to support diversified crop portfolios with reduced climate risk (e.g., through promotion of cherries). The projected impact on individual crop productivity varies by country, with some crops possibly seeing increases due to improved growing conditions. However, climate change may reduce production of food and fiber crops and cut overall food availability per capita across the entire region by 2050. This would likely lead to a rise in food prices, further stressing already vulnerable populations. Heat stress is expected to significantly reduce wheat yields, and variability in climatic conditions and increases in extreme events can affect grain production. Additionally, increasing temperatures and changing rainfall patterns could contribute to increased outbreaks of agricultural pests and diseases, such as locusts and wheat blast, including those traveling across national boundaries. Decreases and changes in water availability are expected to be detrimental to farming practices, particularly for water intensive crops, such as cotton and rice. These changes will probably include a shift in timing of peak flow in key rivers from critical summer growing periods to the spring. Droughts already significantly challenge the region, particularly in Kazakhstan, where up to 66 percent of the total land is affected. Worsening desertification threatens up to half the land in the Kyrgyz Republic in coming decades and potentially shifting larger areas of Turkmenistan and Uzbekistan to arid land. High soil salinity, already affecting arable lands and impacting crop productivity, will increase with greater evapotranspiration and higher irrigation demand.

Livestock production, and the traditional agro-pastoral grazing systems critical throughout the Central Asia region, will also likely face significant consequences due to climate variability and change. Variability in temperature and precipitation patterns, in addition to a likely decrease in water access, could contribute to biological stress on animals, affect growth and reproductive patterns, and increase the spread of infectious diseases among livestock. Feeding sources and grazing areas, particularly pastures, which already face degradation and overgrazing, are also likely to be affected by desertification, droughts, and storms. (2,9,15,17,18,21,22,23,27,31,32,34).

WATER RESOURCES

Central Asia relies on water as an energy source, for agricultural irrigation, and to power economic growth. Despite an expectation of a slight increase in annual rainfall for the region, shifting precipitation patterns within the year combined with increasing dry spells and temperatures will likely lead to increased water stress. This can affect availability of water for drinking and sanitation activities, as well as energy generation,

[3] Kazakhstan is an exception: although the majority of water withdrawals in Kazakhstan also go to agriculture, irrigation is relied upon less than in the region's other countries.

particularly as competition with irrigation demands increases. Changes to river flows, mountain snowmelt, and glacial melt can also be expected to impact the region's biodiversity and ecosystem services, which are critical to the region's population and economy. Projected increases in Central Asia's population and economy will likely increase demand for water resources to a level that, coupled with increased water stress, will exceed water availability in many small and medium rivers in the inner and southern areas. The region also depends heavily on glacial water, which supports large downstream agricultural areas and populations. Mountain snowmelt and glacial melt feed Central Asian rivers during the spring and summer months when agricultural demand is high. Specifically, transboundary rivers provide much of the necessary water for the region's agriculture, underscoring the importance of cross-border cooperation in water resource management.[4] However, climate change impacts to transboundary water resources, including those originating outside the Central Asian countries, may strain regional cooperation, security, and politics. The transboundary Chu and Talas rivers act as central resources for irrigation in agriculture in both Kazakhstan and the Kyrgyz Republic. The Syr Darya and Amu Darya rivers also serve as a source of irrigation before draining into the Aral Sea in western Kazakhstan and Uzbekistan. Insufficient water access, particularly given impacts to energy production and food security, can lead to disputes between countries over their shares of the water supply.

Climate Stressors and Climate Risks WATER RESOURCES

Stressors	Risks
Increased temperatures	Decreased water access
	Increased glacial melt
Changes in precipitation	Increased floods, landslides, and mudflows
	Reduction in water availability for irrigation, drinking and energy generation
Increased drought	Increased disputes over transboundary water resources

Over the past 50 years, the increase in temperature has discernably impacted the region, evidenced by the significant decrease in both mountain snowpack and the volume of the Tien Shan glaciers in Kazakhstan and the Kyrgyz Republic. This decrease has only accelerated in the past 20 years. As climate change continues, total water supply will increase in the short-term, as snowpack melt from the mountains will be concentrated in the spring. However, as the glaciers continue to melt in the coming decades, significant declines in annual water supply are expected. Changes in precipitation, such as snowfall being replaced by rainfall because of warming, are also expected to result in a decrease in river flow during the agriculturally important spring and summer months. Instead, river flow will likely increase in the winter, resulting in winter floods and low river flow in the summer. These combined impacts from glacial melting, changing river flows, and increased droughts are expected to diminish the water supply required for irrigation activities, threaten agricultural production, and exacerbate the challenge of sustaining water levels in the Aral Sea, impacting both the region's economy and ecosystems. (7,16,19,24,26,28,29,31,32)

Climate Stressors and Climate Risks HEALTH

Stressors	Risks
Increased temperatures	Increased malnutrition from crop failures
	Lack of access to clean water
Increased drought	Death and injury from storms and heat stress
	Damage to health infrastructure
Increased storm frequency and intensity	Shifts in vector- and waterborne diseases

HEALTH

Poverty and hunger present major challenges across the region, particularly in Tajikistan and parts of the Kyrgyz Republic. As a result, impacts to the agriculture sector from increased drought, flooding, and desertification could increase crop failures, decrease food security, and significantly impact human health

[4] In cooperation with World Bank, European Union, the German Organization for Technical Cooperation (GTZ), and the Swiss Agency for Development and Cooperation (SDC), USAID provided support to the second and third phases of the Aral Sea Basin Program, which worked to strengthen environmental, socio-economic, and water resource management within the region. The ASBP was developed in response to the objectives of the Executive Committee of the International Fund for saving the Aral Sea (EC-IFAS), to which USAID has likewise provided support.

and nutrition, including for those affected by HIV/AIDS and tuberculosis. In a region where 60 percent of the population lives in rural areas, food security and livelihoods depend extensively upon agricultural productivity, leaving these populations more vulnerable to climate risks. At the same time, increased frequency and intensity of storms can lead to worsening floods and mudflow events, which can result in deaths and affect infrastructure critical to health service delivery (e.g., hospitals, roads, clean water, and electricity). Other extreme weather events such as heat waves and drought can increase mortality, particularly among vulnerable populations such as children and the elderly. Further, climate change impacts to water availability could decrease access to clean water, which already affects over 40 percent of the population of Tajikistan. Finally, after being eradicated in the region in the 1960s–1970s, malaria made a resurgence in the 1990s. While management has been improving, changing rainfall patterns, along with increasing temperatures and flood events, can contribute to favorable conditions and an expanding range for the mosquito vector that spreads malaria. Such changing conditions can also increase transmission of other vector- and waterborne diseases. (2,18,21,26,30,31)

BIODIVERSITY

Mountains: The five countries of the Central Asia region span various mountain ranges, including the Pamir, the Ural, and Tien Shan. These mountains hold the headwaters of Central Asia's primary rivers, with the Tien Shan Mountains as the source of the Syr Darya and the Pamir as the primary source of the Amu Darya. Increased melting of glaciers and permafrost can alter water flow patterns and negatively impact ecosystems and biodiversity, including agro-biodiversity. This can be significant, given that the region's mountains often possess substantial proportions of total species (e.g., two-thirds of terrestrial vertebrate species in Turkmenistan reside in the mountains and foothills) and some species in the region, such as snow leopards and saiga antelope[5], already face pressure from poaching and trafficking. Additionally, changing temperature and precipitation regimes on the mountains can be expected to affect animal ranges and the extent of habitat of some plant species. This may also alter the elevations and distribution of some mountain forests. Climate change shifts in habitat boundaries may result in introductions of new, invasive species. In other cases, decreasing mountain river flows may lead to disappearance of certain aquatic species. The region contains numerous globally important biodiversity hotspots that include wild relatives of key agricultural species. Given that these wild species exhibit tolerance to a wider range of climatic conditions and diseases, it may prove that some varieties are well suited to new climate conditions. (7,8,18,19,39,41)

Climate Stressors and Climate Risks BIODIVERSITY

Stressors	Risks
Increased temperatures	Melting of permafrost and glaciers
Increased drought	Increased forest fires
Change in precipitation and wind patterns	Competition among mountain communities for resources
	Shifting species habitats, including species loss and introduction of non-native species
Extreme weather events	Increased forest degradation

Forests: Central Asia is home to diverse forest ecosystems, including various broadleaved fruit and nut species, such as walnuts, apples, pears, and almonds. The region's forest ecosystems range from taiga forests comprised predominantly of spruce and firs to shrublands found in desert and the region's arid steppe. Central Asia's forests provide vital ecosystem services, such as helping to maintain river discharge from the mountains down to the lowlands of the Syr Darya River and functioning as carbon sinks. Changing temperature and precipitation regimes are leading to shifts in species habitat and distribution, particularly for several species of juniper. At the same time, an increase in forest fires and damage from extreme weather events serve as critical threats to the region's forest. Forest fires have already become more frequent in the

[5] The USAID supported initiative Sustainable Conservation Approaches in Priority Ecosystems (SCAPES), evaluated landscape conservation opportunities for the Ustyurt Plateau, and specifically sought to support conservation of the Saiga Antelope

last decade, a trend expected to further increase with warming temperatures, increasing droughts, and potentially changing wind patterns. Forest fires threaten the safety of lands used for agriculture production as well as people's health due to smoke concentration. Severe weather events, such as storms and droughts, can lead to tree loss. Changes in precipitation patterns and lack of hard freezes may bring about insect infestation outbreaks and invasion of non-native plant species, which can be detrimental to ecosystems. The impacts of climate stressors on agricultural productivity and livestock may also increase competition over forestry resources and land. (2,8,13,18,31,32)

ENERGY

Central Asia is home to an abundance of diverse energy sources, such as hydropower, gas, oil, and coal. Hydropower resources are concentrated in the Kyrgyz Republic and Tajikistan, on the upper reaches of the Amu Darya and Syr Darya rivers, representing 90 percent of the region's economically viable hydropower potential. Although these resources are rich, they are not efficiently distributed. Already, certain areas are not able to meet communities' energy needs due to poor infrastructure or outdated systems. Impacts from increasing temperatures and more intense or frequent storms are likely to further degrade energy infrastructure, including generation and transmission resources. Power shortages already occur, often during the winter. Increasing temperatures will likely decrease energy demand for heating in the winter, yet overall energy demand is expected to rise due to demographic and economic growth, the effect of increased temperatures on cooling requirements, and increased pumping for irrigation demands. Under changing climate conditions, increased droughts and water shortages resulting from warming will reduce water available for hydropower and thermoelectric cooling. Increasing glacial melt and changes in snowmelt and precipitation patterns are likewise likely to affect reliability of hydropower sources in the coming decades, with overall potential for decreases in availability possible in later decades. (1,20,22,24,26,31,32,39)

Climate Stressors and Climate Risks ENERGY

Stressors	Risks
Increased temperatures	Changing energy demand
More intense and/or frequent extreme weather events	Decreased hydropower reliability and productivity
Increased droughts	Damaged energy infrastructure

POLICY CONTEXT

The countries of Central Asia continue to struggle with establishing policies to address the effects of climate change and with applying strategies for future sustainable use of resources. Institutional and political constraints often lead to the absence of environmental and related issues in national policy agendas. However, progress is being made throughout the region. Awareness of climate change impacts, particularly for agriculture, energy, disaster risks, and the water sector, is broadly increasing, as are efforts to reduce greenhouse gas emissions. While targeted climate change policies are lacking, governments in the region are integrating climate change considerations and actions into sectoral policies and sustainable development strategies. USAID, the World Bank, the European Union, the Asia Development Bank (ADB), United Nations agencies, and other donors have supported various initiatives that strive to manage and improve access to resources, including water, energy, and agriculture. Increasing emphasis on security threats for and emanating from the region may align with efforts to address the impacts of climate change on resources and security. USAID's Smart Waters project aims to build relations among water managers and specialists and increase coordination with academic institutions. This will promote and enhance regional cooperation on shared water resources within Central Asia and Afghanistan. USAID's Asia Bureau and Office of Afghanistan and Pakistan Affairs have also supported a number of climate resilience initiatives, such as the Contribution to High Asia Runoff from Ice and Snow (CHARIS) project, which seeks to quantify the contribution of glacier and snow-covered areas to Central Asian rivers and thereby provide future projections of water availability.

Additionally, the USAID-funded Conservation and Adaptation in Asia's High Mountain Landscapes and Communities helps to design and implement community climate adaptation strategies, with a focus on conserving snow leopard habitat. (10,19,20,25,28)

INSTITUTIONAL FRAMEWORK

The countries in Central Asia do not have independent institutional entities charged with addressing climate risks. Efforts are largely diffuse and distributed through sectoral ministries, such as those focused on environment, natural resources, agriculture, energy, and infrastructure. Governments are engaging with international donors to get help designing and implementing institutional structures to support climate change resilience. For example, government representatives are participating in the UNDP National Adaptation Plan Support Program and receiving support from the World Bank's Climate Adaptation and Mitigation Program for Central Asia, among other efforts. (7,23,33)

NATIONAL STRATEGIES AND PLANS

- National Sustainable Development Strategy for the Kyrgyz Republic (2013-2017)
- National Climate Change Strategy of Turkmenistan (2012)
- National Development Strategy of the Republic of Tajikistan for the Period up to 2030 (2016)
- Kazakhstan 2050 Strategy (2012)
- Green Economy Concept for the Republic of Kazakhstan (2013)
- Toward an Uzbekistan National Adaptation Plan (NAP) (2016)

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SELECTED ONGOING EXPERIENCES

Projects below represent current or recently completed development efforts related to climate change in Central Asia. Projects were selected through review of USAID, other donors', and implementing partner project databases.

Selected Program	Amount	Donor	Year	Implementer
Heat Supply Improvement Project for Kyrgyz Republic	$46 million	World Bank	2017-2023	N/A
CASA-1000 (Central Asia South Asia-1000) water and energy initiative	$953 million	World Bank	2011-ongoing	SNC-Lavalin
Sustainable Rural Water Supply and Sanitation Project (Kyrgyz Republic)	$28 million	World Bank	2016-2025	Community Development and Investment Agency
Energy Sector Development Policy Operation (Kyrgyz Republic)	$24 million	World Bank	2015-2016	Ministry of Energy and Industry of The Kyrgyz Republic
Smart Waters	$9.5 million	USAID	2015-2020	Regional Environmental Centre for Central Asia (CAREC)
Farmer-to-Farmer (Kyrgyz Republic and Tajikistan)	$7.9 million[6]	USAID	2013-2018	ACDI-VOCA
Power the Future (Central Asia)	9.0 million	USAID	2017-2019	Tetra Tech
Scaling Up Renewable Energy (Kazakhstan)	1.0 million	USAID	2017-2018	National Renewable Energy Laboratory (DOE)

[6] Budget for entire region, including Armenia, Georgia, Kyrgyz Republic and Tajikistan.

Climate Smart Development in Central Asia	2.2 million	USAID	2016-2022	CGIAR Research Center
Conservation and Adaptation in Asia's High Mountain Landscapes and Communities	$7.0 million	USAID	2012-2017	World Wildlife Fund
Establishment of the Kazakhstan Knowledge Center on Integrated Water Resources Management	$225,000	ADB	2017-2019	3 International Consultants TBD
Fostering the Development of Renewable Energy (Kazakhstan)	$1 million	ADB	2017-2018	International Consultants TBD
Power Generation Efficiency Improvement Project (Uzbekistan)	$450 million	ADB	2017-2019	TBD
Investment Climate Reforms Program - Subprogram 2 (Tajikistan)	$50 million	ADB	2016-2017	State Committee on Investments and State Property Management
Water Resources Management in Pyanj River Basin Project	$25 million	ADB	2016-2022	N/A
South Kazakhstan Water Supply Project	$180 million	EBRD	2017-2020	RGP Kazvodkhoz
Bishkek District Heating Network	$7.2 million	EBRD	2017-2020	Bishkek District Heating Network
Qairokkum HPP Climate Resilience Upgrade - Tajikistan	$38 million	EBRD	2017-Ongoing	Barki Tojik
Transboundary Water Management in Central Asia		GIZ	2009-2019	German Federal Foreign Office (AA)
Ecosystem-Based Adaptation to Climate Change in High Mountainous Regions of Central Asia		GIZ	2015-2019	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)
Strengthening of Livelihoods Through Climate Change Adaptation in Kyrgyzstan and Tajikistan		GIZ	2014-2018	German Federal Ministry for Economic Cooperation and Development (BMZ)
Maximum Cooperation to Manage Glacier Melt in Central Asia	$1.26 million	SDC	2017-2020	SDC/Blue Peace Initiative
Supporting Kazakhstan's Transition to a Green Economy	$10.4 million	UNDP	2015-2018	Government of Kazakhstan
Supporting Climate Resilient Livelihoods in Agriculture	$8.8 million	UNDP	2016-2021	Ministry of Environment-Turkmenistan
Developing Climate Resilience	$23.5 million	UNDP	2014-2019	Government-Uzbekistan