



Policy Brief

Impact of climate change on water resources in Central Asia

Georg Petersen

June 2024

Disclaimer

The CAREC Institute policy brief series is a forum for stimulating discussion and eliciting feedback on ongoing and recently completed projects and workshops undertaken by CAREC Institute's staff, consultants or resource persons. The series deals with key economic and development issues, particularly those facing the CAREC region, as well as conceptual, analytical, or methodological issues relating to project/program economic analysis, and statistical data and measurement.

The policy brief is written by Georg Petersen, ADB International Consultant, based on the research reports "[Water sector financial governance gap analysis in Central Asia](#)" and "[Water Sector Financing Improvement Action Plan for Efficient Water Sector Financing](#)." The research is funded through the technical and financial assistance from the ADB under "TA-6694 REG: Water sector financial governance gap analysis in Central Asia: from planning to practice."

The views expressed in this policy brief are the views of the author and do not necessarily reflect the views or policies of the CAREC Institute, its funding entities, or its Governing Council. The CAREC Institute does not guarantee accuracy of the data included in this policy brief and accepts no responsibility for any consequences of its use. The terminology used may not necessarily be consistent with the CAREC Institute's official terms. The CAREC Institute accepts no liability or responsibility for any party's use of this policy brief or for the consequences of any party's reliance on the information or data provided herein.

By making any designation of or reference to a particular territory or geographical area, or by using country names in the policy brief, the author did not intend to make any judgment as to the legal or other status of any territory or area. Boundaries, colors, denominations, or any other information shown on maps do not imply any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

This policy brief is available under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO) <https://creativecommons.org/licenses/by/3.0/igo/>. By using the content of this policy brief, you agree to be bound by the terms of this license. This CC license does not apply to other copyright materials in this policy brief. If the material is attributed to another source, please contact the copyright owner or publisher of that source for permission to reproduce it. The CAREC Institute cannot be held liable for any claims that arise as a result of your use of the material.

Central Asia Regional Economic Cooperation (CAREC) Institute
21st Floor, Commercial Building Block 8, Vanke Metropolitan,
No. 66 Longteng Road, Shuimogou District, Urumqi, Xinjiang, the PRC, 830028
f: +86-991-8891151

[LinkedIn: carec-institute](#)

km@carecinstitute.org

www.carecinstitute.org

Introduction

Although water resources are affected by climate change worldwide, each region has its own vulnerabilities. In Central Asia, due to the outdated infrastructure and the reliance on the glacier reserves, the impact of climate change on the water sector leads to consequences such as lack of drinking and irrigation water, land degradation, energy deficits, mudflows and floods, avalanches, landslides, which affect the biodiversity and ecosystem of the country.

This policy brief integrates a review of academic literature, the analysis of current policy frameworks and the empirical evaluation of the current situation in Central Asia related to the impacts of climate change on the water resources.

Literature review

The countries of Central Asia are already facing significant challenges in dealing with problems caused by the increasing water demands of its growing populations, exacerbated by the adverse effects of climate change. The region, which is characterized by aridity, severe weather fluctuations, low rainfall, and uneven distribution of resources, is particularly vulnerable to climate change, and particularly the increase in variability that comes with it. The vulnerability of countries is due not only to geographical location or climatic conditions. Existing economic problems, population growth, socio-political instability, limited institutional and scientific capacity, outdated infrastructure, high levels of degradation of agricultural land and natural ecosystems are just some of the factors that undermine the ability and willingness of the countries of Central Asia to cope with the consequences of climate change.¹

The working paper developed by Asian Development Bank presents that until 2050, mean temperatures are projected to rise yearly in the Central Asian region, with an annual mean temperature rise of about 3 degrees Celsius. The warming was projected to be strongest in the mountains and in the more northerly latitudes.²

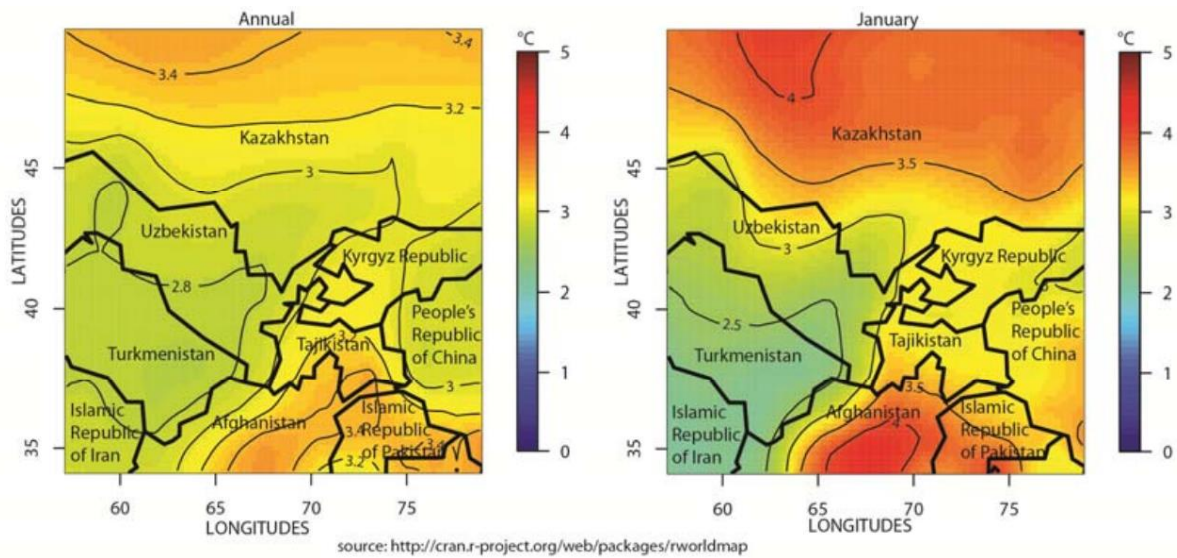
Central Asia's high sensitivity to climate change is due to inefficient water resource utilization rather than a lack of resources. The region's total water withdrawals per capita may be among the highest in the world, but its economic productivity of water usage is among the lowest. Furthermore, the high significance of agriculture in the local economy will magnify the climatic consequences in many areas. Currently, agriculture accounts for half of overall employment and the gross regional product in several provinces across the region.³

¹ Idrisov, T. (2023), Climate change and water resources in Central Asia: Growing uncertainty. <https://cabar.asia/en/climate-change-and-water-resources-in-central-asia-growing-uncertainty>

² Punkari, M., Droogers, P., Immerzeel, W., Korhonen, N., Lutz, A., & Venäläinen, A. (2014). Climate Change and Sustainable Water Management in Central Asia. FCG International <https://www.adb.org/sites/default/files/publication/42416/cwa-wp-005.pdf>

³ Prevention Web article (2023). Improving Central Asia's climate resilience through the water–agriculture–energy nexus <https://www.preventionweb.net/news/improving-central-asias-climate-resilience-through-water-agriculture-energy-nexus>

Figure 1: Average change of annual (left) and January (right) mean temperatures between control simulations for 1971–2000 and simulations for 2045–2065²



Policy context

The region's inefficient water infrastructure and its dependence on glacier-fed water sources makes Central Asia vulnerable to climate change. Rising temperatures and shifts in precipitation patterns directly impact the availability and sustainability of water resources.

Analysis of findings

Based on reviewed literature and empirical evidence, Central Asia region is not prepared to face the challenges related to climate change. The countries are vulnerable to rising temperatures and fluctuations of the weather patterns. More specifically, the melting of glaciers and the reduction of snow cover in the Tien Shan and Pamir-Alai will affect the availability of water supply in the long term, as these glaciers act as natural reservoirs, providing freshwater during the dry season and sustaining river flows.

The agricultural sector is vital for the economic development of Central Asia. This sector (which is highly relying on irrigation) is very sensitive to the fluctuations of water availability. The effects of climate change are expected to increase precipitation variability and can thus negatively affect the agricultural productivity and food security of the region. This comes in addition to the increasing population levels and the increasing demands for water and energy, exerting additional pressure on the existing water resources.

There are several options that can be considered to reduce the vulnerability to climate change. The outdated infrastructure is resulting in significant water losses. Water saving crops and methods of irrigation are not yet sufficiently pursued. Substantial financing would be required to update and to extend the current water infrastructure. Since in the region the water supply systems are mainly funded by the national budgets, additional funding sources are required.

Given Central Asia is characterized by shared river basins and transboundary water resources, water variability as well as -scarcity as a result of climate change could become a topic of dispute in the region. As a consequence, it is extremely important to have regional protocols in case of limited water availability.

Recommendations

Central Asia is facing significant changes in water availability coming with climate change. However, it has a chance to develop a resilient future through prioritizing strategic modernization of infrastructure and fostering transborder water cooperation. Central Asia could improve its water resources usage if proactive measures are adopted.

Urgent infrastructure investment

Ensure that climate change projections are considered in infrastructure investments and modernize existing infrastructure for water-efficiency. This will be key to mitigating the impacts of water scarcity and building climate resilience.

Regional water cooperation

Given the high level of shared water resources in Central Asia, developing robust regional protocols and agreements for water allocation in times of scarcity is critical to reduce conflict risks and promote equitable water use within and across countries. In formulating strategies for regional water cooperation in Central Asia, it's crucial to acknowledge the roles of external actors, such as the Russian Federation, Afghanistan and China. The strategies should take into consideration implementation of nature-based solutions to reduce the impact of climate change on the water resources.

Way Forward / consulting mechanisms

Modernization of infrastructure:

- Conduct a region-wide water system audit which identifies vulnerabilities to changing rainfall patterns, changing glacier melt, and extreme weather events. Such information will enable prioritizing upgrades and replacements;
- Prioritize the allocation of budgets to water projects that are climate resilient e.g. prioritize efficient irrigation systems;
- Seek the involvement of international experts and institutions that have experience in developing climate resilient infrastructure.

Collaboration at regional level:

- Review the current water-sharing agreements from a climate change impacts' perspective. Develop agreements on water allocation during scarcity periods;
- Establish regional platforms for hydrologic data sharing as well as collaborative modeling that can study the effects of climate change on the water resources of the region;
- Develop regional mechanisms for resolving conflicts over water due to climate-induced scarcity.

Innovative funding:

- Seek international funding to build infrastructure resilient to climate change.