CRYOSPHERE PROJECT in Central Asia

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POLICY BRIEF

THE CRYOSPHERE OF CENTRAL ASIA:

FROM JOINT ANALYSIS OF PROBLEMS TO COORDINATED ACTIONS

In Central Asia, there is an obvious relationship between the upper and lower reaches of endorheic river basins.

Inland natural water bodies of Central Asia: the Aral Sea, Lake Balkhash and Lake Issyk-Kul, fed primarily by snow-glacial or glacial-snow waters, are natural indicators of fluctuations in the water regime in the subregion, historically reflecting long-term, century-long and millennial periodicities or climate changes.[i]

According to forecasts presented in the project's scientifically based analytical assessments, the cryosphere of the Tien Shan and Pamirs will undergo significant changes in the 21st century due to rising temperatures and changing precipitation patterns.

IN THE CURRENT CENTURY, THE FOLLOWING ARE PREDICTED:

REDUCTION OF GLACIERS

Total volume of glaciers

860 km³

2020

By 2100 the total loss of ice volume

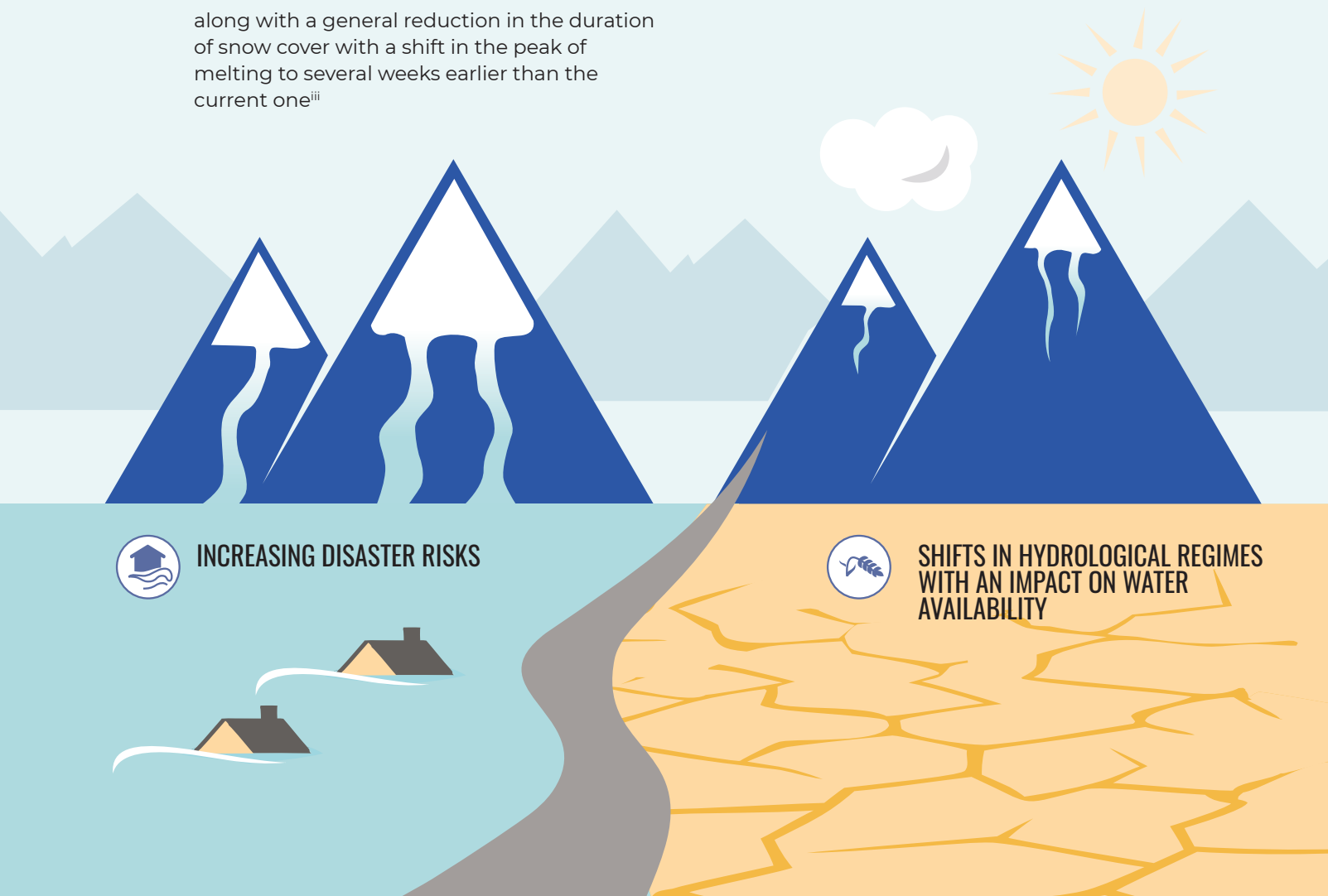
58% under **the low emissions** scenario

2100

85% under **the high emissions** scenario[ii]

REDUCTION OF SNOW COVER AREA ESPECIALLY AT LOW ALTITUDES

along with a general reduction in the duration of snow cover with a shift in the peak of melting to several weeks earlier than the current one[iii]



INCREASING DISASTER RISKS

SHIFTS IN HYDROLOGICAL REGIMES WITH AN IMPACT ON WATER AVAILABILITY

JUSTIFICATION

In response to the request of the Central Asian (CA) countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan to support efforts to determine the impact of climate change on cryosphere components (glaciers, seasonal snow cover and permafrost) and its subsequent impact on water resources the GEF International Waters' Learning Exchange and Resource Network and in the future, a full-sized GEF-UNDP-UNESCO subregional project "Strengthening the Resilience of Central Asian Countries by Enabling Regional Cooperation to Assess Glacio-nival Systems to Develop Integrated Methods for Sustainable Development and Adaptation to Climate Change" has been implemented in CA since 2022.

National hydrometeorological services (NHMS), research institutions, universities of the Central Asian countries, and the University of Fribourg (Switzerland) are participating in implementation of the project.

The UNESCO Regional Office in Almaty is implementing the project in coordination with the UNDP Istanbul Regional Hub, the UNESCO National Commissions, and the designated officials from the Central Asian countries.

The project is being implemented using the methodology and experience of the GEF International Waters' Learning Exchange and Resource Network (IW: LEARN) in assessing transboundary water basin issues and strategically planning actions in response to the identified problems.[1]

UNESCO's key objective within the project is to organize the process and facilitate the joint work of nominated Expert Groups from the Central Asian countries to elaborate a technical analysis framework that clearly identifies the causal chain of the main cryospheric problems, followed by the development of a Joint Subregional Action Programme (JSAP) in Central Asia and National Action Plans (NAPs) on the cryosphere in each project country applying the above methodology.

ANALYSIS OF THE MAIN PROBLEMS OF THE CRYOSPHERE

Diagnostic analysis (DA) **of the main problems in the field of monitoring, observation and research of the cryosphere in Central Asia**[2] was developed by the group of experts from the Central Asian countries based on a collective analysis of the following key issues:

- ***Insufficient quality, limited accessibility, or absence of the data on the cryosphere;***
- ***Lack of knowledge on the status of the cryosphere and of the impact of its degradation under the climate change;***
- ***Deficiency of qualified specialists on cryosphere research, and monitoring the cryosphere.***

In the GEF International Waters practice **Transboundary Diagnostic Analysis** (TDA)[iv] is a technical "living" document for the subsequent development of programmes and action plans.

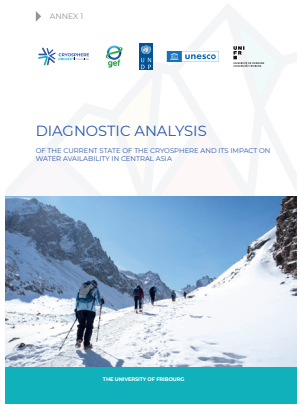
The TDA methodology involves identifying priority transboundary issues in collaboration with a group of stakeholders.

The TDA approach is used to analyze river basins worldwide to help countries identify and understand the problem and then make recommendations on priority and agreed water management measures.

The TDA process allows countries to identify priority issues and collect and systematically analyze relevant empirical data. Based on the data obtained, countries develop recommendations to reduce pressure on the cryosphere and ecosystems.

The TDA process is determined by the participating countries themselves, so while an international consultant can provide guidance on methodology, the participants develop their own approach to the TDA based on their specific conditions and local experience.

The developed DA is based on three fundamental thematic reports:

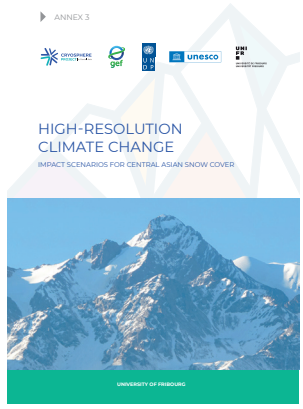


THEMATIC REPORT NO. 1 (TR-1)

«Diagnostic Analysis of the Current State of the Cryosphere and its Impact on Water Availability in Central Asia»[3]

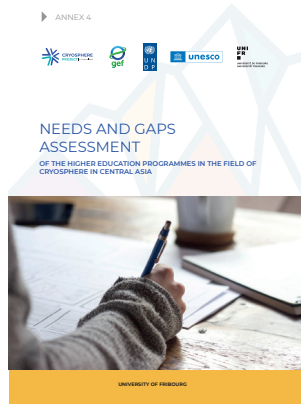
THEMATIC REPORT NO. 2 (TR-2)

«Climate Change Scenarios for Glaciers and Meltwater Contribution on Water Availability in Central Asia»[4]



THEMATIC REPORT NO. 3 (TR-3)

«High-Resolution Climate Change Impact Scenarios for Central Asian Snow Cover»[5]



as well as one

SURVEY STUDY WITH SUBSEQUENT ANALYSIS

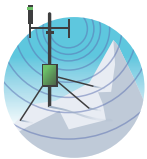
«Needs and Gaps Assessment of the Higher Education Programmes in the Field of Cryosphere in Central Asia»[6]

The thematic reports are the result of the efforts of a team of researchers and specialists from the University of Fribourg, who brought high-quality international experience and advanced approaches not only to the process of preparing thematic reports and DA, but through this work made a significant contribution to research on the Central Asian cryosphere as a whole.

The aggregate analysis made by the DA Expert Group in consultations with key stakeholders as well as the discussion of the DA findings at the Subregional meeting held in Samarkand on April 2–3, 2025 generate following DA recommendations:

- the assessments made already indicate that climate change is causing and will lead to changes in cryosphere components and their impact on water resources, requiring of the development strategies and programmes to adapt them. Each Central Asian country should reduce its economic dependence on water, including per growing population and per unit of GDP;
- cooperation between countries is important for developing a more detailed understanding of the cryosphere and its contribution to water resources over ten-, quarter- and half-century time horizons, as well as for planning changes in agriculture, energy, industry, and ensuring water security and environmental sustainability;
- cooperation among countries is essential for reducing the risks of natural disasters, including their transboundary impacts, and the implementation of early warning systems will be crucial for this. Early warning is not an alarm system, but rather a well-established knowledge exchange about evolving risks, based on precise data tracking of ongoing changes, which will only be possible with enhanced monitoring of cryospheric components;
- developed action programs at both the national and subregional levels, provided they are fully supported and approved by countries, can serve as a basis for resource mobilization and funding from both participating countries and donors. The GEF has experience not only supporting the development of analytical frameworks and action programs but also supporting the implementation of these action programs through an additional project.

In addition to the above, the DA notes the following as key recommendations for action in the short and medium term:



existing cryospheric monitoring efforts need to be strengthened and supported with sufficient investment to ensure the necessary data flow for more accurate water resource forecasting and water intake and use planning in all Central Asian countries. Therefore, addressing the problem of **insufficient quality, limited accessibility, or absence of the data on cryosphere** should be an urgent priority;

at the same time, it is necessary to address the problem of **lack of knowledge on the status of the cryosphere and of the impact of its degradation under the climate change**, and to conduct a corresponding awareness-raising campaign in order to provide information for decision-making regarding the availability of water resources in Central Asian countries in the short, medium and long term and the needs for adaptation to climate change;

there is also an urgent need to address the third problem identified by stakeholders: **deficiency of qualified specialists on cryosphere research, monitoring and management**.

All Central Asian countries are seeking solutions to the above-mentioned issues to improve cryospheric monitoring, observation, and research, but taking into account the specific circumstances of each country and its specific conditions. They view these as areas for joint efforts. This allows for joint efforts to be directed toward finding solutions at both the national and subregional levels.

To develop cooperation on the issues identified within the DA, it is recommended to establish dialogue between the countries participating in the project and create national and subregional technical groups to explore ways to establish cooperation at both the national and subregional levels, and to use the roadmap below to systematize the necessary actions.

The Strategic Action Plan (SAP) [v], according to the GEF methodology, is an agreed-upon policy document that should be approved at the highest level.

The SAP sets out clear priorities for action (legal, institutional, investment) to address the priority cross-border issues identified in the DA.

A clearly defined baseline is a key element of the SAP, allowing for a clear distinction to be made between actions with purely national benefits and actions that address transboundary issues with global benefits.

The SAP, in accordance with GEF practice, can be largely supported by national actions contained in specific NAPs developed during the SAP process.

JOINT SUBREGIONAL ACTION PROGRAMME ON THE CRYOSPHERE

At the subregional meeting in Samarkand, which took place from 2 to 3 April 2025, the Central Asian countries agreed to establish expert working groups to develop cryosphere programs and action plans at the national and subregional levels, and developed the agreed Cryosphere Vision–2050:

CRYOSPHERE VISION–2050

> ***Developed cryospheric monitoring with sustainable funding, qualified personnel, accessible data, and informed population to adapt economic sectors.***

Five further objectives were also developed to achieve the Cryosphere Vision–2050.

OBJECTIVE 1	OBJECTIVE 2	OBJECTIVE 3	OBJECTIVE 4	OBJECTIVE 5
Adapt and use unified systems of methods for monitoring and studying the cryosphere	Expand, restore and improve the cryosphere monitoring network	Develop collaborative/ partnership research	Ensure that the public, professionals and decision makers in their industries are informed about the impact of the cryosphere on their industries	Improve training programs for specialists

During national meetings held from April to July 2025, national working groups presented their proposals for all five objectives of the Joint Subregional Action Programme (JSAP), formulated tasks for the objectives and activities, identified agencies in each Central Asian country responsible for implementation, and discussed ways to present, agree on, and approve the JSAP.

At the 2nd subregional meeting on the development of the JSAP, held from 6 to 8 August 2025 in Boz-Beshik village (Issyk-Kul, Kyrgyzstan), the Central Asian countries confirmed and clarified their positions on the development of the JSAP and, as part of the intercountry working subgroups on the JSAP' objectives, identified tasks and activities for the implementation thereof, determined realistic deadlines for the implementation of the JSAP, taking into account the time for development, as well as the procedures for coordination and approval.

A group of experts representing each Central Asian country, with the assistance of the UNESCO Regional Office, carried out a detailed development of the JSAP activities during August-October 2025.

In October-November 2025, the text of the JSAP and the ***Advanced Cryospheric Monitoring Framework (ACM) were prepared, with sustainable funding, qualified personnel, accessible data, and informed population, to support the adaptation of economic sectors*** for 2027–2035. The JSAP text was submitted to the Central Asian countries for review in November 2025.

In November 2025, a draft Joint Statement of the Central Asian countries on the JSAP was prepared and submitted to the countries for consideration at the Regional Ecological Summit, which will be held on April 22–24, 2026, in Astana, Kazakhstan.

Along with the development of the JSAP, all five Central Asian countries are developing National Action Plans (NAPs) for the cryosphere, which respond to each country's national priorities for monitoring and studying cryospheric components, but at the same time strengthen the capacity for implementing the JSAP.

WAYS TO IMPLEMENT JOINT ACTIONS

Political support for the JSAP through the adoption of the Joint Statement at the 2026 Regional Ecological Forum will open up opportunities for:

- the GEF funding to support high-priority measures and actions that deliver global, subregional and national benefits, as defined in the GEF strategy for the effective Phase 9 of its activities in the «International Waters» priority area;[7]
- potential contributions of other multilateral and bilateral partners;
- commitments and financial contributions from key stakeholders (including, to the extent possible, the private sector).

ABOUT THIS POLICY BRIEF

This policy brief is based on the report «Diagnostic Analysis (DA) of Key Issues in Cryosphere Monitoring, Observation, and Research in Central Asia», developed within the framework of GEF-UNDP-UNESCO subregional project "Strengthening the Resilience of Central Asian Countries by Enabling Regional Cooperation to Assess Glacio-nival Systems to Develop Integrated Methods for Sustainable Development and Adaptation to Climate Change".

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The GEF-UNDP-UNESCO Cryosphere project is implemented by the UNESCO Regional Office in Almaty.

Full report: cryosphereca.org

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GEF-UNDP-UNESCO project “Strengthening the Resilience of Central Asian Countries by Enabling Regional Cooperation to Assess Glacio-nival Systems to Develop Integrated Methods for Sustainable Development and Adaptation to Climate Change”

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