

A REGIONAL APPROACH TO GLOF ASSESSMENT

Glacial Lake Outburst Floods (GLOFs) are sudden releases of water from lakes formed by glaciers. These floods pose significant threats, especially in Central Asia, where Kazakhstan, Tajikistan, Uzbekistan, and the Kyrgyz Republic are particularly vulnerable. While these nations have a strong history of disaster risk reduction in mountain areas, GLOFs require more coordinated regional efforts due to their transboundary nature.

The **GLOFCA project**, funded by the Adaptation Fund and implemented by the UNESCO Regional Office in Almaty in partnership with the University of Zurich, is the first initiative of its kind in Central Asia that works to reduce the vulnerability of communities exposed to GLOF risks.

A key project output is the **Best Practice Guidance Document on GLOF Risk Assessment**, which provides a comprehensive framework for mapping glacial lakes and assessing the risks they pose to surrounding communities, infrastructure, and ecosystems. This document is a critical resource for the management of GLOF risks across borders.

WHY GLOFCA MATTERS

Climate change is rapidly affecting high mountain regions worldwide, leading to shrinking glaciers, degrading permafrost, and transforming landscapes. These changes make traditional risk assessments based on past experiences less reliable, requiring new, forward-looking approaches to manage future risks.

What makes GLOFCA unique is its **regional focus**, recognizing that glacier hazards extend beyond national borders. The project fosters collaboration between Central Asian countries to develop and apply innovative GLOF risk assessment and management tools tailored to the region's landscape.

To learn more about the project's achievements, please visit glofca.org



A PIONEERING REGIONAL APPROACH TO GLOF RISK ASSESSMENT AND MANAGEMENT

"Reducing vulnerabilities of populations in Central Asia region from glacier lake outburst floods in a changing climate" (GLOFCA Project)

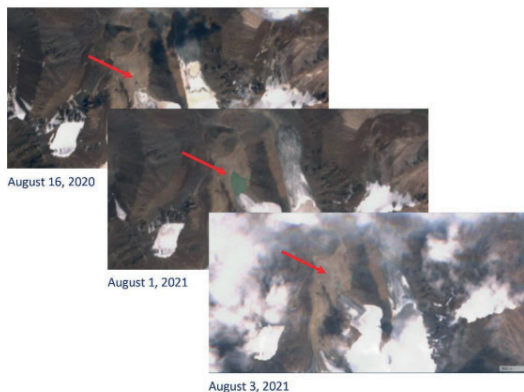


CENTRAL ASIA'S UNIQUE GLACIAL LAKE CHALLENGES

Unlike glacial lakes in other regions, such as the Himalayas or the Andes, Central Asian glacial lakes are often smaller, more dynamic, and prone to rapid development and expansion, making monitoring and risk assessment more challenging.

Case Study: Akpai Lake, the Kyrgyz Republic

The Akpay lake formed over 12 months between August 2020 and August 2021. It grew to hold 300,000 m³ of water—equivalent to 120 Olympic-sized swimming pools, sitting trapped behind unstable glacial sediment. Fortunately, previous work undertaken by local authorities had identified the potential for a lake to develop in a depression on this glacier, and therefore they were aware of the risk. Consequently, tourist access was restricted, and when the lake outburst occurred in early August 2021, no fatalities were reported, although roads were damaged. The case has become a test for the application and development of space-based monitoring tools under GLOFCA.



Development of Akpay Lake

Case Study: Saidoi Nasafi (Baralmos) glacier, Tajikistan

Baralmos Glacier in the upper Vahksh basin, Tajikistan, has been the source of repeated GLOFs in recent years, damaging key transportation infrastructure. Unlike typical 'Himalayan-style' outbursts from large proglacial lakes, these floods originate from water stored within the glacier itself and from supraglacial ponds on the glacier's surface. Although these ponds are small, they can develop quickly over a few weeks or months as seasonal snow melts, and the amount of water stored inside the glacier remains difficult to predict, posing a considerable risk to downstream infrastructure. As a basis for improved hazard and risk assessment, GLOFCA has been supporting locally led field monitoring and measurement of the Baralmos glacial lakes, including lake surveys with remotely controlled boats.

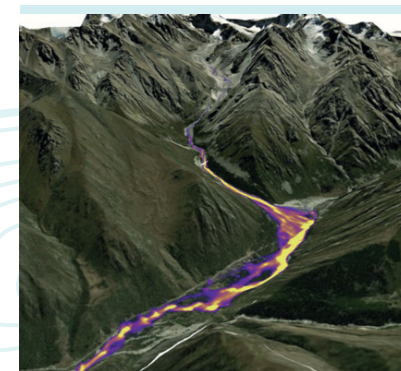


Top: Baralmos Glacier from Google Earth. Bottom: Damaged infrastructure as a consequence of GLOFs

CONTRIBUTIONS TO GLOF RISK ASSESSMENT AND MANAGEMENT

The unique dynamics of glacial lakes in Central Asia highlight the need for tailored GLOF risk assessment methods. The GLOFCA project combines regional expertise with cutting-edge scientific tools to develop approaches that enhance local disaster management and foster regional cooperation.

For example, an interactive **Lake Mapping Toolbox** was developed as an important step toward the automatization of lake monitoring. Using advanced machine-learning techniques and satellite radar imagery that can penetrate cloud cover, this tool enables year-round monitoring, providing high-frequency updates on lake conditions. GLOFCA also leads training on GLOF hazard modelling tools, which contributes to updating hazard maps and development of the design Early Warning Systems in four countries.



Modelling of a GLOF within the Ala-Archa River valley, the Kyrgyz Republic

These advancements are key to improving monitoring capabilities and developing robust risk management practices.