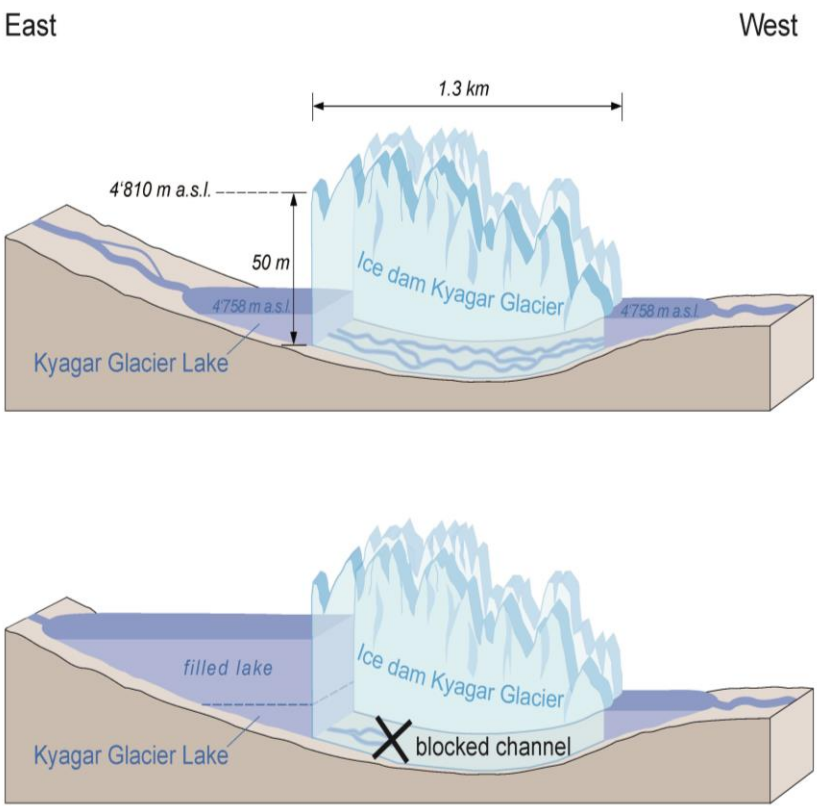


PPP and DRR: Sino-Swiss Cooperation Project on Monitoring and Early Warning in the area of Yarkant River, Xinjiang province, P.R. China



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The problem



Flooding along Yarkant River due to
Glacial Lake Outburst Floods (GLOF)



Why a Sino-Swiss Cooperation to address this problem?



Switzerland has a lot of **experience and knowledge** regarding natural hazards and risks. It hosts the International Center for monitoring of glaciers, which is supported by a large network of public and private actors.

As mountainous countries, China and Switzerland are both **affected by more frequent extreme flood events** and increased glacier melt due to climate change.

Expected outcomes of the collaboration



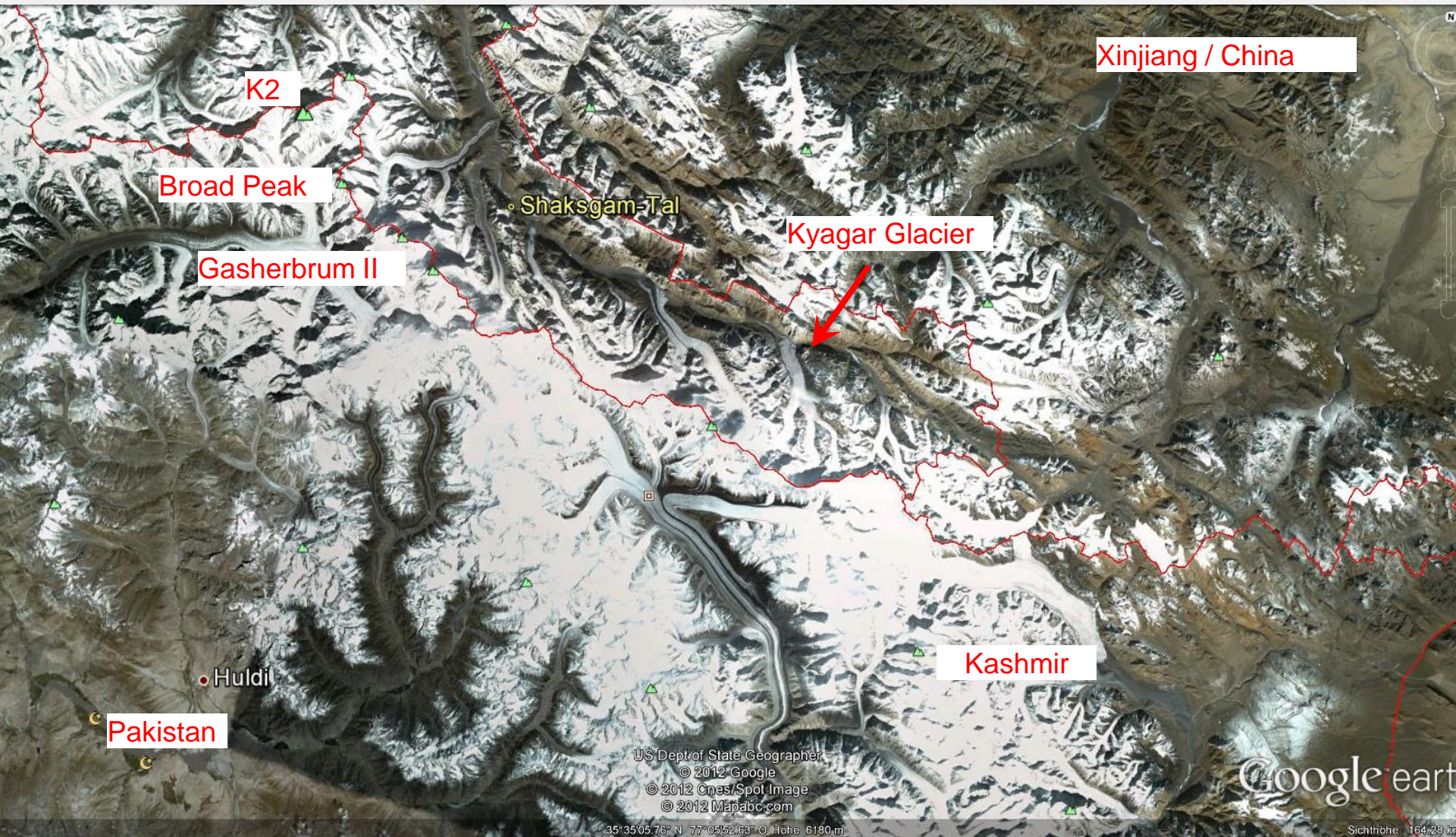
Improved knowledge of climate change impacts and **methods** for risk assessment through the monitoring of changing environmental conditions

Better forecast of GLOF through the establishment of an Early Warning System combining EO and ground measures

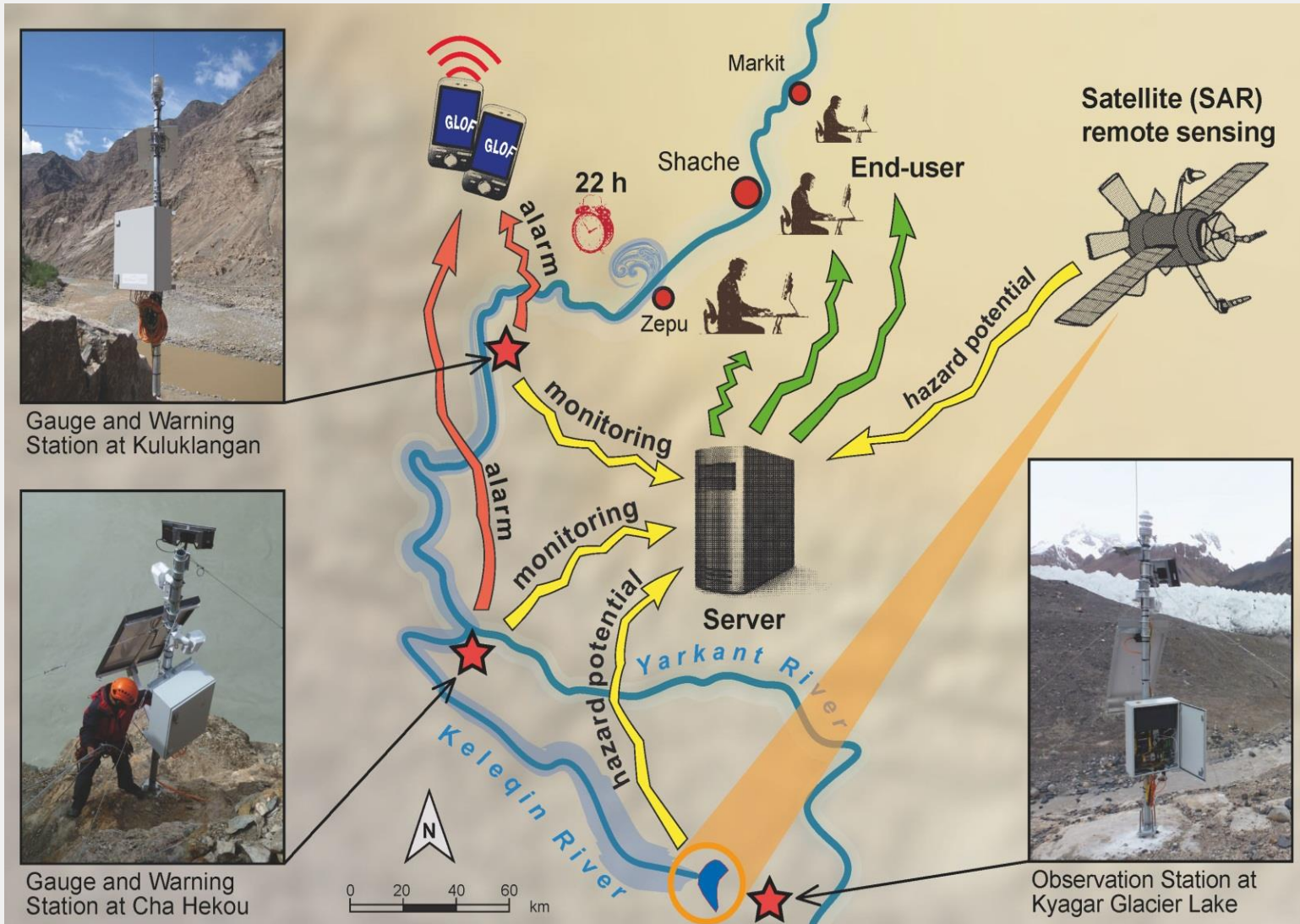
Better Risk Management through the establishment of flooding risk maps and practical measures implemented for a better response in case of GLOF



Project Area: Karakoram Mountains



Early Warning System



Cha Hekou Station: Ground truthing and EWS



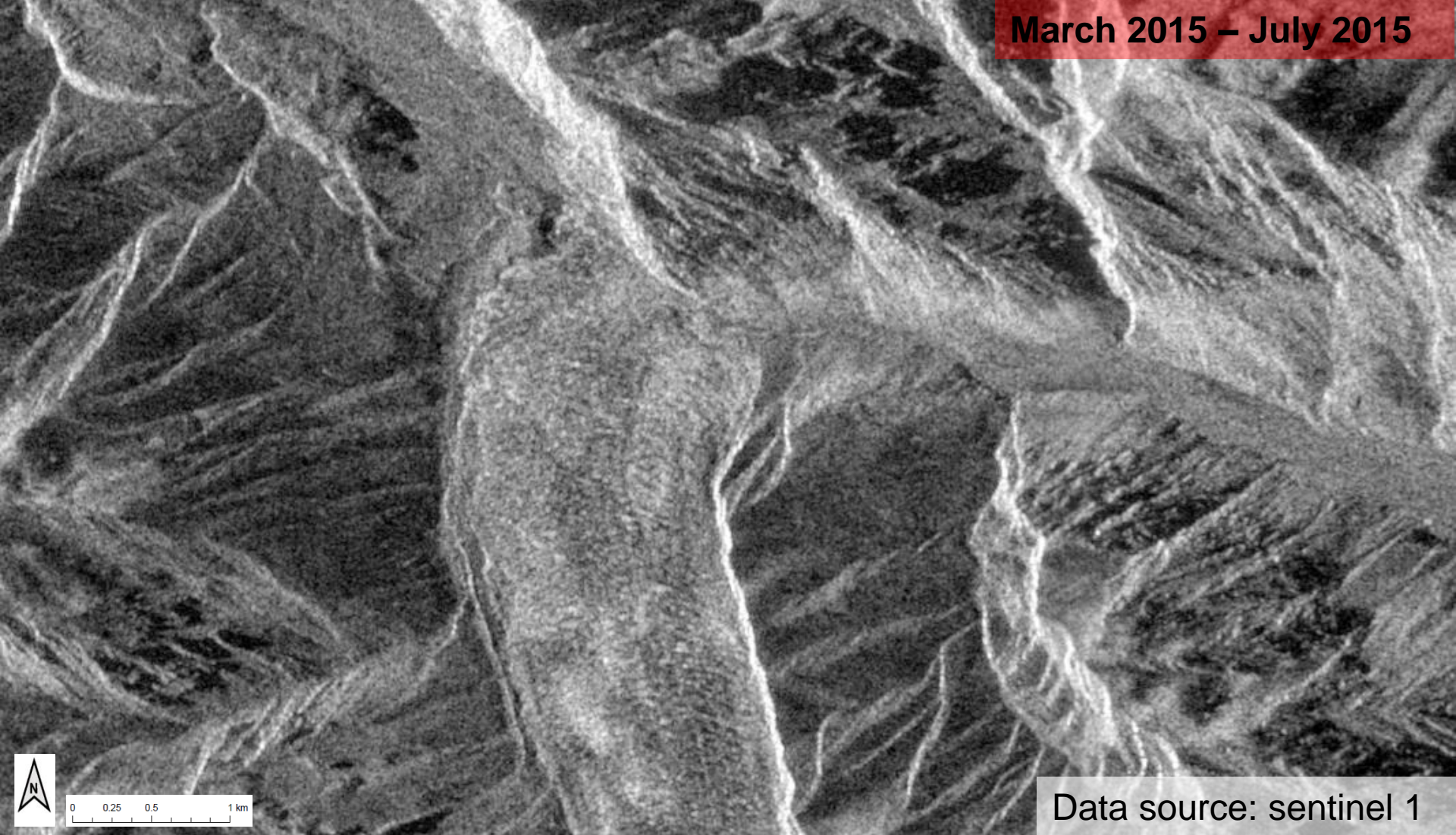
2 radar sensors



Control unit: data logger, 2 cameras, satellite communication unit, weather station, solar panel

Remote Sensing: Kyagar Glacier Lake 2015

March 2015 – July 2015



0 0.25 0.5 1 km

Data source: sentinel 1

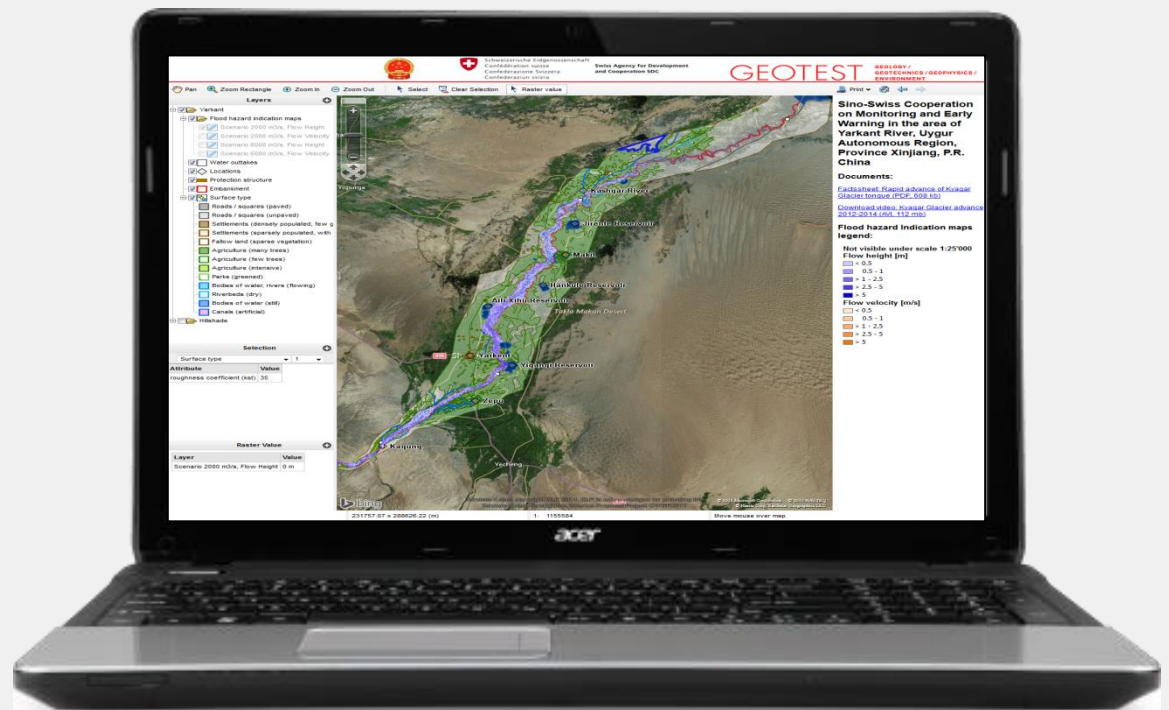


Risk Management in the Floodplain

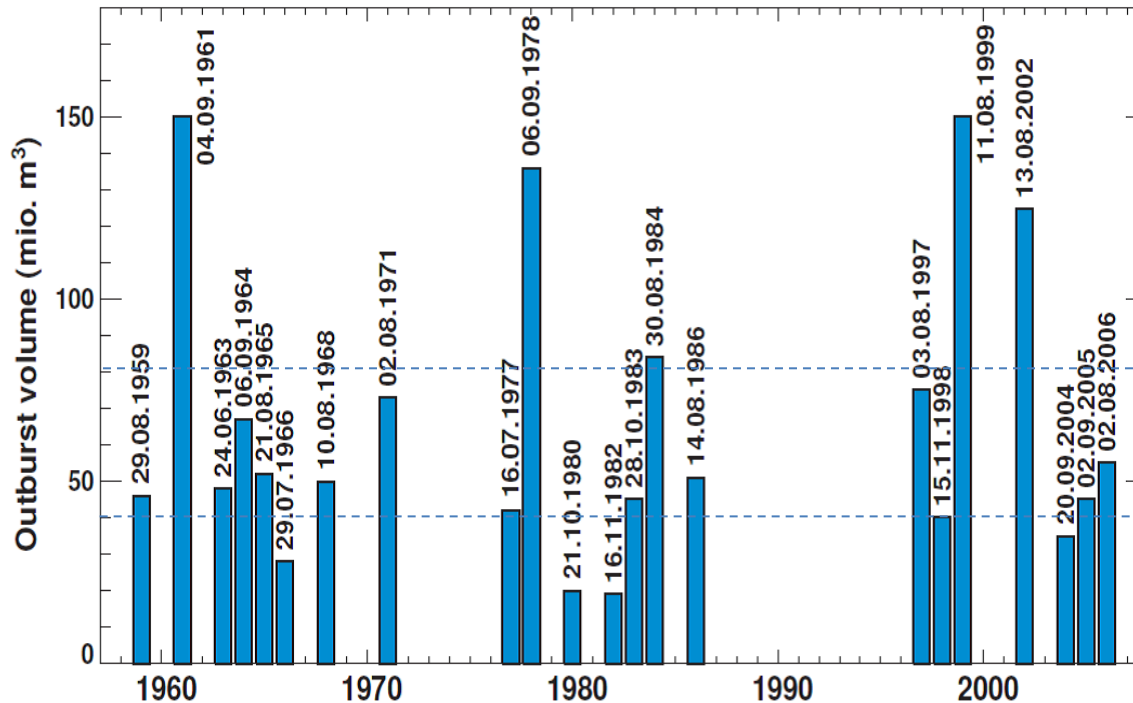


Establishment of a Digital Elevation Model (DEM) and **flood modelling** in the populated area

Elaboration of an **flood hazard indication map** for two GLOF scenarios (WebGIS Application)



Characteristics of Kyagar GLOF of 2015



1954 – 2015: **23 floods** were classified as GLOFs.

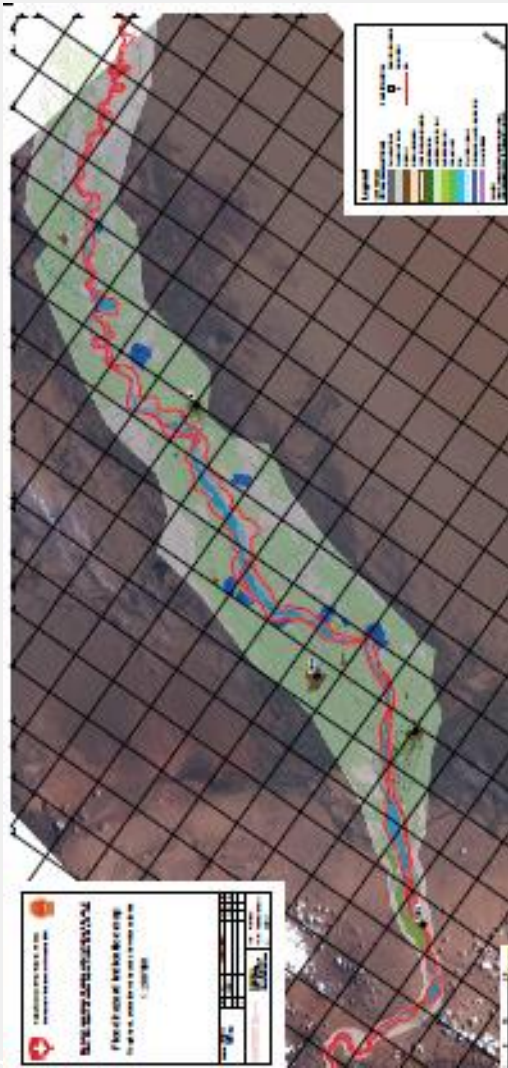
Most GLOFs had outburst volumes between 40 – 80 million m³.

GLOFs mostly occurred during **late summer to early autumn**.

Data redrawn after Zhang (1992) and Chen (2010).

GLOF 2015: 40 – 50 million m³, a medium sized GLOF, which has resulted in limited destruction – it is too early to state if the EWS has made a large difference, although it allowed to make a timely alarm.

Lessons learned I



In remote areas, the continuous **glacier monitoring** proved to be important for the hazard assessment.

Early warning system based on satellite data and terrestrial stations is a reliable and efficient tool for local communities / authorities, but Remote Sensing must be complemented by ground measurements to be trustworthy.

To reduce risks, besides timely forecasting extreme events, efforts need to be made to properly evaluate their effects. **Flooding risk maps** are an important step towards a **safer land use**

Lessons learned II



Meltwater on the Greenland ice-cap

Adaptation strategies in terms of GLOFs mean anticipating the effects of climate change and taking appropriate actions to reduce the damage they can cause.

The strategy to **avoid the unmanageable** (mitigation – land-use planning) and to **manage the unavoidable** (adaptation to climate change – Early Warning System) is valid around the globe.

The implemented **methodology** in the Karakoram Mountains (monitoring, early warning system, risk management) can be transferred to other regions.

Lessons learned III



Plenty of satellite images are available for free today, but their interpretation remains difficult. A strong **working partnership** between **specialised private companies, authorities and universities** has proved to be the backbone of an efficient project management.

It allows **putting together networks** which would otherwise never be reunited.

The Kyagar GLOF project is one example that showed that **well planned, early adaptation actions can save lives and reduce costs.**

The duplication of its approach in other regions could be a **sensible contribution to the Sendai Framework for DRR 2015-2030**

Thank you

Acknowledgements:

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September 15th, 2015

DRR and PPP: Yarkant River



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GEOTEST