Integrated Flood Risk Management Examples: Applications & Experiences

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GEOTEST LTD.

- We are an **independent** public limited company, whose shares are held by the company's executives.
- Together with our associate companies Geopraevent Ltd. and Terre Ltd., we employ 140 staff and are present in all parts of **Switzerland**.
- We operate **internationally** and have a branch office in Santiago de Chile.
- Over **50 years of experience** and ongoing staff training form the basis of our expertise.

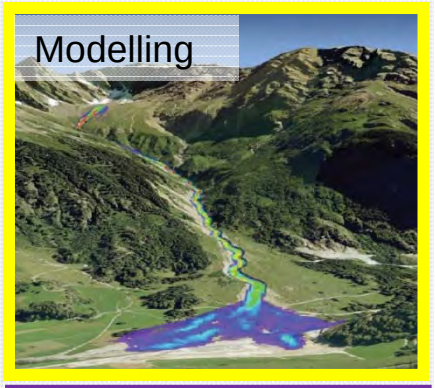
Expertise

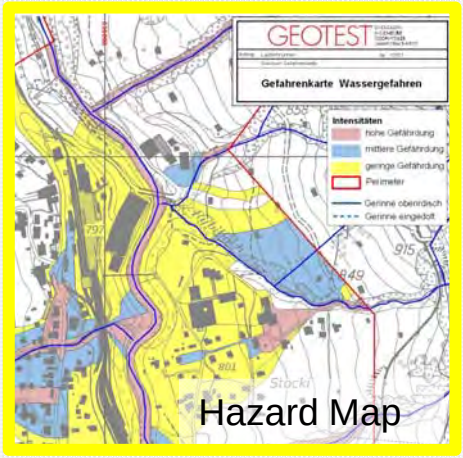
NATURAL HAZARDS

- Alarm and Monitoring Concepts
- Supervision of Protective Structure Construction
- Consultation for Blasting and Removal of Solid Rock
- Rock Rigidity and Safety
- Hazard Analysis, Hazard Mapping, Mass Movements, Floods, Debris Flows
- Debris Transportation Analysis
- Hydraulic Models 1D and 2D, Avalanche, Debris Flow, Slope Debris Flow and Rock-fall Models 2D and 3D
- Measurement Planning
- Permafrost
- Risk Analysis, Cost Efficiency and Effectiveness
- Protection Projects
- Safety Concepts
- Seismic Micro-Zoning
- Hydraulic Engineering

GEOTEST - World Wide Activities

Integrated Risk Management – Private Sector Expertise





Prevention in Georgia (Kazbeg area)

⇒ main tourist and trade route to Russia
⇒ national park area
⇒ **Important social and economic area for Georgia**

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The problem

Debris flow

Prevention in Georgia – Devdoraki Valley

Project Cooperation / Organization

Major DRR Activities**:**

- Georgian Crisis Management Council (lead)
- European Development Bank (support and first event assessment)
- USAid (support and hazard assessment)

GEOTEST AG / GEOPRAEVENT AG:

Main partner for hazard assessment and recommendation of early warning systems

- **Feasibility study** for establishing an early warning system (April 2015)
- Detailed **hazard assessment** study (October 2015)
- Installation of **early warning system** (2016)

Prevention in Georgia – Devdoraki Valley

Objectives:

- Improve Georgian knowhow on climate change induced phenomena
- Implement advanced hazard assessment
- Establish early warning system
- Knowhow transfer

Target group:

- Local communities (gas pipeline)
- Traffic and traders

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Prevention in Georgia – Devdoraki Valley

Damage potential: **Main border Georgia – Russia (economic life line)**

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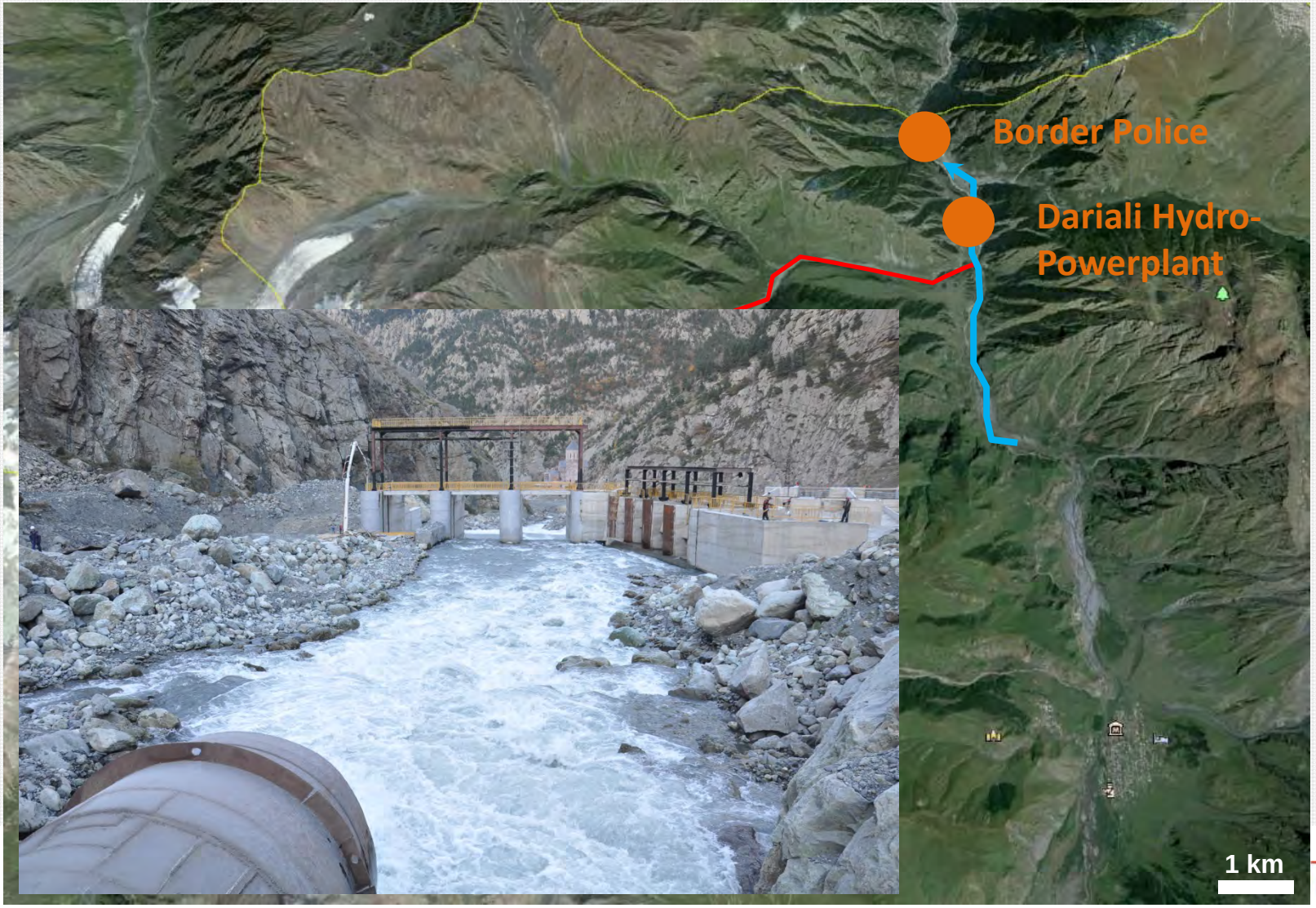
Prevention in Georgia – Devdoraki Valley

Damage potential: **Only powerplant in Kazbeg area**



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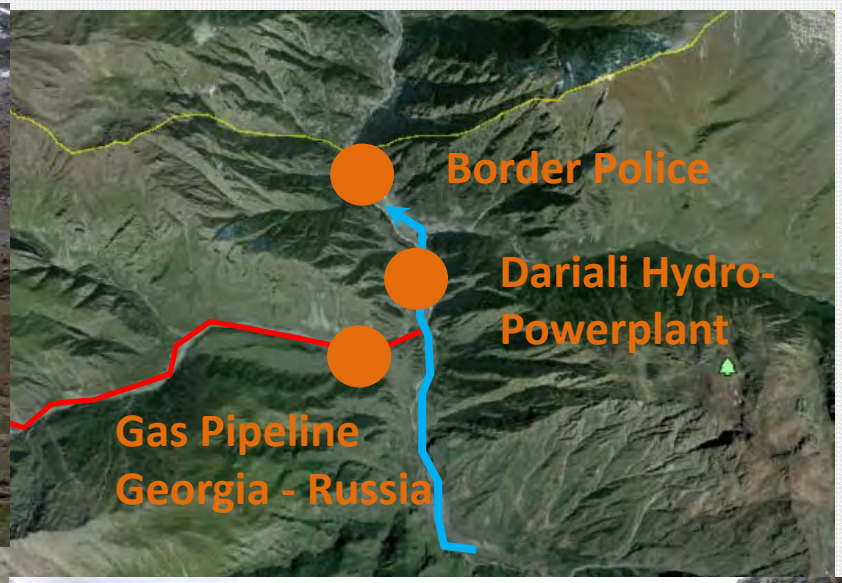
Prevention in Georgia – Devdoraki Valley

Damage potential: **THE pipeline to Russia (economic and social lifeline)**



Prevention in Georgia – Devdoraki Valley

Damage potential: **Main trade and tourist route from Azarbeijan, Armenia, Turkey**

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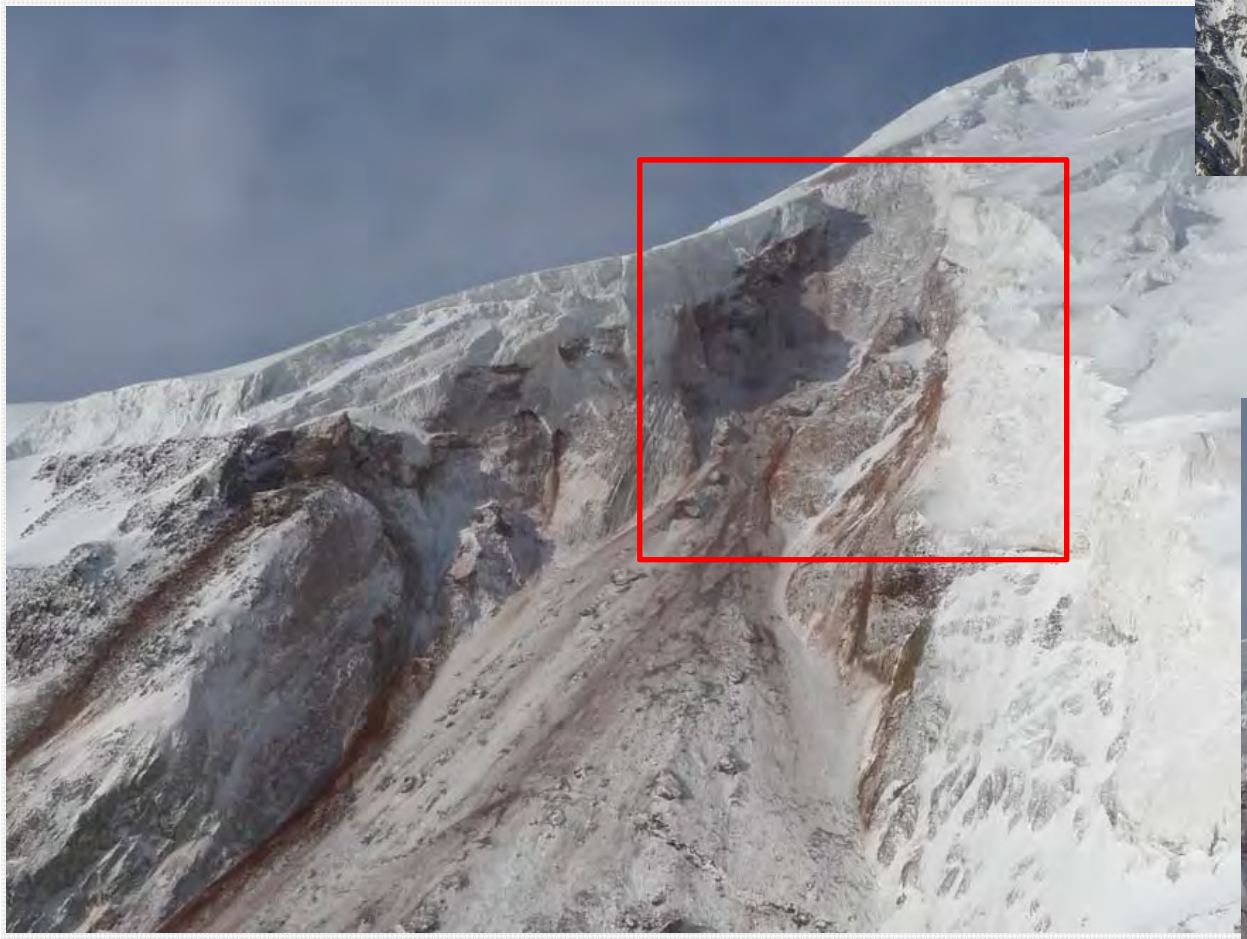
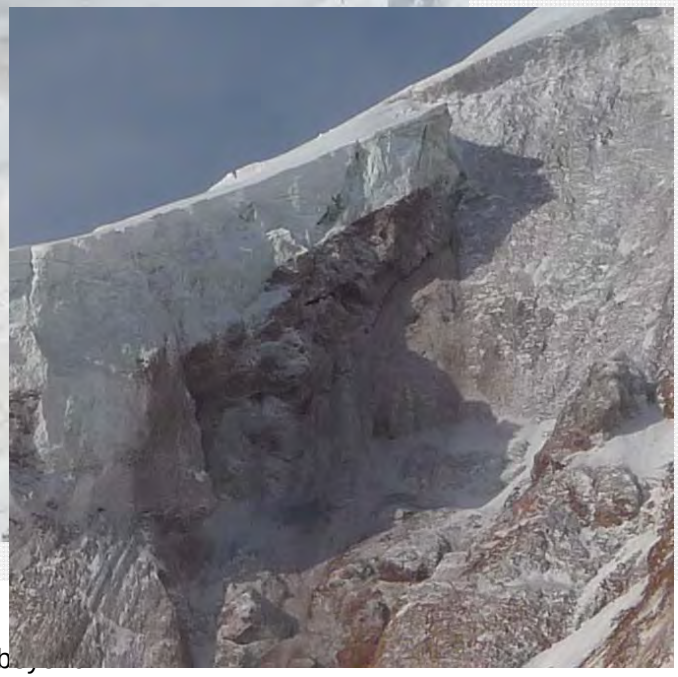
Prevention in Georgia – Devdoraki Valley

Glacier collapse on top of Mt. Kazbeg (May 17th, 2014)





Prevention in Georgia – Devdoraki Valley

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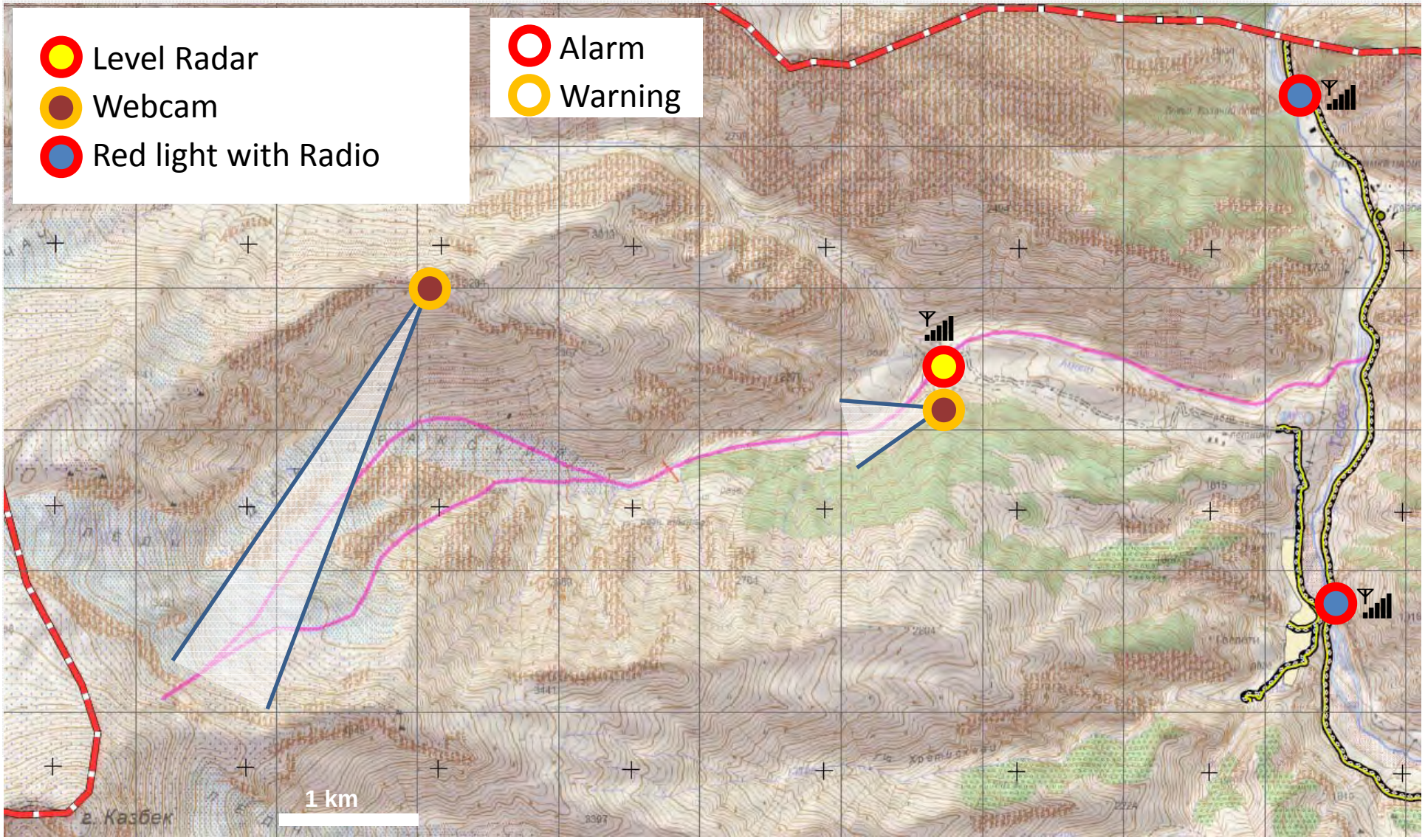
Prevention in Georgia – Devdoraki Valley

Early Warning System consisting of warning and alarm elements



Prevention in Georgia – Devdoraki Valley

Conclusions

- Glacier **monitoring** on a volcano is crucial for hazard management.
- **Early warning system** is a reliable and an excellent first phase warning tool. BUT in this case it is not appropriate as a permanent solution.
- Georgian expert knowhow on process chains is limited – **proactive support is necessary**.

Sino-Swiss Cooperation

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

The problem

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

Outcomes of the collaboration

The project target is to improve Chinese and international **knowledge** in the assessment of climate impacts and risks, and to develop **practical approaches** to climate change adaptation and emergency response.

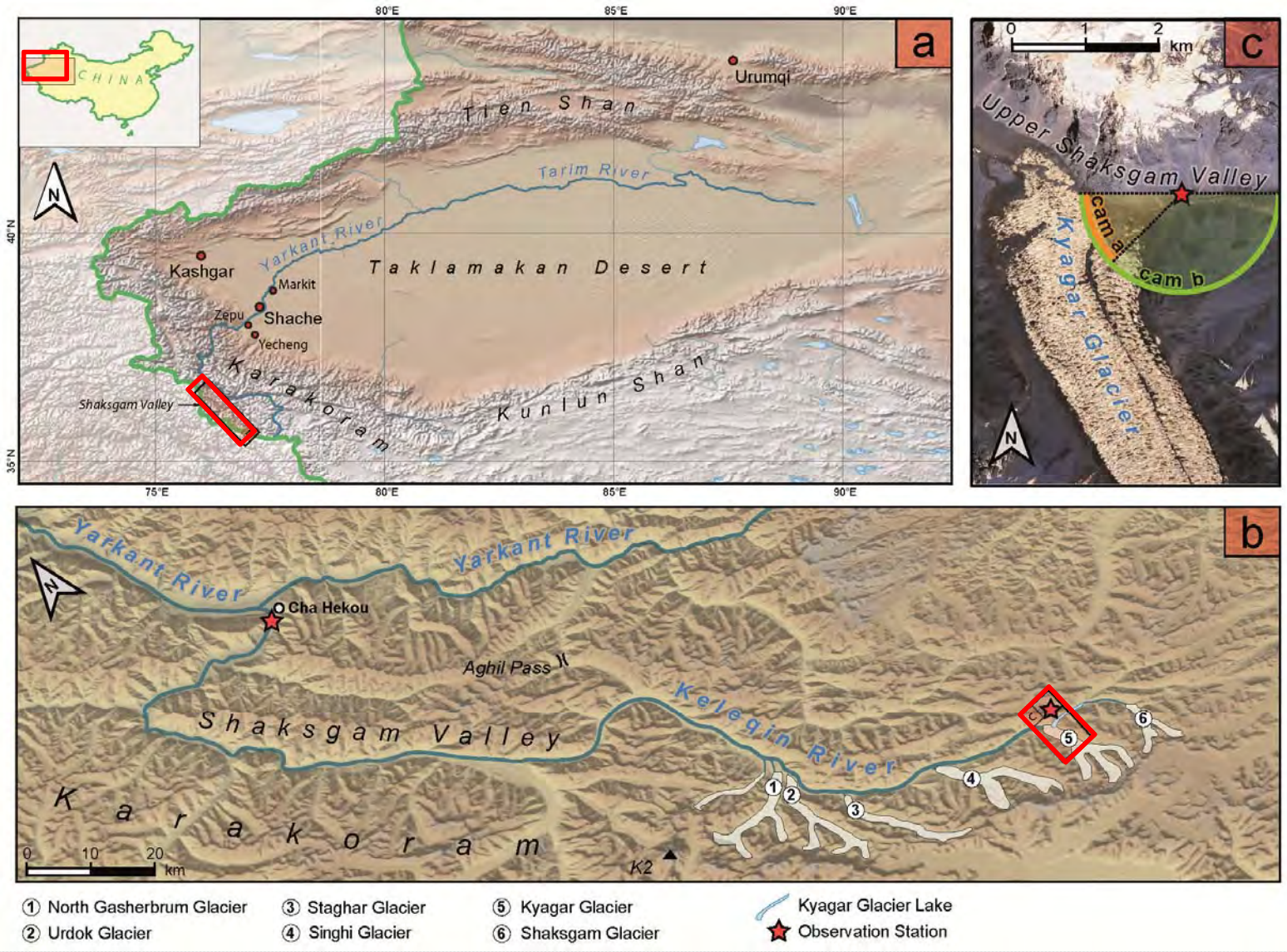
Target group: Vulnerable communities in the floodplain

(1) Establishment of an **Early Warning System** for GLOFs

(2) **Risk management** for the potential flood areas (flood hazard indication map)

(3) **Climate Change monitoring**

Project Area: Karakoram Mountains



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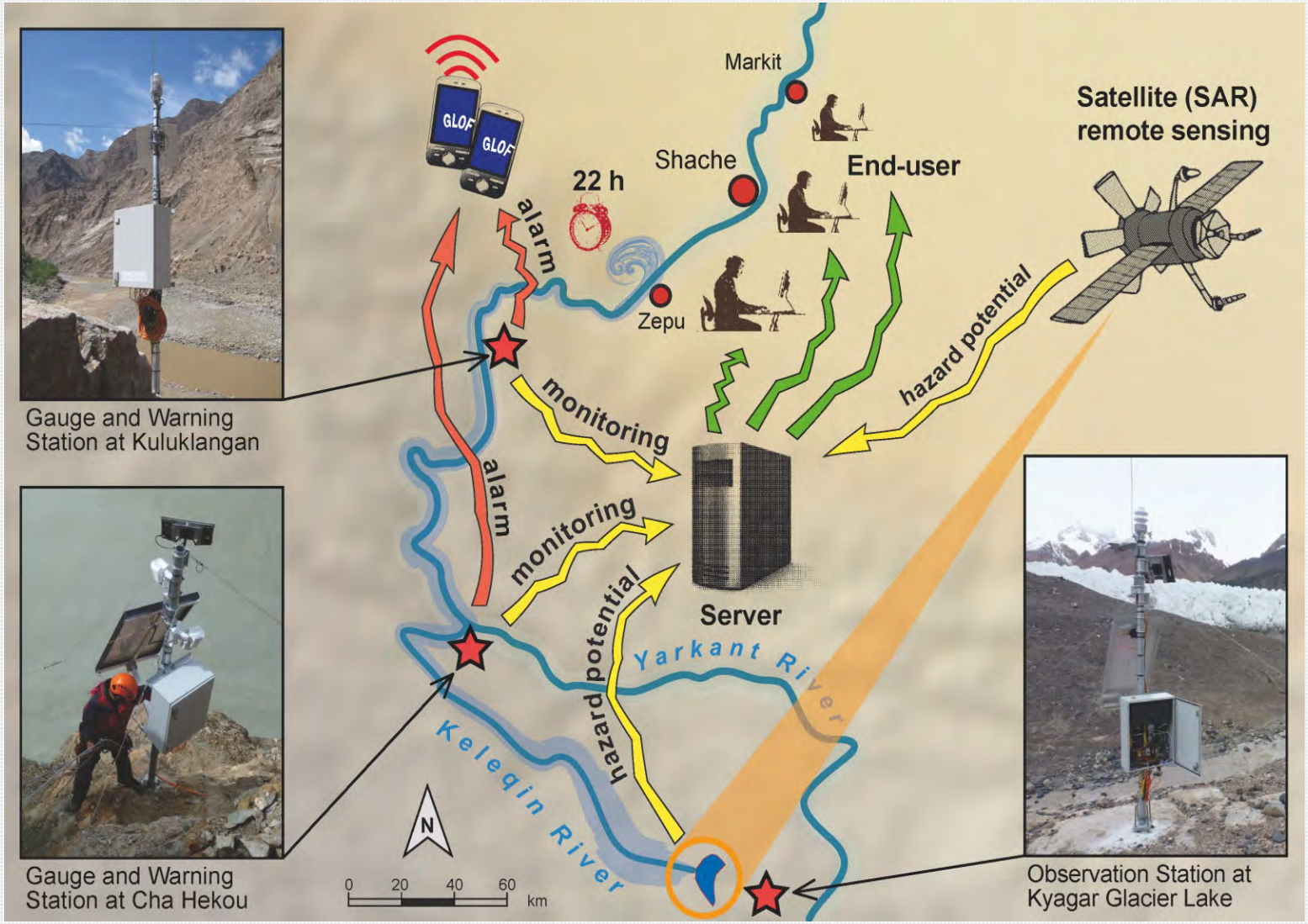
Early Warning System



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Cha Hekou Station: ground truthing and EWS

2 radar sensors

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

Kyagar Glacier

Risk Management in the Floodplain

Flood modelling along Yarkant River.

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

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

Lessons learned I

Sino-Swiss expedition to Kyagar Glacier 2012

In remote areas, a 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.

Expert know-how and human resources on local level are limited. → **Pragmatic planning and proactive support** is necessary.

Cooperation and know-how exchange on local level with a strong governmental backing/support is helpful.

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.

→ Tailor-made adaptations from case to case

Lessons learned III

Plaine Morte, Switzerland (GEOPRAEVENT AG)

The **working partnership** between specialised private companies, authorities and universities is the backbone of a sustainable project management.

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:
The project is supported by a cooperation between the Swiss Agency for Development and Cooperation (**SDC**) and the Federal Office for the Environment (**FOEN**).
On the Chinese side, local authorities, such as the **Xinjiang Department of Water Resources**, the **Xinjiang Kashgar Hydrographic & Water Resources Survey Bureau** and the **Kashgar Management Bureau of Tarim River Basin**, support the project.