Remote Geohazards Assessment in Tajikistan

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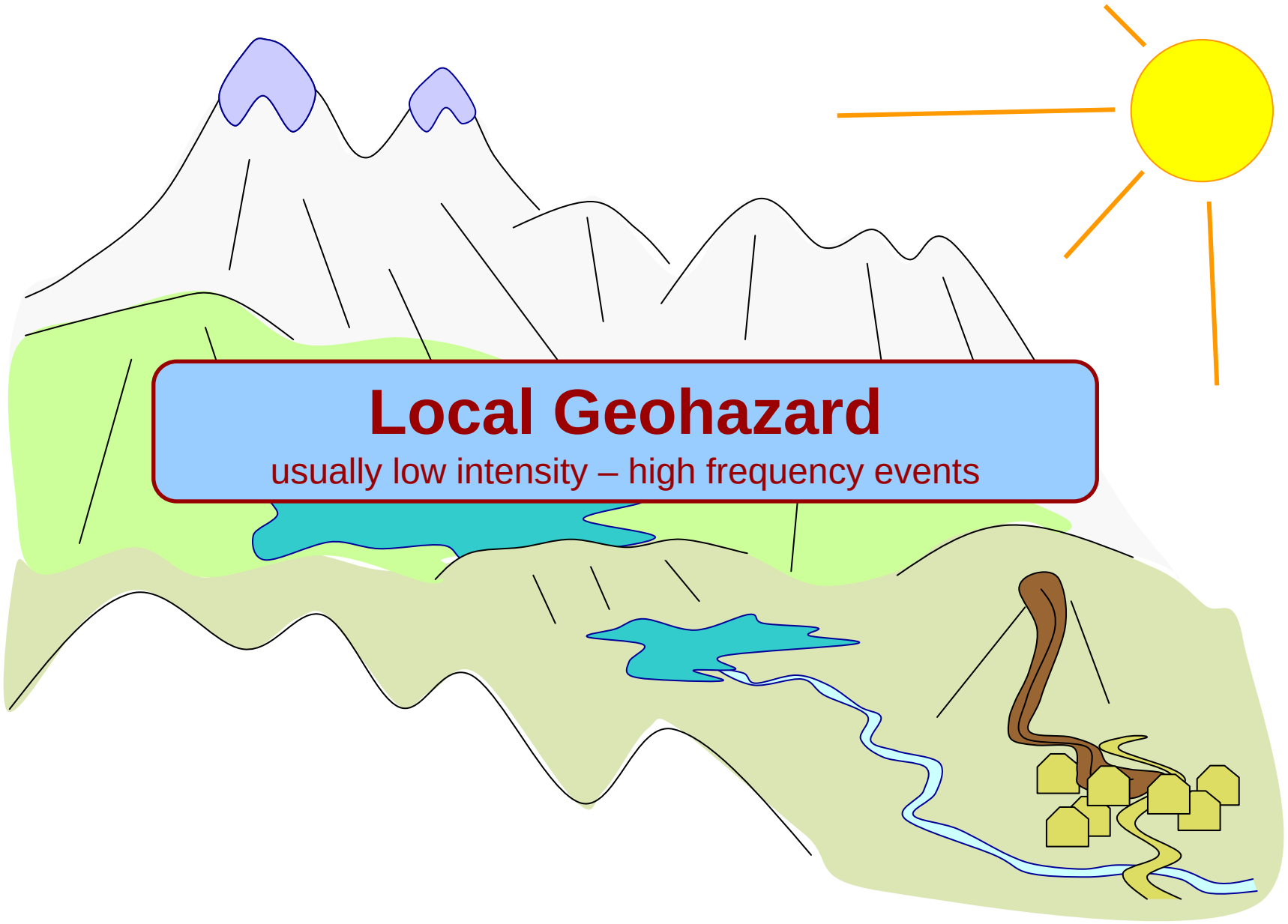
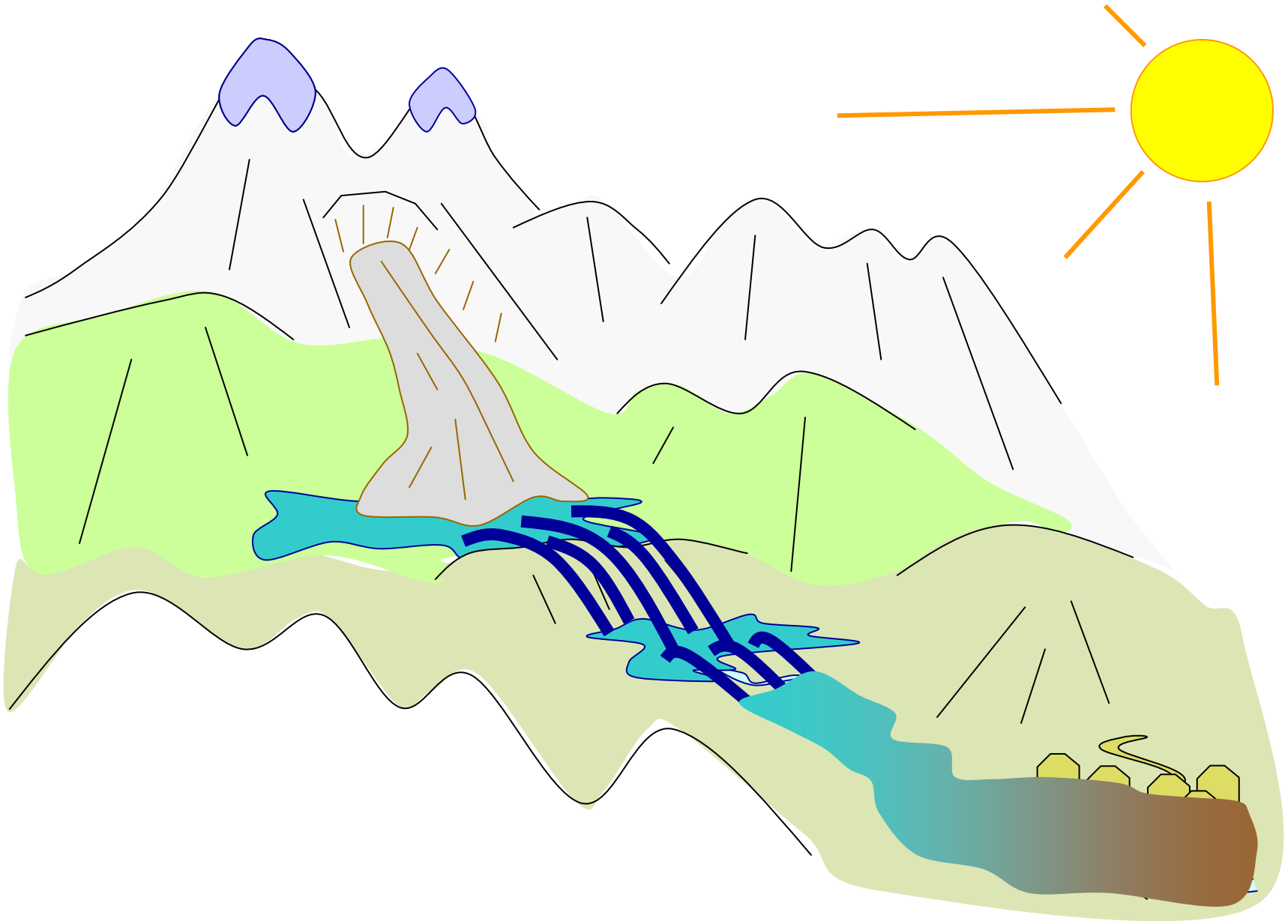
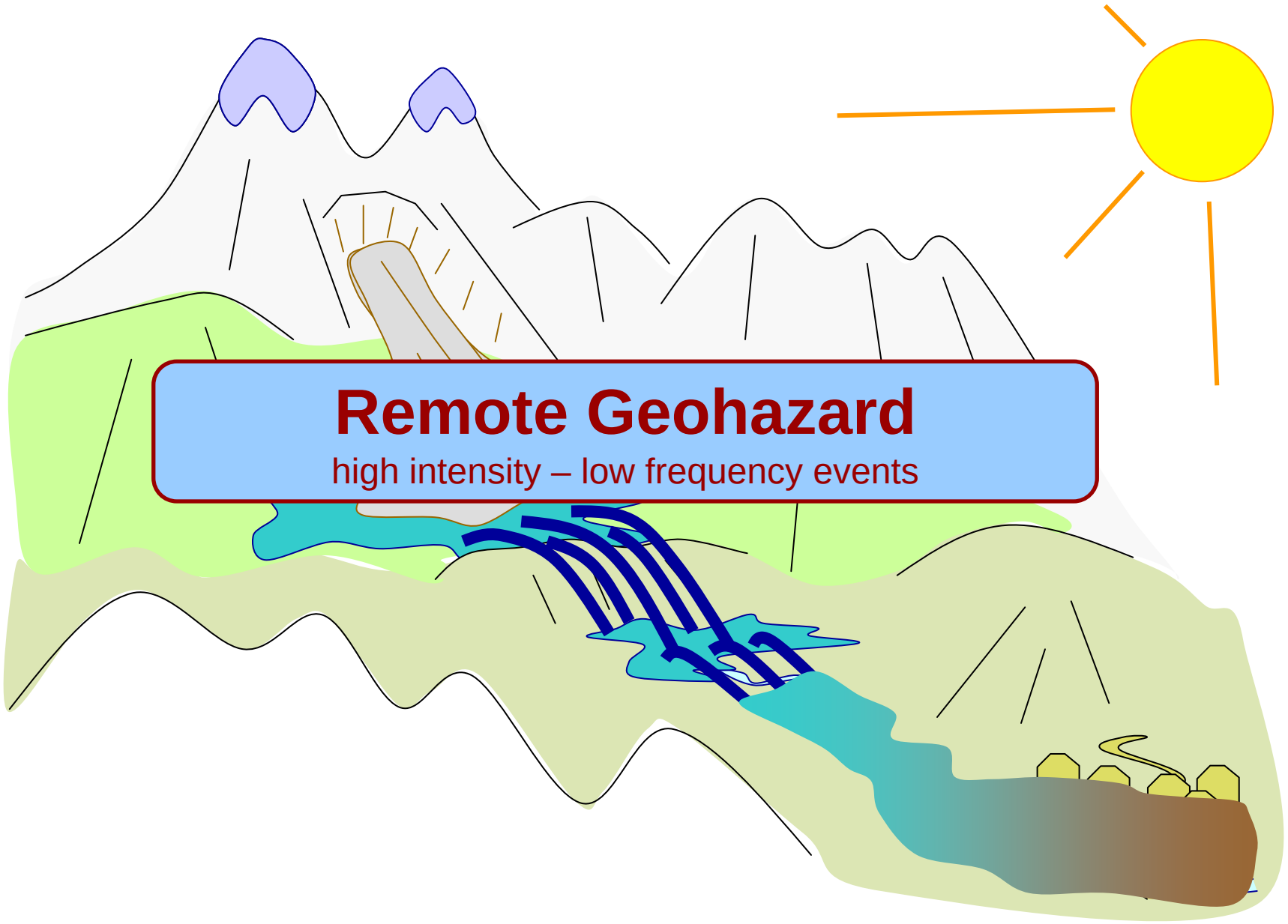
Content of the presentation

- Background of the project
- Objectives
- Study areas
- Work flow
- Hazard rating
- Results
- Conclusions and recommendations
- From assessment to mitigation


Local Geohazard
usually low intensity – high frequency events




Remote Geohazard
high intensity – low frequency events

The Dasht event (2002)

The Dasht event (2002)

Tasks

- To identify remote geohazards in selected areas of Tajikistan (with particular emphasis on GLOFs)
- To assess the impact scenarios connected to selected hazards
- To give recommendations how to mitigate the hazards identified

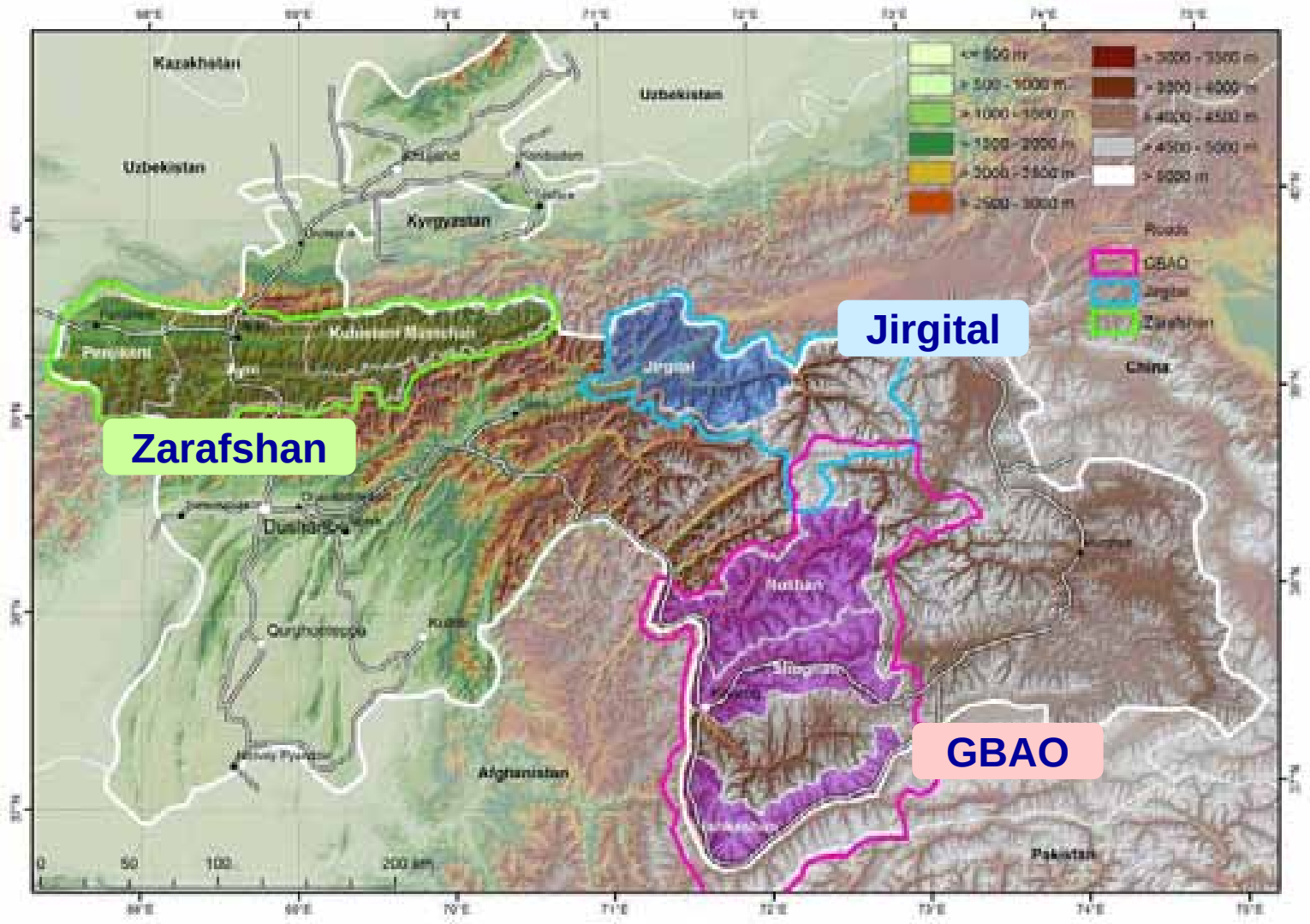
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

FOCUS HUMANITARIAN ASSISTANCE

UKaid from the Department for International Development

Study areas



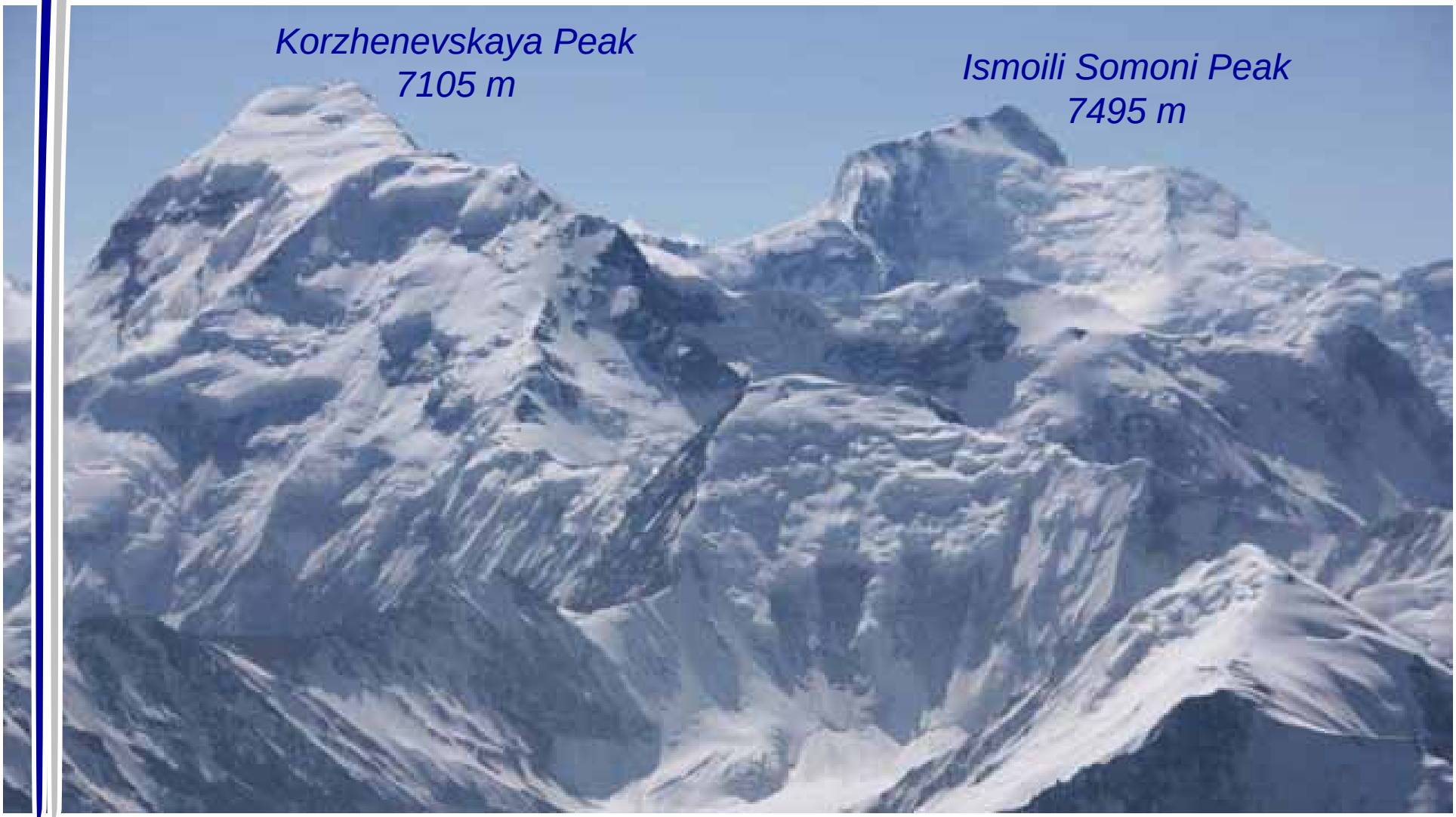
Jirgital

Zarafshan

GBAO

Gunt Valley / Shugnan

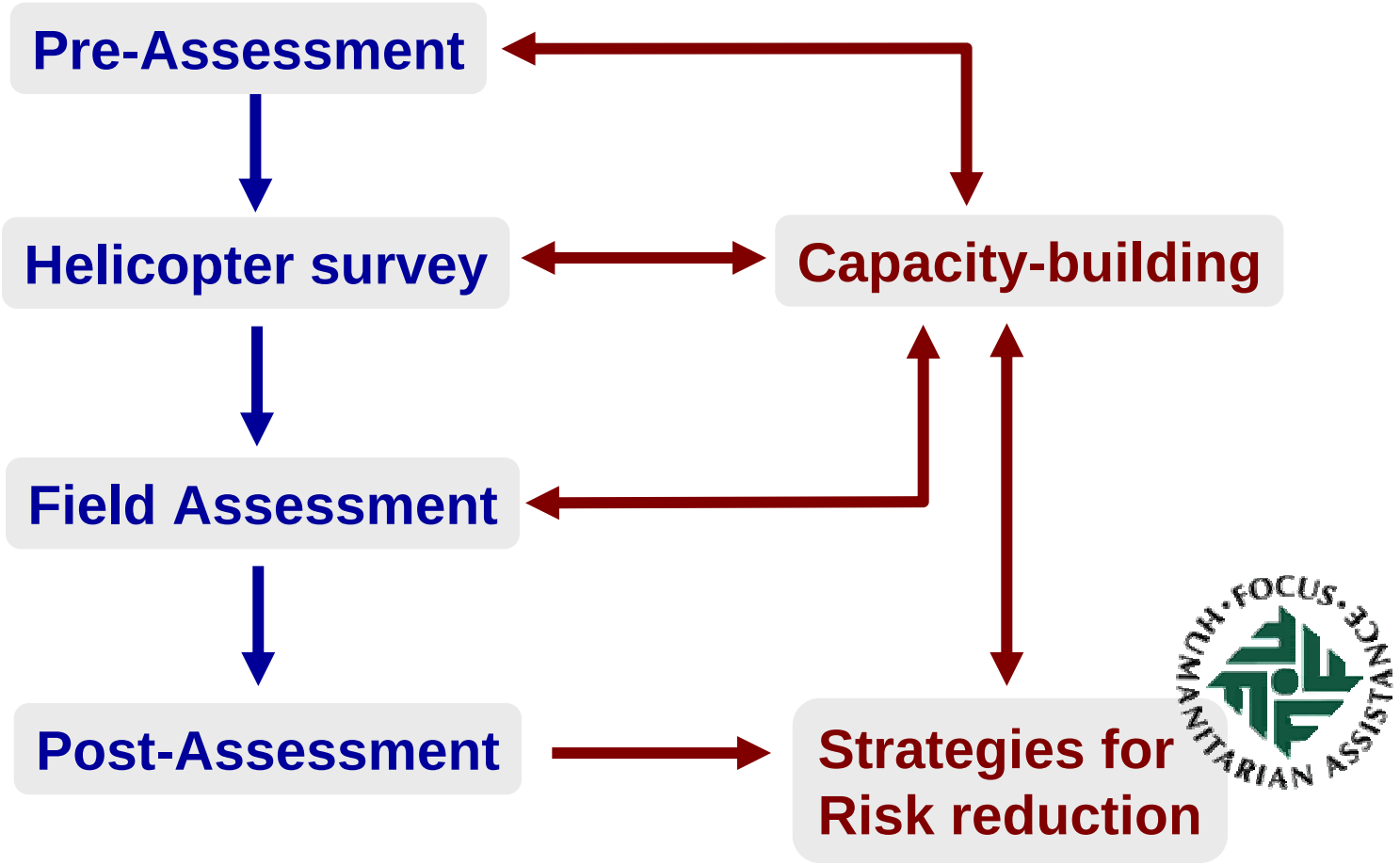
Academy of Sciences Range



Fedchenko Glacier

Vakhan Corridor / Ishkashim

Work flow


Pre-Assessment
Helicopter survey
Capacity-building
Field Assessment
Post-Assessment
Strategies for Risk reduction
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Hazard indication rating scheme

Intensity

Code	Class
I	Low intensity
II	Medium intensity
III	High intensity
IV	Very high intensity

Probability

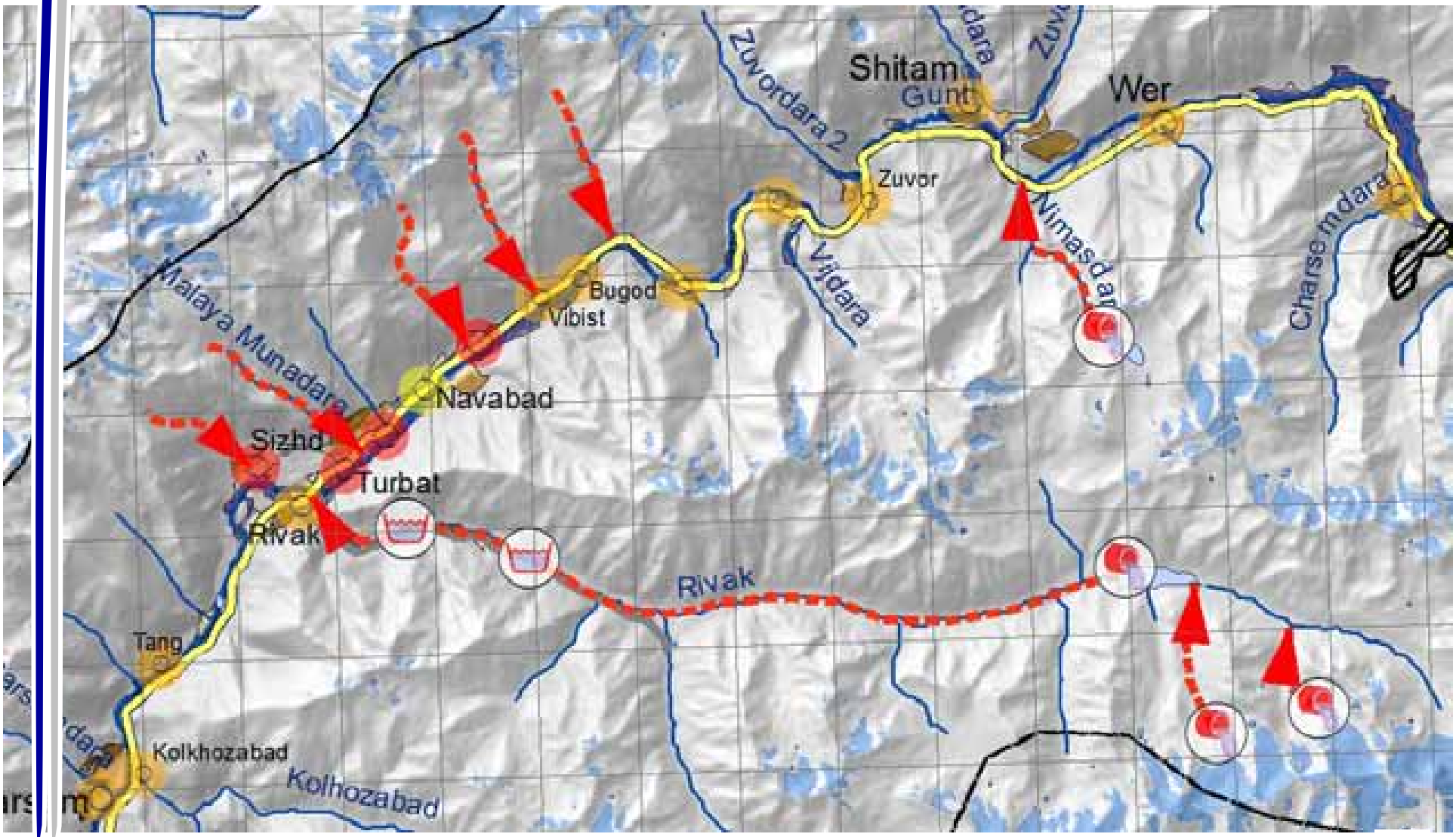
Code	Class
0	Zero probability
1	Low probability
2	Medium probability
3	High probability
4	Very high probability

Code	Hazard indication rating	Range of s
6	Very high hazard	25 – 40
5	High hazard	20 – <25
4	Medium hazard	15 – <20
3	Moderate hazard	10 – <15
2	Low hazard	5 – <10
1	Very low hazard	0 – <5

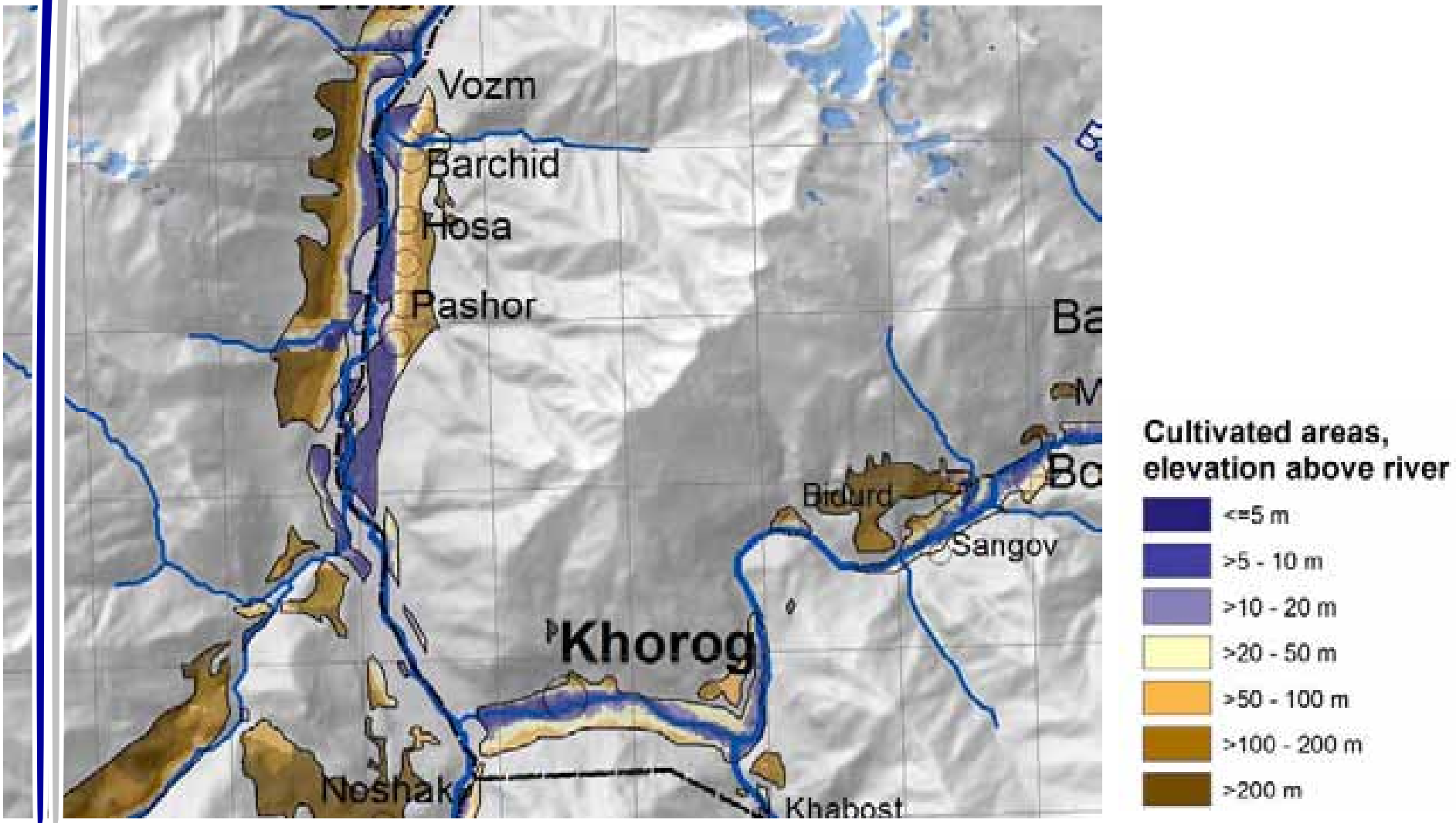
Village

Probability as function of intensity				Confidence
I	II	III	IV	B
4	3	2	1	Rating
				20

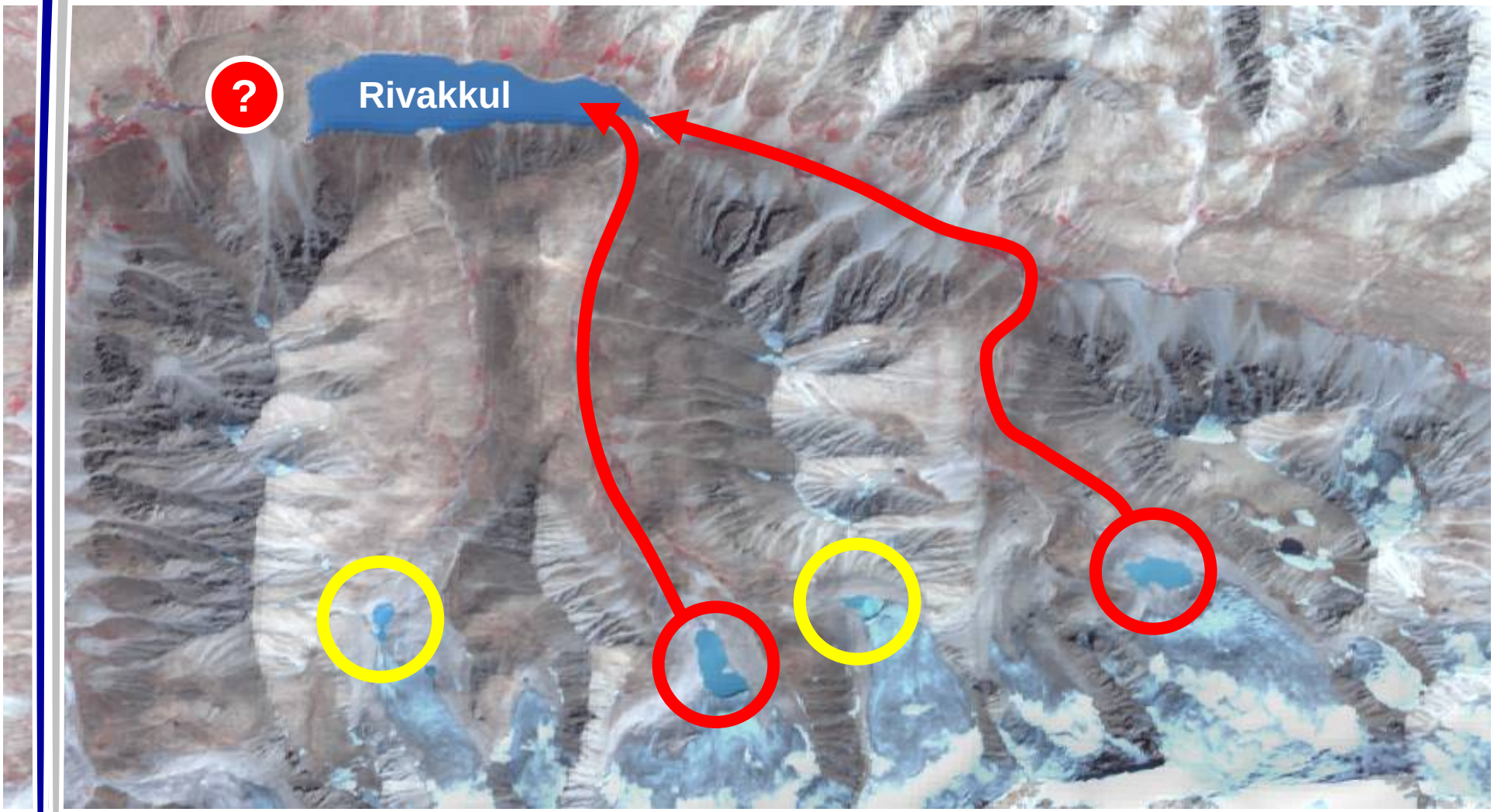
Hazard Indication Map



Hazard Indication Map



Rivakdara (Gunt Valley)



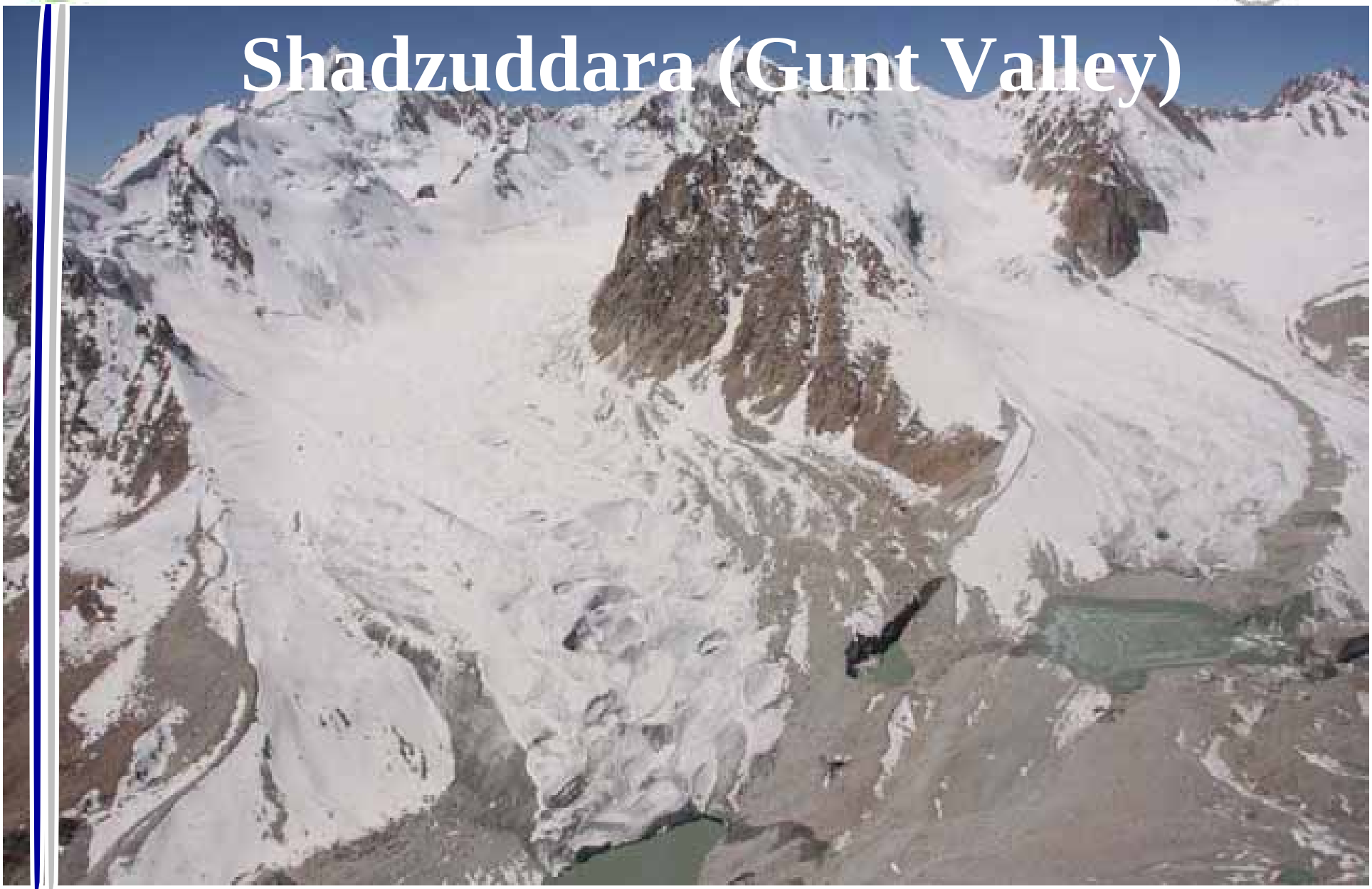
Rivakdara (Gunt Valley)

Rivakkul (Gunt Valley)

Varshedzdara (Gunt Valley)

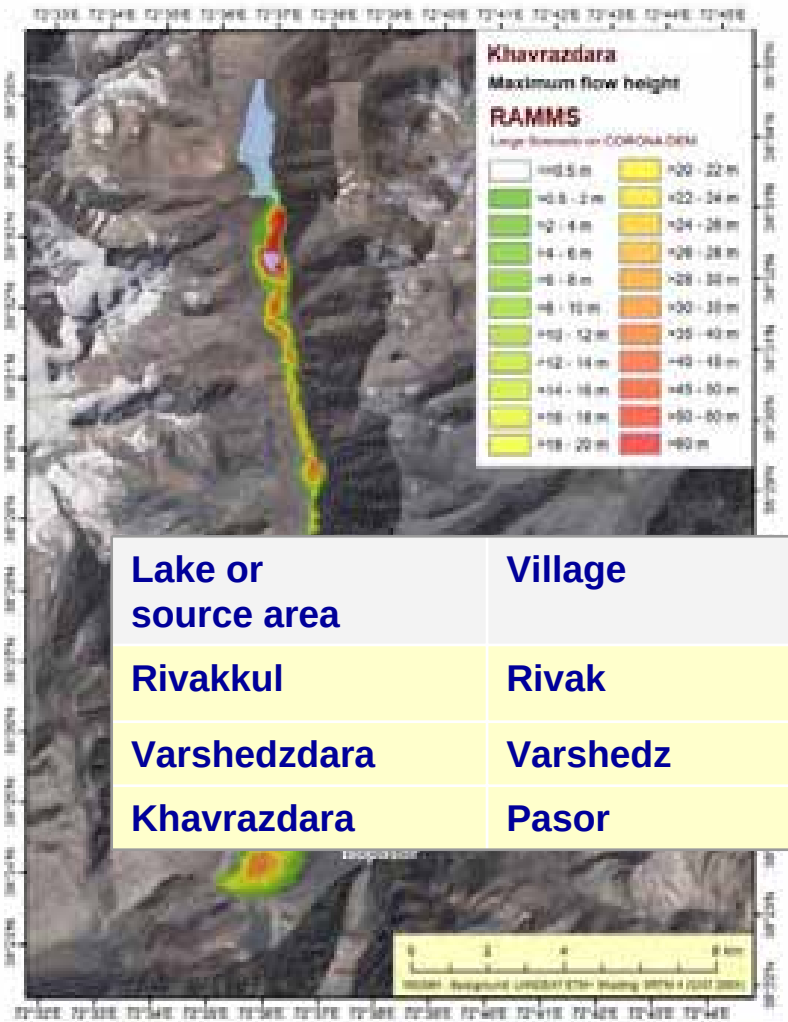
Varshedzdara (Gunt Valley)

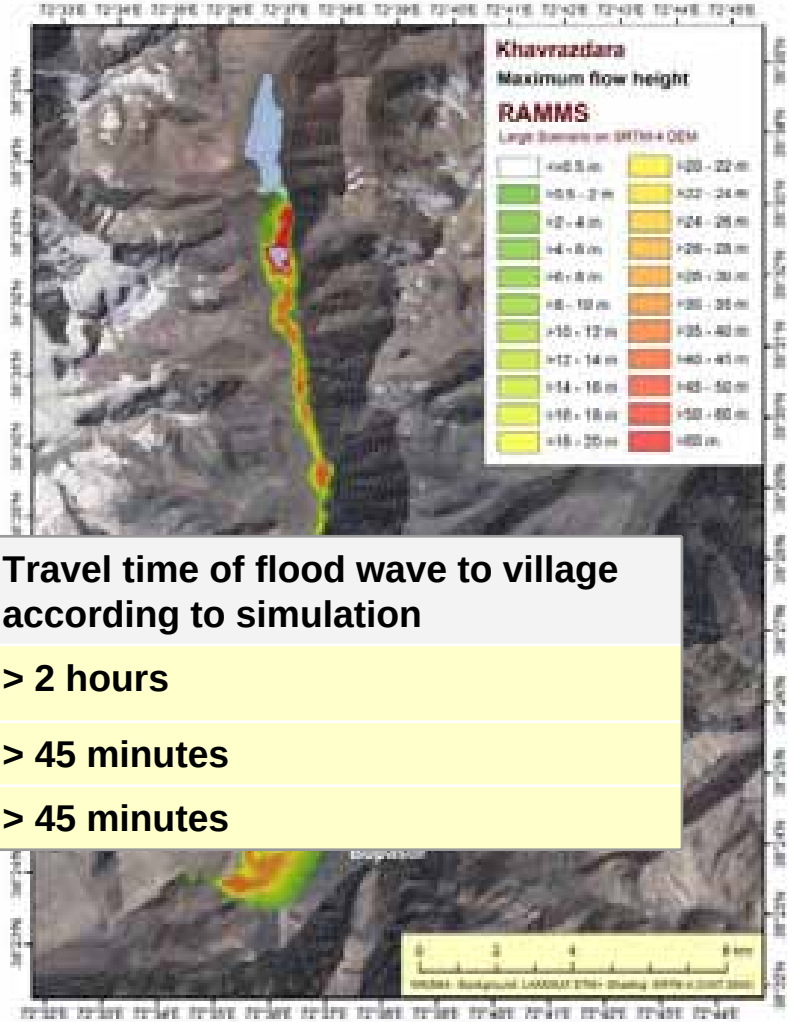
Shadzuddara (Gunt Valley)



Khavrazdara (Bartang Valley)

Modelling results

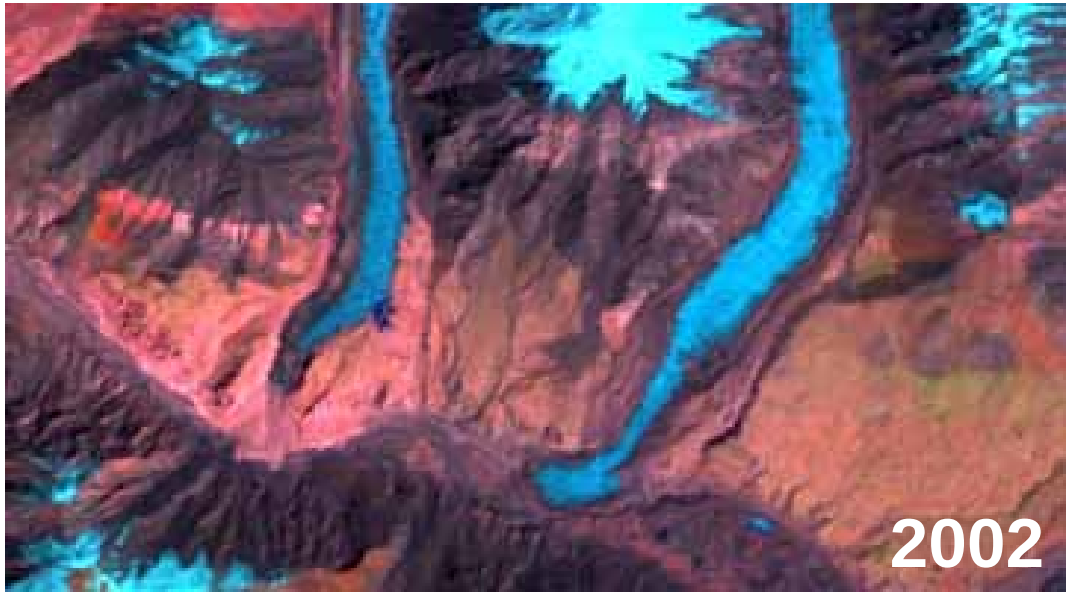




Lake or source area	Village	Travel time of flood wave to village according to simulation
Rivakkul	Rivak	> 2 hours
Varshedzdara	Varshedz	> 45 minutes
Khavrazdara	Pasor	> 45 minutes

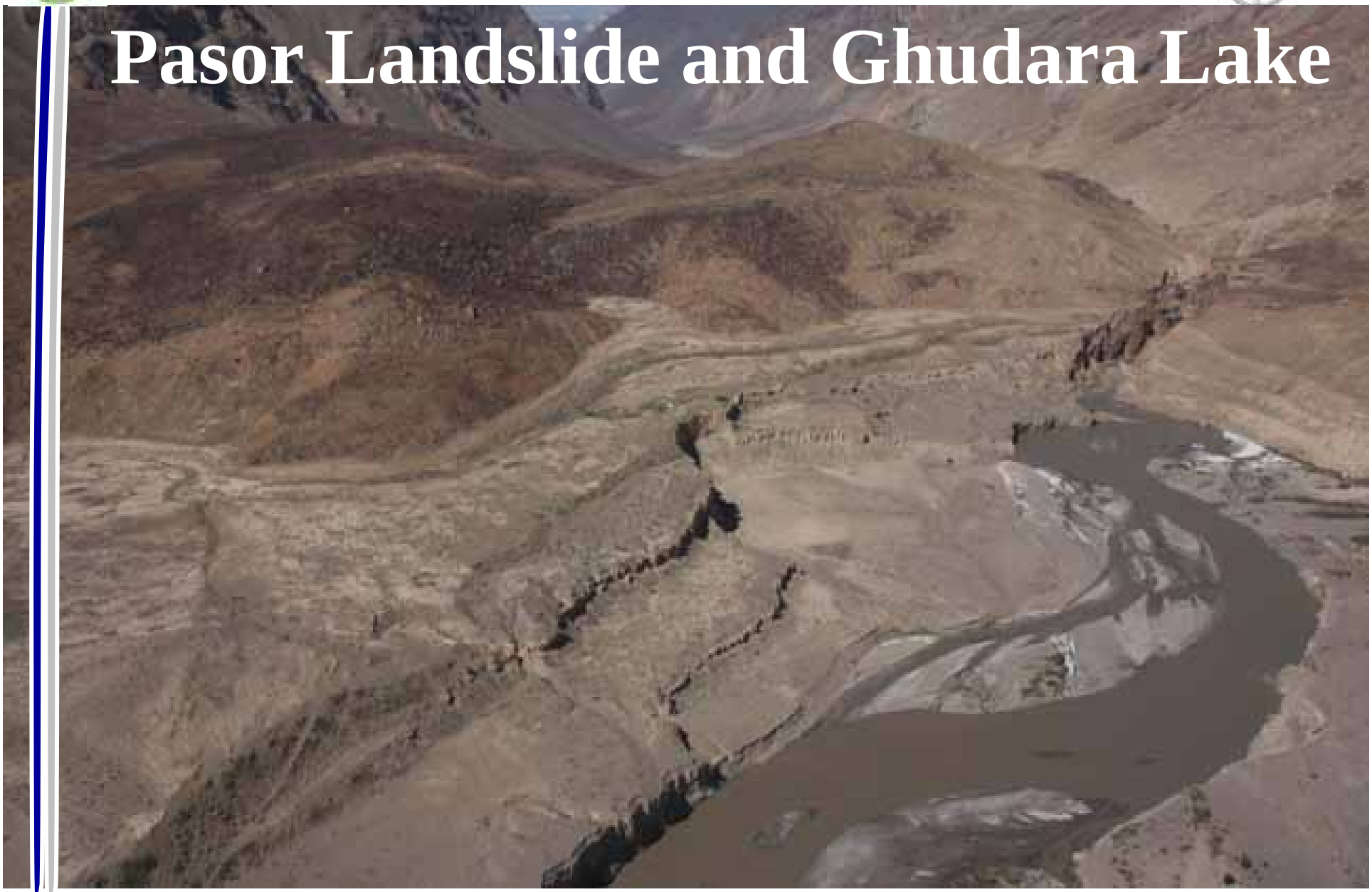
Trans Alai Range

Trans Alai Range (surging glaciers)

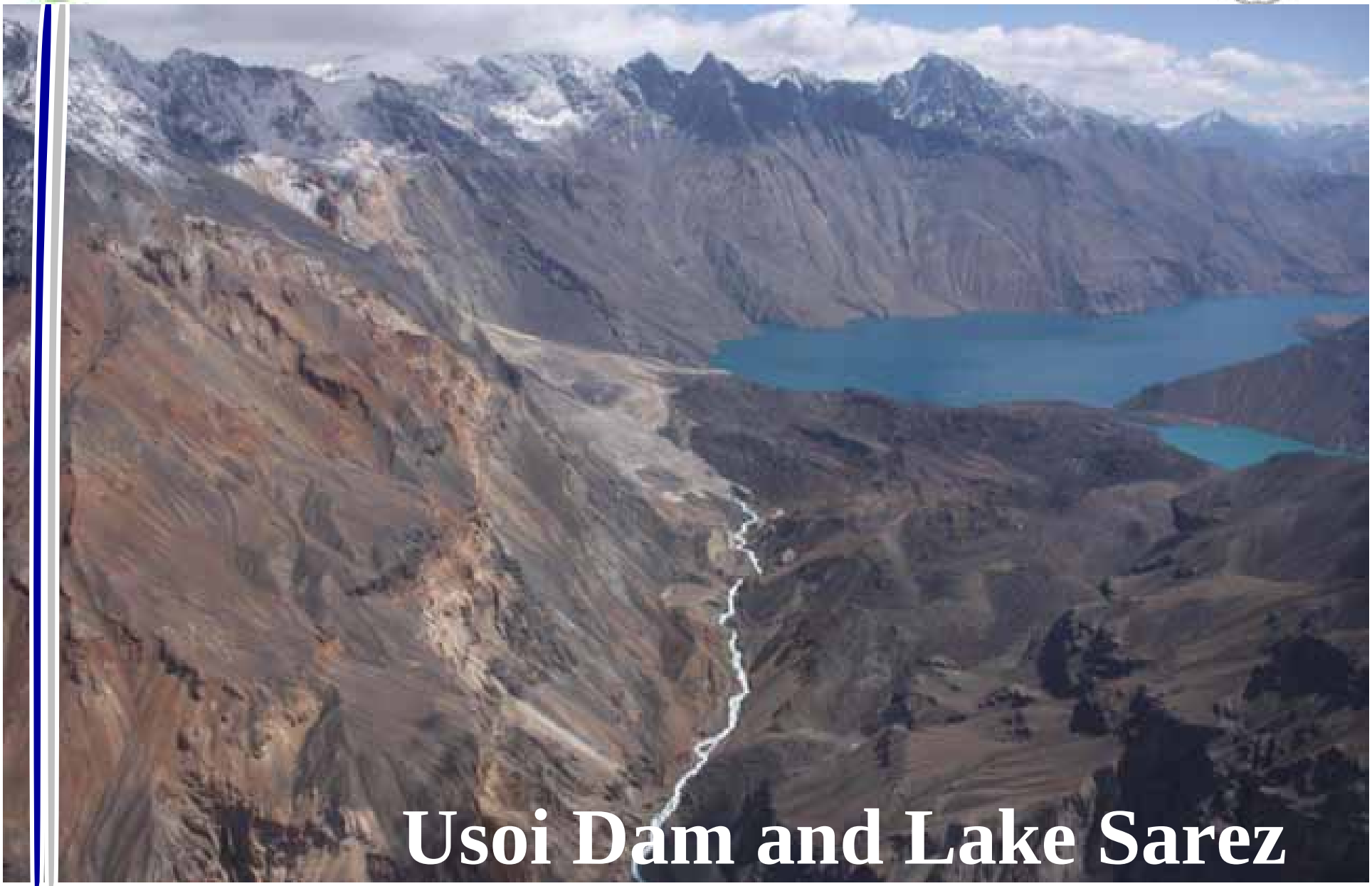


Bivouac Glacier

Pasor Landslide and Ghudara Lake

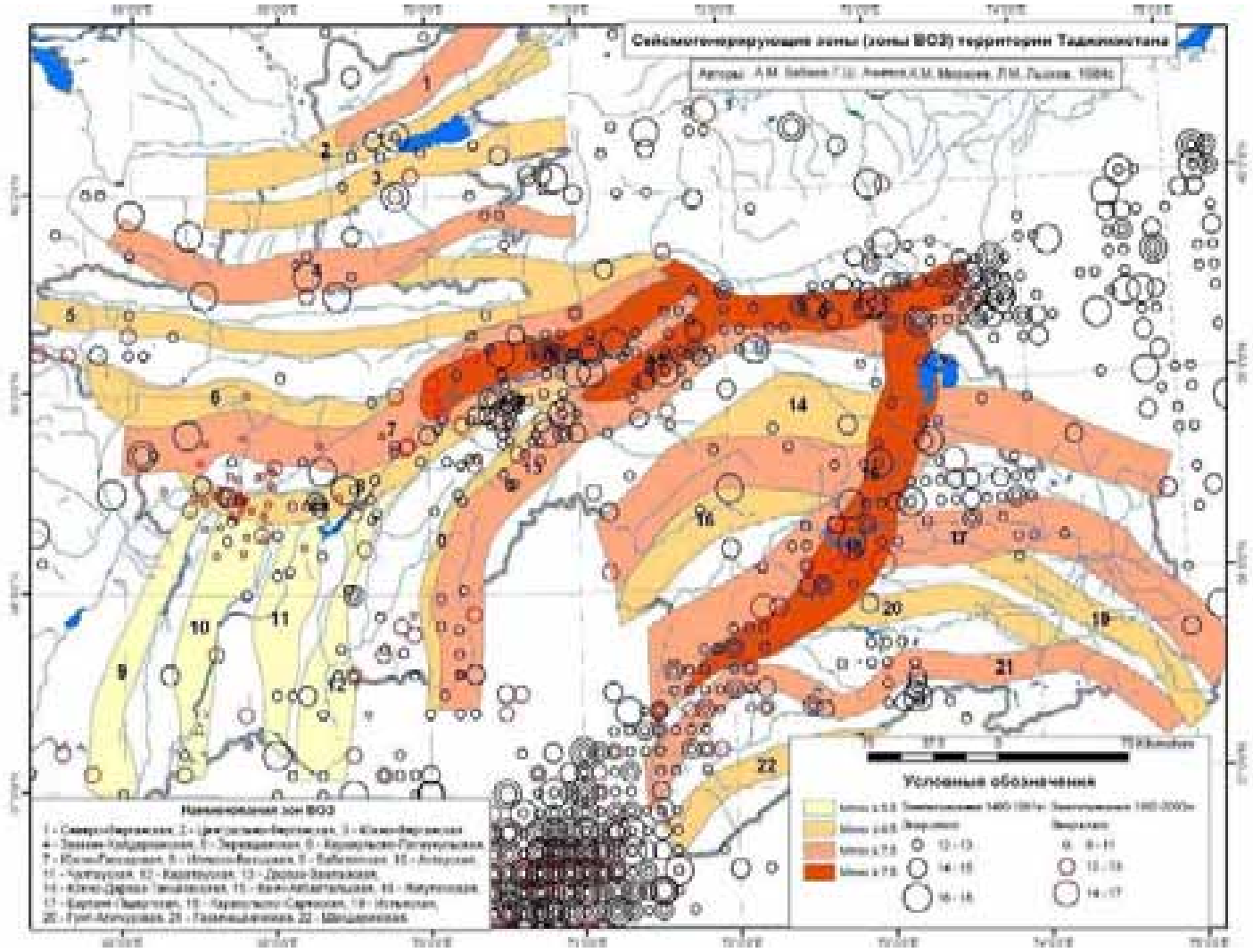


Dusakhdara



Usoi Dam and Lake Sarez

Seismogenic zones and earthquakes



Seven Lakes

Hazard indication rating for Zarafshan

R (S)	Village(s)	Type of hazard	Recommended action
6 (29)	Shing and Badga	Villages located on a slow moving landslide encroached by debris flow channels, repeated events with fatalities and severe damage, catastrophic acceleration of sliding body unlikely at the moment, but possible	Detailed survey and long-term monitoring of movement, emergency warning system for landslide and debris flow, if necessary: evacuation
5 (20)	Vashan	Village located at the base of slopes built up of weak sedimentary rocks, landsliding with damming of lake and severe damage in 2005	Detailed survey and long-term monitoring, emergency warning system, training of population
5 (20)	Padrud, Raz, and Rashna	Villages located along or below Seven Lakes, landslide-triggered lake outburst flood could have catastrophic consequences	Enhancing the awareness and preparedness, monitoring of the slopes, training for recognition of dangerous situations
5 (20)	Pishanza	Village located on slow moving landslide body, damages to houses and agricultural areas have been reported	Monitoring of the movement and training of the population
4 (19)	Revad, Panjrud, Husanobod, Zer-i-Hizor, Shashqat, Narwad, Dijik, Kum, Madm	Villages at the base of slopes built up of weak sedimentary rocks with indicators of landsliding, no reports about past events	Detailed survey and long-term monitoring, emergency warning system, training of population
4 (17)	Sangiston, Soosun, Fatmev, Guzaribod, Ispang, Rarz, Pokhut	Villages at the base of slopes built up of weak sedimentary rocks with indicators of landsliding, cracks are visible in the slopes, but no reports about past events	Detailed survey and long-term monitoring, emergency warning system, training of population
3 (14)	Bagashton, Filmandor, Kosatarosh, Chorbogh	Villages could be affected by outburst of Seven Lakes or outburst of lake if a catastrophic landslide occurs at Shing	Enhancing the awareness and preparedness, training for recognition of dangerous situations
3 (13)	Kanchoch and Saratok	Villages are located below a steep, conspicuous mountain which might collapse in the case of a severe earthquake	Enhancing the awareness and preparedness, monitoring of the slope, training for recognition of dangerous situations

Hazard indication rating for GBAO

R (S)	Village(s)	Type of hazard	Recommended action
5 (23)	Varshedz	Debris flood or debris flow from outburst of glacial lakes in the headwaters of Varshedzdara	Monitoring of the two lakes and their dams; emergency warning system connected to hydrographic station; promoting awareness and preparedness
5 (20)	Gorjvin, Mun, Turbat	Local debris flows, major damage caused by past events	Emergency warning system; promoting awareness and preparedness
4 (17)	Bartang, Ravivd	Detachment of glacier on opposite side	Monitoring; promoting awareness and preparedness
4 (17)	Sizhd, Vibist	Debris flows from tributary valleys; less probable: flood wave from possible outburst of Lake Nimets	Emergency warning system connected to hydrographic stations; promoting awareness and preparedness
4 (17)	Rukhch, Basid, Shujand	Debris flows from tributary valleys	Emergency warning system connected to hydrographic stations; promoting awareness and preparedness
4 (17)	Pasor	Debris flood or debris flow from outburst of glacial lake in the headwaters of Khavrazdara	Monitoring of the lake and its dam; emergency warning system connected to hydrographic station; promoting awareness and preparedness
4 (16)	Shadzud, Patkhur	Debris flood or debris flow from outburst of glacial lakes in Shadzuddara or Patkhurdara	Monitoring of the lakes and the glaciers in the catchments; emergency warning system connected to hydrographic stations; promoting awareness and preparedness
4 (15)	Garm-chashma, Past-Bajuf, Past-Khuf	Debris flood or debris flow out of tributaries, for example, but not exclusively, from outburst of glacial lakes	Monitoring of the two lakes; emergency warning system connected to hydrographic stations; promoting awareness and preparedness
4 (15)	Shitam, Zuvor, Vuzh, Dehmiyona, Tang, Manem, Pitob	Flood wave from outburst of Lake Nimets or Rivakkul (not very probable); local debris flows and rock fall	Monitoring of the lakes and their dams; emergency warning system connected to hydrographic stations; promoting awareness and preparedness
4 (15)	Yamg, Yamchun, Ptup, Zumudg, Sokhcharv, Vomar	Debris flood or debris flow, for example, but not exclusively, from outburst of glacial lakes	Monitoring of the conditions in the catchment; emergency warning system connected to hydrographic station; promoting awareness and preparedness
3 (14)	Rivak	Flood wave from outburst of Rivakkul (not very probable, but potentially highly destructive)	Monitoring of the conditions in the catchment, including Rivakkul and the smaller glacial lakes and their dams; emergency warning system connected to hydrographic station; promoting awareness and preparedness

Hazard indication rating for Jirgital

R (S)	Village(s)	Type of hazard	Recommended action
5 (20)	Oqsoy, Kashat, Karasoy, Dombrachi	Debris flow, loess flow	Detailed assessment of loess flow hazard, monitoring of the slopes, emergency warning system for debris flows and loess flows, raising the awareness and preparedness of the population
3 (14)	Mukur	Deep-seated mountain sagging above the village	Monitoring of the mass movement body with involving the local population, if necessary: training of the population how to react in case of emergency
3 (14)	Alga, Gulama, Jayilan, Chor, Shibili, Kushagba, Chubay, Pildon-i Bolo, Pildon-i Miyona, Pildon-i Chingak, Sayron	Debris flow, loess flow	Detailed assessment of loess flow hazard, monitoring of the slopes, emergency warning system for debris flows and loess flows, raising the awareness and preparedness of the population
3 (13)	Osiyob, Minbulak, Koshtegirmon, Kazaktar, Sartape, Karakenye, Sarykendzhe, Sasykbulok, Jonqirgiz, Yarmazor, Kashqaterak, Yangishahr, Julterak, Kushay, Kaltabuloq, Maydonterak, Karchin, Jirgital, Kulchuchay, Qaromik, Achiqalma,	Debris flow, loess flow	Detailed assessment of loess flow hazard, monitoring of the slopes, emergency warning system for debris flows and loess flows, raising the awareness and preparedness of the population

Conclusions

- No highly critical situations requiring immediate drastic action were detected
- However, there are some lakes (particularly Seven Lakes and lakes in Khavrazdara, Varshedzdara, and Rivakdara) requiring special attention
- Some valleys (particularly portions of Panj, Bartang, and valleys in the district of Jirgital) may be blocked by large landslides in the case of a powerful eathquake
- In some areas (e.g. Transalai Range), glacial hazards may develop in the future

General recommendations (1)

> Under certain conditions, breaking of the dams of some lakes and amplification by cascading effects is possible – more modelling is required to determine the potential effects

> For now, we recommend particularly, but not exclusively for Rivakkul, Varshedzdara, and Khavrazdara

>> to do a regular monitoring of the condition of and changes in the dams, the permafrost and of changes of the lake level. This monitoring has to be implemented by specialists, but shall be supported by the local population

>> to train the population of the villages downstream how to react in the case of a flood wave

>> to install an emergency information system, so that people can react adequately

General recommendations (2)

- Besides GLOFs, a potential for remote geohazards exists specifically in, above, and below steep and narrow sections of the valleys
- We recommend
  - to train the population throughout the valleys how to recognize potentially critical situations (e.g. sudden low river flow) also concerning remote geohazards and how to react appropriately
  - to train the people how to observe the slopes for changes (e.g. Acceleration of movements) and how to communicate these changes to the stakeholders and authorities in charge
  - to train the specialists, stakeholders and authorities how to communicate to the people (in case of emergency, but also regarding preventive measures)

From assessment to mitigation

Taj Haz
Remote Geohazards Assessment in Tajikistan

Hazard Assessment

Recommendations

Risk Assessment

Risk Mitigation

Capacity-building is essential!

Awareness-Building

Handing over Responsibility

Thank you!
Discussion?