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Assessment of Glacial Lake Outburst Flood Hazard in Badakhshan (Afghanistan and Tajikistan)

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Abstract: We investigated GLOF hazard in Badakhshan Province, Afghanistan, and Gorno-Badakhshan Autonomous Region, Tajikistan, using the combination of field research, remote sensing, and two-dimensional modelling methods.

Keywords: Glacial lake, outburst flood, Badakhshan

1. General requirements

Glacial lake outburst flood (GLOF) is a form of flash flood in which water from a lake associated with a glacier is released suddenly, resulting in the outflow of a huge volume of water and sediment downstream. We investigated GLOF hazard in Badakhshan Province, Afghanistan, and Gorno-Badakhshan Autonomous Region, Tajikistan.

2. Research methods

We used the combination of field research, remote sensing, and two-dimensional modelling methods. The study included: 1) field observations, 2) bathymetric surveys, 3) compilation of a database and geographic information system (GIS), 4) satellite and UAV image interpretation and choose case study objects the for GLOFs modelling, 5) glacial lake identification, mapping and inventory creation, 6) analysis of the factors of glacial lakes outbursts, 7) GLOF modelling, 8) creation of bathymetric maps, the risk of hazardous zones and hot spots, 9) analysis of transboundary hazards along Pyanj River, 10) development of recommendations for mitigation.

3. The results

We compiled the inventory of mountain lakes in Badakhshan Province, Afghanistan. We produced 17 bathymetric maps of lakes in GBAO, Tajikistan; assessment maps as a result of modelling; recommendations for mitigation.

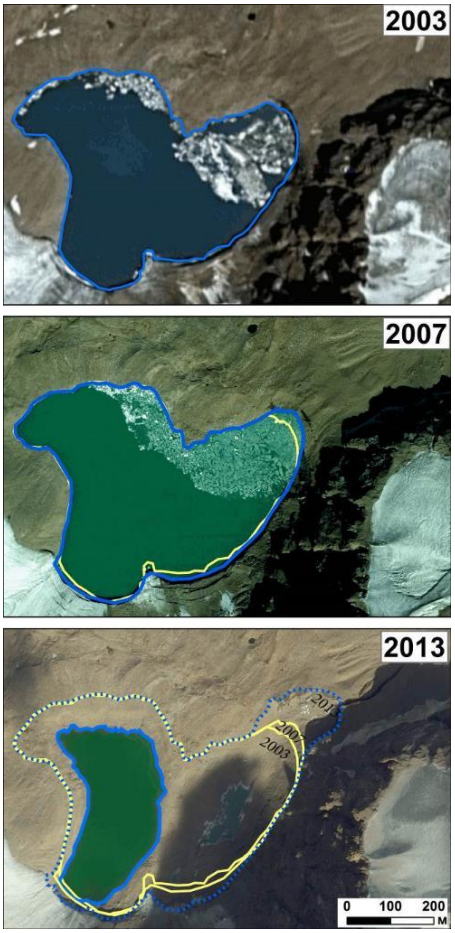

Fig. 1. Glacial lake before and after the outburst.

Fig. 2. Village partially destroyed by GLOF.

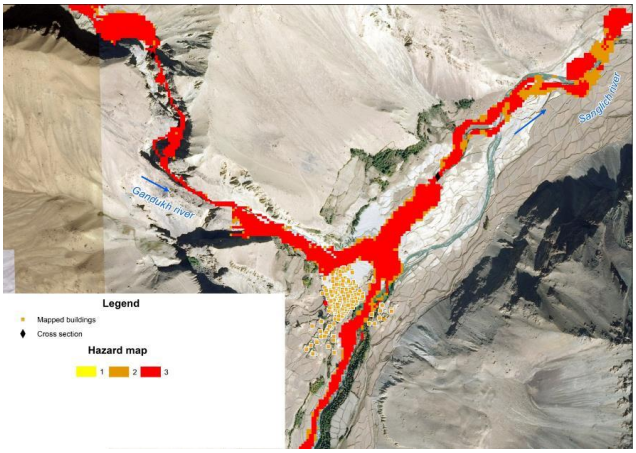

Fig. 3. Simulated on the base FLO-2D model hazard levels in case of the lake outburst.

4. Main conclusions and recommendations

Basing on the results of hazard assessment, we selected the villages for the realization of mitigations measures. Recommendations included: 1) To develop a mitigation project, 2) To install early warning system, 3) To relocate some of residents to safe area, 4) To organize training about GLOF hazard, 5) To investigate additional on-site assessment.