

Integrating disaster risk and water management in the Southern Andes of Peru

Alina Motschmann (1), Christian Huggel (1), Fabian Drenkhan (1,2), Holger Frey (1), Randy Muñoz (1), Luis Vicuña (1), Christine Jurt (1,3), and Lesly Barriga Delgado (1)

(1) University of Zurich, Geographisches Institut, Zürich, Switzerland (alina.motschmann@geo.uzh.ch), (2) Department of Humanities, Pontificia Universidad Católica del Perú, Lima, Peru, (3) School of Agricultural, Forest and Food Sciences HAFL, Bern University of Applied Sciences, Bern, Switzerland

Tropical glaciers are known for their role in the hydrological regulation especially during the dry season when a major fraction of water is available for consumption. However, in recent decades glacier retreat is causing uncertainty in water availability projections and related water management as well as changes in glacier related hazards. An integrative assessment of water and risk management in a complex social, cultural, economic, political and ecological framework is therefore necessary. Glacial ice and lakes represent a crucial source for Andean livelihoods, agriculture, energy supply and tourism.

We present a case study in the Vilcanota-Urubamba River catchment (Cordilleras Vilcanota and Urubamba, Southern Andes of Peru), where emerging risks from the shrinking glacier Chicón and growing lake Riticocha, as well as social conflicts and weak decision-making and governmental institutions are hampering local water management on the long-term. Analyzing the case of Chicón, hazards from glacier shrinkage, such as Glacier Lake Outburst Floods (GLOF), were assessed in combination with the elaboration of a basin-wide hazard map as well as planning and implementation of an Early Warning System (EWS). These disaster risk reduction measures provide valuable tools for spatial planning, evacuation options and timely alert of potentially catastrophic mass movements.

However, not only changes in physical but also socio-ecological systems are exacerbating human vulnerability and hydrological risks. We found that water resources in the Chicón-Urubamba valley are increasingly stressed by urban growth, incrementing tourism and extending agriculture, such as floriculture which implies water allocation and increasing water consumption both affecting spatio-temporal water availability in the catchment. The Vilcanota-Urubamba River catchment is currently in a transition process towards a stepwise decentralization of water management functions, administrative bodies and integration of multiple stakeholders by means of a Water Resources Council.

A key conclusion from this study is that more integrative and adaptive water resources management (I/AWRM) and governance focusing on current low and high flow risks may promote efficient pathways to tackle social, cultural and political challenges and secure future water availability for the local communities and livelihoods further downstream. In this context, integrated disaster risk management (IDRM) considering both low and high flow risks and I/AWRM could be combined within a Multi-purpose Project (MPP), which aims to provide an alternative for the storage and use of water for multiple purposes, such as agricultural, energy, fishing, tourism and consumer use. MPPs developed through a transdisciplinary approach involving research and a range of local stakeholders and actors could provide a framework to contribute to a more robust and successful adaptation to changing conditions in Urubamba at the interface of scientific advice, participation of communities and local decision-making.

Challenges identified in this study relate to the difficult political situation at different levels as well as scarce and inconsistent data along with missing clarity and experience on how to combine and apply this within a consistent risk framework.