



## **Analyzing impacts of mountain cryosphere change through a Loss and Damage perspective – a case study from Peru**

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Under current climate change and future scenarios, the mountain cryosphere is one of the strongest affected systems. In addition to sea level rise, glacier shrinkage will lead to cascading impacts on downstream systems and profoundly influence the natural environment. This will lead to major changes to river flow regimes, altered provision of water resources to human society, reorganization of the regulatory processes that shape water quality and geohazards, and cultural changes associated with tourism, landscape character, and identity.

To address these challenges, we analyze impacts from mountain cryosphere change through a lens of Loss and Damage, a conceptual mechanism of international climate policy that tries to evaluate negative consequence of climate change for humankind but mainly operates on a broad worldwide scale. Climate change research on the other hand deals with climate change on different scales, down to local scales, but often lacks the connection of effects of climate change to consequences for people.

Here, we try bridging policy and research and identify the connection of the two, using the example of the changing cryosphere in the Cordillera Blanca in the Peruvian Andes. We specifically analyze the effects of climate change on glacier change, glacier lake growth and formation and ensuing floods, hydrological effects and impacts on people and economy now and under future scenarios. To do so, we use various different methods such as literature review, glacial lake outburst floods modelling and hydrologic modelling to particularly analyze losses and damages related to three major cryospheric changes: ice loss, glacial hazards and hydrologic variability.

Within each category, we identified major implications such as damage to people and assets, loss of life, damage of livelihoods, economic loss and damage, loss of natural resources or loss of culture and identity. Hence, we argue that Loss and Damage cannot be simply defined as glacier shrinkage and sea level rise as it is commonly done in global climate policy documents and discourse. It also plays a major role for other consequences due to the retreat of glaciers. This study therefore gives further implications for the connection of policy and research based work, and highlights the importance of inter- and transdisciplinary research.