

>> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

Submitted Abstract

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Abstract

Evidence of observed climate change impacts has increased substantially in the past decade. However, understanding the interconnections among natural and human systems and how climate change affects them all is still a challenge. This is especially true for the Andes where there is insufficient research infrastructure and funding, resulting in poor data availability and quality.

We have systematically assessed observed impacts of climate change in the following natural and human systems in the Andes: cryosphere, water, wildfire, mountain hazards, energy, food security, human health, human migration, culture and tourism. In addition, we used expert and model-based methods to identify the role of anthropogenic climate change. The first is based on a comprehensive sample of literature which is analysed to distinguish between natural variability, anthropogenic forcing, and non-climatic factors that drive the observed trends. This assessment is complemented with a systematic comparison of climate model simulations against observations.

Our assessment shows that glacier loss can be attributed to anthropogenic warming with high confidence. Glacier and snow depletion have led to reduced streamflow across many regions in the Andes threatening human water security and intensifying human migration. There is robust evidence that this has also impacted mountain ecosystems, human traditions, cultures and spiritual values, mountain tourism and more frequent disasters, driven by rock falls, ice detachments or snow avalanches that, in some cases, have even triggered glacier lake outburst floods. In addition, we found that impacts related to water have affected all Andean countries with higher frequency in floods, droughts and water quality due to rising temperatures and changes in precipitation that are attributed to anthropogenic influence with medium confidence. Droughts and water scarcity have affected food security in Andean communities, caused human migration, human health issues and loss of hydropower capacity potential.

In summary, our study shows that climate change has already caused glacier retreat, flooding and drought, and this in turn, has caused a cascading of impacts through natural and human systems of the Andes. All these impacts can in large part be attributed to human interference in the climate. These findings highlight the need of understanding complex interactions among systems to further develop adequate adaptation and mitigation strategies.