

Climate change to impact mountains on a global scale

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Under the threat of climate change, mountain landscapes all over the world have the risk of becoming more hazardous to communities surrounding them, while their accelerated evolution may bring further

environmental risks to surrounding areas.

This is according to a scientist from the University of the Witwatersrand in Johannesburg, South Africa, who, on the eve of the COP27 climate meeting, highlights the sensitivity of mountains to [global climate change](#) in a new study. Professor Jasper Knight, from the School of Geography, Archaeology and Environmental Studies at Wits University shows how complex mountain systems respond in very different and sometimes unexpected ways to [climate change](#), and how these responses can affect [mountain landscapes](#) and communities.

"Worldwide, mountain glaciers are in retreat because of [global warming](#) and this is causing impacts on mountain landforms, ecosystems and people. However, these impacts are highly variable. The latest report by the Intergovernmental Panel on Climate Change (IPCC) treats all mountains as equally sensitive and responding in the same way to climate change. However, this approach is not correct," says Knight.

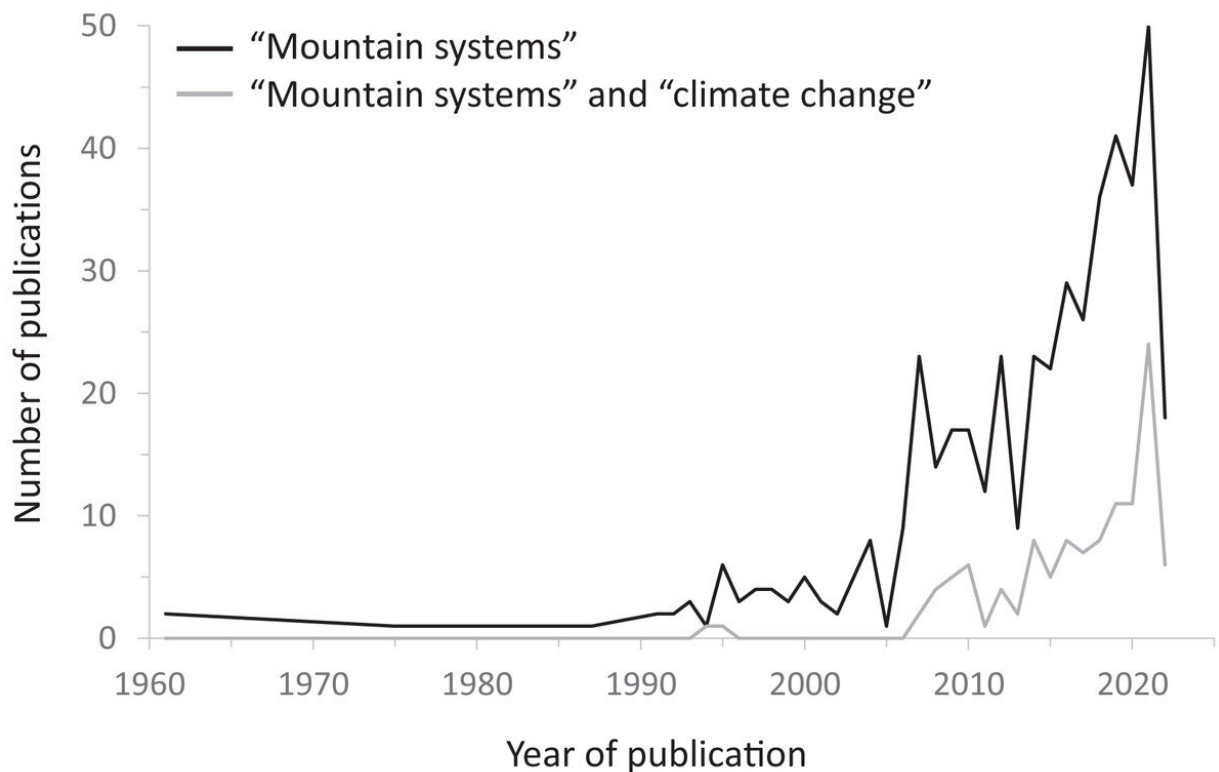
"Mountains with snow and ice work completely differently to low-latitude mountains where snow and ice are generally absent. This determines how they respond to climate and what future patterns of mountain landscape evolution we can expect."

Mountain snow and ice globally provide water for hundreds of millions of people, but this water supply is under threat because of changing weather patterns and as [mountain glaciers](#) get smaller and smaller. In future, the [water crisis](#) in dry continental areas of Asia, North America, South America and Europe will only get worse.

The research also shows how climate change will negatively impact on mountain landscapes and human activity. This includes an increasing risk of hazards such as avalanches, river floods, landslides, debris flows and lake outburst floods. These are made worse because of glacier retreat

and permafrost warming. Alpine ecosystems and endemic species are already threatened with local extinction and mountain slopes are becoming greener as lowland forests spread to higher altitudes.

"As snow and ice shrink, mountain land surfaces are getting darker and this dramatically changes their heat balance, meaning they are warming up faster than the areas around them. Therefore, climate change impacts are bigger on mountains than they are anywhere else. This is a real problem, not just for mountains but also for the areas around them," says Knight.



Graph showing the number of published articles from the Web of Science database (accessed 30 July 2022) according to year of publication, using different search terms. Credit: *PeerJ* (2022). DOI: 10.7717/peerj.14253

Mountain communities and cultures are also affected by climate change. Transhumance—moving livestock from one grazing ground to another in a seasonal cycle—and traditional agriculture are dying out as grazing areas shrink and as water becomes scarcer. Tourism, mining, urbanization and commercial forestry are also pushing out these traditional practices. Mountain heritage landscapes and indigenous cultures and knowledge are not adequately studied or valued.

The new research shows that mountains should be considered and protected as integrated biophysical and socioecological systems, where people as well as physical landscapes are important. This may help safeguard these environments against future change.

"Despite not having significant snow or ice, African mountains are also vulnerable. Our work on climate and landscape change and human adaptations in the Maloti–Drakensberg shows how mountains and people are connected together, and these are also threatened. Understanding these connections can help us better protect them against the worst impacts of climate change," says Knight.

The research was published in *PeerJ*.

More information: Jasper Knight, Scientists' warning of the impacts of climate change on mountains, *PeerJ* (2022). [DOI: 10.7717/peerj.14253](https://doi.org/10.7717/peerj.14253)

Provided by Wits University

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