

Climate Crisis in the Highlands: Impact on Pakistan's Mountainous Regions

Imran Ahmed and Charukeshi Karikalan



Summary

Pakistan's mountainous regions, crucial for water supply and environmental stability, face accelerated glacier melting and increased risk of glacial lake outburst floods. Addressing these issues is critical for Pakistan to manage climate impacts effectively and ensure climate justice for its vulnerable populations.

Despite contributing less than one per cent to [global carbon emissions](#), Pakistan is experiencing severe consequences from global warming. Recent extreme weather events, such as intense heatwaves and unprecedented rainfall, have highlighted Pakistan's vulnerability to climate-related disruptions. This summer, temperatures soared to [52 degrees Celsius in Sindh](#) and [April's rainfall nearly doubled](#) historical averages, leading to catastrophic floods.

Central to this crisis are Pakistan's mountainous regions, which are crucial to the country's environmental stability. Home to over a hundred peaks exceeding 7,000 metres, including [four of the world's 14 highest](#), the mountains are not only geologically significant but also vital for Pakistan's water supply. They form part of the 'third pole', containing the largest body of glacial ice outside the polar regions, which feeds major rivers like the Indus. As climate change accelerates, these mountainous areas are bearing the brunt of its impacts. Due to global warming, glaciers are melting at an accelerated pace, destabilising glacial lakes and leading to sudden catastrophic flooding termed as glacial lake outburst floods (GLOFs). With [over 7,000 glaciers](#) in the Hindu Kush, Karakoram and Himalayas, the risk of GLOFs is tremendous. From 2018 to 2021, Pakistan saw about [14 incidents of GLOFs](#), which dramatically increased to 75 in 2022. Of the 15 million people worldwide at risk of GLOFs, two million of them are in Pakistan. In Gilgit-Baltistan and Khyber Pakhtunkhwa, thousands of newly formed glacial lakes – [33 identified as dangerous](#) – have led to [devastating floods and landslides](#), displacing residents and damaging vital infrastructure.

With [over 30 endangered languages](#) spoken by small populations in Pakistan's mountainous regions, the impact of climate-induced displacement is severe. The 2010 floods displaced the [Torwali-speaking community](#), forcing it to relocate to areas where its language is less prevalent, impacting its cultural practices. The same flood resulted in the [erosion of the Dameli language](#) as 40 per cent of its population was forced to migrate from the Chitral district. Similarly, the 2018 GLOF in Badswat submerged homes and farmland, displacing Wakhi-speaking families to Gilgit City, where they face challenges preserving their dialect and heritage. Moreover, due to financial constraints, most are not able to return to their hometowns.

Glacial retreat in Pakistan is also critically impacting water resources and infrastructure in complex and conflicting ways. The Himalayan glaciers are projected to lose up to 75 per cent of their ice by the end of the century due to global warming. The [Baltoro Glacier](#), one of the longest glaciers outside the polar regions and located in the Karakoram range, has been shrinking at an alarming rate of 0.9 per cent per year from 2003 to 2017. This has led to increased water levels and flooding in the Shigar River, which disrupts infrastructure like roads and impairs water supply for agriculture and daily use. On the other hand, in early 2023, the region of Skardu in the Hindu Kush Himalayas faced an [unprecedented water crisis](#) due to insufficient glacier meltwater inflows into the Sadpara Dam. By March 2023, the Sadpara Dam, the city's primary water source, had nearly run dry, exacerbating water and food scarcity issues.

Following one of the hottest years on record, northern Pakistan, traditionally known for its heavy snowfall, is experiencing a [significant absence of snow](#) in 2024. Similarly, during the 2022-23 winter season, the [Spin Ghar mountain range in Kurram district](#), which usually receives substantial snowfall, saw no snow. This absence disrupted local traditions and agriculture and water supply systems dependent on seasonal snowfall. The implications of reduced snowfall are worrying as [snow cover is projected to decline](#) by up to a quarter under high emissions scenarios, drastically affecting freshwater availability for major rivers such as the Amu Darya, Indus and Helmand, where snow contributes significantly to river flow.

These changes have had knock-on effects. Reduced snow cover and glacier melt, which are crucial for irrigation, have diminished water supply for farming, resulting in lower crop yields and food shortages. Traditional farming practices are also being disrupted due to unpredictable weather. For instance, in Skardu, the [critical timing of sowing and harvesting](#) has been thrown off by water shortages, leading to scorched crops and diminished yields. Furthermore, when glacial lakes overflow or their banks fail, the resulting floods can [devastate infrastructure](#) and wash out fertile land. This compounding effect of climate-induced challenges severely impacts the livelihoods of those dependent on agriculture and threatens their ability to self-sustenance.

The Pakistan government, in collaboration with international organisations, has launched several projects to mitigate climate impacts. The 'Sustainable Actions for Ecosystems Restoration ([SAFER Pakistan](#))' project aims to mobilise US\$10 million (S\$13.24 million) to improve access to safe water and enhance resilience against climate disasters in the Indus basin. Pakistan is also the only country to receive adaptation funding from the [Green Climate Fund](#) – an important financing mechanism under the Paris Agreement – to address the risk of GLOFs. However, more attention is needed for strategies to develop alternative water. The enhancement of infrastructure to better maintain and operate irrigation systems appears now to be more crucial than ever for the affected communities in the mountainous regions. Additionally, climate adaptation policies need to integrate methods of cultural and linguistic preservation and provide psychological and financial support to affected communities.

.....

Dr Imran Ahmed is a Research Fellow at the Institute of South Asian Studies (ISAS), an autonomous research institute at the National University of Singapore (NUS). He can be contacted at iahmed@nus.edu.sg. Ms Charukeshi Karikalan is a Research Intern at the same institute. She can be contacted at isav32@partner.nus.edu.sg. The authors bear full responsibility for the facts cited and opinions expressed in this paper.