

# Warming and Warnings From the High Himalayas

The region is warming much faster than much of the planet, and the consequences are already showing.

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On Sunday, a glacier in the Indian Himalayas burst apart, releasing a torrential flood that destroyed one hydroelectric dam project and damaged another, killed at least 32 people and left nearly 200 people missing and likely dead. Half a world away, this event might seem easy to disregard as yet another distant catastrophe — tragic yet unrelated to our daily lives.

In the Western world, we should not be so sanguine. The disaster was a direct result of extreme climate change in the world's highest mountains. The rapid warming there offers a warning of the potential consequences for the United States and the rest of the world as greenhouse gases continue to heat the planet.

Since taking office, President Biden has sought to reaffirm what scientists have been saying for decades: An effective climate response must be guided by strong research. As his administration works to restore scientific integrity in government and slow climate change, it should also support research in the Himalayas.

Logistical barriers facing scientists in these remote mountains have complicated research efforts. Much more needs to be done to monitor weather and ecological changes and disruptions to the water cycle resulting from global warming.

Like the Arctic and Antarctic poles, the Himalayas are warming much faster than other parts of the world, at a rate estimated to be up to three times the global average. Warming has been rapid over the past century. Though temperatures have varied depending on location, they have averaged 1.8 degrees Fahrenheit higher since 2000 compared with the 25-year period preceding it. The Himalayas thus offer a natural experiment: They are showing the havoc that can occur if we continue business as usual with greenhouse gas emissions.

Severe warming in parts of this towering mountain range, which stretches for 1,500 miles across Asia, from Pakistan to Bhutan, is demonstrating, for example, how climate change can drastically disrupt a region's water cycle. Glaciers have lost mass and retreated

significantly. Even moderate projections predict that the region's massive ice flows will decline by approximately 60 percent by the end of this century, with a large number of glaciers disappearing outright.

Indeed, a recent assessment of warming by a group of scientists at the Indian Institute of Tropical Meteorology warned that continued warming in the broader Hindu Kush Himalaya region, "will further exacerbate the snowfall and glacier decline leading to profound hydrological and agricultural impacts." The region is home to the largest area of permanent ice cover outside the North and South poles.

Compounding this loss of freshwater, the dry season has been more arid and drought-like, while the monsoon season has brought more intense, destructive rainstorms that have increasingly caused flooding and fatal landslides.

All of these changes threaten the flow of the great rivers of Asia that are the primary water source for more than one billion people. They have brought particular upheaval to the approximately 240 million residents of the Hindu Kush Himalaya region. As ecosystems unravel, these people are struggling to adapt to changes that attack their livelihoods on all fronts.

Herders are suffering because warming is hurting productivity in already overgrazed rangelands that are producing less feed for livestock. Farmers are seeing crop failures because of drier conditions. Based on observations of forests in Europe, researchers would have predicted that the timberline would advance to those higher, cooler altitudes, as they have in other mountain ranges. But some forests in the Himalayas did the opposite, underscoring how hidden and chaotic variables can upend expectations.

Other uncertainties that require attention include how these miles-high mountains affect the path of the jet stream, which can have an outsize impact on the Northern Hemisphere; the pace and extent of melting permafrost, which releases greenhouse gases; the long-term impact of planetary warming on the seasonal monsoons of South Asia; and the geopolitical implications of food and water scarcity in a region where tensions already run high.

Researchers also have an opportunity to develop mitigation strategies usable elsewhere. For example, to prevent deadly floods caused by rapidly melting glaciers, international organizations have lowered the level of glacial lakes and created downstream warning systems. Some of these flood-prevention efforts have been successful; others have proved ineffective. Both outcomes have provided lessons with the potential to save limited funds and countless lives.

To face humanity's greatest crisis, we must look across the planet to understand what may come next. In that spirit, long-term environmental research in the Himalayas is critical. When dealing with global climate change, the Himalayas are not as far away as they may seem.

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