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WATER SCARCITY LIKELY IN THE HIMALAYAN CATCHMENT IF WARMING CONTINUES

Relevant for: Environment | Topic: Environmental Degradation - GHGs, Ozone Depletion and Climate Change

Role of melt: The glacier-melt increases about 15% to 70% in a warmer environment with its present volume, but then decreases when glacier volumes shrink. | Photo Credit: Yumi mini

The coldly white snowpacks and glaciers of the Himalayas that make for a picturesque panorama are also important sources of water for about a billion people who live in the basins of the Indus, Ganges and Brahmaputra rivers. But with rising global temperatures, these snowpacks and glaciers, which are highly sensitive, are affected.

This, in turn, affects the Himalayan hydrology. India, Nepal, Pakistan and China hugely depend on these Himalayan rivers for their daily needs and energy production.

A new paper published last month studied how these Himalayan rivers are affected by the different components – rainfall-runoff, snow-melt and glacier-melt – and notes that if drier and warmer scenarios continue in the near future (2031–2050), we are more likely to face water stress in these catchment areas. They also note that if there is increased rainfall, this could lead to a water surplus situation.

The team studied five basins in the central Himalaya – Sutlej, Thulo Bheri, Kali Gandaki, Dudh Kosi and Arun. They analysed the daily precipitation, maximum and minimum daily temperatures, wind speeds, land cover, elevation and soil properties. “We developed a new glacier melt model and integrated it to the currently used land surface model. The currently used land surface model – used even by the Ministry of Earth Sciences – does not take into account glacier melt. This could lead to serious errors in the study of north-Indian rivers. Our model helps make the current one complete and turns it into a more advanced and better one,” explains Subimal Ghosh, the corresponding author of the paper published in *Water Resources Research.* He is from the Department of Civil Engineering at the Indian Institute of Technology Bombay.

The results show that the glacier-melt increases about 15% to 70% in a warmer environment with its present volume, but then decreases to 3%–38% substantially when the glacier volumes shrink. However, such a decrease can be compensated if there is increased rainfall and if a wetter scenario persists.

“Snowpacks and glaciers are two important water storage units in the Himalaya. Though snow is lower density and will melt easily in a warming climate, the reduced snowfall will in turn reduce the amount of snow-melt. Though glacier melt will increase initially, they will shrink in size quickly and the amount of glacier melt will also decline in the latter end of the century,” adds Vikram S. Chandel, first author of the paper. He is a research scholar of Interdisciplinary Program in Climate Studies, IIT Bombay. The future study will focus on understanding the predictability of the land-atmospheric processes.

The team notes that proper water-management and governance are urgently required. “Changing patterns of precipitation systems — Indian Summer Monsoon and Western Disturbances — are important for the future situation of water resources in Himalayan catchments,” adds the paper.

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