



Ministry of Earth Science



## Melting of Himalayan Glaciers

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The government has carried out studies and maintains data regarding melting of glaciers in the Indian Himalayan region.

Several Indian institutes/universities/organizations (Geological Survey of India (GSI), Wadia Institute of Himalayan Geology(WIHG), National Centre for Polar and Ocean Research (NCPOR), National Institute of Hydrology(NIH), Space Application Centre (SAC), Indian Institute of Science (IISc) etc.) monitor Himalayan glaciers for various scientific studies including glacier melting and have reported accelerated heterogeneous mass loss in Himalayan glaciers. The mean retreat rate of Hindu Kush Himalayan glaciers is  $14.9 \pm 15.1$  meter/annum (m/a); which varies from  $12.7 \pm 13.2$  m/a in Indus,  $15.5 \pm 14.4$  m/a in Ganga and  $20.2 \pm 19.7$  m/a in Brahmaputra river basins. However, glaciers in the Karakoram region have shown comparatively minor length change ( $-1.37 \pm 22.8$  m/a), indicating the stable conditions.

Ministry of Earth Sciences (MoES) through its center National Centre for Polar and Ocean Research (NCPOR) has been monitoring six glaciers in the Chandra basin ( $2437\text{km}^2$  area) in western Himalaya since 2013. A state-of-the-art field research station 'Himansh' established in Chandra basin and operational since 2016 for conducting field experiment and expeditions to glaciers. The rate of annual mass balance (melting) ranging from  $-0.3 \pm 0.06$  meter water equivalent per year ( $\text{m w.e.y}^{-1}$ ) to  $-1.13 \pm 0.22 \text{mw.e.y}^{-1}$  during 2013-2020 is observed. Similarly, a mean thinning of  $\sim 50 \pm 11$  m with a mean annual mass loss of  $-1.09 \pm 0.32 \text{mw.e. a}^{-1}$  was observed for the Baspa basin during 2000-2011.

GSI has conducted studies on melting of the glaciers by assessment of mass balance on nine glaciers and also carried out monitoring the recession/ advancement of 76 glaciers in Himalayan region. Majority of Himalayan glaciers are observed melting/ retreating at varying rates in different regions.

Department of Science and Technology (DST) has supported various R&D projects for studying Himalayan Glaciers under the National Mission for Sustaining Himalayan Ecosystem (NMSHE) and National Mission on Strategic Knowledge for Climate Change (NMSKCC). The mass balance studies conducted for some Himalayan glaciers by University of Kashmir, Sikkim University, IISc and WIHG, revealed that majority of Himalayan glaciers are melting or retreating at varying rates.

WIHG is monitoring a few glaciers in Uttarakhand, which reveal that the Dokriani Glacier in the Bhagirathi basin is retreating at 15-20 m/a since 1995, whereas Chorabari Glacier in the Mandakini basin is retreating at 9-11 m/a during 2003-2017. WIHG is also monitoring Durung-Drung and Pensilungpa glaciers in Suru basin, Ladakh, which are retreating at 12 m/a and  $\sim 5.6$  m/a, respectively. NIH has been conducting several studies for the assessment of runoff from melting of glaciers at catchment and basin scales across Himalaya.

Melting glaciers have significant impact on water resources of Himalayan rivers due to change in glacier basin hydrology, downstream water budget, impact on hydropower plants due to variation in discharge, flash flood and sedimentation. They also increase in risk related to glacier hazards due to enhanced number and volume of glacier lakes, accelerated flash flood and Glacial Lake Outburst Floods (GLOFs), impact on agro practices in high Himalayan region etc.

Divecha Centre for Climate Change, IISc Bangalore under the aegis of DST has investigated Satluj River basin and reported that there will be an increase in glacier melt contribution until the middle of the century and then there will be a decline. Numerous small glaciers located in the low altitude region of the Satluj basin indicate significant loss in the area till the middle of the century, creating a scarcity of water during the dry summer season.

The melting of glaciers is a natural process and cannot be controlled. However, melting of glaciers does increase the risks related to glacier hazards. Various Indian institutes, organizations and universities are monitoring the Himalayan glaciers using remote sensing data at large scale to assess the calamities associated with the melting. Recently, the National Disaster Management Authority (NDMA) in collaboration with the Swiss Development Corporation (SDC), prepared the Guidelines, Compendium and Summary for Policy Makers on the management of the Glacial Lake Outburst Floods (GLOFs).

This information was given by the Minister of State (I/C) for M/o Earth Sciences and M/o Science & Technology, Dr. Jitendra Singh in a written reply in Lok Sabha today.

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**SNC / RR**

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