

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 1235
TO BE ANSWERED ON 9TH FEBRUARY, 2022
RAPID MELTING OF HIMALAYAN GLACIERS**

1235. SHRI DUSHYANT SINGH:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether the Government has cognizance of rapid melting of Himalayan glaciers over the past few decades;
- (b) if so, the details thereof and if not, the current status of the glaciers;
- (c) whether the Government has come across the study conducted by the University of Leeds, School of Geography in the UK recently regarding rapid melting of Himalayan glaciers, if so, the details thereof;
- (d) whether the Government has undertaken any study in assessing the melting of Himalayan glaciers in recent times, if so, the details of the study so conducted and if not, whether there are any chances of doing so;
- (e) the details of the effects of the melting of glaciers in the Indian context; and
- (f) the details of the funds allocated and utilized for the research on Himalayan Glaciers during each of the last five years?

ANSWER
THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR
MINISTRY OF SCIENCE AND TECHNOLOGY
AND EARTH SCIENCES
(DR. JITENDRA SINGH)

- (a) Yes, Sir. The government is aware of and maintains data regarding melting of Himalayan glaciers.
- (b) Various 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 ± 15.1 meter/annum (m/a); which varies from 12.7 ± 13.2 m/a in Indus, 15.5 ± 14.4 m/a in Ganga and 20.2 ± 19.7 m/a in Brahmaputra river basins. However, glaciers in the Karakoram region have shown comparatively minor length change (-1.37 ± 22.8 m/a), indicating the stable condition.
- (c) Yes, the government is aware of the study conducted by the University of Leeds, regarding the rapid melting of Himalayan glaciers, published in Journal Nature Scientific Reports in 2021.

The University of Leeds reconstructed the size and ice surfaces of 14,798 Himalayan glaciers during the Little Ice Age, which was 400-700 years ago. The study concludes that the Himalayan glaciers have lost ice ten times more quickly over the last few decades than on average since the last major glacier expansion. In the last 400 to 700 years, the glaciers have lost around 40 per cent area – shrinking from 28,000 square kilometer (km²) to around 19,600 km².

- (d) Yes. The Ministry of Earth Sciences (MoES) through its autonomous institute NCPOR is monitoring six glaciers in the Chandra basin (2437km² area) in western Himalaya since 2013. The rate of annual mass balance (melting) ranging from -0.3 ± 0.06 meter water equivalent per year (m w.e.y⁻¹) to -1.13 ± 0.22 m w.e.y⁻¹ during 2013-2020. Similarly, a mean thinning of $\sim 50 \pm 11$ m with a mean annual mass loss of -1.09 ± 0.32 m.w.e. a⁻¹ was observed for the Baspa basin during 2000-2011.

GSI has taken up project on melting of glaciers in Beas Basin, South Chenab basin and Chandra Basin in Himachal Pradesh, Shyok and Nubra basin in Ladakh during Field Season 2021-22.

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 ~ 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.

- (e) Recent publication suggests that at regional scale, mass loss rate varies between -0.41 ± 0.11 m.w.e.y⁻¹ in the eastern, -0.58 ± 0.01 m.w.e.y⁻¹ in the central, -0.55 ± 0.37 m.w.e.y⁻¹ in the western Himalaya and -0.10 ± 0.07 m.w.e.y⁻¹ in Karakoram region in the last decade.

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.

- (f) NCPOR has utilized Rs. 11.88 crore during last five years for Himalayan Glacier research. Rs. 15.44 crore has been utilized by DST and Rs. 1.1 crore by GSI during the last five years.
