

GOVERNMENT OF INDIA  
MINISTRY OF EARTH SCIENCES  
RAJYA SABHA  
STARRED QUESTION NO. - \*167  
ANSWERED ON – 17/03/2022

**MELTING OF GLACIERS**

\*167. **Dr. C.M. RAMESH:**

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether glaciers are undergoing mass loss at an alarming rate that may lead to formations of glacial lakes due to melting snow and cause overflow or burst leading to flash floods, the details thereof; and
- (b) whether Government is considering long term glacier monitoring programmes to study likely impact on agriculture and water availability, if so, the details thereof, and if not, the reasons therefor?

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

(a) to (b): A statement is laid on the Table of the House.

**STATEMENT REFERRED TO IN REPLY TO PARTS (a) to (b) OF THE RAJYA SABHA  
STARRED QUESTION NO. \*167 REGARDING MELTING OF GLACIERS FOR  
ANSWER ON 17<sup>TH</sup> MARCH, 2022.**

- (a) Yes Sir. Studies have revealed that the Himalayan glaciers are retreating in general. The rate of melting/recession varies from glacier to glacier depending on topography and climatic variability of the region. While, the glaciers in the eastern and central part of Indian Himalaya are continuously retreating, some of the glaciers in the Karakoram region of Himalaya are reported to be advancing. Overall, at regional scale, mass loss rate varied between  $-0.41 \pm 0.11$  meter water equivalent per year ( $\text{m.w.e.y}^{-1}$ ) in the eastern,  $-0.58 \pm 0.01$   $\text{m.w.e.y}^{-1}$  in the central,  $-0.55 \pm 0.37$   $\text{m.w.e.y}^{-1}$  in the western Himalaya and  $-0.10 \pm 0.07$   $\text{m.w.e.y}^{-1}$  in Karakoram region in the last decade. National Centre of Polar and Ocean Research (NCPOR), an autonomous Institute of MoES has been monitoring six glaciers in Chandra basin, one of the tributaries of Indus basin since 2013 for mass and Hydrological balance. NCPOR studies highlight varying rate of mass loss and retreat. The rate of annual mass balance (melting) ranges from  $-0.3 \pm 0.06$   $\text{m.w.e.y}^{-1}$  to  $-1.13 \pm 0.22$   $\text{m.w.e.y}^{-1}$  during 2013-2020. Similarly, annual rate of glacier terminus retreat was varying from 13 to 33 meter/annual (m/a) during the decade. The Chandra basin has lost approximately 6% of glacierised area during last 20 years.

Retreat of Himalayan glaciers in many cases are also creating proglacial lakes, which expand as the glaciers are retreating. Central Water Commission, Ministry of Jal Shakti regularly monitors more than 400 glacial lakes and water bodies (having water spread area of more than 50 hectare) in the Himalayan Region using satellite data. As per their June 2021 report, 209 lakes were monitored, out of which 70, 75 and 64 have shown decrease, increase and no-change in area, respectively. NCPOR study has indicated that two major glacial lakes of Samudra Tapu and Gepang Gath of Chandra Basin showed substantial expansion in their area and volume over the last four decades (1971–2014). Accelerated melting of the feeder glaciers over this period is the major contributor to expand the volumes of both these lakes, which has significance in terms of their hazard potential for glacial lake outburst floods (GLOF).

- (b) 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.) are engaged in regular monitoring of glacier dynamics, snow and glacier melting, geometrical changes and climate studies on the Himalayan glaciers. A number of glaciers have been taken up for long term measurements on glacier-climate interaction in the different parts of Indian Himalayan Region by some of these agencies. NCPOR/MoES has been monitoring glaciers and their contribution to water budget of Indus river basin. GSI has taken up projects 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 (Dokriani, Chorabari etc) and Ladakh region (DurungDrung, Pensilungpaetc). NIH has been conducting several studies for the assessment of runoff from melting of glaciers at catchment and basin scales across Himalaya. Melting of glaciers has significant impact on water resources of Himalayan rivers due to change in glacier basin hydrology, downstream water availability for various purposes including agriculture, impact on hydropower plants due to variation in discharge, flash flood and sedimentation.

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