GOVERNMENT OF INDIA

MINISTRY OF JAL SHAKTI

DEPARTMENT OF WATER RESOURCES, RIVER DEVELOPMENT & GANGA REJUVENATION

LOK SABHA

UNSTARRED QUESTION NO. 3249

ANSWERED ON 20.03.2025

RECESSION OF GLACIERS

3249. SHRI ASADUDDIN OWAISI

Will the Minister of **JAL SHAKTI** be pleased to state:

(a) the total number of glaciers in the country along with their distribution across States and Union Territories;

(b) whether the Government has conducted studies to monitor the status and rate of recession of glaciers in the country and if so, the details thereof;

(c) whether the Government has measured the extent of glacial retreat for individual glaciers and if so, the details thereof indicating the data on the amount of retreat recorded for each glacier during the last two decades;

(d) the key findings of such studies including the impact of glacial retreat on water availability, ecosystems and local communities; and

(e) the steps taken/being taken by the Government to mitigate the adverse effects of glacier recession and to enhance long term monitoring mechanisms?

ANSWER

THE MINISTER OF STATE FOR JAL SHAKTI

(SHRI RAJ BHUSHAN CHOUDHARY**)**

(a) According to the Inventory of Himalayan Glaciers, Special Publication No. 34, 2009 published by the Geological Survey of India (GSI), the country has a total of 9,575 glaciers. State and Union Territories wise distribution of glaciers across the country is given at **Annexure-I**.

(b) & (c) Government has conducted comprehensive studies to monitor the status and recession rates of glaciers across the country. Efforts for regular and long-term monitoring of glaciers and snow cover in the Himalaya are undertaken under the Himalayan Glaciological Programme, coordinated by the Department of Science and Technology, Ministry of Science and Technology, and Ministry of Earth Sciences, Government of India. These initiatives involve national institutions such as the Wadia Institute of Himalayan Geology (WIHG), Geological Survey of India (GSI), National Institute of Hydrology (NIH), Space Application Centre (SAC), National Centre for Polar and Ocean Research (NCPOR), Govind Ballabh Pant National Institute of Himalayan Environment (NIHE), Indian Institute of Science (IISc) as well as numerous state and central universities including Indian Institute of Technologies (IITs), Jawahar Lal Nehru University (JNU), Hemvati

Nandan Bahuguna (HNB) Garhwal University, Delhi University, Jammu University, University of Srinagar, and Lucknow University.

WIHG actively monitors glaciers through field-based observations in the Central Himalaya, Western Himalaya, and Karakoram regions. Currently, WIHG monitors ten glaciers: four in the Central Himalaya, six in the Western Himalaya and Karakoram. The monitored glaciers in Uttarakhand include Dokriani Glacier (since 1991) in the Bhagirathi Basin, Chorabari Glacier (since 2003) in the Mandakini Basin, and Dunagiri Glacier (since 2012) in the Alaknanda Basin. In Ladakh, WIHG monitors Pensilungpa and Parkachik glaciers (since 2015) in the Suru River Basin, and DurungDrung Glacier in the Doda Basin. In the Karakoram region, WIHG has been monitoring the Saser La and Changmolung glaciers (since 2022) in the upper Nubra Valley.

Long-term ground-based monitoring studies indicate significant recession trends:

- Dokriani Glacier in the Bhagirathi Basin has retreated at a rate of 15-20 meters per year since 1995.
- Chorabari Glacier in the Alaknanda Basin retreated by approximately 9-11 meters per year between 2003 and 2016.
- Pensilungpa Glacier in the Western Himalaya retreated around 2,941 meters, averaging 5.6 meters per year, from the Little Ice Age (LIA) until 2019.
- DurungDrung Glacier receded by about 624 meters (average 12 meters/year) from 1971 to 2019.
- Parkachik Glacier retreated 210.5 meters (average 4.21 meters/year) between 1971 and 2021.

Furthermore, WIHG has extensively utilized satellite imagery and Geographic Information Systems (GIS) to monitor glaciers and glacial lakes in Uttarakhand, Himachal Pradesh, and the Eastern Himalaya.

Key findings on monitoring of glaciers based on remote-sensing studies include:

- Identification of 220 surge-type glaciers covering approximately 7,733 km² (43% of the total area under glacier cover) in the Karakoram, including 100 previously unreported surge-type glaciers, significantly enhancing understanding of their distribution and behavior.
- Documentation of 252 glaciers covering 481.32 km² in the Suru Basin, Zanskar, Ladakh, with a total reduction of area covered under glacier is 32 km² (~ 6%) from 1971 to 2017.
- Remote sensing studies of about 80 glaciers in the Garhwal Himalaya indicate a glacier area decrease from about 600 km² in 1968 to 573 km² in 2006, representing a loss of 4.6%. The Alaknanda and upper Bhagirathi basins experienced area reductions of 18.5 km² (5.7%) and 9.1 km² (3.3%), respectively, between 1968 and 2006.

Notable linear recession rates in Tons Valley glaciers between 1962 and 2010 include Jaundhar Glacier (34.2 m/year), Jhajju Glacier (15.4 m/year), and Tilku Glacier (13.5 m/year).

Further, Geological Survey of India (GSI) has conducted studies to monitor the rate of recession of some of the selected glaciers in the country. GSI has conducted mass balance studies on nine glaciers and carried out secular movement studies on 83 glaciers to assess the recessional and advancement pattern of the glaciers. Majority of Himalayan glaciers are observed to be melting/ retreating at varying rates in different regions. The retreat trends of some Himalayan glaciers is at **Annexure-II.**

(d) The key findings from studies on glacial retreat in the Himalayas, particularly in the context of water availability, ecosystems, and local communities, often include the following points:

i. **Impact on Water Availability:**

- As glaciers retreat, the long-term reduction in melt-water will likely lead to decreased flow in rivers during the dry seasons. The Himalayas serve as a critical water source for major river systems like the Ganga, Brahmaputra, and Indus.
- Initially, glacial melt may cause increased water flow, but as glaciers shrink, this contribution declines, leading to shortages, especially in the summer months.
- Reduced melt-water affects hydropower generation, a significant energy source for the country, which rely on glacier-fed rivers for electricity production.

ii. **Impact on Ecosystems:**

- Reduced glacier melt impacts freshwater ecosystems by changing river flow patterns, temperature, and sediment load. These changes affect aquatic species' habitats and can lead to shifts in biodiversity.
- Retreating glaciers alter vegetation zones, causing stress on high-altitude flora and fauna that depend on cold environments.
- Glacial retreat often leads to the formation of glacial lakes, which may threaten local ecosystems through the potential for glacial lake outburst floods (GLOFs).

iii. **Impact on Local Communities:**

- Reduced water availability affects irrigation for agriculture, a critical livelihood source in Himalayan communities. Changes in water flow can disrupt planting and harvesting cycles.
- As glaciers retreat, there is an increased risk of GLOFs, which can devastate downstream communities, destroy infrastructure, and damage arable land.
- Communities dependent on glacier melt-water may face economic pressures, leading to migration or shifts in livelihoods (e.g., from agriculture to tourism or other industries).
- Many Himalayan communities have deep spiritual connections to glaciers, rivers, and mountains, and the retreat of glaciers can have profound cultural and religious consequences.

These findings highlight the increasing threats posed by the climate change in the region, emphasizing the need for continued monitoring and mitigation strategies to protect both ecosystem and local communities from the cascading effect of glacial retreat.

(e) In collaboration with WIHG, the Uttarakhand State Disaster Management Authority (USDMA) is assessing the risks of 13 glacial lakes across the Pithoragarh, Chamoli, Tehri, Uttarkashi, and Bageshwar districts. WIHG specifically monitors Vasundhara Tal in the Dhauliganga Basin, Chamoli District. This proglacial lake, located at the terminus of the Raykana Glacier, expanded from 0.14 km^2 in 1968 to 0.59 km^2 in 2021. Several supraglacial lakes in the ablation zones of the Raykana and Purvi Kamet glaciers are also combined with Vasundhara Tal. To mitigate potential hazards, WIHG continuously monitors these lakes for risk assessment.

As part of the Integrated Operational Warning System (IOWS) project, funded by the Department of Science and Technology (DST), WIHG is to install hydro-meteorological and seismic stations in the Dhauliganga Basin. These stations are to provide real-time data to analyze various triggering factors and downstream hazards, enhancing early warning systems and disaster preparedness. Assessment of risks and implementation of effective risk mitigation strategies can be done on the basis of the collected data.

In 2024, WIHG participated in a joint field expedition, conducting a bathymetric survey to assess the potentially hazardous Vasundhara Tal in Chamoli District. WIHG has also contributed to research on GLOF-related disasters, including the 2013 Kedarnath disaster, the 2021 Chamoli disaster, and the 2023 South Lhonak glacial lake outburst

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ANNEXURE-I

ANNEXURE REFERRED TO IN REPLY TO PART (a) OF UNSTARRED QUESTION NO. 3249 TO BE ANSWERED IN LOK SABHA ON 20.03.2025 REGARDING "RECESSION OF GLACIERS".

Distribution of glaciers of India Across States and Union Territories.

States of India	**Number of Glaciers**	**Area (km^2)**
Jammu & Kashmir and Ladakh	5262	29163
Himachal Pradesh	2735	4516
Uttarakhand	968	2857
Sikkim	449	706
Arunachal Pradesh	161	223
Total	**9575**	**37465**

ANNEXURE-II

ANNEXURE REFERRED TO IN REPLY TO PART (b) & (c) OF UNSTARRED QUESTION NO. 3249 TO BE ANSWERED IN LOK SABHA ON 20.03.2025 REGARDING "RECESSION OF GLACIERS".

Retreat trends of glacier snouts of the Himalayan Glacier.

S.N.	Name of glacier	Basin	Period	Average annual retreat (m/year)
1.	DurungDrung	Indus	1971-2013	13.1
2.	Hagshu	Indus	1975-2015	11.4
3.	Pensilungpa	Indus	1962-2015	7.4
4.	Shafat	Indus	1975-2015	22.0
5.	Parkhachik	Indus	1962-2015	3.2
6.	ChhotaShigri	Chenab	1962-1995	6.8
7.	Bara Shigri	Chenab	1962-2015	32.4
8.	Hamtah	Chenab	2000-2010	12.5
9.	Triloknath	Chenab	1968-1996	17.9
10.	YocheLungpa	Chenab	1963-2006	19.5
11.	Mulkila	Chenab	1963-2006	14.8
12.	Panchinala – I	Chenab	1963-2007	10.6
			1971-2019	3.95
13.	Panchinala - II	Chenab	1963-2007	11.9
			1971-2019	2.89
14.	Tingal Goh	Chenab	1963-2008	16.0
15.	Miyar	Chenab	1961-1996	16.4
			1962-2017	21.90
16.	Sonapani	Chenab	1906-2014	17.6
17.	Gangstang	Chenab	1963-2008	29.7
18.	Gepang Gath	Chenab	2003-2012	45.0
19.	SamundarTapu	Chenab	1962-2013	24.8
20.	Batal	Chenab	1962-2014	7.2
21.	Man Talai (Gl. No. 115)	Beas	1989-2004	23.3
22.	Beas Kund	Beas	1963-2003	18.8
23.	Gl. No. 30	Beas	1963-2003	13.8
24.	Jobri	Beas	1963-2003	2.5
			1971-2019	2.58
25.	Sara Umga	Beas	1963-2004	41.5
26.	Tal	Ravi	1963-2005	39.9
27.	Manimahesh	Ravi	1968-2005	29.1
28.	Gara-I	Satluj	1979-2010	25.6
29.	ShauneGarang	Satluj	1963-1984	31.1
30.	BilareBange	Satluj	1963-2011	65.2
31.	NaraduGarang	Satluj	1963-2011	34.1
32.	Pin	Satluj	1965-2014	12.7
33.	Nisti	Satluj	1965-2014	14.5
34.	Parang	Satluj	1962-2013	11.0
35.	Padma	Satluj	1962-2013	7.0
36.	NagpoTokpo	Satluj	1962-1998	6.4

37.	Bandarpunch	Yamuna	1960-1999	25.5
38.	JhajjuBamak	Yamuna	1960-1999	27.6
39.	JaundarBamak	Yamuna	1960-1999	37.3
40.	Tilku	Yamuna	1960-1999	21.9
41.	Bhrigupanth	Bhagirathi	1962-1995	16.7
42.	Gangotri	Bhagirathi	1935-1996	18.8
43.	Glacier No. 3	Alaknanda	1932-1956	8.3
44.	Chorabari	Alaknanda	1992-1997	11.0
45.	Bhagirathi Kharak	Alaknanda	1962-2001	14.7
46.	Dunagiri	Alaknanda	1992-1997	3.0
47.	Pindari	Alaknanda	1958-2001	9.4
48.	Milam	Ghaghra	1906-2011	20.6
49.	Burphu	Ghaghra	1963-2011	69.7
50.	Jhulang	Ghaghra	1962-2012	9.4
51.	Nikarchu	Ghaghra	1962-2002	9.1
52.	Poting	Ghaghra	1963-2011	29.0
53.	Adikailash	Ghaghra	1962-2002	13.1
54.	Sankalpa	Ghaghra	1881-1957	6.8
55.	Meola	Ghaghra	1912-2012	18.6
56.	Chipa	Ghaghra	1961-2012	24.9
57.	Zemu	Tista	1907-2012	9.0
58.	ChangmeKhangpu	Tista	1983-2012	13.4
59.	East Rathong	Tista	1966-2015	20.0
60.	Kedar Bamak	Bhagirathi	1976-2016	30.8
61.	Raykana	Dhauliganga	1968-2016	7.19
62.	Mabang	Dhauliganga	1962-2017	6.96
63.	Pyungru	Dhauliganga	1962-2017	4.45
64.	Takdung	Chenab	1989-2017	9.64
65.	Uldhampu	Chenab	1989-2017	4.66
66.	Menthosa	Chenab	1965-2018	4.32
67.	Gumba	Chenab	1971-2018	10.38
68.	Gangpu	Chenab	1989-2018	2.79
69.	Sagtogpa	Rongdo	1973-2018	7.4
70.	Sagtogpa East	Rongdo	1973-2018	8.13
71.	Thara Kangri	Rongdo	1973-2018	+11.13 (Surged)
72.	Garam Pani	Rongdo	1973-2018	4.96
73.	Rassa I	Rangdo	1973-2019	8.13
74.	Rassa II	Rangdo	1973-2019	2.63
75.	Arganglas Glacier	Rangdo	1973-2019	18.86
76.	Phunangma	Rangdo	1973-2019	11.65
77.	Panamik-I	Shyok, Nubra	1969-2021	1.68
78.	Panamik-II	Shyok, Nubra	1969-2021	4.09
79.	Saser-I	Shyok, Nubra	1980-2021	3.25
80.	Saser-II	Shyok, Nubra	1980-2021	2.85
81.	Trilokinath Glacier	South Chenab	1969-21	18
82.	Beas Kund Glacier	Beas Basin	1964-2021	15
83.	Glacier no. 20	Beas Basin	1965-21	3.2

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