GOVERNMENT OF INDIA
MINISTRY OF HOME AFFAIRS

RAJYA SABHA
UNSTARRED QUESTION NO. 1193

TO BE ANSWERED ON THE 30TH JULY, 2025/ SRAVANA 8, 1947 (SAKA)

DISASTER RESPONSE IN GLOF EVENTS

1193 SMT. SANGEETA YADAV:

Will the Minister of Home Affairs be pleased to state:

(a) whether Government has taken some concrete actions to monitor Glacial Lake Outburst Flood (GLOF) events in glacial lakes of the Indian Himalayan States;

(b) if so, the details thereof;

(c) whether any SOP has been prepared to address the loss to human lives in GLOF like event in co-ordination with other Ministries like MHA, DST AND MoJS;

(d) if so, the details thereof; and

(e) the details of disaster response taken in case of such GLOF events and steps taken to avoid loss to human lives in re-occurrence of such events in future?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF HOME AFFAIRS
(SHRI NITYANAND RAI)

(a) and (b): Central Government has taken strategic and systemic actions to monitor glaciers and glacial lakes, especially in the Indian Himalayan Region (IHR). Department of Science & Technology (DST) conducts Research & Development projects in Himalayan glaciers under the

National Mission for Sustaining Himalayan Ecosystem (NMSHE) and the National Mission on Strategic Knowledge for Climate Change (NMSKCC).

Wadia Institute of Himalayan Geology (WIHG) also monitors the glaciers and provides comprehensive analysis of factors that trigger hazards and its associated downstream risks to significantly enhance early warning capabilities and disaster preparedness. WIHG has prepared glacial lake inventories for Uttarakhand (2015) and Himachal Pradesh (2018), identifying 1,266 lakes (7.6 km²) in Uttarakhand and 958 lakes (9.6 km²) in Himachal Pradesh.

DST's Center of Excellence at Sikkim University is conducting capacity-building programs focused on water resource management, glacier monitoring, and climate change studies. The Centre has prepared updated glacial lake inventory for the Sikkim Himalayas and mapped 738 lakes for the year 2020 including assessment of 93 glacial lakes in the Changme Khangpu basin for vulnerability towards producing GLOF.

Further, DST's State Climate Change Cell (SCCC) of Sikkim has conducted Vulnerability and Risk Assessment at the district level on 6 sectors - agriculture, forest, health, gender, socio-economic and disaster. Sikkim

SCCC also installed 70 Automatic weather stations across Sikkim with DST support.

Central Water Commission (CWC) has published "Guidelines for structural measures to mitigate adverse effects of GLOF on Dams" in July 2025. This guideline support dam designers, engineers, planners and safety authorities in incorporating GLOF considerations into infrastructure planning and risk reduction strategies.

CWC monitors 902 Glacial Lakes and Water Bodies, of size greater than 10 Ha, in the Himalayan Region of Indian River Basins, for the period June to October every year, using remote sensing techniques. The monitoring reports are shared with all stakeholders and e-published on CWC website for any time access by the concerned.

A Steering Committee on 'Monitoring of Glacier', with National Institute of Hydrology (NIH) as Secretariat, is formed by the Ministry of Jal Shakti to monitor and coordinate the work being carried out by the concerned Ministries/organizations on the Himalayan glaciers.

Central Government has also approved National Glacial Lake Outburst Flood Risk Mitigation Programme (NGRMP) in four Himalayan States viz.

Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh with a total budget of Rs.150.00 crore. Central share from National Disaster Mitigation Fund (NDMF) is Rs. 135.00 crore while states have to contribute Rs.15.00 core from their own resources.

The fund provision for the four (04) states and the status on release of fund as on date are as under:

(Rs. in Crores)

States	Total project outlay	Approved central share from NDMF	States share	Installment released from central share
Arunachal Pradesh	45.00	40.50	4.50	1.83
Uttarakhand	30.00	27.00	3.00	8.10
Sikkim	40.00	36.00	4.00	8.35
Himachal Pradesh	35.00	31.50	3.50	9.45
Total	150.00	135.00	15.00	27.73

The key initiatives under NGRMP include creation of a scientific inventory of glacial lakes with identification of high-risk glacial lakes using satellite analytics and expert validation, installation of Early Warning System (EWS) and Automatic Weather Stations (AWS) at key locations to ensure realtime monitoring, formation of the Committee on Disaster Risk Reduction (CoDRR) and Technical Advisory Committee (TAC) to guide and monitor implementations in coordination with leading institutions.

(c) and (d): National Disaster Management Authority (NDMA) has issued guidelines for the Management of Glacial Lake Outburst Floods in October 2020. The guidelines lay down the Standard Operating Procedure (SOP) titled, "averting threats emanating from GLOFs and Landslide Lake Outburst Floods (LLOFs) in Himalayan Region".

The SOP lays down structured and multi-agency response mechanism including Pre-Disaster Preparedness, Emergency Response during GLOF event and Post-Disaster Phase.

This SOP has been developed in coordination with various central Ministries including Ministry of Home Affairs (MHA), Department of Science and Technology (DST), Ministry of Jal Shakti (MoJS). The coordinated approach ensures an integrated multi-sectoral response, leveraging scientific knowledge and operational capabilities for effective GLOF risk management.

(e): The disaster response undertaken in case of GLOF events and important steps taken to avoid loss of human lives in re-occurrence of such events in future are as under:

(i) National Disaster Response Force (NDRF) has responded in two major GLOF incidents viz Chamoli Glacial Lake Outburst & Flash Flood, Uttarakhand, 2021 and Sikkim Glacial Lake Outburst, 2023.

(ii) A GLOF event at South Lhonak Lake in Sikkim on October, 2023 prompted an immediate technical response, post-event assessments and urgent repair of Early Warning System (EWS) infrastructure at the event site.

(iii) State-led interventions, including installation of Automatic Weather Stations (AWS) / EWS bathymetric surveys and establishment of community evacuation protocols

(iv) Two AWS have been installed in Sikkim with further deployments of EWS planned in collaboration with C-DAC, ISRO and Space Applications Centre, Ahmedabad to provide early warning to local communities in case of any GLOF event.

(v) The CoDRR under NDMA involving representatives from six Himalayan States / Union Territories and other Stakeholders, has identified a set of high-risk glacial lakes for sending expeditions to directly assess these lakes and prepare comprehensive mitigation strategies in terms of setting up EWS / other structural and non-structural measures.

(vi) Subsequent to Teesta-III Hydroelectric dam collapse in October, 2023, CWC has decided to review the design flood of all the existing and

under construction dams vulnerable to GLOFs to ensure their adequate spillway capacity for a combination of Probable Maximum Flood / Standard Probable Flood and GLOF. Further, GLOF Studies has been made mandatory for all new dams planned having Glacial Lakes in their catchments.

(vii) CWC has also finalized the Criteria for Risk Indexing of Glacial Lakes offering a structured approach for identifying and ranking Glacial Lakes based on their likelihood of failure and the potential damage they could cause in the event of GLOF.

(viii) Defence Geoinformatics Research Establishment (DGRE), Chandigarh under Defence Research and Development Organisation (DRDO) is also the nodal agency for studying and developing avalanche mitigation technologies. DGRE has installed 72 Snow Meteorological Observatories and 45 AWS.

(ix) Risk assessments and downstream hazard modelling completed by National Remote Sensing Centre (NRSC) with detailed scenario-based simulations in Ghepang Gath Lake, Himachal Pradesh.

(x) Formation of risk-specific lake categories and prioritized funding for mitigation and monitoring.

(xi) GLOF risk reduction and mitigation measures undertaken in NGRMP.

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