**Quarterly Progress Report of the Project**

# ‘Long-Term Monitoring of Gangotri Glacier, Garhwal Himalaya’

***(January 2026 – March 2026)***

***Submitted***

**by**

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**Background**

The Himalayan Mountain Range hosts one of the largest concentrations of glaciers outside the Polar Regions, comprising several thousand glaciers that vary widely in size, morphology, and dynamic behavior. These glaciers play a crucial role in regional hydrology and serve as sensitive indicators of climate variability and change. Recent glaciological observations across the Himalaya reveal a pronounced reduction in snow accumulation rates accompanied by enhanced ablation, reflecting a sustained negative mass balance and accelerated glacier retreat. Despite their scientific and societal importance, systematic ground-based glaciological investigations in the Himalaya remain sparse due to the region's challenging terrain, harsh climatic conditions, and logistical constraints. Recognizing the need to strengthen long-term glacier monitoring, the Department of Science and Technology (DST), Government of India, has mandated the Wadia Institute of Himalayan Geology (WIHG), Dehra Dun, to undertake comprehensive monitoring of selected Himalayan glaciers. In this context, the Uttarakhand State Disaster Management Authority (USDMA) has sponsored a research project entitled ***"Long-term Monitoring of Gangotri Glacier, Garhwal Himalaya,"*** which was awarded to WIHG in December 2021, with financial support formally released in March 2022.

**The approved objectives of the project are the following:**

- Mapping and monitoring of the Gangotri group of glaciers.
- Mapping and monitoring of glacial lakes in the Gangotri group of glaciers.
- Monitoring of meteorological (temperature, rainfall and snowfall) and hydrological (water level/discharge and sediment transfer) parameters throughout the year and identification of extreme events.
- Risk assessment of glacial hazards (GLOF, debris flow, flash floods, etc.) using an integrated approach i.e. meteorological, hydrological, seismological and satellite data.
- Dissemination of information to the local administration with regard to any emanating threat from the glacial hazards.

**WIHG has carried out the following tasks during the January 2026 to March 2026.**

- *To ensure continuity of monitoring during winter from January to March 2026, two (02) watch and wards were already engaged in project related activities. They conducted frequent visits, depending on accessibility despite harsh weather conditions, ensured the safety of instruments, and regularly checked their proper functioning at the Bhojwasa, Chirbasa, and Maneri sites.*
- *Following the extension of the project up to September 2025, both the Project Assistant and Project Scientist positions remained vacant during this period, as the selected candidates either did not join or served only for a short duration. After the further extension of the project until December 2027 and to maintain project continuity, the recruitment process for both roles will be initiated. In the meantime, a request to relax the qualification criteria and fellowship emoluments for the Project Scientist position was made and subsequently approved by USDMA and the Director, WIHG. Interviews for both positions were conducted on 23$^{rd}$ and 24$^{th}$ March, and the selected project staff are expected to join soon.*
- *Observations from multiple field visits conducted between January and March 2026 indicate that the Gaumukh (Snout) and base camp, remained completely snow-covered, with intermittent episodes of fresh snowfall* ***(Figure 1)****. Despite the harsh winter conditions, all installed instruments were found to be functioning properly, and no unusual activity was observed during the visits. These observations suggest relative stability in the region during the winter monitoring period, while also highlighting the persistence of seasonal snow cover.*

**Figure 1.** The base camp at Bhojwasa and field instruments remained under partial snow during March 2026, followed by a transition to largely snow-free conditions.

- *The temporal monitoring of snow cover and snowmelt dynamics within the basin was carried out over an annual cycle using multispectral satellite data, primarily derived from Landsat 7/8, Sentinel-2, and LISS-4 sensors and field observations were complemented by satellite-based analysis.*
- *In January 2026, snow cover fluctuated between ~58%, 49%, and 52%, indicating a shift from the stable December regime to a more dynamic system influenced by intermittent snowfall and short-term ablation. In February, a marked increase in snow cover was observed, with peaking at ~91% (04$^{th}$ February 2026) and then gradually declining to ~80% (14$^{th}$ February) and ~71% (24$^{th}$ February 2026), reflecting strong initial accumulation followed by systematic melting* ***(Figure 2)****. In March, the snow regime showed further variability, with decreasing from ~69% (01$^{st}$ March) to ~60% (06$^{th}$ March 2026) due to early-month ablation, followed by a sharp increase to ~96% (21$^{st}$ March 2026), indicating a major late-season snowfall event.*
- *The installation of the Automatic Water Level Recorder (procured from WIHG) temporarily, along with fencing of observatories and maintenance of hydrological sites using gabion mesh, is planned after the winter season, likely from May 2026. An integrated module for real-time data transmission from the BBS installed at Maneri has been procured, and its installation is also scheduled for May 2026. Additionally, the production of a documentary*

*film is planned once all instruments are integrated with real-time monitoring systems. Tenders for satellite data procurement, a new AWLR, and fencing works for observatories are currently underway and will be floated upon receipt of the third installment.*

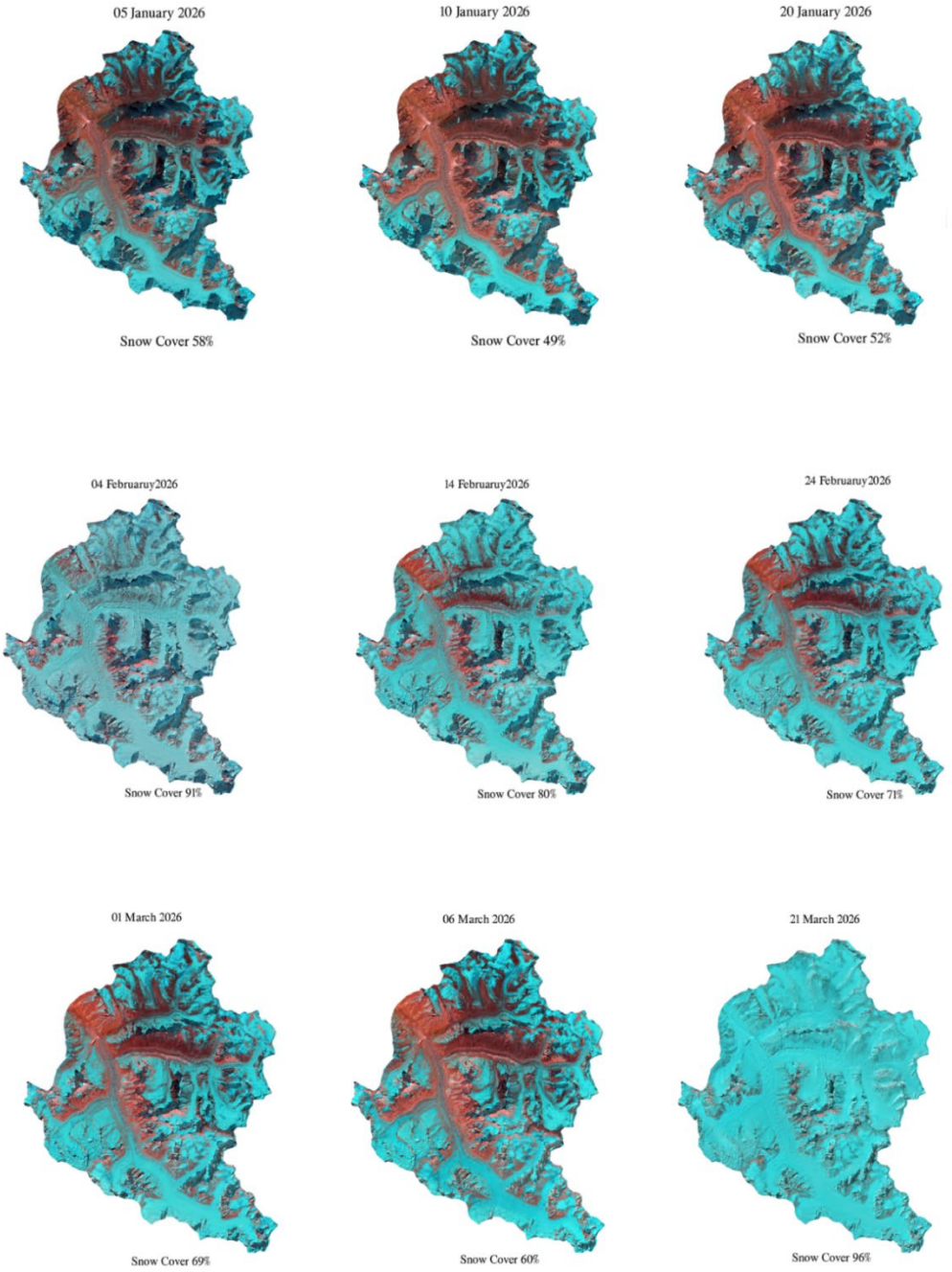


**Figure 2.** Distribution of snow cover conditions in Bhojwasa during January to March, derived from Sentinel-2 imagery.

- ***Based on the field visit, it was verified that the instruments installed at Bhojwasa, Chirwasa, and Maneri were functioning properly. Available satellite data and field observations were jointly examined to identify any major events, such as debris flows or the formation of new glacial lakes near Gaumukh. The analysis confirmed the absence of debris flows, major glacial lake development, or significant geomorphological changes in the vicinity of the Gangotri Glacier.***

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