# Training Programme on GLOF Risk Mitigation

## 29-31 October 2025 | NIDM Rohini Campus, Delhi

### Background

The Indian Himalayan Region (IHR), one of the most dynamic and fragile mountain environments in the world, is experiencing significant changes due to rising temperatures, accelerated glacier retreat and changing precipitation patterns. The retreat and melting of glaciers have resulted in the expansion of existing glacial lakes and the formation of new lakes, many of which are impounded by potentially unstable moraine or ice dams. Sudden failure of such dams can release large volumes of water and debris within a short period, resulting in Glacial Lake Outburst Floods (GLOFs) with potentially devastating consequences for downstream communities, infrastructure and ecosystems. The six Himalayan States/UTs of Jammu & Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh are particularly exposed to GLOF hazards.

The increasing exposure of settlements, hydropower projects, roads, bridges, tourism infrastructure and other critical facilities in mountain valleys has further amplified the potential socio-economic consequences of GLOFs. Historical events across the Himalayan region, including the Sikkim GLOF of 2023 and flash flood events in Ladakh, Himachal Pradesh, as well as the Kedarnath disaster of 2013 and Chamoli event of 2021, demonstrate the cascading and far-reaching impacts of extreme mountain hazards.

GLOF risk is highly site-specific and is influenced by the physical characteristics of the glacial lake and its surrounding terrain, possible triggering mechanisms, downstream flow paths, exposure and vulnerability of communities and infrastructure. Consequently, effective GLOF risk reduction requires an integrated approach combining scientific assessment, continuous monitoring, early warning, site-specific mitigation, preparedness and community participation.

### Why GLOF Risk Reduction?

- GLOFs and flash floods pose severe risks to mountain communities, hydropower projects, roads, bridges, and ecosystems.
- Effective management requires risk assessment, early warning systems, structural and non-structural mitigation, community preparedness, and inter-agency coordination.
- This training aims to sensitize and equip stakeholders with the knowledge, skills, and strategies needed to address these unique high-altitude hazards.

### About NIDM

The **National Institute of Disaster Management (NIDM)** was constituted under an Act of Parliament with a vision to play the role of a premier institute for capacity development in India and the region. The efforts in this direction that began with the formation of the National Centre for Disaster Management (NCDM) in 1995 gained impetus with its redesignation as the National Institute of Disaster Management (NIDM) for training and capacity development. Under the Disaster Management Act 2005, NIDM has been assigned nodal responsibilities for

human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management.

**Target Group**

This programme is designed for Group A and B government officials and professionals involved in disaster management in the Himalayan states/UTs:

- State/UT Disaster Management Authorities (SDMAs/DDMAs)
- Irrigation & Flood Control Departments
- Municipal Corporations & Urban Local Bodies (ULBs)
- Public Works Department (PWD) & BRO
- Urban Planning Departments
- SDRF & NDRF officials
- Research and technical institutions working on GLOFs/flash floods

**Course Objectives**

- To strengthen understanding of GLOF hazards, including glacial lake dynamics, triggering mechanisms, hazard processes and their potential impacts in the Himalayan region.
- To familiarize participants with the NGRMP framework, including its institutional architecture, implementation mechanism, key components and roles of different stakeholders.
- To enhance capacity in GLOF hazard, vulnerability and risk assessment, including glacial lake inventory, classification, risk prioritisation, hazard mapping, monitoring and early warning systems.
- To build knowledge of site-specific GLOF risk mitigation measures, including structural and non-structural interventions, technology-based monitoring and early warning solutions, and preparation of DPRs for mitigation projects.
- To strengthen preparedness and community-based risk reduction, with emphasis on evacuation planning, identification of safe sites, last-mile warning dissemination, community participation and coordinated response mechanisms.

**Course Schedule**

**Learning Unit 1: Understanding GLOFs**
- Basics of Glacial Lake Outburst Floods (GLOF) Hazard
- GLOFs and debris flow events- case studies.
- Glacial Lake Inventory, Classification and Risk Prioritisation

**Learning Unit 2: GLOF Hazard, Vulnerability and Risk Assessment**
- Glacial Lake Dynamics and GLOF Triggers
- Hazard Mapping and Vulnerability Assessment
- NDMA Guidelines on Management of GLOFs
- How is India preparing against GLOF events

**Learning Unit 3: GLOF Mitigation**
- Glacial Lake Monitoring and GLOF Early Warning Systems: From Satellite to Last Mile

- Structural and Non-Structural Mitigation Measures, with emphasis on the Sikkim experience
- NGRMP Framework & DPRs for GLOF Mitigation
- GLOF EWS Solution- LoRa

**Learning Unit 4: Preparedness and Response**

- GLOF Risk Reduction through Community-Based Approaches
- Evacuation Planning, Safe Site Identification and Community GLOF Preparedness

**Mode of Instruction**

The primary language of instruction will be **English**. However, resource persons may use Hindi or local languages based on participants' needs.

**Registration Details**

- Nomination: The participants are requested to send the filled nomination form to the programme coordinator.

- Confirmation: The confirmation to attend the programme will be shared via email. Only confirmed participants will be permitted to attend the course.

- On-site Registration: For confirmed participants, in-person registration will take place on Day 1, Monday 28 September, 2026, from 9:30 AM at the venue.

**Transport, Accommodation, and Food**

- **No Course Fee:** The training programme is fully sponsored by NIDM for all government officials.
- **Boarding & Lodging:** Free accommodation and meals will be provided at NIDM during the course.
- **Travel Costs:** Participants/sponsoring organizations must bear to & fro travel expenses, including local transport.
- **Meals:** Tea and working lunch will be provided during the training.

**Evaluation**

A dedicated session for **feedback and valediction** will be conducted. Participants will fill out an **evaluation form** to assess the effectiveness of the training.

**Attendance & Certification**

- Attendance **before and after lunch** is mandatory for certification.
- Participants who complete the programme successfully will receive an official **Certificate of Participation** from NIDM.

**Training Methods**

The training will include a mix of:

✓ **Classroom Lectures**

✓ **Case Study Discussions**

✓ **Group Exercises**

✓ **Video Demonstrations**

**Organizing Team**

**Patron**

**Shri Madhup Vyas, IAS**
**Executive Director, NIDM**
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**Programme Coordinator**

**Dr. Gagandeep Singh**
**Assistant Professor, NIDM**
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# Training Programme on GLOF Risk Mitigation

**28th September – 1st October 2026**
**Venue: NIDM, Rohini**

## Programme Schedule

| | | |
|---|---|---|
| 0930-1000 | Registration | NIDM Team |
| **Inaugural Session (Monday): 28.09.2026** | | |
| 1000-1010 | Introduction and Context Setting | Dr. Gagandeep Singh, Assistant Prof., NIDM |
| 1010-1015 | Welcome Address | Col. Vineet Banga, Joint Director, NIDM |
| 1015-1025 | Address | Prof. Amir Ali Khan, Head, RID, NIDM |
| 1025-1035 | Inaugural Address | Shri Madhup Vyas, IAS., Executive Director, NIDM |
| 1035-1100 | **Group Photograph and Tea** | |
| 1100-1130 | Pre-training Introduction & Ice Breaking Session | |

**DAY 1 (28.09.2026) Learning Unit 1: Understanding GLOFs**

| Time (hrs) | Session Title | Andragogy | Resource Person |
|---|---|---|---|
| 1130-1300 | **Session 1: Basics of Glacial Lake Outburst Floods (GLOF) Hazard** | Interactive Lecture & Discussion | Dr. Gagandeep Singh, Assistant Professor, NIDM |
| 1300-1400 | Lunch | | |
| 1400-1515 | **Session 2: GLOFs and debris flow events-case studies** | Interactive Lecture & Discussion | Dr. Gagandeep Singh, Assistant Professor, NIDM |
| 1515-1530 | Tea Break | | |
| 1530-1700 | **Session 3: Glacial Lake Inventory, Classification & Risk Prioritisation** | Interactive Lecture & Discussion | CWC (TBC) |

**DAY 2 (29.09.2026) Learning Unit 2: GLOF Hazard, Vulnerability and Risk Assessment**

| Time (hrs) | Session Title | Andragogy | Resource Person |
|---|---|---|---|
| 1000-1015 | Recap of Day 1 | Participant-led | Participants |
| 1015-1130 | **Session 4: Glacial Lake Dynamics & GLOF Triggers** | Interactive Lecture & Discussion | Dr. Vishal Singh, Scientist-D, NIH (TBC) |
| 1130-1145 | Tea Break | | |
| 1145-1315 | **Session 5: Hazard Mapping & Vulnerability Assessment** | Interactive Lecture & Discussion | Dr. Vishal Singh, Scientist-D, NIH (TBC) |
| 1315-1415 | Lunch Break | | |
| 1415-1515 | **Session 6: NDMA Guidelines on Management of GLOFs (2020)** | Interactive Lecture | Dr. Gagandeep Singh, Assistant Professor, NIDM |
| 1515-1530 | Tea Break | | |
| 1530-1700 | **Session 7: How is India preparing against GLOF events** | Interactive Lecture & Discussion | Shri Safi Ahsan Rizvi (Ex-Government, Former IPS officer) (TBC) |

**DAY 3 (30.09.2026) Learning Unit 3: GLOF Mitigation**

| Time (hrs) | Session Title | Andragogy | Resource Person |
|---|---|---|---|
| 1000-1015 | Recap of Day 1 | Participant-led | Participants |
| 1015-1145 | **Session 8: Glacial Lake Monitoring and GLOF Early Warning Systems: From Satellite to Last Mile** | Interactive Lecture & Discussion | Sikkim SDMA (TBC) |
| 1145-1200 | Tea Break | | |
| 1200-1315 | **Session 9: Structural & Non-Structural Mitigation Measures (Sikkim)** | Interactive Lecture & Discussion | Sikkim SDMA (TBC) |
| 1315-1415 | Lunch Break | | |
| 1415-1515 | **Session 10: NGRMP Framework & DPRs for GLOF Mitigation** | Interactive Lecture | NDMA (TBC) |
| 1515-1530 | Tea Break | | |
| 1530-1700 | **Session 11: GLOF EWS Solution- LoRa** | Interactive Lecture & Discussion | Dr. Stanzin Pasang, SEOC, Ladakh (TBC) |

**DAY 4 (01.10.2026) Learning Unit 4: Preparedness & Response**

| Time (hrs) | Session Title | Andragogy | Resource Person |
|---|---|---|---|
| 1000-1015 | Recap of Day 3 | Participant-led | Participants |
| 1015-1130 | **Session 12: GLOF Risk Reduction through Community-based Approaches** | Interactive Lecture | Dr. Gagandeep Singh, NIDM |
| 1130-1145 | Tea Break | | |
| 1145-1300 | **Session 13: Evacuation Planning; Safe Site Identification; Community GLOF Preparedness** | Group Work | Dr. Prerna Joshi, NIDM |
| 1300-1315 | **Post Training Assessment** | Quiz | Dr. Gagandeep Singh, NIDM |
| 1300-1400 | Lunch Break | | |
| 1400-1500 | Feedback & Valediction<br>Certificate Distribution | | |