

GLACIER PRESERVATION:GEOGRAPHY

NEWS:

WHAT'S IN THE NEWS?

India participated in the 2025 High-Level International Conference on Glacier Preservation in Dushanbe, highlighting the vital role of glaciers in sustaining ecosystems and water security. With accelerated melting due to climate change, pollution, and unregulated development, India is advancing national and global initiatives for glacier monitoring, disaster management, and cross-border cooperation.

Why Glaciers are Important

Global Water Resources

- Glaciers are a major source of freshwater for drinking, agriculture, and industry.
- They store about 69% of the world's freshwater and feed major rivers such as the Ganga, Indus, and Brahmaputra.

About Glacier

- A glacier is a persistent mass of dense ice formed through the accumulation, compaction, and recrystallization of snow over centuries.
- Glaciers move slowly under their own weight.
- Found primarily in polar regions and high-altitude mountains like the Himalayas, Alps, and Andes.
- There are over 275,000 glaciers globally, covering around 700,000 km².

Water Security for Agriculture and Human Settlements

- Glacial melt provides seasonal water flow essential for agriculture, especially in the Indo-Gangetic plains.
- Example: Mass loss in the Bhaga basin (6–9 m water equivalent from 2008–2021) raises concerns about future water scarcity.

Glacier Disaster Regulation and Risk Generation

- Glaciers regulate water flow, but rapid melting can increase disaster risks such as Glacial Lake Outburst Floods (GLOFs), avalanches, and flash floods.
- NDMA has initiated GLOF risk mapping and early warning systems.

Support to Ecosystems and Biodiversity

- Glaciers support diverse ecosystems and plant communities.

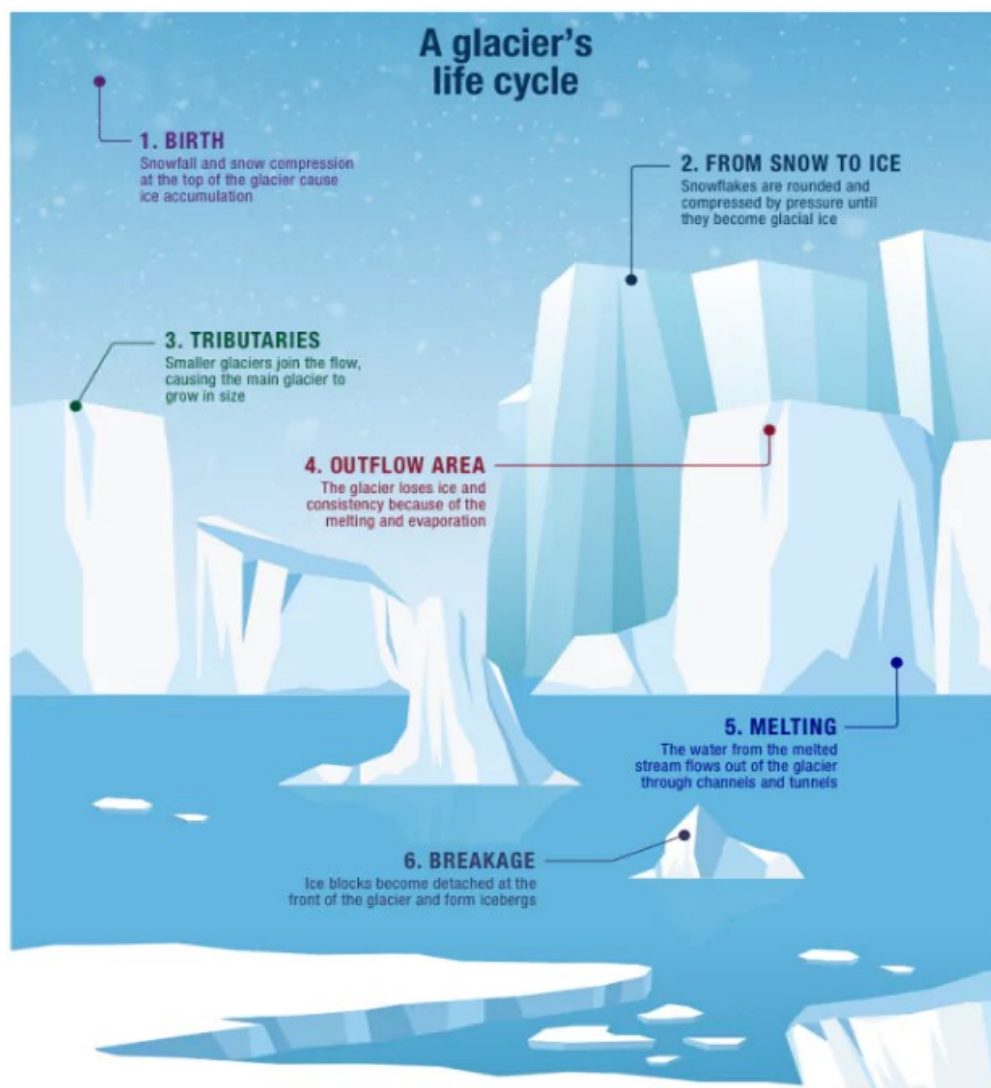
- They maintain biodiversity and ecosystem resilience, such as in Nandadevi National Park, Uttarakhand.

Climate Regulation

- Glaciers reflect sunlight, helping regulate global temperatures.
- Glacier retreat reduces reflectivity, accelerating warming (example: 1°C rise in tropical Indian Ocean surface temperatures between 1951–2015).

Scientific Records

- Glaciers store information about past climates, serving as archives of Earth's history.
- Example: Ohio State University research shows viral adaptation over 41,000 years.



Factors Contributing to Glacier Melting

1. Climate Change

- Rising global temperatures are causing accelerated glacier melting.
- Himalayan glaciers may lose 30–50% of their mass by 2100.

2. Rising Air Pollution

- Black carbon from industrial emissions and biomass burning reduces glacier albedo, increasing melting.
- UNEP's 2024 report highlighted black carbon as a major contributor in South Asia.

3. Extreme Weather Patterns

- Heavy rainfall and heatwaves contribute to faster melting.
- Example: The 2025 Swiss flood followed days of warm, wet weather.

4. Human Activities

- Deforestation, urbanization, and tourism disrupt glacial ecosystems.
- Example: Char Dham Project impacts in Uttarakhand.

5. Glacial Lake Outburst Floods (GLOFs)

- Rapid melting forms unstable glacial lakes, increasing flood risks.
- Past disasters: 2013 Kedarnath, 2021 Chamoli, and 2023 Sikkim floods.

Impacts of Glacier Melting

1. Sea-Level Rise

- Glacial melt has contributed about 2.7 cm to sea-level rise since 1961.
- Currently, glaciers lose 335 billion tonnes of ice annually.

2. Destruction of Infrastructure and Habitats

- Melting-induced landslides and floods damage settlements and ecosystems.
- Example: Birch Glacier collapse in May 2025 destroyed 90% of Blatten village.

3. Accelerated Climate Feedback Loops

- Reduced glacier coverage decreases albedo, increasing global warming.

4. Economic Impacts

- Glacier retreat affects tourism and local economies.
- Example: Iceland's tourism sector is threatened by glacier loss.

5. Public Health Risks

- Melting glaciers may release ancient pathogens.
- Example: 2016 Siberia anthrax outbreak from thawed permafrost.

Indian Government Initiatives for Glacier Preservation

1. National Mission for Sustaining the Himalayan Ecosystem (NMSHE)

- Aims to study climate impacts, promote conservation, and build resilience in mountain communities.

2. Centre for Cryosphere and Climate Change Studies

- Promotes advanced research on glacier dynamics and permafrost.
- Supports real-time data collection and risk forecasting.

3. Use of Remote Sensing and GIS

- ISRO monitors glacier changes using satellite data.
- Supports early warning systems and long-term climate modelling.

4. Glacial Lake Outburst Flood (GLOF) Risk Mapping

- NDMA has zoned GLOF-prone areas and established early warning systems.

5. Research by National Institutes

- WMO, TPRCC-Network, WGMS: Global monitoring and data collection.
- NCPOR, NIH Roorkee, Wadia Institute, GB Pant Institute: National research efforts.

6. International Cooperation & Climate Diplomacy

- India reaffirmed its commitment to glacier preservation at the Dushanbe 2025 conference.
- Advocated for equity, CBDR-RC, and enhanced technology and finance flows.

Global Initiatives for Glacier Preservation

1. International Year of Glaciers' Preservation – 2025

- Declared by the UN to raise awareness and promote glacier research and adaptation.

2. Decade of Action for Cryospheric Sciences (2025–2034)

- Proposed by the UN for advancing cryospheric science and risk mitigation.

3. World Day for Glaciers

- First celebrated on March 21, 2025, as part of the International Year of Glaciers' Preservation.

4. Paris Agreement & NDCs

- Aims to limit warming to well below 2°C to protect cryospheric systems.

5. Cryosphere Monitoring Programmes

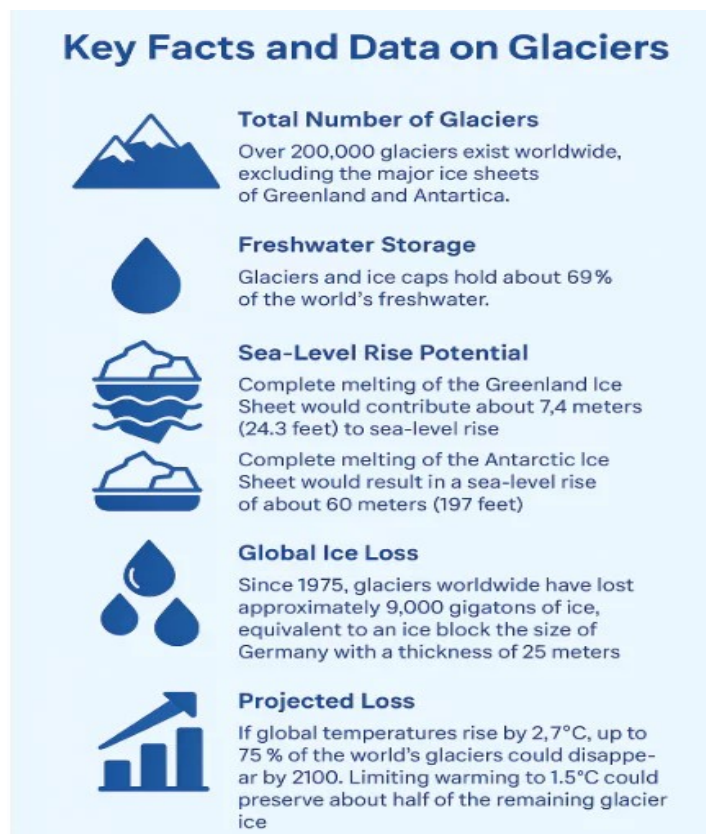
- Led by WGMS, NASA's Operation IceBridge, and ESA's CryoSat missions.

6. International Centre for Integrated Mountain Development (ICIMOD)

- Promotes cross-border research and resilience in the Hindu Kush Himalaya region.

7. Arctic Council

- Addresses Arctic glacier and sea ice preservation, with India as an observer.



Challenges in Glacier Preservation

1. Accelerating Climate Change

- Record ice loss of 604 billion tonnes globally in 2023.
- Current emission pledges are insufficient.

2. Lack of Real-Time and Localised Data

- Remote glaciers lack comprehensive long-term monitoring.

3. Low Financial and Technological Capacity

- Mountain nations need access to advanced research tools and finance.

4. Transboundary Nature of Glacier Systems

- Glacier systems span across political borders, requiring diplomatic cooperation (ICIMOD plays a key role).

5. Poor Regulation of High-Altitude Infrastructure

- Unregulated development and tourism destabilize glacial systems.
- Examples: Uttarakhand (2021), Himachal Pradesh (2023) floods.

6. Underutilization of Community Knowledge

- Indigenous and local insights are often excluded from scientific monitoring and early warning systems.

Way Forward for Glacier Preservation

1. Accelerate Global Climate Action

- Limiting warming to 1.5°C could preserve ~50% of glacier mass by 2100.

2. Strengthen Glacier Monitoring Infrastructure

- Expand real-time monitoring using automated weather stations and satellites.

3. Scale Up GLOF Early Warning Systems

- Invest in predictive modelling, sirens, and community-led response drills.
- Extend NDMA's efforts to all high-risk glacial lakes.

4. Institutionalize Transboundary Cooperation

- Foster Himalayan climate diplomacy for joint risk management.
- Strengthen ICIMOD's role.

5. Promote Eco-sensitive Development and Tourism

- Enforce environmental clearances for infrastructure near glacier zones.
- Example: Lessons from Kedarnath and Joshimath disasters.

6. Leverage Traditional Knowledge

- Integrate indigenous observations with scientific monitoring.

7. Ensure Climate Finance and Technology Transfer

- Advocate for CBDR-RC principles to enable the Global South's adaptation.

Conclusion

India's commitment at the Dushanbe 2025 conference reflects its leadership in glacier preservation. By aligning national programs (like NMSHE) with global initiatives (such as the International Year of Glaciers' Preservation), India aims to safeguard Himalayan glaciers, ensuring water security and ecological balance for millions.

Source: <https://newsarenaindia.com/international/india-reaffirms-commitment-to-glacier-preservation-at-dushanbe/46107>