



CRYOSPHERIC CHANGES: IMPACTS ON WATER AND FOOD SECURITY AND ADAPTATION STRETEGIES

SRAVAN SHRESTHA

Senior Research Associate

ICIMOD submission to the 18th UNFCCC Research Dialogue

June 9, 2026 | Bonn, Germany



THE HKH: WATER TOWER OF ASIA UNDER PRESSURE

Source of **10 major Asian rivers** and supporting **2 billion people** downstream

1/3 vs 2/3

GLACIER VOLUME LOSS

Projected 1/3 glacier volume loss by 2100 at +1.5°C, rising to 2/3 loss under current 3°C+ trajectory.

0.3°C

WARMING PER DECADE

Significantly above the global average, accelerating ice loss across the Third Pole

12%

GLACIER AREA LOST

Documented glacier area loss across the HKH from 1990–2020, per ICIMOD's 2026 Assessment

50%

FASTER RATE OF LOSS

The rate of glacier loss in 2010–2020 (4.9%) was 50% higher than in the 1990s (3.2%)

Change is **not linear, it is accelerating**. The Third Pole loses ice faster each decade.

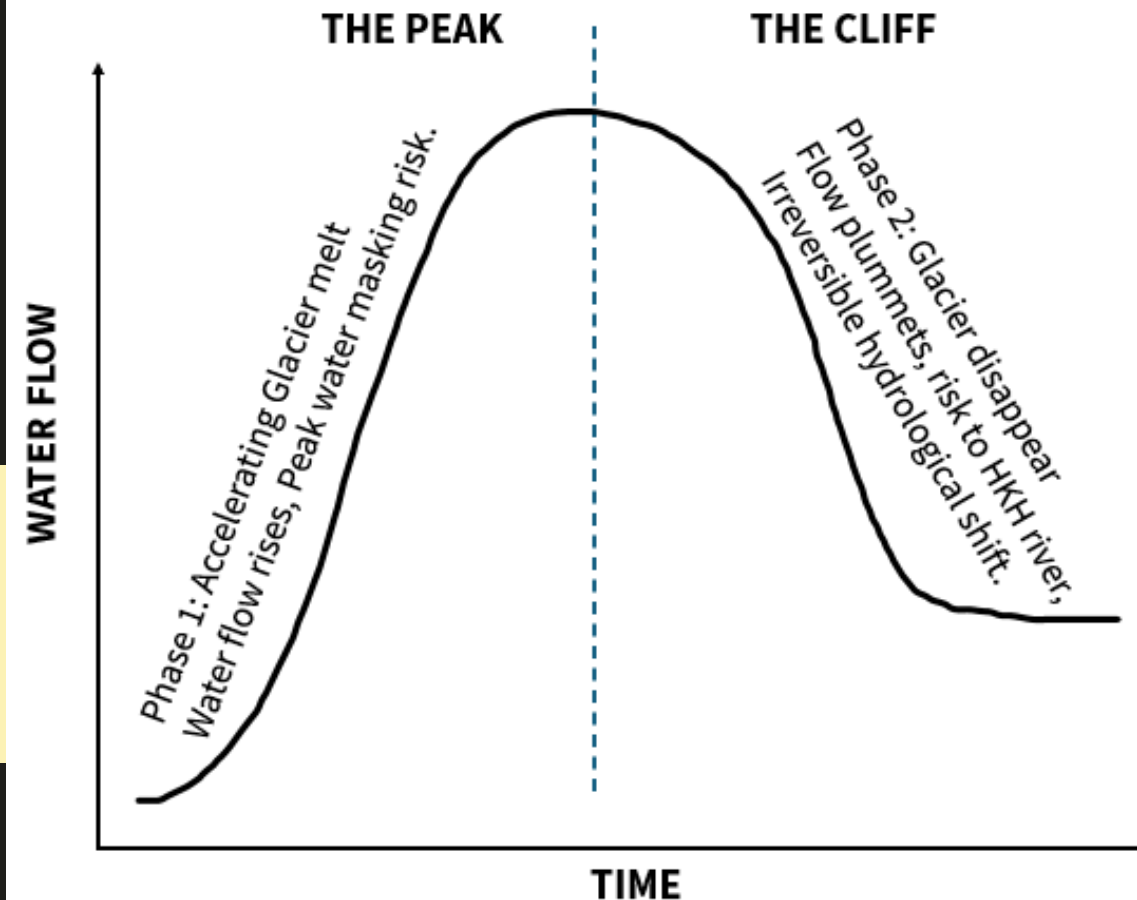


EVIDENCE OF ACCELERATING GLACIER LOSS AND MONITORING GAPS

50 YEARS OF OBSERVATIONS (1974–2024)

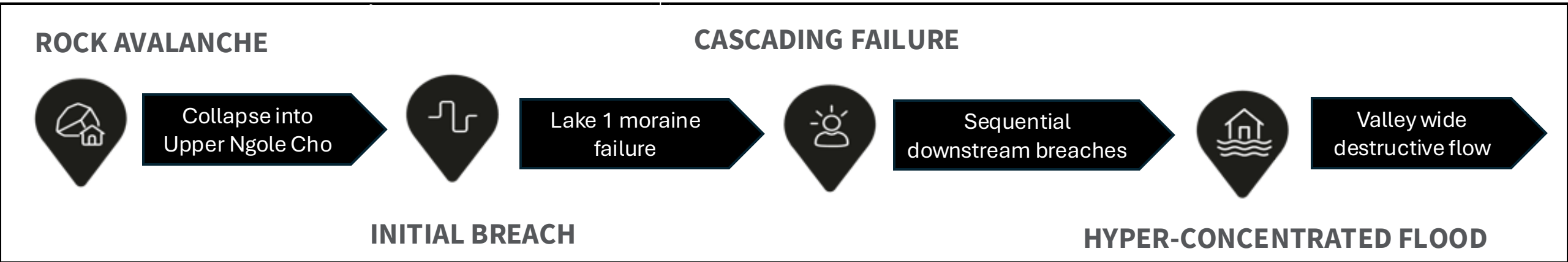
- ICIMOD's Glacier Outlook: **89% of annual mass balances negative**
- **~63,700 glaciers in HKH, but only 38 have continuous field monitoring**
- **<0.06% observational coverage** across the region
- **Major gaps** in Karakoram, Sikkim, and Bhutan
- **Urgent need to expand coordinated cryosphere observation systems**
- Critical for **understanding glacier tipping points & climate risks**

APPROACHING IRREVERSIBLE TIPPING POINTS



THE THAME GLOF (2024): A CASCADING MULTI-LAKE FAILURE

On **August 16, 2024**, Nepal's Thame Valley experienced one of the HKH's most catastrophic GLOF sequences, a cascading, multi-lake failure.



DOCUMENTED IMPACTS

- **25 homes** destroyed or severely damaged
- **1 school + 1 health post + 1 hydropower plant intake** destroyed
- **135 people** displaced

THE STRATEGIC LESSON

- High-risk glacial lakes require continuous monitoring
- Cascading failures from destabilized permafrost are the **new normal**
- GLOFs demand transboundary early warning systems



SLOW-ONSET DISASTER: THE 2025 MADHESH DROUGHT

Nepal’s agricultural heartland shows the slow-onset face of cryospheric loss: unreliable meltwater, erratic monsoons, and extreme heat driving food system collapse.

GROUNDWATER COLLAPSE

- **30%+ groundwater boreholes** dried up
- Eliminating critical backup for drinking and irrigation

RICE TRANSPLANTATION

- **52%** transplantation (Jul 2025) vs **92%** (Jul 2024)
- Catastrophic single-season decline

FOOD SHORTFALL

- Rice deficit: **400,000–450,000 tonnes**
- Threatening food security for millions

WHO BEARS THE BURDEN

- **Women, smallholder farmers, and persons with disabilities** hardest hit
- Compounded losses of income, food, and safety nets

Cascading failure of water, food, and social systems, not merely just agricultural loss. The most vulnerable bear the heaviest cost.



ICIMOD'S NICHE: REGIONAL SCIENCE TO COMMUNITY LED ACTION

HIGRID project in the Lower Koshi Basin, a science-based, community-led adaptation to **'TOO MUCH & TOO LITTLE WATER'**



LOCAL AND REGIONAL

- **CBFEWS, a UNFCCC Lighthouse Activity** winner in Lower Koshi Basin
- Life-saving lead time flash floods
- Scaling across HKH borders



NATURE BASED SOLUTION

- **Springshed restoration**
- **6-step management protocol** reviving water sources
- Year-round supply for drinking, livestock, and irrigation



PROVEN AND INCLUSIVE

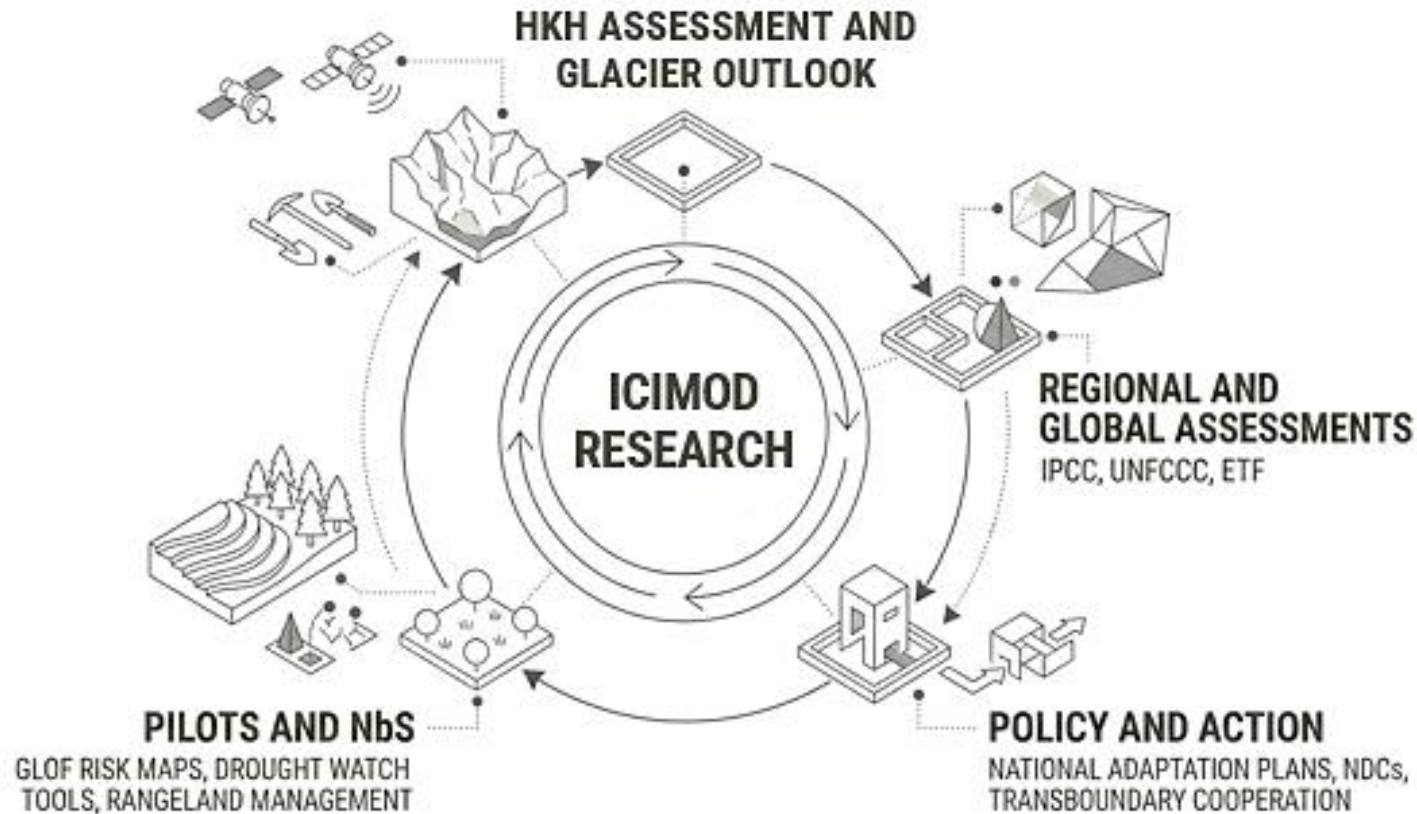
- **GEDSI-responsive DRR plans** in 28 municipalities
- Gender, disability, and social inclusion structurally integrated

Nature-based solutions work across altitudes, from glacier zones to floodplains, when locally led and equity-centered.



FROM SCIENCE TO POLICY: CLOSING THE LOOP

Research into decision-making at every scale from village DRR plans to IPCC assessments and UNFCCC texts.



KNOWLEDGE & DATA PLATFORMS

- **HimalDoc**: open-access knowledge repository for HKH research
- **Regional Database System (RDS)**: data curation and dissemination
- **Regional Drought Monitoring and Outlook System**

CAPACITY & POLICY REACH

- **250+ SANDEE research grants** for next-gen regional scientists
- **1,500+ trainees** in climate adaptation across HKH states
- Direct technical support to **NAPs and NDCs** in Regional Member Countries

LOOKING AHEAD: A CALL TO ACTION

The HKH is a global tipping point. The window is narrowing, but evidence and partnerships are ready. The **Decade of Action for Cryosphere Science (2025–2034)** must deliver three imperatives:

SUSTAIN CRYOSPHERE OBSERVATION

Long-term investment in glacier and permafrost monitoring, closing gaps in Karakoram, Bhutan, and Sikkim as the foundation for transboundary early warning

SCALE NATURE-BASED SOLUTIONS

Fund proven NbS, community EWS, springshed restoration, and inclusive DRR governance across the HKH like ICIMOD's springshed and CBFWS models

CENTER MOUNTAIN VOICES

Embed intersectional vulnerability (disability, gender, indigeneity) in Loss & Damage mechanisms, adaptation finance, and UNFCCC outcomes

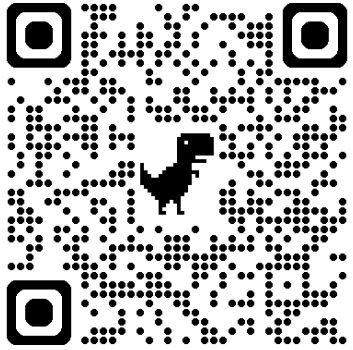
ICIMOD's Commitment: Regional partner for science, solutions, and transboundary cooperation. Ready to support the Global Goal on Adaptation and National NAP and NDC processes



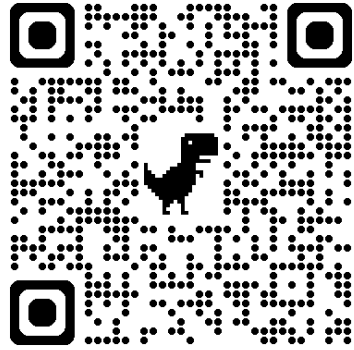


Thank You.

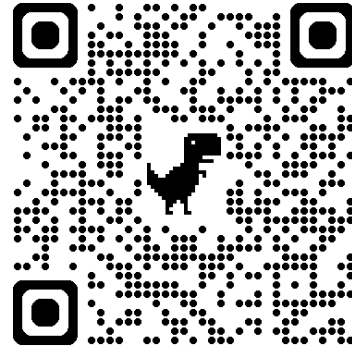
QR CODES FOR RELATED REPORTS



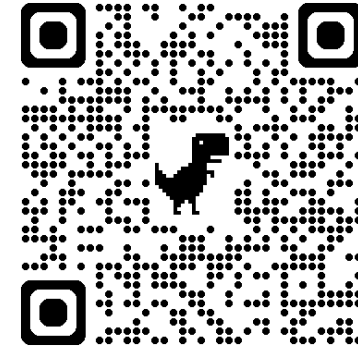
HKH glacier
outlook 2026



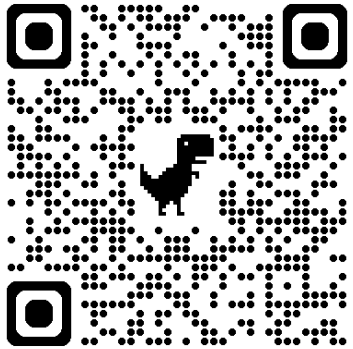
HKH snow
update 2026



The Hindu Kush
Himalaya Assessment



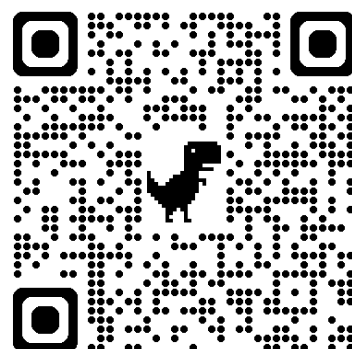
Changing dynamics of glaciers
in the Hindu Kush Himalayan
region from 1990 to 2020



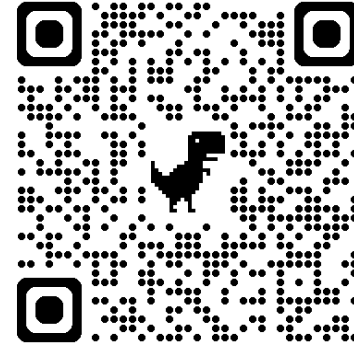
2025 Drought in
Nepal's Madhesh
Province



A regional drought
monitoring and
outlook system for
South Asia



Thame Valley Glacial
Lake Outburst Flood
2024



HI-GRID: Building Capabilities
for Green, Climate-Resilient
and Inclusive Development in
the Lower Koshi River Basin