GLACIER LOSS AND INDIGENOUS COMMUNITIES:

Adapting to a Changing Water Future

Presented By

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Presentation Roadmap

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2. Cultural & Spiritual Ties
3. Water Security & Livelihoods impacts
4. Biodiversity impacts
5. Natural Hazards & Community Displacement
6. Ancestral Sciences
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Why Glaciers Matter to indigenous communities

- Water Management & Local Resilience
- Foundational to Cultural Practices
- Longstanding Land Management
- Indicator of Environmental Harmony

Cultural & Spiritual Ties

- Sacred Landscapes: Many Indigenous groups revere glaciers as deities or ancestral spirits.
  - In Bolivia we call them Apus
- Ceremonial Rites & Festivals: Tied to glacial cycles, often marking seasons or harvest times.
- Threat to Identity: As glaciers recede, communities can experience cultural loss and environmental migrations, amplifying the climate impact.

Water Security & Livelihoods impacts

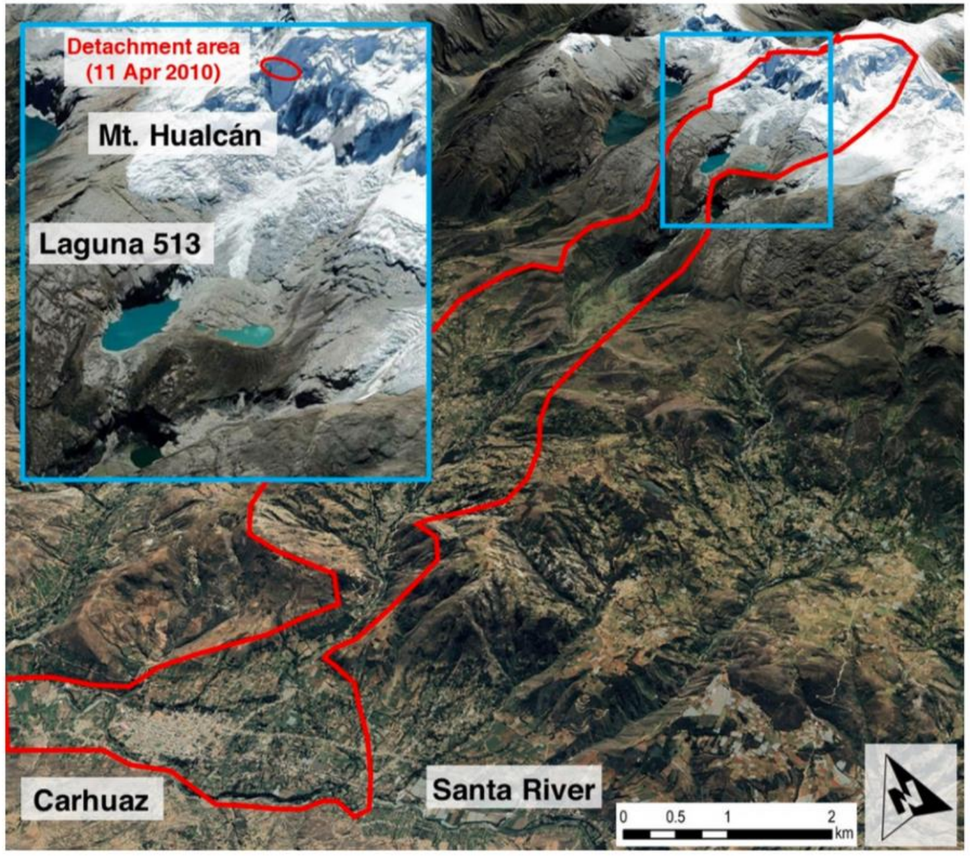
- Unpredictable Water Supply
- Reduced Agricultural Productivity
- Migration & Displacement
- Increased Hazard Risk
- Biodiversity Disruption

Biodiversity impacts

- Habitat Loss & Fragmentation
- Altered Species Distribution.
- Biodiversity Loss: Shifts in streamflows disrupt terrestrial and aquatic species' breeding cycles, impacting local diets and economies.
- Reduced Water Retention & Quality
- Threats to Pollinators & Food Webs
- Cultural & Livelihood Implications

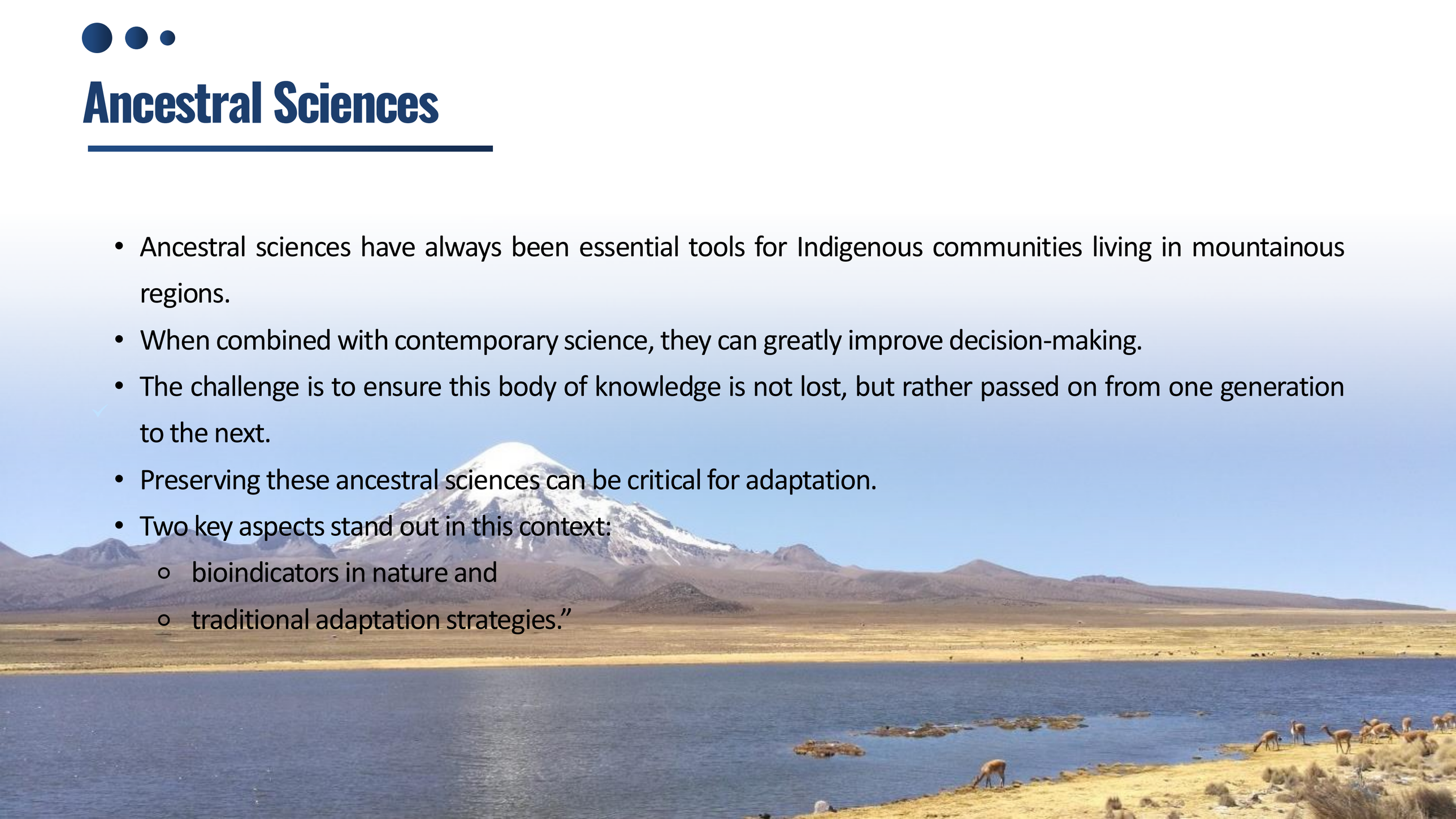
Natural Hazards & Community Displacement

- Glacial Lake Outburst Floods (GLOFs)
- Landslides & Avalanches
- Displacement & Cultural Fragmentation
- Dry-Season Droughts.



Ancestral Sciences

- Ancestral sciences have always been essential tools for Indigenous communities living in mountainous regions.
- When combined with contemporary science, they can greatly improve decision-making.
- The challenge is to ensure this body of knowledge is not lost, but rather passed on from one generation to the next.
- Preserving these ancestral sciences can be critical for adaptation.
- Two key aspects stand out in this context:
  - bioindicators in nature and
  - traditional adaptation strategies.”

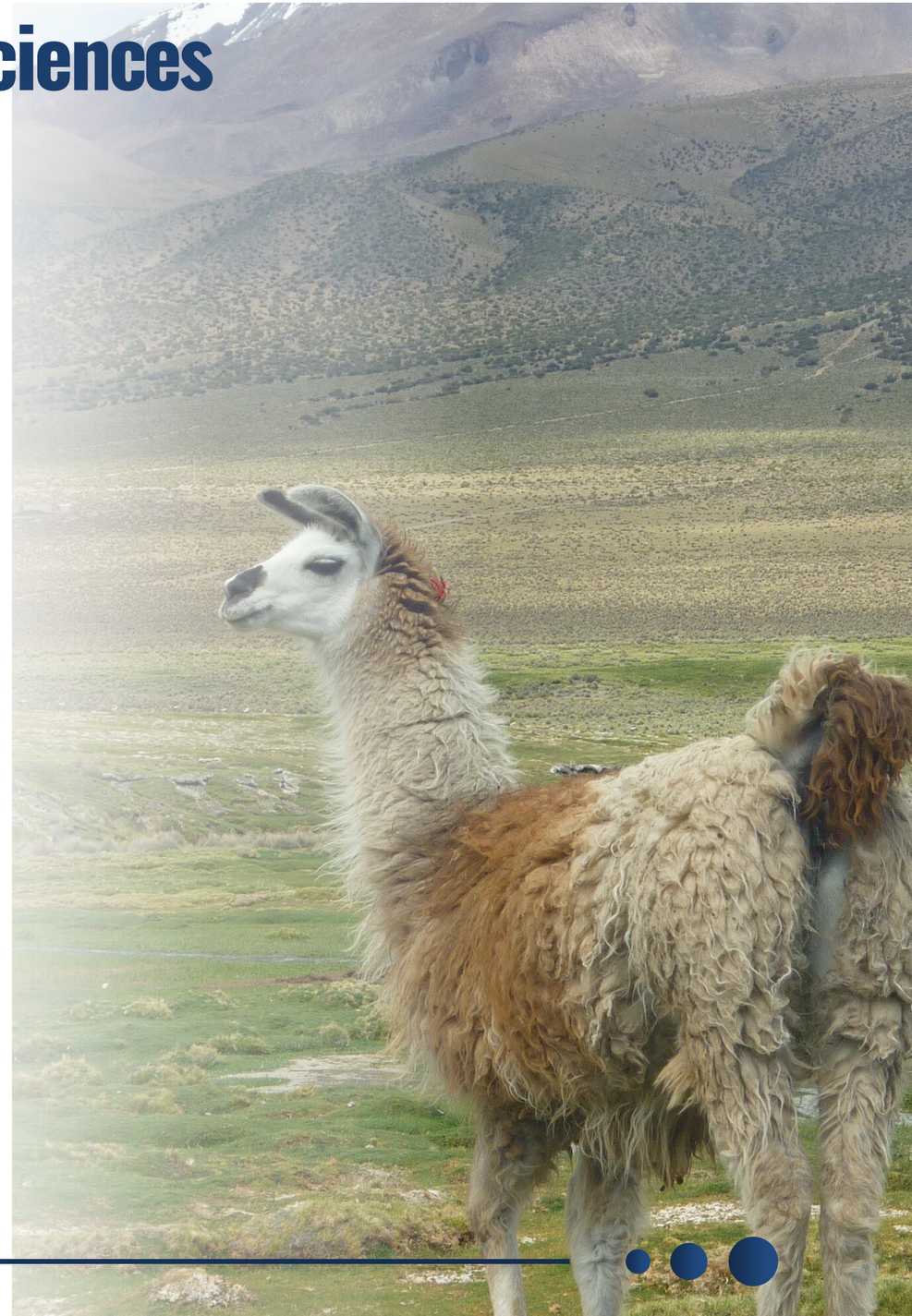


Bio-indicators

- Andes
  - Flowering Patterns of High-Andean Plants: In certain areas of the Peruvian and Bolivian Andes, Indigenous communities observe the flowering cycles of specific plants (for example, the Sancaya). Changes in blooming times—coming earlier or later than usual—indicate shifts in temperature and precipitation patterns. These observations help farmers predict the onset of the rainy season or potential droughts and adjust their planting strategies accordingly.
- Himalayas
  - Rhododendron Bloom Cycles: In parts of Nepal and Bhutan, the timing and intensity of rhododendron flowering serve as a local climatic cue. When communities notice these plants blooming prematurely at higher altitudes, it can signal warming trends and a receding snow line. This information influences decisions about livestock movement (e.g., yak herding routes) and planting schedules for high-elevation crops.

Adaptation Strategies based on ancestral sciences

- Terraced Agriculture (Andes)
- Amunas or Ancestral Water Harvesting (Andes)
- Yak-Based Transhumance (Himalayas) and camelids-based (Andes)
- Kuhl Irrigation Systems (Himalayas)
- Forest Protection and Sacred Groves (Common to Andes & Himalayas)



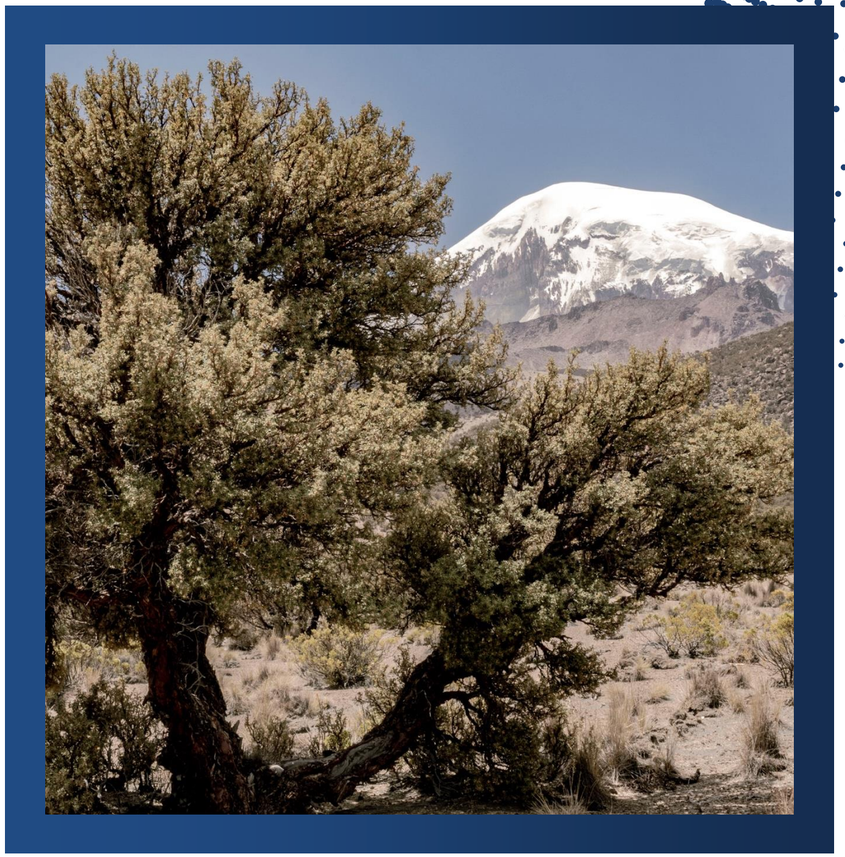
Community-Led Adaptation

- Local Monitoring Initiatives
- Partnerships between Indigenous communities and scientific bodies to track temperature, and runoff trends.
- Infrastructure Solutions Small-scale reservoirs, restored ancient irrigation canals, and reforestation projects to stabilize soils and manage water.
- Cultural Revitalization Activities and ceremonies that reinforce community ties and foster stewardship for glacial landscapes.

Nature-Based Solutions

White Sponge vs. Green Sponge

- The White Sponge: Glaciers act as natural reservoirs, slowly releasing meltwater for agriculture, drinking, and ecosystem health. As they recede, their capacity to regulate water flow diminishes.
- The Green Sponge: High-altitude wetlands (e.g., bofedales, páramos) can help offset the loss of glacier storage. These ecosystems soak up and release water gradually, filtering and stabilizing flows to downstream communities.

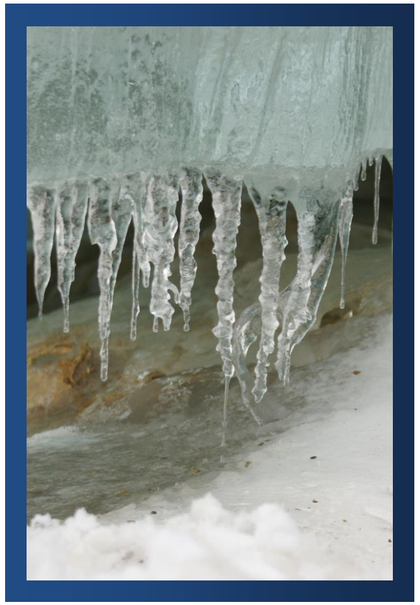


Challenges & barriers to enforce resilience

Institutional Fragmentation: Multiple agencies operating in silos can delay critical adaptations (e.g., water resource management vs. cultural preservation).

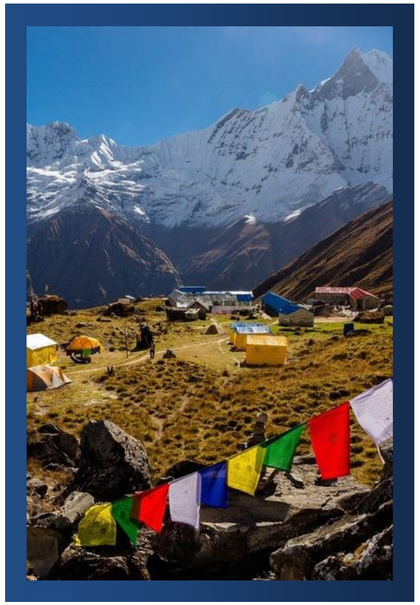
Lack of Data & Monitoring: Some areas remain too remote for consistent data collection, limiting response time to hazards.

Insufficient Policy Priority: Despite clear evidence of glacier retreat and its impacts, some governments are slow to enact or enforce policies



Next Steps & Further Work

- Prioritize Mountain Water Towers in Climate Negotiations
  - Develop specific funding and action commitments tailored to safeguarding these high-elevation ecosystems.
- Expand Community-Led Data Collection
  - Enhance glaciological and hydrological research in remote areas by training local observers in data-gathering techniques and user-friendly technologies.
  - Integrate citizen science approaches to empower communities, especially youth, in ongoing glacier and water monitoring.
- Increase Funding & Technical Support
  - Streamline grants for Indigenous-led research and adaptation projects, ensuring equitable resource allocation.
  - Promote capacity-building in climate education and technology transfer, with an emphasis on sustainable, locally adapted solutions.



Next Steps & Further Work

- Facilitate Technology and Knowledge Exchange
  - Encourage cross-regional collaborations—Andes, Himalayas, Alps, and beyond—to share best practices, adaptation tools, and innovations.
  - Establish international symposia and digital platforms that bring Indigenous communities, scientists, and policymakers together to co-create climate resilience strategies.
- Strengthen Policy Integration
  - Ensure that lessons learned from local initiatives inform broader policy decisions at national, regional, and global levels.
- Promote Collaborative Research and Pilot Projects
  - Pair ancestral sciences with contemporary methods to test new adaptation models, preserving cultural heritage while advancing ecological resilience.
  - Document and evaluate pilot successes for replication in other mountain regions, scaling up solutions that work.

Conclusions

- **Core Message**
  - Glacial retreat directly threatens the cultural identity, spiritual practices, and water security of Indigenous communities worldwide.
- **Resilience Through Integration**
  - We must foster collaboration and dialogue among ancestral knowledge, contemporary science, and policy frameworks to navigate our changing water future effectively. By sharing strategies and technologies across different mountain regions, communities can strengthen their collective resilience.
- **Call to Action**
  - We urge glaciologists, policymakers, Indigenous leaders, NGOs, and all relevant stakeholders to unify efforts in safeguarding both glaciers and the cultural heritage they sustain. Recognizing the common challenges faced by high-mountain areas—and the solutions that arise from these shared experiences—can spark innovative, inclusive responses that protect local livelihoods and preserve these invaluable landscapes for future generations.

THANK YOU

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