

AI-Driven Climate Resilience for Nepal & Beyond

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The Himalayan Frontline

- **The Context:**

Nepal contributes <0.1% of global emissions but faces the highest risk.

- **Core Challenges:**

- **Glacier Retreat:** Unprecedented melting in the Hindu Kush Himalaya.
- **Radical Weather:** Erratic monsoons and "Pre-monsoon" droughts.
- **National Stake:** Agriculture is the backbone (24% of GDP), now under direct threat from climate-induced water uncertainty.

AI as a Multiplier for Climate Action

- **The Shift:** Moving from "Observation" to "Active Prevention."
- **AI's Role:**
 - **Pattern Recognition:** Processing decades of satellite data to predict GLOF (Glacial Lake Outburst Flood) risks.
 - **Speed:** Modern AI (like Google's Graph Cast) predicts extreme weather in seconds- too faster than traditional supercomputers.
- **Goal:** Building a "Predictive Governance" framework.

Current Global Scenario: Best Practices

- **India:** The **Fasal** platform uses AI field sensors to save 30%+ water in irrigation—a model for the Nepal Terai.
- **Europe:** AI-optimized smart grids reducing industrial carbon footprints by 20%.
- **Africa: Tumaini App** (image-based pest detection) allows smallholder farmers to diagnose climate-stressed crops using a mobile camera.
- **The Takeaway:** We don't need to reinvent; we need to **contextualize**.

Focus Area 1-

Glacial Monitoring & GLOF Prevention

- **Current Tool:** ICIMOD's AI-enhanced monitoring.
- **The Technology:** Machine Learning analyzes SAR (Synthetic Aperture Radar) data to see through clouds and monitor lake expansion in real-time.
- **Actionable Strategy:** Integrating AI with IoT-based "Water Level Sensors" at high-risk lakes like **Imja** and **Tsho Rolpa** for automated, high-speed early warning systems.

Focus Area 2-

AI in Climate-Smart Agriculture

- **Challenge:** Traditional calendars no longer work due to radical weather changes.
- **Solution: Hyper-local Weather Intelligence.**
- **Nepal Case:** Using AI to bridge the "Extension Gap." One officer can support 10,000 farmers via AI-driven SMS alerts (e.g., "Postpone planting by 3 days; 80% chance of extreme rain").
- **Outcome:** Reducing post-harvest losses and optimizing fertilizer use during floods.

The Future—"Digital Twins" of our Watersheds

- **The Tool: Digital Twin Technology.**
- **Vision:** Creating a virtual 3D replica of the Koshi or Gandaki river basins.
- **Usage:** Simulating "What if" scenarios—e.g., "If 20% of the glacier melts by 2030, how will it affect downstream irrigation in the Terai?"
- **Benefit:** Allows the GoN to design infrastructure (dams, bridges) that can withstand 2050's climate, not just today's.

What Nepal Should (and Should Not) Adopt

- **Adopt:** * **Edge AI:** Low-bandwidth AI that works offline for mountain remote areas.
- **Regional Data Sharing:** Collaborative AI models with India (ISRO/IMD) for cross-border flood prediction.
- **Wait & Watch:** * **Massive AI Data Centers:** Nepal should leverage "Cloud-based" global AI rather than building energy-intensive hardware locally.
- **Autonomous Heavy Machinery:** High cost and low suitability for steep mountain terraces.

Policy & Governance: The GoN Roadmap

- **National AI Policy 2081 (2025):** Prioritizing AI for Disaster Risk Reduction (DRR).
- **Data Sovereignty:** Collecting localized data in Nepali dialects to make AI accessible to the average farmer.
- **International Collaboration:** Inviting Indian and global researchers to use the Himalayas as a "Live Lab" for climate AI.

The "AI Paradox"—Sustainability Matters

- **Caution:** AI itself has a carbon footprint (energy/water).
- **Our Approach:** "Green AI." Using high-efficiency models (LSTMs and Transformers) that require less compute.
- **Ethics:** Ensuring AI doesn't leave behind the digitally illiterate; it must be a tool for **equity**, not just efficiency.

Conclusion—From Vulnerability to Leadership

- **Final Word:** Nepal isn't just seeking aid; we are seeking **Technology Partnerships**.
- **Call to Action:** Let's integrate AI into the **Trans-Himalayan Climate Corridor** to protect the water tower of Asia.

Thank You