

# Building Climate Resilience in Nepal: Technology & Success Story

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# Strategic Policy Framework (2025 Updates)

- ❖ **National AI Policy 2081 (2025):** The Cabinet officially endorsed the [National AI Policy 2081](#) in August 2025. The policy identifies climate action as a priority, specifically calling for AI-based analysis of weather patterns and crop trends to help farmers adapt to environmental shifts.
- ❖ **National AI Centre:** Under the Ministry of Communication and Information Technology, a new National AI Centre has been established to manage ethical AI development and align technology with national development priorities like net-zero carbon by 2045.
- ❖ **"Green Data Centers" Vision:** Nepal is leveraging its abundant hydropower and naturally cool climate to position itself as a hub for "green data centers," turning its geography into a digital and economic advantage.

# AI-Powered Landslide Early Warning (SAFE-RISCCS)



# Core Technology & Methodology

- ❖ The system integrates advanced mathematical modeling with machine learning to identify the precise moment rain-soaked terrain reaches a breaking point.
- ❖ **AI Engine:** Uses a specialized open-access AI tool developed at the [University of Melbourne](#) that performs spatiotemporal analysis on big data sets.
- ❖ **Predictive Modeling:** Combines mathematical models of saturated granular material failure with real-time data to forecast when and where a slope will slide.
- ❖ **Risk Mapping:** Generates continuously updated landslide risk maps that visualize thresholds and hazard levels for local decision-makers.

# Data Inputs

- ❖ SAFE-RISCCS utilizes a "multi-sensor" approach, merging high-tech space data with local ground observations:
- ❖ **Satellite Imagery:** Real-time near-infra imagery from the European Space Agency (ESA), NASA, and the Japan Aerospace Exploration Agency (JAXA) is used to monitor ground displacement.
- ❖ **Ground Instruments:** Includes data from rain gauges, soil moisture sensors, and extensometers to monitor environmental triggers.
- ❖ **Community Science:** Local volunteers contribute by sending photos of water levels and ground cracks via mobile devices, bridging the gap in sparse meteorological networks.

# Pilot Implementation in Nepal

- ❖ The project is a collaborative effort between the National Disaster Risk Reduction and Management Authority (NDRRMA), Tribhuvan University, and the University of Melbourne.
- ❖ **Locations:** Currently being tested in high-risk zones, including **Kimtang** (Nuwakot district) and **Jyotinagar** (Dhading district).
- ❖ **Warning Lead Time:** Designed to provide alerts weeks in advance, significantly longer than the few hours offered by traditional ground-only systems.

# Pilot Implementation in Nepal

- ❖ **Operational Goal:** While currently in the data-collection phase (requiring 1-2 years of historical data to refine local rainfall thresholds), the system aims for a fully automated alert generation based on graphical threshold monitoring.
- ❖ **Video Link** ([Nepal's Early Warning System for Landslides | Inside South Asia](#))

# Imja Lake:



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- ❖ One of the starkest examples is **Imja Lake in Nepal's Everest region.**
- ❖ Until the 1960s, it was only a relatively small pool of meltwater high in the mountains.
- ❖ But as the glaciers around it began to retreat, its size swelled dramatically, reaching a surface area of 1.28 square kilometres, a depth of nearly 150 metres and a volume of over 75 million cubic metres of water by 2014.
- ❖ Located above mountain villages, this shimmering reservoir had become a looming threat to the communities downstream.

# Imja Lake:

- ❖ To reduce the risk of a catastrophic outburst flood and subsequent flooding in the country's southern plains, Nepal secured US\$7 million from the Global Environment Facility (GEF)'s [Least Developed Country Fund](#).
- ❖ With these resources and the technical support of UNDP, the Department of Hydrology and Meteorology (DHM) mobilized the Nepal Army and high-altitude workers to carve an artificial drainage channel, [successfully lowering the lake's water level](#) by 3.4 metres.
- ❖ **Video Links** ([Dangers in the Himalayas: the Risks of Climate Change](#))

# Imja Lake:

- ❖ Of the 47 glacial lakes in the Hindu Kush Himalaya region considered at imminent risk of bursting, [21 are in Nepal](#), threatening downstream communities with devastating floods.
- ❖ Nepal's success in reducing the threat posed by Imja Lake set an important precedent, paving the way to address other high-risk glacial lakes.
- ❖ In 2025, the Green Climate Fund (GCF) [approved a \\$36.1 million grant](#) to reduce the growing threat of glacial lake outburst floods in the country.
- ❖ This new initiative, led by the DHM in partnership with UNDP, is focused on four potentially dangerous glacial lakes – Thulagi, Hongu 2, Lower Barun and Lumding Tsho.

# AI for Flood-Resilient Farming



# AI for Flood-Resilient Farming

- ❖ Nepal is ranked among the top ten most climate-vulnerable countries globally, and agriculture, the backbone of the rural economy that supports the livelihood of two-thirds of the population, bears the brunt of those impacts.
- ❖ For farmers, the difference between a good year and a devastating one often hangs on the weather they cannot predict.
- ❖ The problem is not the absence of data. The Department of Hydrology and Meteorology already generates forecasts, but this information is scattered across agencies, sits on government websites that most farmers never visit, and is often written in technical language they cannot understand.

# AI for Flood-Resilient Farming

- ❖ Many rural communities have limited internet access, and even when the forecasts reach them, they are too general for Nepal's sharply contrasting micro-climates, where conditions can shift radically from one hillside to the next. So planting becomes guesswork.
- ❖ To break this cycle, Nepal, with support from the [Climate Technology Centre and Network \(CTCN\)](#), technical partners [RMSI](#) and [The Small Earth Nepal](#), introduced a new early warning system in the communities of Rainas, Bhojpur, and Sarlahi: the Customized Weather and Climate Information System.

# AI for Flood-Resilient Farming

- ❖ Using artificial intelligence systems and more than thirty years of local weather data, the system generates 3-day forecasts, 7-day forecasts, and seasonal outlooks, then translates them into practical and accessible advice: when to sow, irrigate, fertilize, control pests, or delay harvest.
- ❖ Farmers choose how they receive the guidance, either through SMS, WhatsApp, or email. Most prefer SMS. Every three days, the messages arrive automatically, and the impact is immediate.

# AI for Flood-Resilient Farming

- ❖ Nepal is utilizing AI to bridge the gap between complex meteorological data and practical farming through SMS-based advisory services.
- ✓ **Localized Advisories:** Farmers in flood-vulnerable regions now receive AI-generated forecasts and crop-specific advice directly on basic mobile phones.
- ✓ **Success Story:** As of late 2025, these systems have stabilized rural communities by preventing "mis-timed" farming decisions that lead to catastrophic debt. Farmers are reporting improved crop productivity and the ability to "outrun the storm" with timely harvest alerts.
- ✓ **Video Link** (<https://youtu.be/NBp8lmUEUSQ>)

# Drones and "Seed Bombing" for Restoration

- ❖ In a first for Nepal, the government and UNDP deployed **AI-controlled drones** to restore degraded forests through "seed bombing".
- ✓ **Implementation:** These drones identified four critical degraded areas and dropped nutrient-encased seeds to accelerate reforestation.
- ✓ **Result:** This initiative has contributed to the restoration of lost forests, directly benefiting over 121,000 people by improving watershed health and reducing landslide risks.
- ✓ **Video Link** ([\(1\) Drone Seeding – YouTube](#))

**THANK YOU!**