

Geo-Safe Monitor PH

The Vision: From Reactive Response to Proactive Prediction

To build the Philippines' first integrated landslide early-warning system that fuses satellite geohazard mapping with a network of ground-based IoT sensors. Our vision is to provide timely, actionable, and barangay-level warnings to protect lives, secure critical infrastructure, and build climate-resilient communities, starting right here in Northern Mindanao.

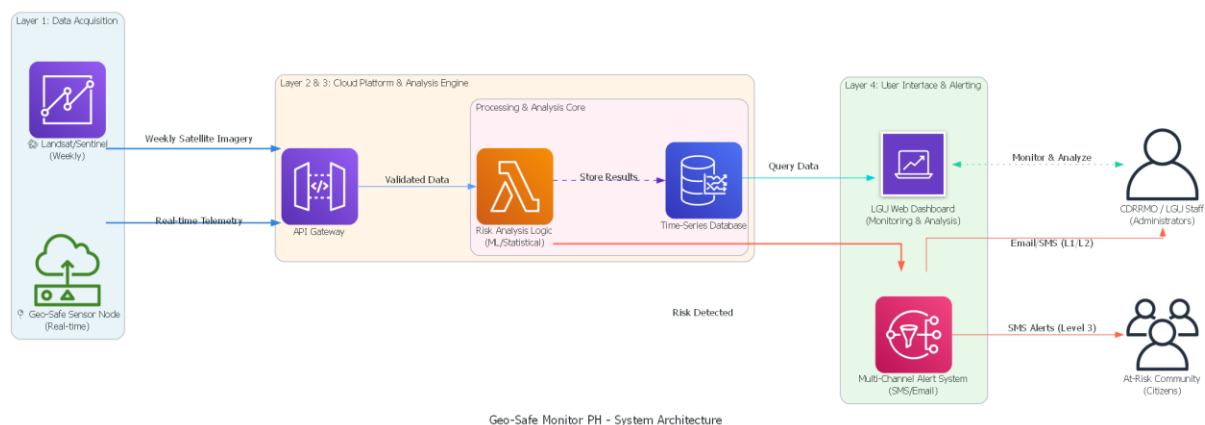
The Problem: A Clear and Present Danger

The Philippines is one of the most landslide-prone countries in the world. Here in Northern Mindanao, the combination of mountainous terrain (like the Kitanglad and Kalatungan mountain ranges), frequent intense rainfall from typhoons, and ongoing land-use changes (deforestation, quarrying, and road construction) creates a constant threat.

A painful local example is Tropical Storm Sendong (Washi) in 2011, which devastated Cagayan de Oro and Iligan. While known for its catastrophic floods, the event also triggered numerous landslides in the surrounding uplands, exacerbating the disaster. Current systems are often limited to regional rainfall advisories, which lack the precision to tell a specific community, "The slope above your homes is becoming unstable. Prepare to evacuate." Geo-Safe Monitor PH fills this critical information gap.

The Solution: A Two-Layered Monitoring System

Our solution is a "funnel" approach. We start wide with satellite data and then focus our resources with precision hardware.



System Architecture

Layer 1: Macro-Scale Risk Mapping (The Satellite Brains 📡)

This layer uses Landsat data (complemented by other free sources like Sentinel) to create a Dynamic Geohazard Risk Map of a province or municipality. This is not a static map; it's a living dashboard that updates regularly.

- **Land-Use Change Analysis:** We use decades of Landsat archives to identify long-term changes. For example, we can pinpoint a specific slope along the Sayre Highway in Bukidnon that has lost 40% of its forest cover in the last 10 years, dramatically increasing its instability.
- **Vegetation Health Monitoring:** Using the Normalized Difference Vegetation Index (NDVI), we can spot areas where vegetation is stressed or dying, which can be a precursor to soil erosion and slope failure.
- **Soil Moisture Estimation:** We analyze Landsat's infrared bands to create regional maps of soil moisture. Before a typhoon, we can identify which slopes are already near saturation and are therefore at highest risk.

The output of this layer is the strategic identification of "hotspot" zones without ever needing to visit the site.

Layer 2: Micro-Scale Threat Detection (The Hardware Nerves 🤖)

Once a hotspot is identified, we deploy our proprietary, low-cost Geo-Safe Sensor Nodes. These are robust, solar-powered devices that form a wireless mesh network on the slope itself.

Each node contains a suite of sensors:

- **Pore Pressure Piezometer:** This is the most critical sensor. It's inserted into the ground to measure water pressure within the soil. A rapid spike in pore pressure is a direct scientific indicator that the soil is losing its internal cohesion and is on the verge of failure.
- **High-Precision Tiltmeter:** Measures minute changes in the slope's angle. It can detect the slow "creep" that often precedes a catastrophic collapse.
- **Automated Rain Gauge:** Provides hyper-local rainfall data. It answers the question, "Exactly how much rain is falling on *this specific slope* right now?"—far more accurate than a regional forecast.
- **Soil Moisture Sensor:** Provides a direct, real-time measurement to complement the satellite's broader estimation.

The Synergy: How a Real-World Alert Would Work

Scenario: A slope above a community in Baungon, Bukidnon.

1. **Strategic ID:** Our satellite analysis identifies the slope as a high-risk zone due to historical deforestation and its steepness. We partner with the LGU to deploy a network of 5 Geo-Safe Sensor Nodes.

2. **Monitoring:** For weeks, the system gathers baseline data. The dashboard shows normal conditions.
3. **The Trigger:** PAGASA issues a Yellow Warning for heavy rainfall associated with an incoming tropical depression. Our system automatically elevates the status of the Baungon slope to "WATCH".
4. **Ground-Truth Confirmation:**
 - The sensor's rain gauge reports rainfall intensity exceeding 15mm per hour.
 - The soil moisture sensors show the ground reaching 95% saturation.
 - Critically, the piezometer detects a sharp increase in pore water pressure, and the tiltmeter records a 0.5-degree shift.
5. **Automated Multi-Level Alert:** The system's algorithm recognizes these combined inputs as a high-probability landslide precursor and triggers a cascade of alerts:
 - **Level 1 (Technical Alert):** An alert is sent to the Geo-Safe monitoring team and the Provincial/Municipal DRRMO with detailed sensor readings.
 - **Level 2 (Warning):** An automated call and SMS is sent to the Barangay Captain and local disaster officials, advising them to prepare community evacuation centers.
 - **Level 3 (Evacuation Alert):** Once a critical threshold is breached, the system sends a mass SMS blast (via the NDRRMC's free SMS alert system) to all residents in the registered danger zone and can trigger a local siren.

Business Model and Target Market

This is a "Safety-as-a-Service" (SaaS) model. We don't just sell the hardware; we sell the entire monitoring and alerting service.

- **Primary Customers:**
 - **LGUs (Provinces/Cities/Municipalities):** Our main market. We offer subscription packages based on the number of hotspot zones monitored. This is a budget item for their Disaster Risk Reduction and Management Fund.
 - **National Agencies (DPWH, DENR):** Project-based contracts to monitor critical infrastructure like major highways, bridges, and government projects.
- **Secondary Customers:**
 - **Private Corporations:** Mining companies, quarry operators, and real estate developers with hillside properties have a legal and financial responsibility to ensure

the stability of their sites. We provide the data for their compliance and risk management.