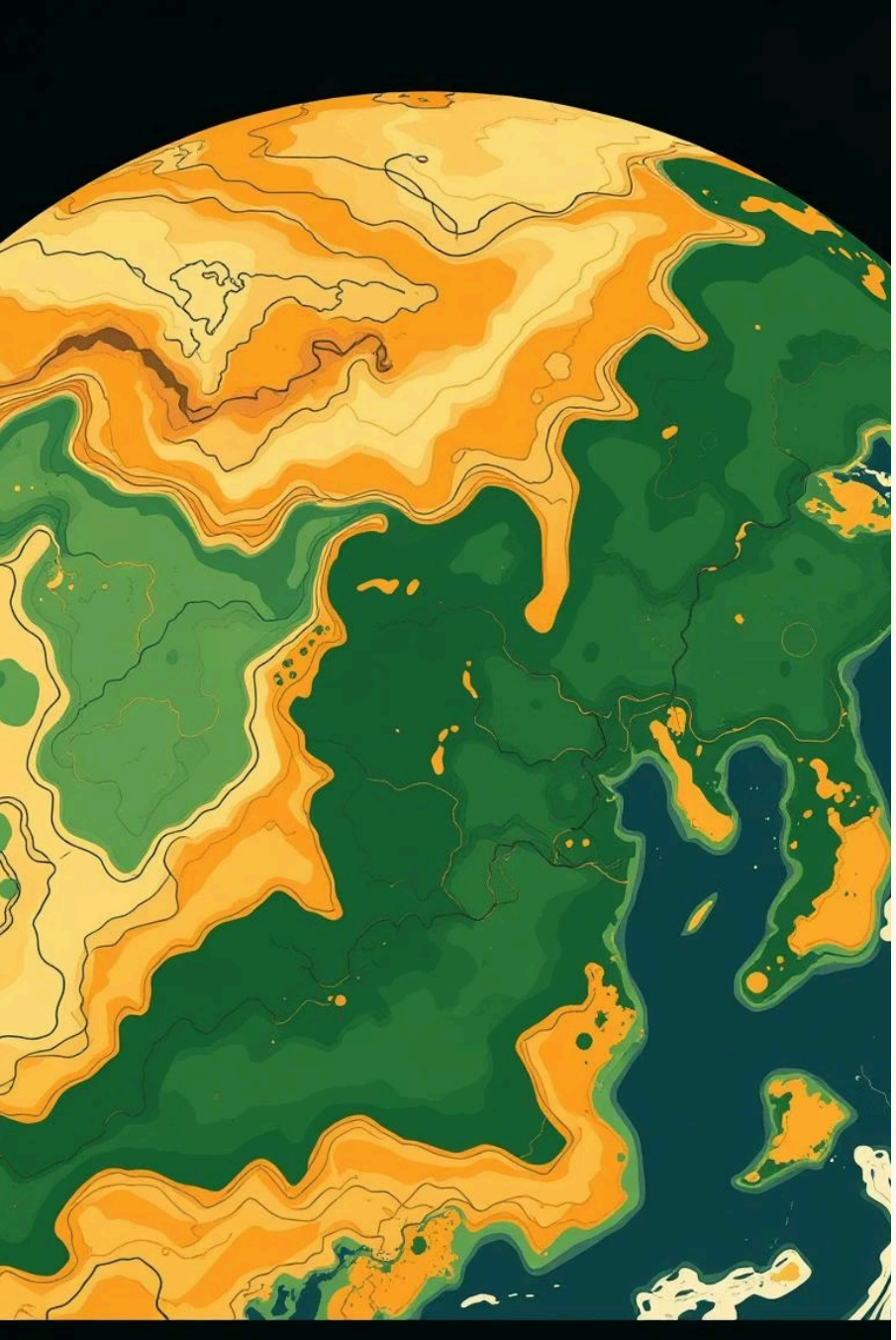


AI for Early Detection of Soil Degradation & Vegetation Loss

TerraGuard: A Scalable AI Solution for Proactive Land Management, Aligned with UN SDG 15: Life on Land.

OVERVIEW

The Silent Crisis of Land Degradation

AI-Powered Platform

Leveraging Machine Learning, GIS, and Remote Sensing.

Proactive Detection

Identifies the earliest signs of soil degradation and vegetation loss.

SDG 15 Alignment

Provides actionable intelligence for sustainable land management.

Land degradation threatens the livelihoods of over **3.2 billion people** worldwide, demanding immediate, proactive intervention.

The Global Challenge: Root Causes & Impacts

Root Causes

- **Deforestation:** Removal of trees exposes soil to erosion.
- **Overgrazing:** Depletion of vegetation cover by livestock.
- **Unsustainable Farming:** Monocropping and improper irrigation.
- **Climate Change:** Increased droughts and floods.

Global Impacts

Food Insecurity

Reduced agricultural productivity.

Loss of Biodiversity

Degraded lands cannot support diverse ecosystems.

Economic Decline

Loss of income for farming communities.

Regional Focus: Ethiopia & East Africa

The Horn of Africa is extremely vulnerable due to erratic rainfall and highland slopes, making solutions like TerraGuard critical.

Vulnerable Topography

Highland slopes are susceptible to water and wind erosion.

Current State

An estimated **50%** of cultivated land in Ethiopia is significantly degraded.

THE DETECTION GAP

Reactive vs. Predictive

Conventional methods are slow, non-scalable, and reactive. By the time damage is visible, it is often severe and costly to reverse.

Conventional Methods

Manual field surveys are time-consuming and impossible to deploy across millions of hectares.

Visible Damage

Degradation is only detected when it is visibly apparent, leading to delayed responses.

TerraGuard Solution

Automated analysis of subtle, early-warning signals in multi-spectral satellite imagery.

Proactive Intervention

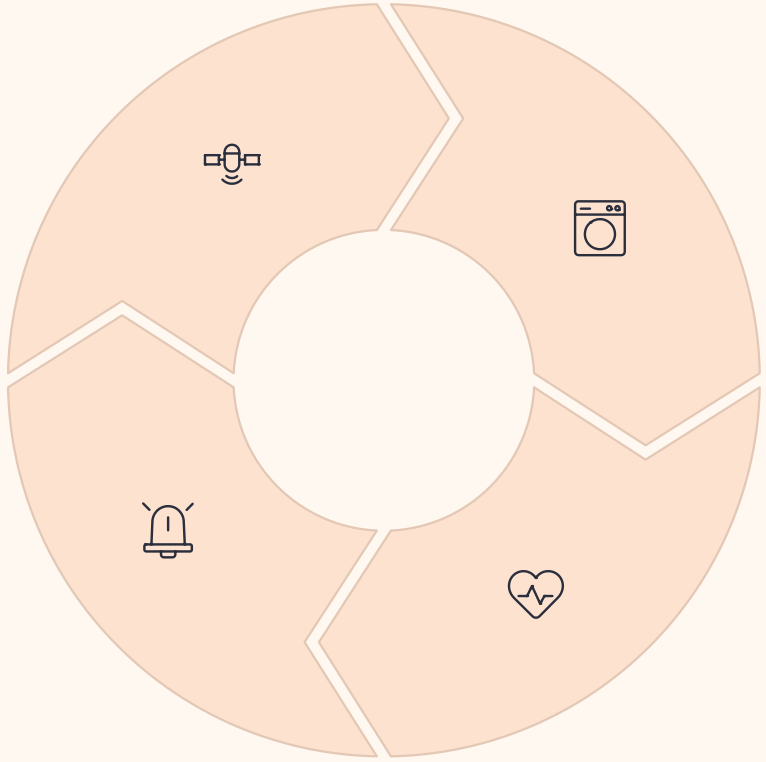
Timely alerts enable land managers to act before damage becomes irreversible.

TerraGuard: Our Automated Early-Warning System

We transform land management from reactive to predictive by computing a composite Land Health Index (LHI).

Data Ingestion

Multi-spectral satellite imagery (Sentinel-2, Landsat) and climate data.



AI Analysis

Proprietary models detect subtle changes in soil and vegetation health.

Actionable Alerts

Timely notifications sent via email or SMS to stakeholders.

LHI Computation

Composite Land Health Index (LHI) is calculated for precise risk assessment.

Key Features & Actionable Insights

Predictive LHI

Comprehensive Land Health Index combining multiple vegetation and soil indices (NDVI, BSI, SAVI, MSAVI).

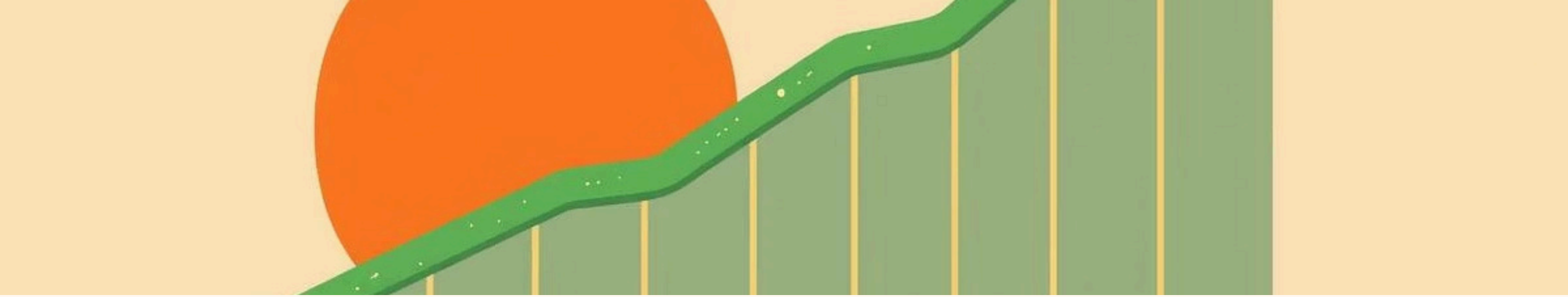
Interactive Dashboard

Intuitive GIS-based interface to visualize land health metrics, risk zones, and historical trends.

Targeted Reforestation

Data guides physical measures like terracing, contour plowing, and identifying optimal tree planting locations.

TerraGuard enables **Precision Conservation**, directing limited resources to the most critical, at-risk areas first.



Measuring Success: Impact Metrics

Our success is measured by tangible contributions to SDG 15 and land degradation neutrality.

70%

Time-to-Detection

Targeted reduction in time to detect degradation processes.

1M+

Hectares Monitored

Targeted land brought under proactive management in Year 1.

High

Economic Savings

Estimated savings for stakeholders by avoiding costly rehabilitation.

> Environmental Impact focuses on Carbon Sequestration, Biodiversity Preservation, and Water Conservation.

Project Roadmap: Scaling Our Impact

Phase 1: MVP Development

Core LHI algorithm, Backend API (FastAPI), React dashboard, and functional prototype.

Phase 2: Pilot & Validation

Enhanced AI models (Sentinel-1 SAR), field validation in 3-5 East African regions, and multi-language support.

Phase 3: Scale & Impact

Automated alert system deployment, mobile application, advanced predictive analytics, and expansion across East Africa.

Phase 4: Global Platform

Worldwide land degradation monitoring, custom models for all major biomes, and policy integration for SDG 15 reporting.

We are actively seeking partnerships with NGOs, government agencies, and research centers for ground-truthing and pilot programs.

Join the Mission: Safeguarding Our Land

Land degradation is a borderless crisis requiring global cooperation and locally-adapted solutions.

Support Needed

- Cloud Computing Credits for data processing.
- Grant Funding for development and regional expansion.
- Pilot Organizations for testing and validation.
- Scientific Advisors in soil science and ecology.

Contact Edris Abdella (Project Lead) at **edrisabdella178@gmail.com**.

> "The land does not belong to us; we belong to the land." - African Proverb