ClimaShield

AI for Predictive Protection and Dignified Adaptation

- **Predict. Protect. Prepare.**
  : Empowering vulnerable communities with foresight and resilience through AI-driven climate intelligence.

- **AI-powered foresight for people & planet**
  : ClimaShield leverages advanced predictive models to anticipate displacement and enable dignified climate adaptation.

The Problem

Climate change is displacing millions

Extreme weather and environmental degradation are forcing over 20 million people each year to flee their homes, often without warning.

Warning systems arrive too late

Current infrastructure fails to alert vulnerable communities in time, leaving families unprepared and exposed to danger.

Protection is unequal

Support is disproportionately distributed — the poorest are hit hardest and recover slowest, widening global inequality.

Rising frequency of disasters

Floods, droughts, and heatwaves are increasing in both intensity and frequency, compounding systemic vulnerabilities.

Our Vision

Migration should be a choice — not a tragedy

We envision a world where families can choose to adapt with dignity, supported by data and early warnings, not fear and last-minute escapes.

ClimaShield empowers timely action

Through predictive alerts and transparent data systems, communities can prepare, protect, and stay connected.

Building equitable adaptation pathways

The platform bridges humanitarian aid with technological foresight, ensuring no one is left behind during crises.

From vulnerability to agency

By returning time to communities, ClimaShield restores agency to the displaced — transforming disruption into resilience.

The Two-Part Solution

Predictive Protection

Advanced AI analyzes multi-source climate, migration, and vulnerability data to forecast displacement zones and deliver tailored insurance models.

Dignified Adaptation

A post-crisis support platform matches families to safe destinations, connects them with work opportunities, and integrates humanitarian assistance.

Real-time intelligence for at-risk zones

ClimaShield uses adaptive dashboards to monitor risk and deploy early alerts to vulnerable populations.

Equitable outcomes at the core

Designed with inclusive ethics, the platform prioritizes the needs of the most affected communities.

How It Works

AI Architecture Overview

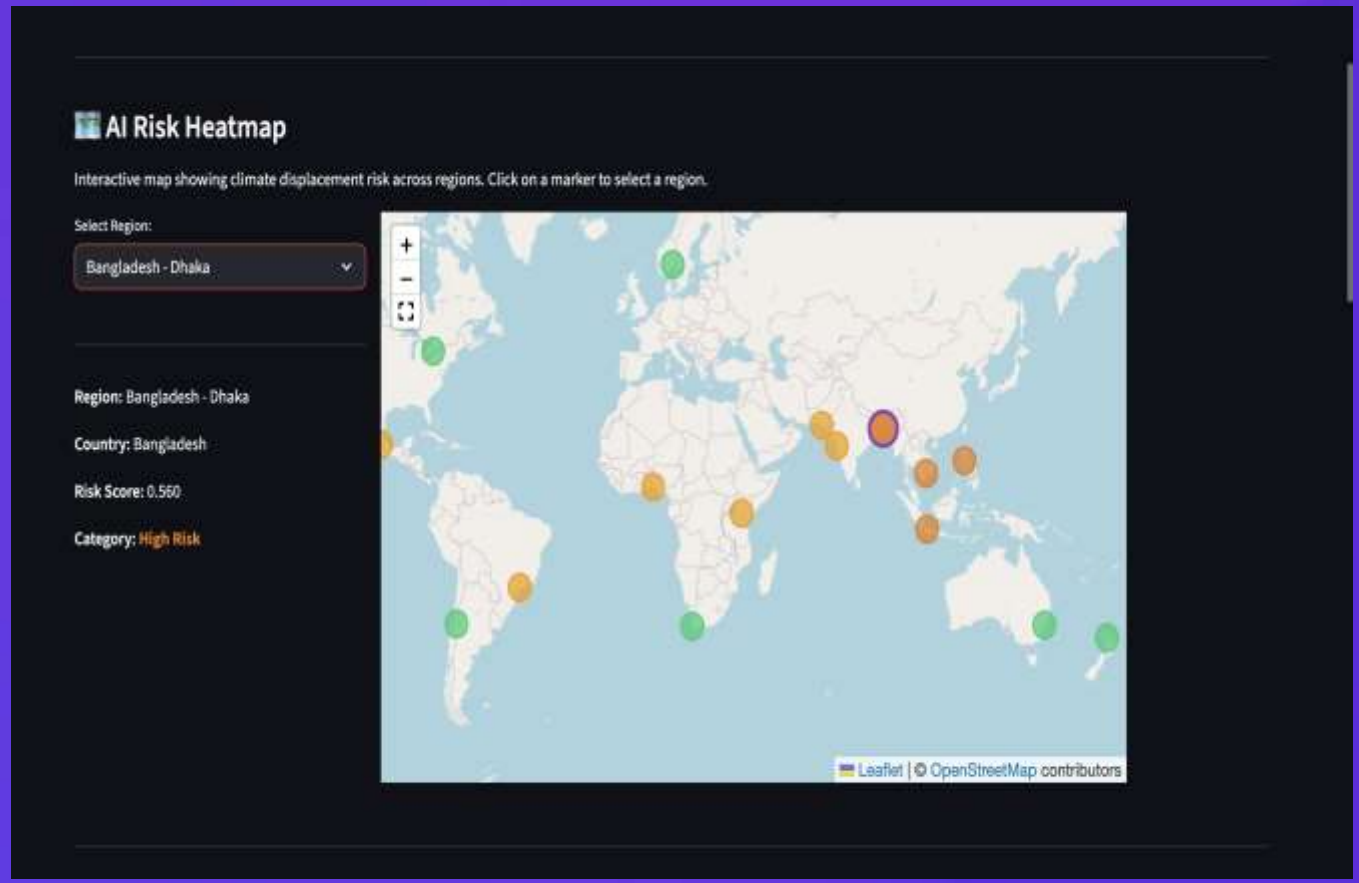
- **Data Sources**: Integrated climate and development data from ASDI, Copernicus, World Bank, and humanitarian inputs ensure contextual intelligence.
- **Risk Scoring Model**: Uses a composite index: $R = 0.4C + 0.3V + 0.3(1 - I)$ to quantify climate, vulnerability, and insurance gaps for targeted protection.
- **Adaptive Premium System**: Premiums follow: $P = P_0(1 + \alpha R)$, dynamically adjusting coverage affordability based on real-time risk.
- **Intelligent Dashboards & Alerts**: Outputs real-time heatmaps, mobile alerts, and AI-driven migration recommendations to policymakers and users.

User Journey

- **Step 1: Early-Warning Alert**: Users receive AI-powered climate alerts via voice or text, tailored by location and device accessibility.
- **Step 2: Risk Forecast & Insurance Options** : Mobile dashboard presents local risk analysis and micro-insurance choices based on user profile.
- **Step 3: Access to Relocation & Jobs**: The platform connects families to verified NGO-led relocation programs, including housing and employment.
- **Step 4: Supported Migration**: Displaced families are guided safely to new homes with logistical and legal support networks.

Demo Preview

- **AI Risk Heatmap**: Interactive global map powered by live climate feeds to show displacement hotspots and risk zones.
- **Insurance Simulation**: Users test micro-insurance scenarios based on real-time risk profiles using accessible UI tools.
- **Migration Support Dashboard**: NGOs and governments coordinate safe relocation options for families, visible via ClimaShield interface.
- **Voice Alerts**: Multilingual, AI-generated voice messages notify users with clear instructions in high-risk scenarios.



Technology Stack

- **AI Modeling**: ClimaShield utilizes scikit-learn with Random Forest models for interpretable climate risk scoring and displacement forecasting.
- **Frontend Interface**: Streamlit and Folium provide an interactive web app experience for both end users and agencies.
- **Explainability with SHAP**: Model transparency is maintained using SHAP values, clarifying AI decision-making for ethical assurance.
- **Voice Integration**: ElevenLabs API delivers natural-sounding, multilingual alerts, crucial for low-literacy or offline communities.
- **Data Backbone**: Primary datasets include ASDI, Copernicus satellite imagery, World Bank climate indices, and NGO field data.

Impact

Social

Empowers communities with early insights and access to adaptation tools, reducing trauma and increasing preparedness.

Economic

Prevents displacement from becoming a poverty trap through dynamic micro-insurance and job connectivity.

Environmental

Uses forecasts to minimize ecosystem disruption, encouraging proactive planning and resource resilience.

Ethical

Builds transparent, explainable AI to ensure climate risk tech supports the most vulnerable without bias.

Challenges & Learnings

Data Ethics & Integration

Bridging sensitive migration and insurance data required ethical frameworks to ensure privacy, transparency, and agency.

Explainable AI

Balancing accuracy and transparency with SHAP values was essential to gain trust from NGOs and local leaders.

Empathy in Design

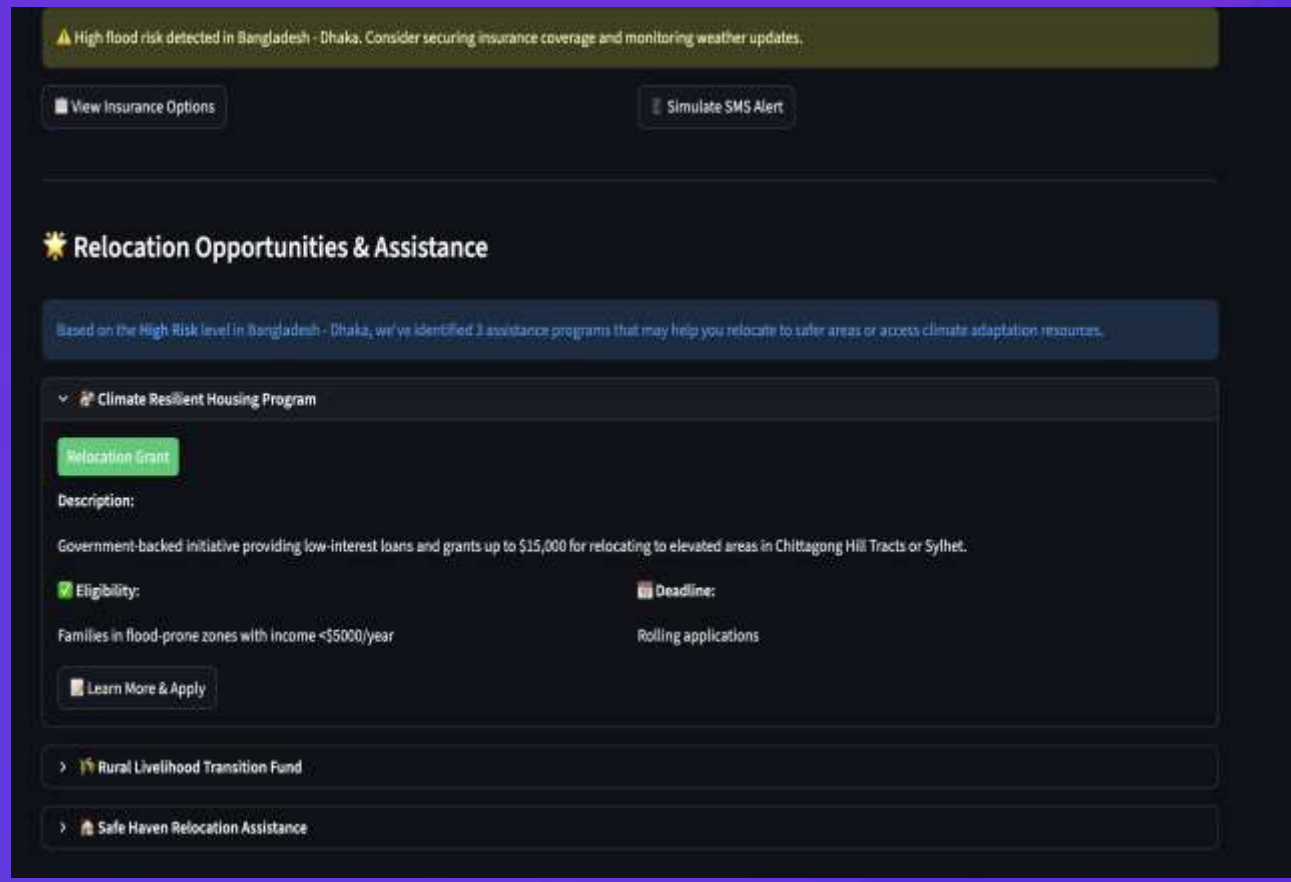
Human-centered UX helped balance technical precision with emotional clarity for users under stress.

Designing for Dignity

We learned that data can protect dignity — if it's built for people first, not just systems.

Future Vision

- **Global Migration Mapping**: Scale AI-driven migration pathways to include climate-vulnerable zones across the Global South and Pacific regions.
- **Insurance via Open Finance**: Integrate with decentralized finance platforms to deliver transparent, low-cost adaptive insurance.
- **NGO & Policy Integration**: Build deeper partnerships across local governments, NGOs, and aid groups to increase resilience delivery.
- **Toward Resilience Ecosystems**: Advance from response to resilience — ClimaShield will help communities not only survive, but thrive.



Closing

- **Predict. Protect. Prepare.**: With ClimaShield, technology becomes a force for empathy — enabling proactive adaptation that honors human dignity.
- **AI for Dignified Climate Adaptation**: We stand at a crossroads: use AI to control nature, or to care for one another. ClimaShield chooses care.
- **Where Technology Meets Empathy**: Every alert, every match, every insight is built to support lives, not just systems. Climate tech should be humane.

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