# IDEA PROPOSAL \_FinalResQNet+ – AI Emergency Response & Satellite-Based Disaster Monitoring

## 1. Project Idea

ResQNet+ is a Liberia-focused emergency management platform that combines rapid citizen and first responder communication with real-time disaster monitoring. The platform builds on the original ResQNet’s emergency response features—including panic button alerts, GPS location sharing, offline first-aid education, voice-activated commands, multilingual support, community help network, medical profile integration, training and certification, and incident data analytics—while adding a new satellite and AI-based disaster detection layer.  
  
Using Google Earth Engine and free datasets from Sentinel-1, Sentinel-2, MODIS, and other sources, ResQNet+ will monitor hazards such as floods, bushfires, coastal erosion, and drought. AI-driven anomaly detection will trigger early warnings for at-risk communities and relevant agencies. The pilot phase will focus on flood detection for Greater Monrovia and bushfire hotspot monitoring in Nimba and Lofa counties.

## 2. Relevance to Sustainable Development Goals (SDGs)

- SDG 3: Good Health & Well-being – Faster emergency care and reduced mortality via rapid alerts and guidance.  
- SDG 9: Industry, Innovation & Infrastructure – Building national resilience through open geospatial technology.  
- SDG 11: Sustainable Cities & Communities – Risk-informed planning in flood-prone areas.  
- SDG 13: Climate Action – Real-time monitoring of climate-related hazards and support for community preparedness.

## 3. Literature Examples

1. Copernicus Emergency Management Service (EMS) Rapid Mapping – Demonstrates the feasibility of fast satellite-based hazard mapping for floods and fires.  
2. Ushahidi Crisis Mapping (Kenya) – Combines citizen reports and geospatial data for effective emergency coordination in low-bandwidth contexts, similar to ResQNet’s community-first approach.

## 4. Describe Your Data

Data sources will include:  
- Sentinel-1 SAR (GeoTIFF): Flood mapping under cloudy conditions.  
- Sentinel-2 optical (GeoTIFF): NDWI/NDVI for water and vegetation health.  
- MODIS/VIIRS active fire points (CSV/GeoJSON): Thermal detection of bushfires.  
- Ancillary: WorldPop/LISGIS population data, OSM road/health facility data, CHIRPS rainfall data.  
- Crowd-sourced: In-app incident reports (JSON/CSV) and SMS/USSD submissions.  
  
Preprocessing will include radiometric calibration, speckle filtering (Sentinel-1), cloud/shadow masking (Sentinel-2), index calculations (NDWI/NDVI), mosaicking, resampling, and alignment. Ground truth data will be collected through partnerships with NDMA, LISGIS, and the Red Cross.

## 5. Approach (Machine Learning or Deep Learning)

The project will adopt a hybrid approach:  
- Deep Learning (e.g., U-Net, DeepLab) for pixel-wise segmentation of satellite imagery to map floods and fire-affected areas.  
- Machine Learning (e.g., Gradient Boosting, Isolation Forest) for anomaly detection in environmental time-series data.  
- On-device: Rule-based offline features for first-aid and alerts, with ML inference running on the server to save device resources.  
  
Pilot Implementation:  
- Set up Google Earth Engine processing pipeline for flood detection.  
- Integrate hazard alerts into the existing ResQNet mobile app.  
- Partner with local agencies for field validation.  
- Deploy in Greater Monrovia and selected rural pilot sites within 3–4 months.