

# **1M1B INTERNSHIP PROJECT**

## **AI-Based Flood Susceptibility Prediction & Early Warning Assistant**

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### **SDG Alignment**

**Primary SDG: SDG 13 – Climate Action**

**Secondary SDGs: SDG 11 – Sustainable Cities and Communities, SDG 6 – Clean Water and Sanitation**

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### **Problem Statement Background**

Floods are among the most frequent and destructive disasters, causing loss of life, damage to property, and disruption of essential services. Climate change, extreme rainfall, rapid urbanization, and poor drainage systems have increased flood risk in many regions. Current flood risk assessment methods often depend on manual GIS analysis and delayed reporting, making it difficult for authorities to identify high-risk zones early and plan preventive actions. With the availability of satellite imagery, rainfall records, and terrain data, an AI-based solution can help detect flood-prone areas faster and support timely decision-making for disaster preparedness and sustainable development.

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### **Problem Statement**

**How might we use AI to predict flood-prone regions using multi-source environmental data so that communities can become safer, more resilient, and sustainable?**

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### **Target Users**

- Disaster management and emergency response teams
- Municipal corporations and smart city planning authorities
- Residents in flood-prone regions
- NGOs working on disaster preparedness and relief
- Researchers and students in climate/environmental studies

## AI Solution Overview

This project proposes an **AI-driven flood susceptibility prediction system** that analyzes multiple datasets such as rainfall, elevation, slope, land cover, and proximity to water bodies. The system predicts risk zones and generates flood susceptibility maps to support early warning and planning.

### AI Elements Used

- **Machine Learning (ML):** Predicts flood risk levels (Low/Medium/High) using geospatial and weather features.
  - **Agentic AI Workflow:** Automates the pipeline from data input → prediction → map generation → reporting.
  - **Retrieval-Augmented Generation (RAG):** Retrieves disaster SOPs and government safety guidelines to provide context-aware recommendations.
  - **Prompt Engineering / IBM Granite (Optional):** Produces clear and explainable summaries for users.
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## Workflow / Prototype

### 1. Input Data

- Rainfall history / forecast
- DEM (elevation and slope)
- Drainage/river network
- Land use/land cover information

### 2. Processing

- Feature extraction (runoff potential, slope, water proximity)
- ML-based flood susceptibility prediction

### 3. Outputs

- Flood risk map (Low/Medium/High)
  - Risk ranking of regions
  - AI-generated explanation and action plan
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## Expected Impact

- Faster identification of flood-prone zones
  - Improved disaster preparedness and mitigation planning
  - Better allocation of emergency resources
  - Reduced loss of life and infrastructure damage
  - Increased climate resilience for sustainable communities
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## Responsible AI Considerations

- **Fairness:** Use diverse datasets to avoid region-specific bias.
  - **Transparency:** Provide explainable reasons behind risk predictions.
  - **Ethics:** Avoid panic messaging; provide verified guidance only.
  - **Privacy:** Use only public environmental and satellite datasets.
  - **Reliability:** Mention limitations and confidence of predictions.
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## Conclusion

This project demonstrates how AI can support climate resilience by predicting flood susceptibility and generating actionable insights. By automating risk mapping and providing explainable outputs, the solution helps authorities and communities take timely preventive measures, improving safety and sustainability aligned with SDG goals.