DEVELOPMENT OF A WEB APPLICATION THROUGH A MOBILIZED CROWDSOURCING PLATFORM TO ENABLE PARTICIPATORY RISK SENSITIVE URBAN DEVELOPMENT

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

11/03/2025

Signature: Date:

The above candidate has carried out research for the Master's thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: 22/03/2025

Dr. Chathura De Silva

Dr. Nayomi Kankanamge

22/03/2025

Signature of the Supervisors: Date:

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ABSTRACT

Flooding remains the most frequent and destructive natural disaster in Sri Lanka, exacerbated by rapid urbanization and evolving precipitation patterns, leading to extensive socio-economic damage. Despite the availability of technological tools for disaster management, community engagement in early warning systems and risk mitigation remains minimal. This study addresses this gap by developing an integrated platform comprising a crowdsourcing-based mobile application and a web-based geospatial decision support system, aimed at fostering participatory risk-sensitive urban development. The mobile application enables real-time flood data collection from affected communities, while the web platform visualizes and validates this data, providing actionable insights for disaster response authorities. A flood vulnerability assessment model was developed using 30 years of historical flood data, nine key conditioning factors—including topography, weather patterns, hydrology, land cover, and soil type—and Sentinel-2 satellite imagery to enhance prediction accuracy. The methodological approach integrates machine learning techniques for crowdsourced data verification, participatory workshops for system validation, and mobilization strategies for community engagement. The research makes significant contributions to both theory and practice. Theoretically, it advances the discourse on participatory disaster management by integrating community-based crowdsourcing with remote sensing analytics. The study also refines geospatial modelling techniques for flood vulnerability assessment, incorporating novel indicators such as Night-Time Light (NTL) data to measure human exposure to flooding. In practice, the developed platform enhances disaster preparedness by providing a scalable, cost-effective solution for real-time flood risk assessment. The findings demonstrate that combining crowdsourced data with remote sensing can bridge critical information gaps in disaster management, empowering communities and authorities to respond proactively to flood hazards. The study's framework can be adapted to other flood-prone regions, contributing to global efforts in urban resilience and risk-sensitive development.

Keywords: Community engagement, Crowdsourcing, Flood vulnerability assessment, Remote sensing.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AI	Artificial Intelligence
CBDM	Community-Based Disaster Management
CBS	Community-Based Solutions
DEM	Digital Elevation Model
DRR	Disaster Risk Reduction
GDP	Gross Domestic Product
GEE	Google Earth Engine
GIS	Geographic Information System
IoT	Internet of Things
ML	Machine Learning
NDVI	Normalized Difference Vegetation Index
NTL	Night-Time Light
NUACI	Normalized Urban Area Composite Index
P-RSUD	Participatory Risk Sensitive Urban Development
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RS	Remote Sensing
SAR	Synthetic Aperture Radar
SRTM	Shuttle Radar Topography Mission
TWI	Topographic Wetness Index
UAV	Unmanned Aerial Vehicles

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