IOCUS 2026 Conference

The 1st International Online Conference on Urban Sciences

20–22 May 2026 | Online

MDPI

A Participatory Chatbot for Strengthening Urban Flood and Landslide Resilience: Integrating Community Awareness and Planning Decision Support

Harini Sawandi1, Sachin Mamoru2, Amila Jayasinghe3, Pradeep Kalansooriya4, Jasintha Jayasanka5, Buddhika Amila Kumara6, Choolaka Hewawasam1

1 Department of Civil and Environmental Technology, Faculty of Technology, University of Sri Jayewardenepura, Sri Lanka
2 Faculty of Information Technology, University of Moratuwa, Moratuwa, Sri Lanka
3 Department of Town & Country Planning, University of Moratuwa, Moratuwa, Sri Lanka
4 Department of Computer Science , Faculty of Computing, KDU General Sir John Kotelawala Defence University, Sri Lanka
5 Department of BioSystems Technology, Faculty of Technology, University of Sri Jayewardenepura,, Sri Lanka
6 Department of Materials and Mechanical Technology, Faculty of Technology, University of Sri Jayewardenepura, Sri Lanka
Corresponding author: choolaka@sjp.ac.lk

INTRODUCTION & AIM

Background

Urban communities are increasingly vulnerable to floods and landslides, while existing disaster communication systems remain fragmented, technical, and difficult for non-expert users to interpret.

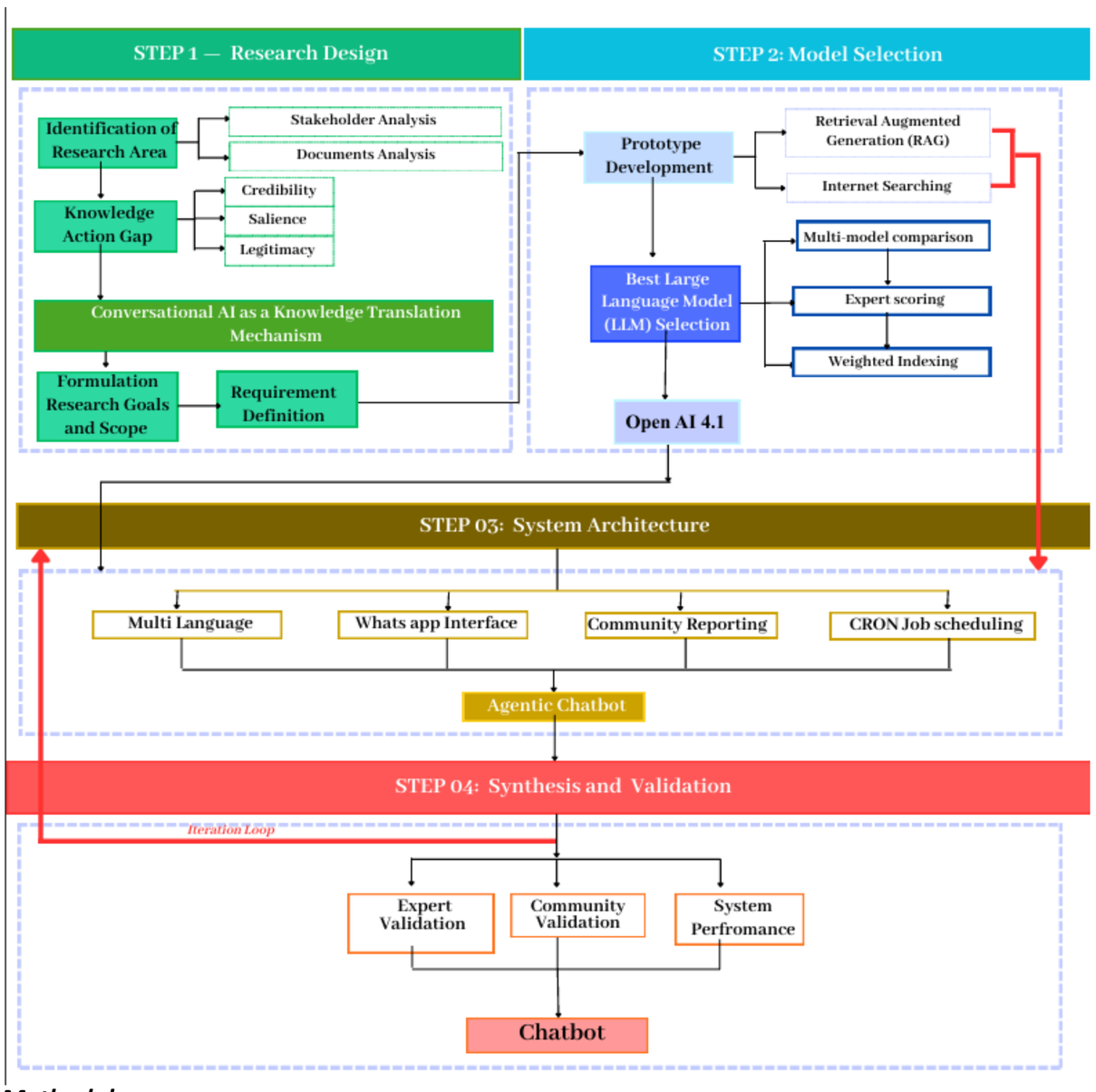
Research Gap

Current disaster chatbots mainly focus on information dissemination and early warning, with limited support for participatory engagement, planning interpretation, and context-aware decision-making.

This study develops a **participatory AI-driven WhatsApp chatbot** integrating retrieval-augmented generation (RAG), community reporting, and planning-based decision support to strengthen urban disaster risk reduction and resilience.

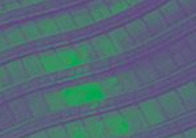
METHOD

- A **User-Centred Design (UCD)** approach was adopted to identify stakeholder requirements and develop a participatory disaster chatbot framework.
- Planning documents, hazard guidelines, and stakeholder insights informed system design and knowledge integration.
- The chatbot was developed using a **Retrieval-Augmented Generation (RAG) with web search, scheduler module** architecture integrated **with GPT-based large language models.**
- A **participatory community reporting** module was incorporated to support contextual risk communication and validation.
- Four LLMs were evaluated using a weighted multi-criteria framework. The final system was validated through expert review and user-based evaluation.



Methodology


WhatsApp Interface


Community Insight Collector

OpenAI LLM

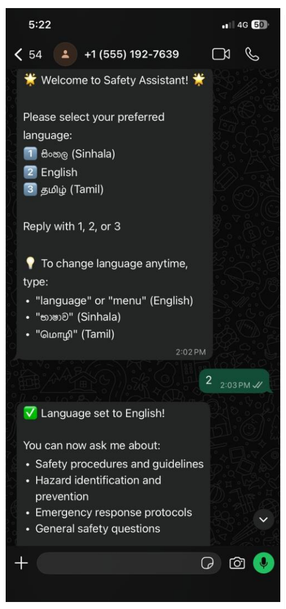

Alert Scheduling

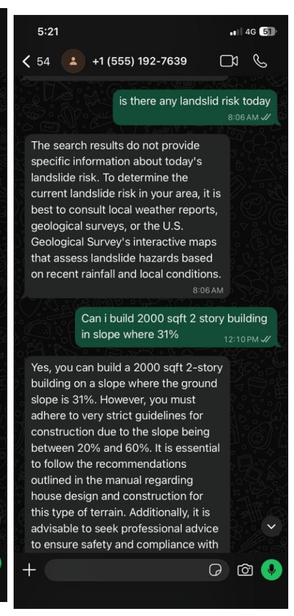
Documents Database

Multilingual

RESULTS & DISCUSSION

SYSTEM DEMONSTRATION

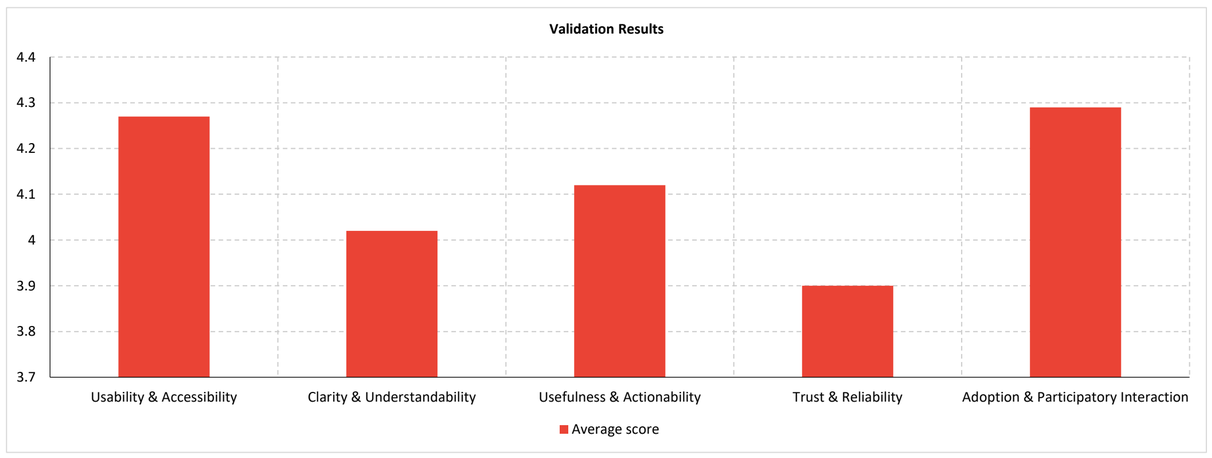




KEY SYSTEM CAPABILITIES

- Moves beyond early warning toward **contextual decision support.**
- **Integrates planning regulations and hazard knowledge** through RAG.
- Enables **participatory community interaction via WhatsApp**
- Supports **multilingual and accessible** disaster communication.
- Strengthens urban resilience through informed community-level decision-making.
- **Transforms complex disaster and planning information** into real-time, guidance for non-experts

EVALUATION RESULTS



CONCLUSION

The study demonstrates a shift from static disaster communication toward contextual and interactive decision support for urban communities.

By improving accessibility to hazard information, and community participation, the system supports informed decision-making and strengthens urban disaster resilience.

Highlights the potential of AI-driven systems to support inclusive and community-centered disaster risk reduction.

FUTURE WORK / REFERENCES

Future work will focus on real-world deployment, integration with live hazard and GIS-based systems, and expansion into multi-hazard disaster contexts.

Urbanelli, A., Frisiello, A., Bruno, L., and Rossi, C. (2024). The ERMES chatbot: A conversational communication tool for improved emergency management and disaster risk reduction. Int. J. Disaster Risk Reduct. 112, 104792. doi: 10.1016/j.ijdrr.2024.104792