IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁙ Peer-reviewed & Refereed journal ⁙ Vol. 14, Issue 11, November 2025

DOI: 10.17148/IJARCCE.2025.141197

Wireless Communication Framework for Natural Disaster Alerts

Mrs. Savitri G Pujar[1], L Prajwal[2], Naveena K R[3], Nikhil Partha[4], Sangamesh Meli[5]

Assistant Professor, Department of ECE, East West Institute of Technology, Bangalore, India[1]

Student, Department of ECE, East West Institute of Technology, Bangalore, India[2]

Student, Department of ECE, East West Institute of Technology, Bangalore, India[3]

Student, Department of ECE, East West Institute of Technology, Bangalore, India[4]

Student, Department of ECE, East West Institute of Technology, Bangalore, India[5]

Abstract: This project focuses on creating a wireless communication system for natural disaster alerts using IoT and GSM technology. The system integrates sensors that monitor ground vibration, water levels, rainfall, and temperature. Data from these sensors is processed by an Arduino controller and transmitted through an Android application for instant alerts. It ensures timely warnings to people in remote areas, enhancing safety during disasters. Powered by solar energy, it functions even during power failures. The system improves communication reliability, enabling quick emergency responses and reducing damage caused by floods, landslides, or earthquakes in disaster-prone regions.

Keywords: GSM technology, Arduino, solar energy, disaster-prone regions, landslides.

I. INTRODUCTION

Natural disasters such as floods, earthquakes, and landslides cause major destruction to life and property. Many remote areas lack reliable communication systems to alert residents on time. This project introduces a wireless alert system that provides instant disaster notifications using GSM and IoT technology. The aim is to create a responsive system that operates even during power cuts and network failures. It collects data through environmental sensors and transmits it wirelessly for real-time monitoring. Such systems can help authorities take early action, ensuring community preparedness and minimizing the risks associated with natural disasters effectively.

II. LITERATURE SURVEY

UP NOAH plays a major role in strengthening disaster resilience in the Philippines by creating detailed multi-hazard and risk maps. These maps covering floods, landslides, storm surges, and other threats provide communities and agencies with crucial information for planning and early preparedness. The system combines scientific data and real-time monitoring to support safer and more informed decision-making during natural disasters.

The NOAH Initiative also uses an online WebGIS platform to display real-time hazard data on interactive maps. Through this system, users can access information such as rainfall intensity, weather forecasts, and flood modelling results directly from a web interface. This improves the speed and accuracy of disaster response, allowing both the public and local government units to view updated conditions and act accordingly.

Wireless Sensor Networks (WSN) are widely used in real-time monitoring applications across many fields. These networks enable continuous data collection for disaster detection, environmental sensing, healthcare monitoring, agriculture automation, and industrial systems. They provide fast, reliable updates on physical conditions, although challenges such as energy consumption and long-term reliability still exist. Overall, WSN technology is essential for systems that require constant and immediate information.

III. METHODOLOGY

The system development process includes five key stages: analysis, design, implementation, testing, and evaluation. In the analysis phase, disaster types and environmental parameters are identified. The design phase involves selecting sensors like water level, vibration, and temperature detectors integrated with Arduino and NodeMCU modules. The implementation connects these components to a GSM network and Android app for real-time communication. Testing involves simulating flood and earthquake conditions to check performance. Finally, evaluation measures accuracy, efficiency, and reliability, ensuring the system functions effectively even under poor signal or power loss conditions.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 11, November 2025

DOI: 10.17148/IJARCCE.2025.141197

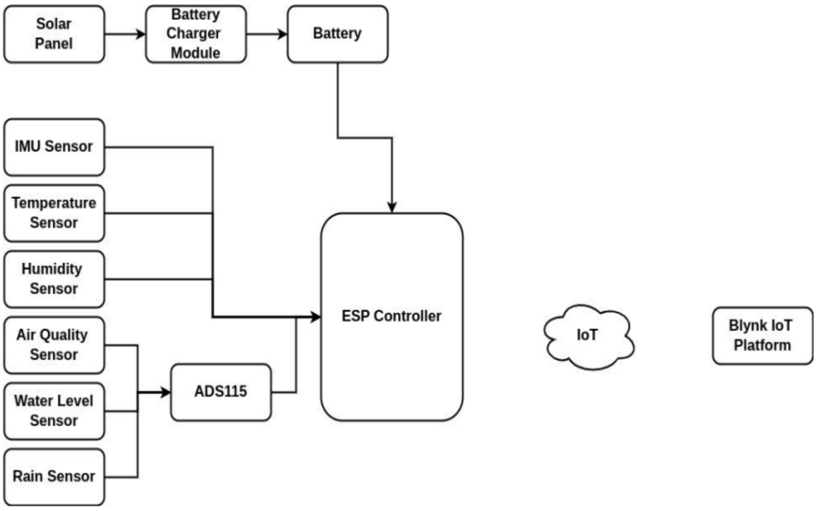

Fig.1: Block Diagram of Proposed System

1**. Sensor Integration:** • Connect DHT11, IMU, MQ, Rain, and Water Level sensors to ESP8266 GPIO pins.
2. **Data Acquisition**: • Continuously read values from all sensors using analog and digital inputs.
3. **Threshold Setting**: • Set threshold values for each sensor (e.g., acceleration spike for earthquake detection, water level rise for flood alert).
4. **Wireless Transmission**: • Use the ESP8266 Wi-Fi capabilities to send sensor data to the Blynk cloud server.
5. **Cloud Monitoring**: • Display real-time data on the Blynk app dashboard. • Trigger alerts when sensor values exceed thresholds.
6. **Power Supply System**: • Use a solar panel to charge a Li-Ion battery via a charging module (e.g., TP4056).
• Connect battery output to power the ESP8266 and sensors.

IV. RESULTS

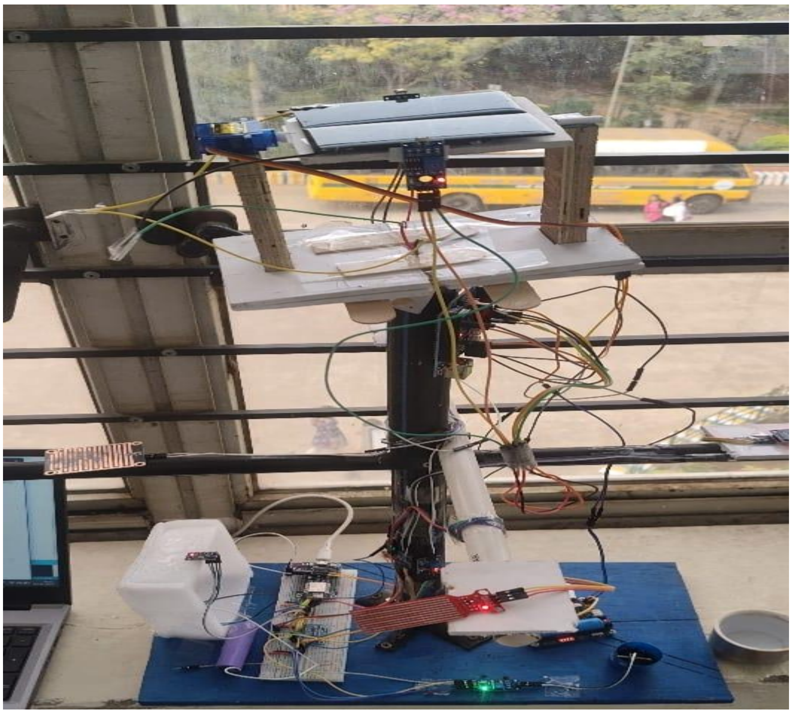

Fig.2: Protype of Proposed System

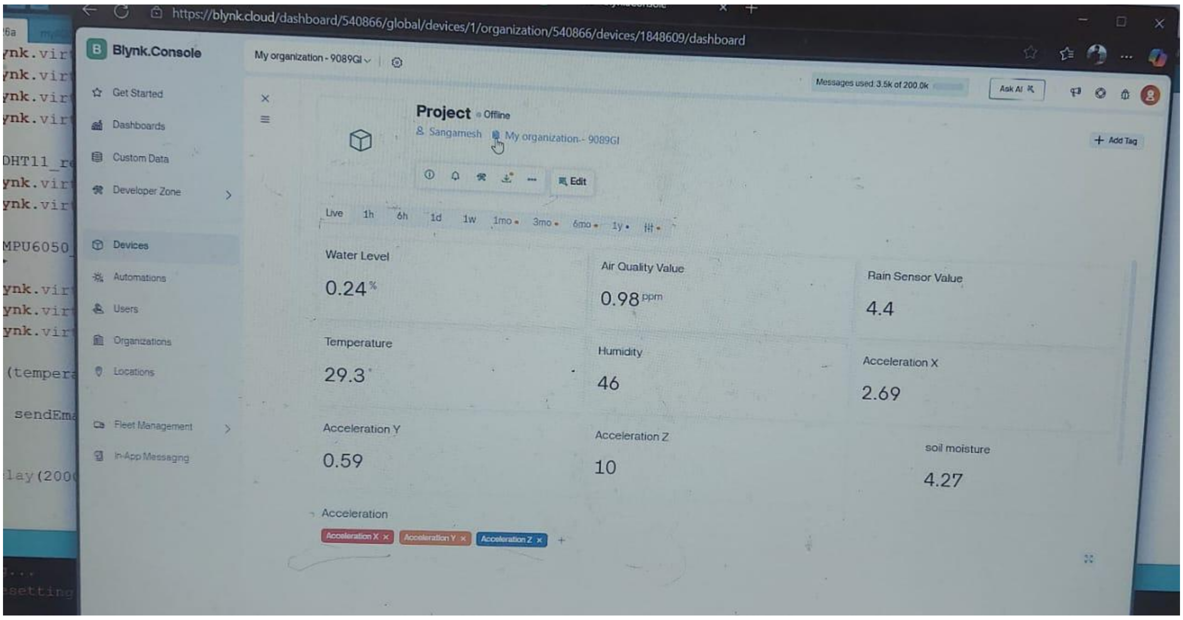

Fig.3: Output of Proposed System

The project is expected to produce an efficient, solar-powered disaster alert system that transmits real-time data to authorities and residents. It can detect floods, earthquakes, and temperature variations, sending alerts through mobile applications instantly. The data is stored in a central server for monitoring and analysis. Even during network interruptions, the system continues data collection and local display.
The outcome demonstrates reliable performance with high accuracy in detecting environmental changes. It provides a cost-effective, scalable solution for rural and urban areas, enhancing disaster preparedness and ensuring timely emergency response.

V. CONCLUSION AND FUTURE SCOPE

This work demonstrates a practical and efficient system for monitoring natural disasters in real time using IoT technology and wireless communication. By combining various environmental sensors with the ESP8266 module and linking the data to the Blynk platform, the setup is able to identify potential hazards at an early stage and provide timely alerts.
The use of solar power further enhances its reliability, allowing the system to operate in remote or disaster-prone locations without the need for external power sources. Overall, the developed model offers a sustainable and adaptable solution that can support effective disaster preparedness and management efforts.

ACKNOWLEDGMENT

The completion of this project has been possible thanks to the support and involvement of many individuals. Achievements of any kind are rarely the result of individual effort alone; they are shaped by the encouragement, guidance, and cooperation of mentors, elders, and colleagues. We are grateful to everyone who contributed to this work in their own meaningful ways.

We express our sincere thanks to the Almighty for granting us the strength and ability to successfully carry out and complete this project.

We are deeply thankful to Dr. K. Channakeshavalu, Principal, EWIT, Bangalore, for his continuous encouragement and support throughout the duration of our work. Our heartfelt appreciation also goes to Dr. Hiremath, Professor and Head of the Department of ECE, EWIT, Bangalore, for providing valuable suggestions and professional insights that enriched our project.

We owe our special gratitude to our guide, Prof. Savitri G. P, Assistant Professor, Department of ECE, EWIT, Bangalore, for her patient guidance, constructive feedback, and constant motivation. Her support played a key role in helping us prepare and organize this project report effectively.

Impact Factor 8.471 ⁙ Peer-reviewed & Refereed journal ⁙ Vol. 14, Issue 11, November 2025

DOI: 10.17148/IJARCCE.2025.141197

We also extend our thanks to the project coordinators—Dr. Anand M (Associate Professor), Mrs. Bhagya (Associate Professor), and Mrs. Hema (Assistant Professor)—for their continued assistance, advice, and encouragement during the course of this work.

Our heartfelt thanks go to our parents and to all the faculty members of the Department of Electronics and Communication Engineering for their steady support and motivation.

Lastly, we appreciate our classmates and friends for their helpful suggestions, cooperation, and moral support, which contributed significantly to the successful completion of this project.

REFERENCES

[1] Global climate in 2015-2019: Climate change accelarates. World Meteorological Organization, September2019[Online]. Available: https://public.wmo.int/en/media/press-release/global-climate-2015-2019-climate change-accelerates

[2] Primery on the 18 August 2020 magnitude (Mw) 6.6 Masbate earthquake. Department of Science and Technology-Philippine Institute of Volcanology and Seismology, August 19,2020[Online]. Available: https://www.phivolcs.dost.gov.ph/index.php/news/10460primer-on-the-18-august.

[3] J. P. Elm, R. Stoddard, J. McCurley, S. Sheard, and T. Marshall-Keim "Wireless Emergency Alerts: Trust Model Technical Report," pp. 1351, 2014.

[4] N. R. Cadiz, "UP NOAH in building resilient Philippines; multi-hazard and risk mapping for the future," Procedia Engineering, Vol. 212, pp. 1018-1025, 2018.

[5] J. A. Alconis, R. C. Eco, A. M. F. A. Lagmay, K. Aracan, and L. Seveses. "The NOAH Initiative: Disaster Management Using WebGIS." in AGU Fall Meeting Abstracts, Vol. 2013, pp. NH51B1619. 2013.

[6] Ali, Y. Ming, S. Chakraborty, and S. Iram, "A comprehensive survey on real-time applications of WSN," Future internet, Vol. 9, No. 4, p. 77, 2017.

