

ABSTRACT

Landslides rank second in terms of the highest frequency of occurrence in Indonesia, with 3,705 incidents recorded between 2020 and 2024. The village of Aribaya, Pagentan sub-district, Banjarnegara regency, experienced 10 landslides in 2024, but the community faced financial constraints in purchasing early warning detection devices available on the market. The system developed uses soil moisture sensors, rainfall sensors, and potentiometer sensors as inputs, with outputs including real-time monitoring data via a website and early warnings to the community via buzzers. Dusun IV in Aribaya Village has the highest risk of landslides, so a monitoring system for parameters that could potentially cause landslides is needed. High rainfall in this highland area is the main factor causing slope failure, where rainwater seeping into the slope reduces friction and cohesion between soil particles. The research uses a prototype method with the implementation of Low Power Wide Area Network (LPWAN) through Long Range (LoRa) technology. The system integrates Arduino Uno as the sensor controller, LoRa Shield for long-distance data transmission, NodeMCU ESP8266 for internet connection, and the Thingspeak platform for cloud data storage displayed through a monitoring website. Sensor testing showed very high sensitivity when conditions changed. LoRa communication successfully reached a distance of >200 meters with 100% PDR but RSSI -90 to -96dBm and SNR 4 to 0 dB. The overall system success rate reached 100% in black box testing. The contribution of this research is the creation of an affordable, real-time IoT-based early warning system for landslides, enhancing public awareness of disaster risks.

Keywords: *Landslide, Internet of Things (IoT), LoRa, Early Warning System (EWS), Disaster Mitigation*