DESIGNING AND DEVELOPING AN EARLY WARNING SYSTEM FOR LANDSLIDES BASED ON ESP32 WROOM

Abdul Fattah
Electrical Engineering Study Program, Faculty of Science and Technology
University of Technology Yogyakarta
Jl. Ringroad Utara Jombor Sleman Yogyakarta
E-mail: fdoty076@gmail.com

ABSTRACT

Landslides are among the most frequent natural disasters in hilly and mountainous regions, often resulting in significant material damage and loss of life. A major challenge in disaster mitigation is the delay in detecting potential landslides, especially in areas with limited internet access and electrical infrastructure. This study aims to design and develop an early warning system for landslides using the ESP32 WROOM microcontroller, integrating an MPU-6050 accelerometer sensor and an FC-28 soil moisture sensor. The system employs LoRa communication technology to enable long-distance data transmission without relying on the internet and is powered primarily by solar panels. The device is engineered to measure soil moisture and inclination levels, categorizing risk levels into Normal, Alert Level 1, Alert Level 2, and Alert Level 3. The data is transmitted in real time to a monitoring center via LoRa networks and is simultaneously displayed through WhatsApp notifications and a web interface. Test results demonstrate that the system effectively detects soil condition changes and delivers timely early warnings. The sensors used provide reliable accuracy in identifying early signs of potential landslides, and the system proves capable of autonomous operation in geographically challenging environments.

Keywords: Early warning, landslide, ESP32 WROOM, LoRa

.