

ABSTRACT

Indonesia, with its diverse topography and high rainfall due to its tropical climate, faces a high risk of various natural disasters, including landslides. According to data from the Badan Pusat Statistik Indonesia (BPS), landslides have occurred at an average of 743.6 incidents per year over the past six years (2018–2023). Data from the Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) show that 591 landslide incidents were recorded in 2023, making it one of the most frequent natural disasters. This highlights the urgent need for research-based information as part of mitigation efforts. Various factors, including geological conditions, heavy rainfall, and structural failures trigger landslides. To support research related to landslide disaster mitigation, the development of tools capable of representing real-world conditions and facilitating data collection and analysis is essential.

This study aims to design and develop a control and monitoring system for a landslide simulator. The simulator is designed to control the chamber's inclination and simulate rainfall intensity. Additionally, it will be equipped with features to monitor soil moisture using sensors and visually observe soil conditions through a camera. All control and monitoring functions will be integrated into a website accessible from anywhere via a WiFi connection using the MQTT protocol. The website will also feature a digital twin that digitally and in real-time represents the inclination condition of the landslide simulator, reflecting actual conditions during simulations.

The simulator is expected to serve as an effective research tool, enabling researchers to analyze soil movements, accelerate data acquisition, and support mitigation and preparedness efforts for landslide disasters in Indonesia.

Keyword: Control and monitoring systems, landslide simulators, websites, digital twins, Internet of Things (IoT)