

ABSTRACT

Environmental management through efficient systems encourages the use of technology as a modern solution to support urban sustainability. Limited human resources for monitoring the TPST and goat pen areas make internet based systems a strategic alternative to improve monitoring effectiveness and accuracy. Due to the operational complexity of both areas, this study aims to design a monitoring and controlling system utilizing the Telkom University campus Wi-Fi network.

The system implementation uses an ESP-32 microcontroller as the central unit for IoT-based sensor control. In the TPST maggot area, two sensors are used: DHT11 to detect room temperature and air humidity, and soil moisture to detect maggot media moisture. If low moisture is detected, a water misting system is activated manually or automatically via a relay. In the goat pen, the MQ-4 sensor detects methane gas, which poses health risks. Meanwhile, the incinerator area uses two sensors: MQ-7 to detect toxic carbon monoxide from waste burning and thermocouple type-k to measure ambient temperature.

Analysis results show that the thermocouple type-k sensor achieved an average accuracy of 67.52%–99.68%, and the DHT11 reached 97.76%–100%. However, the soil moisture sensor was only accurate under wet conditions (100%), decreased to 59.8% under humid conditions, and dropped to 3.98% when dry. The MQ-4 sensor recorded an accuracy of 40.16%, while the MQ-7 sensor only performed accurately at the beginning (60%–100%) but completely failed after the 27th test, showing a value of 0.

Keywords: IoT, Monitoring, Sensors, Integrated Waste Management Site, Wi-Fi