ABSTRACT

Air quality monitoring is a crucial aspect in the context of sustainable development and effective environmental management. This research aims to develop and implement an air quality, groundwater and weather monitoring system using LoRa (Long Range) technology. The designed system consists of several main components: sensor devices installed in various locations for collecting environmental data such as temperature, humidity and air quality, LoRa gateway which functions as a center for collecting data from sensor devices using LoRa modules and sending data to the IoT platform via MQTT protocol, as well as an IoT platform that performs real-time data analysis and provides in-depth information about environmental conditions.

System testing was carried out by implementing five sensor nodes in distributed locations to test the performance and reliability of the system in a variety of different environmental conditions. Test results show that the system is able to send sensor data efficiently and analyze data accurately on the IoT platform, thereby supporting appropriate and responsive decision making in air quality management.

This system uses the LILYGO TBEAM LoRa32 SX1276 module to receive data from five sensor nodes, namely node 1, node 2, node 3, node 4 and node 5. Data from the sensor nodes is sent to a database to be stored and displayed on a website. The research results show that the sensor nodes tested ten times can receive data well from the gateway. The data reception process also shows a time comparison between all nodes and gateways, with an average RSSI of -111 dBm and a delay of 15 seconds. Apart from that, the time for sending data from the gateway to the database is only around 1 second when the gateway gets data from the sensor node. Sending data over a distance of 850 meters is the system's best potential.

Keywords: *LoRa, IoT, MQTT, Gateway*