

ABSTRACT

Air pollution in Telkom University Purwokerto is an important issue due to increased mobility, especially motorized vehicles. This research develops an IoT-based air quality monitoring system using LoRaWAN to monitor CO, CO₂, temperature, and humidity in real-time. The system consists of end-device with MQ-7, MQ-135, and DHT11 sensors, LoRa RFM96 module, Chirpstack as network server, and OpenRemote as application server through MQTT protocol. Coverage monitoring was carried out in the DSP, DC, TT, and Rectorate Buildings, but air quality measurements were only carried out in the DSP and Rectorate Buildings. CO levels in the DSP Building ranged from 5-16 ppm and CO₂ 319-478 ppm, reflecting vehicle activity and high mobility. In the Rectorate, CO levels stabilized at 4-6 ppm and CO₂ at 222-241 ppm, indicating better air circulation. In general, the air quality within Telkom University Purwokerto is within the healthy category, however at certain times such as rush hour with high density of motor vehicles in certain areas, the air quality can decrease to slightly unhealthy levels. Temperature and humidity affect the dispersion of pollutants, while rain lowers concentrations through wet deposition. In terms of communication, TT Building had the best signal communication quality (RSSI -73 dBm, SNR 9.3 dB) due to Line of Sight (LOS). The Rectorate experiences Non-Line of Sight (NLOS) conditions due to obstructions from buildings and trees that absorb or reflect signals. The uplink Spreading Factor (SF) is dynamically controlled with ADR, while the downlink is static using SF7. Network performance experiences delay in the range of 1- 7 seconds and packet loss of up to 9%, resulting in an impact on data transmission, which should be observed further.

Key words *Air pollution, LoRaWAN, Monitoring , MQTT, Real-time*