

ABSTRAK

WINDY FEBRY DYANA SINAGA. Rancang Bangun Modul *Monitoring* Cuaca Berbasis LoRa GPS pada *Platform* Drone di Senggarang. Dibimbing oleh DOLI BONARDO dan M. HASBI SIDQI ALAJURI.

Informasi kondisi atmosfer secara vertikal diperlukan untuk mendukung berbagai kegiatan, seperti pemantauan cuaca, mitigasi bencana, dan penelitian lingkungan. Pengukuran menggunakan stasiun cuaca statis umumnya hanya dilakukan di permukaan sehingga belum mampu menggambarkan perubahan parameter atmosfer pada variasi ketinggian. Penelitian ini bertujuan merancang *sistem monitoring* cuaca berbasis drone yang mampu mengukur suhu, kelembapan, dan tekanan udara secara *real-time* pada variasi ketinggian sekitar 0 hingga 50 meter, menganalisis profil vertikal parameter atmosfer di wilayah Senggarang, serta mengevaluasi performa komunikasi LoRa berdasarkan nilai *Received Signal Strength Indicator* (RSSI), *Signal to Noise Ratio* (SNR), dan *packet loss*. Sistem menggunakan sensor BME280 sebagai pengukur parameter cuaca, GPS Neo-M8N sebagai penentu posisi, modul LoRa SX1278 sebagai media komunikasi, serta kartu microSD sebagai penyimpanan data. Pengujian dilakukan di Klenteng Senggarang dan Bundaran Kantor Wali Kota Tanjungpinang pada tanggal 28 dan 29 Juni 2026.

Hasil penelitian menunjukkan bahwa sistem mampu melakukan pengukuran dan pengiriman data secara *real-time*. Profil vertikal suhu dan tekanan udara cenderung menurun seiring bertambahnya ketinggian, sedangkan kelembapan udara meningkat. Suhu tertinggi tercatat sebesar 35,94°C, kelembapan tertinggi sebesar 91,61%, dan tekanan udara tertinggi sebesar 1012,65 hPa. Perbedaan hasil pengukuran dipengaruhi oleh karakteristik lingkungan, waktu pengambilan data, dan kondisi cuaca selama penelitian. Hasil pengujian komunikasi LoRa menunjukkan nilai RSSI berada pada rentang -43,08 dBm hingga -90,96 dBm, nilai SNR 4,15 dB hingga 9,81 dB, serta *packet loss* sebesar 0–8,3%. Berdasarkan standar Tiphon, kualitas komunikasi masih berada pada kategori baik sehingga sistem mampu mendukung proses *monitoring* cuaca berbasis drone secara *real-time*.

Kata kunci: Drone, GPS, LoRa, BME280, *Monitoring* Cuaca,.

ABSTRACT

WINDY FEBRY DIANA SINAGA. Design and Construction of a LoRa GPS-Based Weather *Monitoring* Module on a Drone Platform in Senggarang. Supervised by DOLI BONARDO and M. HASBI SIDQI ALAJURI.

Vertical atmospheric condition information is essential to support various activities, such as weather *monitoring*, disaster mitigation, and environmental research. Measurements using static weather stations are generally conducted only on the surface and therefore cannot accurately depict changes in atmospheric parameters at varying altitudes. This research aims to design a drone-based weather *monitoring* system capable of measuring temperature, humidity, and air pressure in real time at varying altitudes of approximately 0 to 50 meters, analyzing the vertical profile of atmospheric parameters in the Senggarang area, and evaluating LoRa communication performance based on Received Signal Strength Indicator (RSSI), Signal-to-Noise Ratio (SNR), and packet loss. The system uses a BME280 sensor to measure weather parameters, a Neo-M8N GPS for positioning, an SX1278 LoRa module for communication, and a microSD card for data storage. Tests were conducted at the Senggarang Temple and the Tanjungpinang Mayor's Office Roundabout on June 28 and 29, 2026.

The results showed that the system was capable of measuring and transmitting data in real time. The vertical profile of temperature and air pressure tended to decrease with increasing altitude, while humidity increased. The highest temperature recorded was 35.94°C, the highest humidity was 91.61%, and the highest air pressure was 1012.65 hPa. Differences in measurement results were influenced by environmental characteristics, data collection time, and weather conditions during the study. The results of the LoRa communication test showed RSSI values ranging from -43.08 dBm to -90.96 dBm, SNR values of 4.15 dB to 9.81 dB, and packet loss of 0–8.3%. Based on Tiphon standards, communication quality is still in the good category so that the system is able to support real-time drone-based weather *monitoring* processes.

Keywords: Drone, GPS, LoRa, BME280, Weather *Monitoring*.