

ABSTRACT

Global warming due to carbon dioxide (CO₂) emissions accelerates climate change, causing environmental degradation and hydrometeorological disasters. One important mitigation is maintaining land cover, including green open spaces as carbon pools that store almost one-third of the 2,344 gigatons of global organic carbon from terrestrial carbon, living biomass, necromass, and litter. This study develops an Internet of Things (IoT)-based Soil Organic Carbon (SOC) monitoring system in the Telkom University forest, using LoRa and ESP32 with NPK, EC, pH, moisture, soil temperature and ambient temperature sensors for real-time monitoring. Data is sent to the website for validation, prediction, and analysis with correlation of real-time in-situ measurement data with the laboratory. SOC prediction is carried out using a machine learning algorithm, namely Random Forest with the Leave One Out Cross Validation (LOOCV) evaluation method to determine the predicted value of soil organic carbon content.

Keywords: Climate change, Leave One Out Cross Validation (LOOCV), Machine Learning, real-time, Random Forest Regressor, Soil Organic Carbon (SOC).