Project SEAS: Smart Environmental Awareness System via Buoy Monitoring for Marine Sanctuaries

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Project SEAS is a smart buoy monitoring system designed to overcome the issues of monitoring marine sanctuaries, especially in remote locations. This system employs an ESP32 microcontroller and an array of advanced sensors to effectively monitor critical water quality parameters, including wind speed, ambient temperature, humidity, sound levels, pH, turbidity, and water temperature. It transmits real-time data over the LoRaWAN network to a central server for detailed analysis. The data gathered was also displayed on a website and an app, with a notifying system via email. A two-week deployment at Pili Fish Sanctuary tested the system's performance regarding sensor accuracy, operational capability, and data transmission reliability. The sensors provided accurate and reliable data, proving that the system can operate autonomously yet maintain continuous communication with the server. Such robust performance guards the sanctuary from piracy, fishing violations, pollution, and red tide occurrences. Project SEAS greatly increases remote access to critical environmental monitoring information through inexpensive, power-free technology, furthering this ability to support sustainable practice in marine management. Capacities to improve timely, informed decision-making enable stakeholders to embrace better environmental stewardship and clarify needs regarding marine conservation support. This project represents the potential for advancing conservation at a time when it offers one of the best vehicles for countering threats along coastlines.

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