Private Text Messaging Using LoRaWAN : A Resilient Communication Solution For Disaster Risk Reduction And Community Resilience

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Abstract

[Reliable communication is critical to disaster risk reduction (DRR), enabling timely information exchange, emergency coordination, and community response when conventional communication infrastructure becomes unavailable or unreliable. This study developed a private and secure text-messaging system using Long Range Wide Area Network (LoRaWAN) technology as an alternative communication infrastructure independent of commercial mobile service providers. The system integrates LILYGO TTGO T-Beam ESP32 LoRa nodes, Meshtastic firmware, and Android smartphones to enable private messaging, node identification, and location-aware communication through a low-power wireless network. An experimental evaluation was conducted in San Pedro, Laguna, Philippines, using varying distances and node elevations to examine signal strength and message transmission. Results showed that signal strength generally decreased with increasing distance, while higher node elevation improved signal reception. At distances of 121.92 m, 134.11 m, and 140.21 m, measured signal strengths varied according to node elevation, with higher placement generally producing stronger reception. These findings demonstrate the potential of LoRa-based private communication as a low-cost, low-power, and infrastructure-independent option for connectivity-limited communities during disasters and emergencies. From a DRR perspective, the system can support preparedness, response, and communication continuity through an alternative channel for short-message exchange when commercial services are disrupted. Potential applications include barangay emergency coordination, disaster information dissemination, evacuation support, and search-and-rescue operations. The study further encourages transdisciplinary collaboration among computer engineering, information technology, telecommunications, disaster-risk management, local government units, emergency responders, and communities. Future development may incorporate additional nodes, improved antennas, higher node placement, and solar-powered charging to extend coverage and operational sustainability. By integrating low-power wireless technology with DRR strategies and resilient infrastructure, the study contributes to inclusive, adaptable, and sustainable communication solutions that strengthen community resilience and support safer, more disaster-resilient communities.]

Keywords: [LoRaWAN]; [Emergency Communication]; [Private Messaging]; [Disaster Resilience]; [Sustainable Communication]

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Formatting guidelines:

Paper size	: A4
Font	: Times New Roman
Author/s	: 11 pt, centered
Length	: 250–300 words
File format	: Microsoft Word (.docx) or PDF (.pdf)

Margins	: 1 inch on all sides
Title	: 14 pt, bold, centered
Abstract text	: 11 pt, single-spaced, justified
Keywords	: 3–5 keywords