

From Sensors to Safety: A Multisectoral Earthquake Early Warning Framework for ASEAN

Jack Febrian Rusdi¹, Rina Indrayani¹, Ai Nurhayati¹, Muhamad Sabar¹, Hanafi² and Teguh Rahayu³

¹Universitas Teknologi Bandung, Bandung, Indonesia.

²Universitas Amikom Yogyakarta, Yogyakarta, Indonesia.

³Badan Meteorologi, Klimatologi, dan Geofisika, Bandung, Indonesia.

*Corresponding e-mail: jack@utb-univ.ac.id

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ABSTRACT – The ASEAN region, positioned along the seismically active "Ring of Fire," faces substantial earthquake risks that demand advanced, context-aware early warning systems. Existing systems often exhibit limitations in detection accuracy, processing latency, fragmented data sources, and the absence of integrated decision-making frameworks. This study proposes an innovative multi-layered framework that synergizes Internet of Things (IoT) sensors, Artificial Intelligence (AI) enhanced by ontology-based reasoning, and Geographic Information Systems (GIS) for real-time seismic monitoring and disaster risk reduction. The framework facilitates structured data collection via IoT, impact prediction through AI with ontological context, and geospatial visualization and alert dissemination using GIS platforms. A pivotal component is the Asia-Pacific Earthquake Resilience Partnership (APERP), which plays a central coordination role in harmonizing protocols and enabling cross-border collaboration. Expected outcomes include improved early warning performance, expanded coverage, enhanced public information access, and minimized earthquake impact—contributing to strengthened regional resilience and alignment with Sustainable Development Goals (SDG) 11 and 17.