

ABSTRACT

Geophysical research has been conducted to determine soil vulnerability in the Gunungpati area of Semarang by passively recording microtremor signals that propagate on the Earth's surface. Based on HVSR analysis, the natural frequency range (f_0) in the study area is found to be between 4.89 - 12.72 Hz. High f_0 values (>8 Hz) dominate the study area, which is evenly distributed across three sub-districts: Kandri, Pongangan, and Sadeng. Based on soil classification, this area consists of tertiary or older rocks with very thin sediment thickness (less than 5 meters). The amplification values in the study area range from 1.13 - 6.18, with high amplification (>6) located around the Sadeng area, indicating that this region is composed of soft rocks. The study area has a seismic vulnerability index (K_g) range of 0.13 - 7.81. High K_g values (>6) are found in the Sadeng area, indicating vulnerability to ground movement and potential structural damage. The study area has a PGA range of 7.79 - 12.74 gal. The obtained PGA values fall within the earthquake intensity scale (MMI) V - VI, with a moderate risk level of III to a high level of I. The GSS values at the research site are dominated by strain and minor shifts during an earthquake, as they are in the range of $0 - 9 \times 10^{-6}$. The largest GSS value is located at the measurement point in the Sadeng area. The Sadeng area has a high GSS value category with a range of $(1.1 - 6) \times 10^{-5}$, indicating the potential for building cracks during an earthquake of significant intensity. Therefore, it is more appropriate for this area to be optimized as a green zone rather than for infrastructure development.

Keywords: Microtremor, HVSR, Soil vulnerability, Mitigation