

ABSTRAK

Pulau Jawa sering terdampak bencana gempa bumi signifikan, karena dinamika tektoniknya yang kompleks. Penelitian ini bertujuan menganalisis aktivitas seismik Pulau Jawa 2010-2024 menggunakan metode Gutenberg-Richter estimasi maximum *likelihood*. Parameter utama yang dianalisis adalah *a-value* dan *b-value* sebagai parameter tingkat aktivitas gempa dan kerapuhan batuan wilayah penelitian. Data parameter kegempaan bersumber *database* BMKG yang diolah memakai *software* ZMAP v6.0, dan QGIS 2.28.2. Metode penelitian meliputi pengumpulan data, pengecekan duplikasi-redunansi, validasi data, *declustering data*, pemetaan seismisitas, serta perhitungan parameter seismotektonik. Analisis dilakukan secara spasial dan temporal berdasarkan segmen zona tektonik, dan sumber tektonik. Analisis perhitungan dilakukan pada segmen megathrust, benioff, Sesar Bawean, Opak dan Cimandiri. Hasil penelitian menunjukkan nilai *b-value* 0.404-0.753 dan nilai *a-value* 3.75-5.69 sebagai parameter tingkat aktivitas seismik dan kerapuhan batuan tiap zona. Wilayah Pulau Jawa bagian timur perlu diwaspadai karena memiliki *a-value* tinggi dan *b-value* rendah. Zona Megathrust bagian timur Jawa paling dominan dengan *b-value* (0.776) dan *a-value* (5.69). Zona Benioff bagian timur Jawa dengan *b-value* (0.433) dan *a-value* (4.03). Sedangkan Sesar Bawean di Utara Jawa Timur merupakan sesar lokal paling dominan selama periode penelitian dengan *b-value* (0.516) dan *a-value* (3.55). Penelitian ini diharapkan mampu memberikan informasi aktivitas seismik guna mitigasi bencana di Pulau Jawa.

Kata Kunci: aktivitas seismik, *a-value*, *b-value*, Gutenberg-Richter, mitigasi bencana

ABSTRACT

Java Island is often affected by significant earthquakes, due to its complex tectonic dynamics. This study aims to analyze the seismic activity of Java Island in 2010-2024 using the Gutenberg-Richter maximum likelihood estimation method. The main parameters analyzed are a-value and b-value as parameters of the level of earthquake activity and fragility of the study area. Seismicity parameter data is sourced from the BMKG database which is processed using ZMAP v6.0 software, and QGIS 2.28.2. The research methods include data collection, duplication-redundancy checking, data validation, data declustering, seismicity mapping, and calculation of seismotectonic parameters. The analysis is carried out spatially and temporally based on tectonic zone segments, and tectonic sources. The calculation analysis is carried out on the megathrust, Benioff, Bawean, Opak and Cimandiri Fault segments. The results of the study showed a b-value of 0.404-0.753 and an a-value of 3.75-5.69 as parameters of the level of seismic activity and rock fragility in each zone. The eastern part of Java Island needs to be watched out for because it has a high a-value and a low b-value. The Megathrust Zone in eastern Java is the most dominant with a b-value (0.776) and a-value (5.69). The Benioff Zone in eastern Java with a b-value (0.433) and a-value (4.03). Meanwhile, the Bawean Fault in North East Java is the most dominant local fault during the study period with a b-value (0.516) and a-value (3.55). This study is expected to provide seismicity information for disaster mitigation in Java Island.

Keywords: seismic activity, a-value, b-value, Gutenberg-Richter, disaster mitigation