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**Integrasi Kerentanan Multi-Bahaya Gempa dan Tsunami pada Bangunan Sekolah Dasar di Kecamatan Banggae
Kabupaten Majene**
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INTISARI

Penelitian berjudul **"Integrasi Kerentanan Multi-Bahaya Gempa dan Tsunami pada Bangunan Sekolah Dasar di Kecamatan Banggae Kabupaten Majene"** dilatarbelakangi oleh tingginya ancaman gempa bumi dan tsunami di wilayah pesisir Majene serta pentingnya bangunan sekolah sebagai infrastruktur publik yang melindungi kelompok usia rentan. Penelitian ini bertujuan menganalisis kerentanan bangunan sekolah dasar terhadap gempa bumi dan tsunami, mengintegrasikan kedua indeks kerentanan tersebut, serta menyusun prioritas mitigasi berdasarkan distribusi spasialnya. Penelitian dilakukan pada 31 bangunan sekolah dasar negeri di Kecamatan Banggae. Kerentanan gempa dianalisis menggunakan metode *Rapid Visual Screening* FEMA P-154 dengan mempertimbangkan tipe struktur, jumlah lantai, ketidakberaturan bangunan, tahun konstruksi, kelas situs, bahaya geologi, potensi *pounding*, dan bahaya nonstruktural. Bahaya tsunami dimodelkan menggunakan COMCOT versi 1.7 dengan skenario gempa multi-segmen bermagnitudo Mw 7,4 berdasarkan PUSGEN 2024. Kerentanan tsunami dihitung melalui metode *Building Tsunami Vulnerability* dengan mempertimbangkan kondisi bangunan, ketinggian genangan, dan keberadaan perlindungan pantai. Selanjutnya, indeks kerentanan gempa dan tsunami dinormalisasi dan diintegrasikan menggunakan *Euclidean Distance*, kemudian dipetakan secara spasial. Hasil penelitian menunjukkan bahwa 30 dari 31 bangunan memiliki skor FEMA P-154 antara 0,3–1,1 dan termasuk kategori rentan, sedangkan SD Negeri 54 Inpres Rangas memperoleh skor 2,3. Pemodelan tsunami menghasilkan luas genangan 17,25 ha atau 0,69% dari luas Kecamatan Banggae, dengan dominasi kedalaman kurang dari 2 m. Hanya SD Negeri 52 Palipi yang berada dalam zona genangan dan memperoleh nilai BTV sebesar 66,67%, sehingga termasuk kategori D4 atau kerusakan tinggi. Hasil integrasi menempatkan SD Negeri 52 Palipi sebagai prioritas mitigasi tertinggi dengan indeks 0,85, sedangkan SD Negeri 54 Inpres Rangas berada pada prioritas terendah. Temuan ini menunjukkan bahwa integrasi kerentanan gempa dan tsunami dapat memberikan dasar yang lebih utuh dalam penentuan prioritas mitigasi bangunan sekolah.

Kata kunci: *FEMA P-154; COMCOT; Building Tsunami Vulnerability; jarak Euclidean; mitigasi infrastruktur pendidikan.*

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ABSTRACT

The study entitled ***"Integration of Earthquake and Tsunami Multi-Hazard Vulnerability in Elementary School Buildings in Banggae District, Majene Regency"*** *was motivated by the high exposure of Majene's coastal area to earthquakes and tsunamis, as well as the strategic role of school buildings as public infrastructure accommodating vulnerable age groups. This study aimed to assess the vulnerability of elementary school buildings to earthquakes and tsunamis, integrate the two vulnerability indices, and establish mitigation priorities based on their spatial distribution. The study examined 31 public elementary school buildings in Banggae District. Earthquake vulnerability was assessed using the FEMA P-154 Rapid Visual Screening method by considering structural type, number of stories, building irregularities, construction year, site class, geological hazards, potential pounding, and non-structural hazards. Tsunami hazards were modelled using COMCOT version 1.7 under a Mw 7.4 multi-segment earthquake scenario derived from the 2024 PUSGEN model. Tsunami vulnerability was calculated using the Building Tsunami Vulnerability method, which incorporates building condition, inundation depth, and coastal protection. The earthquake and tsunami vulnerability indices were subsequently normalised, integrated using Euclidean Distance, and spatially mapped. The results showed that 30 of the 31 buildings obtained FEMA P-154 scores ranging from 0.3 to 1.1 and were classified as vulnerable, whereas SD Negeri 54 Inpres Rangas obtained a score of 2.3. The tsunami simulation produced an inundated area of 17.25 ha, equivalent to 0.69% of Banggae District, with inundation depths predominantly below 2 m. Only SD Negeri 52 Palipi was located within the inundation zone and recorded a BTV value of 66.67%, placing it in the D4 or high-damage category. The integrated assessment identified SD Negeri 52 Palipi as the highest mitigation priority with an index value of 0.85, while SD Negeri 54 Inpres Rangas had the lowest priority. These findings demonstrate that integrating earthquake and tsunami vulnerability provides a more comprehensive basis for prioritising mitigation measures for school buildings.*

Keywords: *FEMA P-154; COMCOT; Building Tsunami Vulnerability; Euclidean distance; educational infrastructure mitigation*