Prioritisasi Zona Mitigasi Kenaikan Muka Air Laut Berbasis Kerentanan Pesisir di Kota Semarang : Pendekatan Spasial Geographic Information System (GIS) dan Analytical Hierarchy Process
(AHP)
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ABSTRAK

Kenaikan muka air laut (*sea level rise*) dan banjir rob merupakan ancaman nyata bagi wilayah pesisir Kota Semarang dengan topografi rendah. Selama ini, upaya penanganan masih didominasi oleh *grey infrastructure* yang dinilai memerlukan biaya tinggi dan berpotensi menimbulkan dampak lingkungan. Maka, pendekatan adaptasi yang lebih berkelanjutan diperlukan melalui pengembangan infrastruktur hijau.

Penelitian ini bertujuan untuk menganalisis tingkat kerentanan pesisir berdasarkan aspek fisik, sosial, dan ekonomi menggunakan kerangka IPCC (*exposure, sensitivity, adaptive capacity*); sebagai dasar penentuan zona prioritas mitigasi kenaikan muka air laut; memberikan rekomendasi infrastruktur hijau sesuai karakteristik masing-masing zona prioritas. Metode yang digunakan adalah analisis spasial berbasis Sistem Informasi Geografis (SIG) yang diintegrasikan dengan *Analytical Hierarchy Process* untuk pembobotan parameter berdasar pakar berbagai sudut pandang keahlian (Akademisi, Praktisi, dan Regulator).

Hasil penelitian menunjukkan bahwa tingkat kerentanan "Sangat Tinggi" terkonsentrasi di Kelurahan Tanjung Mas dan Bandarharjo yang memiliki karakteristik skor paparan *Population Close to Coastline* dan sensitivitas *Land Elevation* berada dalam rentang 4.00 – 5.00. Keduanya paling kritis pada masing-masing parameter (PCL : *exposure)* dan (LE : *sensitivity*) *dengan* bobot 0.4462 dan bobot 0.6191. Penentuan lima kategori zona prioritas dilakukan dengan mempertimbangkan Indeks Kerentanan Pesisir. Strategi mitigasi per zona dipilih melalui sintesis literatur yang menyesuaikan tipologi wilayah. Strategi yang direkomendasikan adalah pendekatan *Nature-based Solutions hinterlands* untuk Tipologi A (Pusat Urban), pendekatan *coral and shellfish reefs*, *muddy shores, mangrove forests* untuk Tipologi B (Kawasan Terbuka Minim Proteksi), pendekatan *mangrove forests and salt marshes* untuk Tipologi C (Kawasan Terbuka Proteksi Alami). Hasil penelitian ini diharapkan menjadi dasar perencanaan adaptasi berbasis lingkungan berkelanjutan untuk meningkatkan ketahanan wilayah pesisir Kota Semarang.

Kata kunci: Kenaikan muka air laut, Kerentanan, Analisis spasial, Kota Semarang, Zona mitigasi

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ABSTRACT

Sea level rise and tidal flooding represent a real threat to the low-lying coastal areas of Semarang City. Traditionally, mitigation efforts have been dominated by grey infrastructure, which entails high costs and potential negative environmental impacts. Therefore, more sustainable adaptation approach through the development of green infrastructure is necessary.

The study aims to analyse coastal vulnerability index based on physical, social, economic aspects using the IPCC framework (exposure, sensitivity, adaptive capacity); as a basis for determining priority mitigation zones; and to provide green infrastructure recommendations tailored to the characteristics of each priority zone. The methodology employed is spatial analysis based on Geographic Information Systems (GIS), integrated with the Analytical Hierarchy Process (AHP) for parameter weighting based on experts from various perspectives (academics, practitioners, and regulators).

The results indicate that "Very High" vulnerability levels are concentrated in the Tanjung Mas and Bandarharjo sub-districts, characterized by Population Close to Coastline (PCL) exposure scores and Land Elevation (LE) sensitivity scores in the range of 4.00 – 5.00.. These parameters are the most critical, with weights of 0.4462 for PCL (exposure) and 0.6191 for LE (Sensitivity). The determination of five priority zone categories was carried out by considering the Coastal Vulnerability Index (CVI). Mitigation strategies for each zone were selected through a literature synthesis adapted to the regional typology. The recommended strategies include a Nature-based Solutions (NbS) hinterlands approach for Typology A (Urban Center); a coral and shellfish reefs, muddy shores, and mangrove forests approach for Typology B (Open Area with Minimal Protection); and mangrove forests and salt marshes approach for Typology C (Open Area with Natural Protection). The findings of this research are expected to serve as a basis for sustainable environmental-based adaptation planning to enhance the coastal resilience in Semarang City.

Keywords: *Sea level rise, Vulnerability, Spatial analysis, Semarang City, Mitigation zone*