

**DEVELOPMENT OF SEISMIC MICROZONATION MAPS USING
GEOGRAPHIC INFORMATION SYSTEMS (GIS)
FOR BANDA ACEH CITY, INDONESIA**

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ABSTRACT

The location of Banda Aceh which lies about 100km from Sumatra Subduction Zone and very close to the Sumatran Transform Faults which is about 10km makes this place extremely vulnerable to earthquake hazards. Learning from the experience of earthquake and tsunami on 26 January 2004 which caused many deaths, property loss and devastation of the city, therefore, urban planning and development in the future should take into consideration the earthquake hazards. Based on this purpose, seismic microzonation maps which are capable of identifying and mapping different earthquake hazard potentials can be used as an initial phase for earthquake risk mitigation. The purpose of this study is to create seismic microzonation maps using Geographic Information Systems (GIS) and in turn can be used as guidance in urban planning and development. The maps were developed through a series analysis of the parameters that influence the earthquake hazards which includes seismological data, such as Peak Ground Acceleration (PGA), faults, tsunami, and site characteristic data such as geotechnical data (soil type, site class, groundwater distribution and depth), geological data, and geophysical data (contour or slope). The maps produced encompasses the variations of earthquake hazard such as ground shaking hazard map, liquefaction susceptibility hazard map, landslide potential hazard map, surface faulting hazard map and tsunami hazard map. The resulting maps identified three levels of hazards (low, medium and high hazard). Identifying the variation in earthquake hazards makes it possible to select relatively safe zones for future development and some recommendations should be taken into cognizance in carrying out any development in the medium or high hazard zone areas.

Keywords: Earthquake, Seismic, Hazard, Mitigation, Microzonation, and GIS.

ABSTRAK

Lokasi Banda Aceh yang terletak sekitar 100 km dari Sumatera Subduction Zone dan sangat dekat sekitar 10 km dari Sumatera Transform Faults membuat tempat ini berisiko tinggi terhadap bahaya gempa. Berdasarkan dari pengalaman gempa dan tsunami pada tanggal 26 Januari 2004 yang menyebabkan banyak kematian, kehilangan harta dan kemusnahan bandar, perancangan bandar dan pembangunan di masa hadapan harus mempertimbangkan bahaya gempa. Berdasarkan tujuan ini, peta mikrozonasi seismik yang mampu mengenal pasti dan memetakan potensi bahaya gempa bumi yang berbeza boleh digunakan sebagai tahap awal untuk mitigasi risiko gempa bumi. Tujuan dari penyelidikan ini adalah untuk membuat peta mikrozonasi seismik menggunakan Sistem Maklumat Geografi dan pada masa yang sama dapat digunakan sebagai panduan dalam perancangan dan pembangunan bandar. Peta tersebut dikembangkan melalui siri analisis parameter yang mempengaruhi bahaya gempa yang meliputi data seismologi, seperti Peak Ground Acceleration (PGA), faults, tsunami, dan data ciri-ciri laman seperti data geoteknik (jenis tanah, kelas laman, pengedaran dan kedalaman air tanah), data geologi, dan data geofizikal (kontur atau cerun). Peta-peta yang dihasilkan meliputi variasi bahaya gempa seperti peta bahaya getaran tanah, peta bahaya risiko likuifaksi, peta bahaya potensi tanah runtuh, peta bahaya patahan permukaan dan peta bahaya tsunami. Peta-peta yang dihasilkan mengenal pasti tiga peringkat zon bahaya (rendah, menengah dan tinggi). Mengenal pasti variasi dalam bahaya gempa bumi membolehkan untuk memilih zon yang relatif aman untuk pembangunan di masa hadapan dan beberapa cadangan perlu diambil dalam melaksanakan pembangunan di kawasan peringkat zon bahaya menengah atau tinggi.

Kata kunci: Gempa bumi, Gempa, Bahaya, Mitigasi, Mikrozonasi, GIS