

## INTISARI

### ANALISIS POTENSI LIKUIFAKSI DI KOTA YOGYAKARTA BERDASARKAN DATA MIKROTREMOR, KEDALAMAN AIR TANAH, DAN DATA BOR

Oleh:

Ilham

16/403566/PPA/05083

Munculnya fenomena likuifaksi seperti *sand boil*, *fracture*, dan *lateral spreading* di wilayah Kotamadya Yogyakarta menandakan bahwa tanah di daerah ini berpotensi mengalami likuifaksi. Hal ini diperkuat pula dengan ditemukannya tiga faktor utama yang dapat menyebabkan likuifaksi di wilayah ini, seperti litologi tanah yang bersifat lepas (selang-seling pasir, kerikil, lanau dan lempung vulkanik), kedalaman air tanah yang dangkal, dan lokasinya yang berdekatan dengan sumber gempa bumi (berasosiasi dengan sesar Opak). Adanya lapisan sedimen yang sangat tebal dan lunak juga akan memperkuat kekuatan guncangan gempa bumi karena pengaruh amplifikasi. Oleh karena itu, dilakukan analisis potensi likuifaksi di wilayah Kotamadya Yogyakarta berdasarkan data mikrotremor, kedalaman air tanah dan data bor. Ketiga parameter tersebut di *overlay* untuk mendapatkan peta potensi likuifaksi di Kota Yogyakarta yang akurat.

Hasil analisis data mikrotremor menunjukkan bahwa sebaran nilai *ground shear strain* di Kotamadya Yogyakarta berkisar antara  $0,20 \times 10^{-3}$  –  $5,80 \times 10^{-3}$ . Sebaran lokasi kejadian likuifaksi bersesuaian dengan sebaran nilai *ground shear strain* yang tinggi yang berada di bagian selatan daerah penelitian. Hasil korelasi dengan lokasi kejadian likuifaksi menunjukkan bahwa nilai *ground shear strain* minimum yang dapat menyebabkan likuifaksi adalah  $2,51 \times 10^{-3}$ . Hasil *overlay* nilai *ground shear strain* dan kedalaman air tanah menunjukkan bahwa potensi likuifaksi di Kotamadya Yogyakarta berada pada kategori rendah hingga tinggi. Daerah dengan tingkat bahaya likuifaksi tinggi berada di bagian selatan daerah penelitian yang meliputi Kecamatan Mantrijeron, Mergangsan, Umbulharjo, dan Kotagede. Pemetaan potensi likuifaksi berbasis data mikrotremor dan kedalaman air tanah memiliki korelasi yang baik dengan analisis *factor of safety* dari data bor. Lapisan sedimen yang berpotensi mengalami likuifaksi berada pada kedalaman 9,4 – 34,5 m dengan ketebalan berkisar antara 0,6 – 2 m. Lapisan tersebut tersusun atas lempung, lanau, dan campuran lempung-pasir sangat halus.

**Kata kunci:** likuifaksi, *ground shear strain*, kedalaman air tanah, *factor of safety*.

## ABSTRACT

### **ANALYSIS OF LIQUEFACTION POTENTIAL IN YOGYAKARTA CITY BASED ON MICROTREMORS, GROUNDWATER LEVEL, AND BOREHOLES DATA**

By:

Ilham

16/403566/PPA/05083

The appearance of liquefaction phenomena such as a sand boil, fracture, and lateral spreading in Yogyakarta city indicates that the ground in this area is potential to liquefied. This is also reinforced by the discovery of three key factors that could cause liquefaction in the area, such as the soil lithology which is loose (sand, gravel, silt and volcanic clay), the groundwater level which is shallow, and the location which is near from earthquake source (associated with Opak fault). The presence of a very thick and soft sediment layer will increase the earthquake shaking due to the amplification factor. Therefore, an analysis of liquefaction potential in Yogyakarta city was done based on microtremor, groundwater level, and boreholes data. These three parameters were overlaid to get an accurate liquefaction potential map in Yogyakarta city.

The results of microtremor data analysis showed that the distribution of ground shear strain value in Yogyakarta city ranged from  $0.20 \times 10^{-3}$  -  $5.80 \times 10^{-3}$ . The location of liquefaction events corresponds to the distribution of high ground shear strain values located in the southern part of the study area. The correlation with the liquefaction event locations shows that the minimum value of ground shear strain that can cause liquefaction is  $2.51 \times 10^{-3}$ . The result of overlay of ground shear strain and groundwater level maps indicate that the liquefaction potential in Yogyakarta city is in low to high level. The areas with the high liquefaction potential levels are located in the southern part of the study area covering Mantrijeron, Mergangsan, Umbulharjo, and Kotagede Subdistricts. Mapping of liquefaction potential based on microtremor and groundwater level has a good correlation with a factor of safety analysis of boreholes data. The potentially liquefying sediment layers are at a depth of 9.4 - 34.5 m with thicknesses ranging from 0.6 to 2 m. The layer is composed of clay, silt, and silty very fine sand.

Keywords: liquefaction, ground shear strain, groundwater level, factor of safety.