



## **ABSTRACT**

Major geological disasters have a devastating effect. They usually occur only in a short period of time, enabling efforts to mitigate and restore affected areas can be done quickly. LUSI (Sidoarjo mud volcano) is an ongoing disaster, causing continuous and dynamic progressive damage over the past sixteen years. Therefore, it becomes very important to discuss the characterization, the formation mechanism, the high pore pressure in the LUSI area. All those traits can trigger the process of melting rocks, as well as the eruption of mud to the surface continuously. This study focuses on mechanisms, triggering factors, the process of high pore pressure events, and the potential for similar events that can occur in other areas. It also emphasizes the impact of subsequent disasters closely associated with the presence of high pore pressure that leads to reduced soil/rock strength.

This study uses quantitative analysis method based on the results of previous studies and measurement in the form of petrophysical log data, piezometer measurement data, geoelectric, CPTu, GPR, shallow seismic, drilling data, coring, and geotechnical analysis data. Qualitative analysis of geological parameters that took place in LUSI is also used as a basis for consideration. The research method is an empirical analysis based on standard penetration test (SPT) based evaluation, SPT tests from 26 drill points with N-SPT values <15. Using the seismic code with a 10% in 50 years and site characteristics, Sidoarjo City has an earthquake PGA of 0.28 to 0.38g.

Analysis and measurements show pore pressure anomaly up to a depth of 20 m that reaches a value close to 600 kPa, which is close to 3 times the normal pore pressure. Various mechanisms and factors triggering the high pore pressure in LUSI include being caused by disequilibrium compaction, diagenesis in the layers of clay rock deposits. The mechanisms of fluid expansion, pressure transfer, hydrocarbon maturation activity, and the presence of a hydrothermal. The analysis yielded the value of  $FS < 1$ , Liquefaction Potential Index (LPI) from low to very high. Input of high pore water pressure parameters so far has not been done. CPT-u measurement data for pore pressure value input consists of 13 points of measurements. The input of these parameters will provide variations in the differences in the level of potential liquefaction in the study area. The result is changes occur in the decrease in the safety factor value ranging from 0.1 to 0.4 and the change in LPI value from originally low to high, and originally high to very high. The anomaly input of pore pressure in CPT-u measurement results ranges from 40% to 70% higher than normal pore pressure in the sand layer. Analysis of liquefaction potential showed that the results of the high-very high liquefaction potential in the northern and eastern research areas, and the low liquefaction potential was in the southern areas. The potential for liquefaction is largely determined by soil properties, the distribution of loose sand layers, and the depth of the water table in the study area.

**Keywords:** Liquefaction, LUSI, Simplified Procedure, High Pore Pressure, Transfer Pressure.