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# Earthquake Microzonation and $V_{S,30}$ Mapping Based on Microtremor Measurement (Case Study in Kaliwates and Sumbersari Sub-District, Jember Regency)

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**Abstract**

This research was conducted to estimate the value of the wave velocity of the S at 30 meters depth (Vs,30) below the surface and do a microzonation of the spectrum microtremor H/V, related to the area based on the research that's been done. Then, data weve collected is processed with HVSR method. It supposed to get the HVSR curve, natural frequency, and the thickness of the sediment. To obtain the value of the Vs below the surface, the depth of the bedrock, and Vs,30, HVSR curve then is inversed. Moreover, by integrating the data natural frequency, amplification, depth of bedrock, and VS,30. Related to the Eurocode 8 reference and also based on N-SPT. According to the value of Vs 30, the research area can be classified into three types of soil: C, D and S1.


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*Keywords:* Earthquake, Eurocode 8, HVSR, Jember, Kaliwates Microzonation, Mikrotremor, Sumbersari, $V_{S,30}$.

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## 1. Introduction

Java Island is located in the subduction zone plate that has high seismicity. The danger resulted from earthquakes are categorized into three, the effect of the soil vibrations directly, the effect on the soil surface caused by the fault or deformation, and the effects triggered by vibrations such as the tsunami or landslides. Jember in East Java is an area prone to landslides caused rain and seismic activity, although each year reported landslides because heavy rain. Significant seismic activity felt in Jember since 1981 until 2014.

Conditions geological map cantered on the District Kaliwates and Sumbersari, Jember. It appears that the geographical condition of Jember have Argopuro Mountains in the north, Raung Mount in the northeast, while in the south-east there are mountains that stretches from east to west.

Seismic microzonation is the process of dividing a zone into smaller zones by local geological responses to earthquakes. This response, depending on the structure of the subsurface. Seismic microzonation is the process of dividing a zone into smaller zones based on the response the local geology to earthquakes. The characteristics and value of this response is determined by the condition of the soil and rocks in the subsurface structures. Microzonation effort is an effort to improve the accuracy and precision of estimating the characteristics of the seismicity of the region.

Microzonation performed using data microtremor analysis. Microtremor is a soil vibrations with amplitudes several micrometers that can be caused by natural events or man-made, such as wind, waves, vibrations of the vehicle. Microtremor detection tool has three sensor components, two sensors horizontal and one vertical sensor.

The damage to buildings caused earthquakes depend on subsurface structures, in this case the secondary speed ($V_S$) (Herak et al., 2009). As disclosed Daryono, et al (2008) that the damage to the buildings affected by the natural frequencies and proportional to the amplification, which occurs because multireflection wave that occurs in sedimentary layers. And both of these parameters depend on the below the surface Vs value.

The Surface Vs value obtained from the inversion HVSR curve is used to estimate $V_{S,30}$ which is useful for soil classification based on the vibration strength of the earthquake caused local effects (Roser and Gosar, 2010). Thus, as disclosed by Roser and Gosar (2010) value $V_{S,30}$ can be used to estimate the danger of earthquakes and earthquake resistant standard foundation with soil classification recognition based on Eurocode 8 setting.

This study is expected to classify the vibration and subsurface geological characteristics which caused damage to buildings as well as foundation type for building simple house with 2 floors in Jember accordance with the results of microtremor data processing. Microtremor measurement spread in District Kaliwates and Sumbersari, Jember as many 61 points.

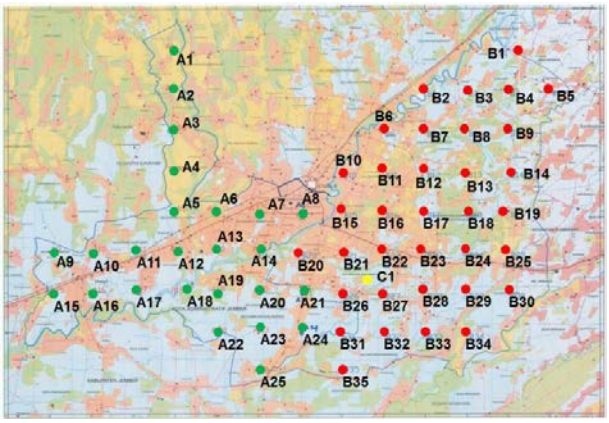


Fig. 1. The Location Point Microtremor Research