

## **Multi Geosciences Approach at Blawan-Ijen Volcano-Geothermal Complex, East Java, Indonesia to Understand It Utilization and Hazard**

S MARYANTO<sup>1\*</sup>, A. S. WICAKSONO<sup>2</sup>, D. R. SANTOSO<sup>1</sup>, A. NADHIR<sup>1</sup>, H. GUNAWAN<sup>3</sup>, E. PRASODJO<sup>3</sup>, I. G. SUANTIKA<sup>3</sup>

<sup>1</sup>Department of Physics, Faculty of Sciences, Brawijaya University, Malang, East Java, Indonesia, correspondence: sukir@ub.ac.id

<sup>2</sup> Postgraduate Program, Brawijaya University, Malang, East Java, Indonesia, agus2wicaksono@yahoo.co.id

<sup>3</sup>Center of Volcanology and Geological Hazard Mitigation, Geological Agency, Bandung, West Java, Indonesia, hendraparis@yahoo.com

Blawan-Ijen volcano-geothermal complex is one of the most active volcanoes, located in eastern of Java, Indonesia and known as its large hyper acidic crater lake, poses significant volcanic and environmental hazards to its immediate surroundings. Besides its threats, the volcano give some benefits for the surrounding people due to the prospect of its "sulfur mining", tourism and geothermal energy. In Blawan village at northern of Ijen volcano, there is an industry of Java Coffee using the supporting energy from biomass and solar energy for drying the coffee-fruit. There was also developed energy based on microhydro power plant to support its own electricity need. Based on the geological and surface investigation, about 21 hot springs have been found in Blawan area with the surface temperature ranged from about 40°C-55°C. The geothermal system, type of hot spring waters, reservoir temperature and geothermal reserve potential of Blawan geothermal field have been studied by a multi geosciences methods such as Magnetotelluric (MT), Seismicity, Geoelectrical, GPR, and Geochemistry. There were 19 sites of magnetotelluric measurement spacing in 250 m up to 1200 m, whereas 6 locations of Blawan hot spring have been sampled for geochemical survey. The results of 2D modeling indicated that the geothermal system in the research area consisted of cap rock zone ( $\leq 32 \Omega.m$ ), reservoir zone ( $> 32 \Omega.m - \leq 512 \Omega.m$ ), and a heat source zone ( $> 512 \Omega.m$ ), and identified of faults. The characteristics of the hot spring water identified through analyzing the major and minor elements of some sampled water, then the reservoir temperature approximately 150°C based on Na-K-Ca geothermometer result. An estimate of the geothermal energy using the volumetric method, gave total geothermal reserve potential of 32,547 MWe. Geoelectrical resistivity and Ground Scan Penetrating Radar (GPR) was performed to investigate the underground seepage of hot water in Blawan geothermal field. Furthermore, seismicity of Blawan-Ijen volcano-geothermal complex estimated the magma chamber system beneath the complex.