Identification of Andesite Resource Potential In Kalirejo Area, Kokap Sub-District, Kulon Progo Using Resistivity Method

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Identification of Andesite Resource Potential In Kalirejo Area, Kokap Sub-District, K Progo Using Resistivity Method

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Abstract

In the last five years, the need for materials to build infrastructure in Kulon Progo Regency has increased with the constructi international airport. In the construction process, strong earth or rock materials are needed to make buildings resistant to earthquake which is andesite rock. This study aims to determine andesite rocks' resources using a three-dimensional model based on the resistivity in Kalirejo district Kokap Kulon Progo. The research was conducted by geological and geophysical survey. Based on da distribution of rocks in the research area included in the intermediate igneous rocks, andesite. These rocks are intrusions that de research areas. Petrography analysis is used to determine the types of minerals in andesite rocks and determine which levels of rock have changed or not to affect the strength of rocks. These rocks are intrusions that develop in research areas. Geophysical surv resistivity method using configuration dipole-dipole with five lines, and each stretch is 200 m. B on three-dimensional model r fresh andesite is at a depth of between 5-10 m. Value of andesite resistivity is more than 668 Ωm, while the value of weathered resistivity ranges from 256-536 Ωm and andesite resources about 332,580 tons.

Keywords: Andesite, Geoelectric, Kalirejo, Resources

1. Introduction

In the Long-Term Development Plan of Kulon Progo Regency in 2005-2025, competitive and growing economic compe makes the economy's structure more advanced and reliable. Sectors that support the economy are industrial, tourism, agriculture natural resources, and services. One that supports this is the business and investment in Kulon Progo equivalent to other develo (Pemerintah Kabupaten Kulon Progo, 2007). Until 2020, Kulon Progo Regency has had an investment in airports located in Temon To support the integration of Airport facilities, The Kulon Progo Regency government needs other facilities. Based on this, it is nec have material availability information to support the implementation of development. One of the critical materials is andesite. And type of volcanic igneous rock used in construction such as building foundation raw materials, paving, and bridge construction. Its util needed andesite rocks that have not experienced weathering (fresh), while most of the andesite roc posed on the surface have exp weathering with different levels. Andesite is also a suitable aggregate-making material (, 2009). Andesite aggregates provide goo and contribute to a low coefficient of heat may value on concrete (Mackechnie, 2004). Based on this, it is necessary to have informat the presence of andesite in the area around Kulon Progo. One of the sciences to know the existence of andesite is geophysics. Geoph science that studies the earth based on the magnitude of physics (Kearey *et al.*, 2002).

Rocks having superior physical properties, such as hardness, density, and water and weather resistance, can be utilized appr for infrastructure since they are resistant to damage. Andesite is one of the rocks with a solid physical characteristic (Sariisik *et a* Due to its vast chemical content of silica (SiO2) 62.30 percent, it is one of the mined rocks with a vast potential for civilization since utilized as the primary material of buildings, bridges, roads, trains, and other structures (Chalikakis *et al.*, 2011). Andesite is found in intrusive rock units in the research region, ranging from hypersthenic andesite to augite-hornblende andesite and trachyandesite (Ra *al.*, 1995). Because these rocks can also be connected with lava flow igneous rock types, miners must know that not all intrusive r are intrusive rocks. Miners must understand the distinctions between intrusive and lava rocks, thick but not widely spread, and lava broad but thin. This difference leads to discrepancies in potential resource calculations (Purwasatriya, 2013).

Geophysical exploration is one of the first surveys that can be carried out. In the discipline of geosciences, geophysical expl one of the sciences. Geophysical e ration can help with geological mapping, possible mining sites, and disaster-prone location other things (Hu *et al.*, 2007). The Geoelectr method is one of the geophysical approaches used to calculate the potential area of material or substance (Galletti *et al.*, 2013). The geoelectric method is a geophysical technique that uses the electrical properties namely rock resistivity. Rocks are generally poor/resistant conductors of electricity, although their qualities and compositions vary, in a wide range of resistivity levels (Phillips, 2006). Geoelectrical techniques can be used to assess the exploitability of these depo alternative to high-cost drilling programs (Lugo *et al.*, 2008). The resistivity value is used to discriminate between different types The Geoelectric Method's 3D modeling of rock resistivity is projected to provide an overview of the pattern of mountain rock di (Woodruff *et al.*, 2015). Its rock resistivity measures the electrical inhibition of rock. The lower the current that can flow in a cond higher the resistivity rating of the rock, and vice versa (Hrenovic *et al.*, 2009). The non-invasive nature of this procedure and its inc cost are both positives (Guinea, 2010).

2. Research Method

Field research activities were carried out in Kalirejo Village, Kokap District, Kulon Progo Regency, Yogyakarta. Perfor early-stage activities in secondary data in regional geological maps of Yogyakarta sheets and early geological surveys to determine ge stretches' location. This research was done by mapping the surface and sub-surface by describing and grouping rocks based on geo rock resistivity. Based on the mapping results, there is a unit of rocks in the form of andesite. Research conducted with geolo geophysical surveys, the flow of research can be seen in Figure 1.

Geoelectric measurements have been carried out as many as five lines with the dipole-dipole array. The geoelectric line is 20 n ≤6. Geoelectric measurement is in 3 vertical lines and two horizontal lines. Measurements are carried out using a tool called Naniu 300. While data processing using RES2DINV software and 3D Modeling software. Dipole-dipole is the array in a geoelectric method produce good imaging vertically and laterally (Octova, 2017; Dentith, 2014). 3D modeling of rock resistivity with the Geoelectric M expected to provide an overview of andesite rock distribution patterns. Modeling is significant in exploring andesite rocks to a potential and resources of andesite rocks in research areas. Method tomography resistivity will continuously develop with measurement depth and accuracy (Yan, 2012). The resistivity method shows promising results in the determination of excavation (Mostafaie, 2015). Because the resistivity of rocks varies, Telford (1976) defines resistivity as follows in Table 1.

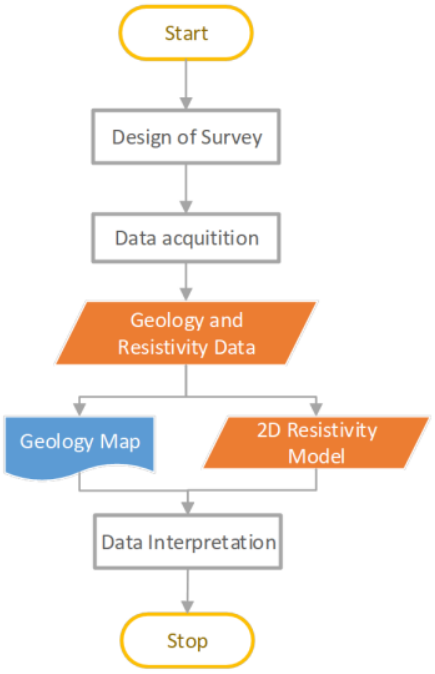

Figure 1. Flowchart of the research.

Table 1. Material Variations of the Earth (Rocks) (Guinea, 2010).

No	Name of rock	Resistivity (Ωm)
1	Air	0
2	Clay	1 – 100
3	Ground Water	0.5 – 300
4	Old Breccia / Gravel	100 – 600
5	Old Andesite / Dry Gravel	600 – 10.000

The survey location map can be seen in Figure 2 below.

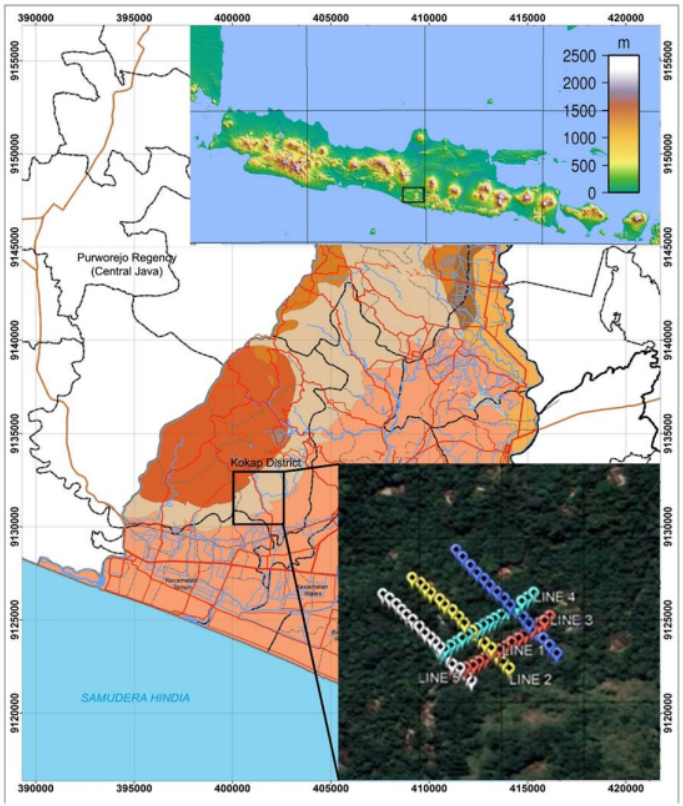

Figure 2. Survey location.

3. Results and Discussion

3.1. Results

The Kulon Progo Mountains are defined as large domes with flat peaks and steep slopes. The dome's core consists of andesite volcanoes, whose former magma chambers are now open (Harjanto, 2011). Elephant Mountain, located in the dome's cent of the oldest volcanoes that produce Hypersthenic Augite Andesite rock. Mount Ijo produces basaltic andesite pyroxene. Mount Mer the youngest volcano to make andesite hornblende on Aug. Determination of 6 units of formations in the Kulon Progo Mountains fr young, namely: Central-Oligoceous Nanggulan Formation, Kaligesing Formation, Dukuh Formation, Jonggrangan Central Miosen Fo Central-Late Miosen Sentolo Formation, and Alluvium (Van Bemmelen, 2009). Kulon Progo Volcanokano stratigraphy Based on through topographic and morphological maps, satellite imagery, absolute age assessment data, and field observation, the stratigrap research area consists three hills (Ijo, Jonggrangan, and Sigabug) and two volcanic hills (Kukusan and Pence) (Harjanto, 20 geological observations show that the study area is dominated by andesites, as seen in Figure 3.

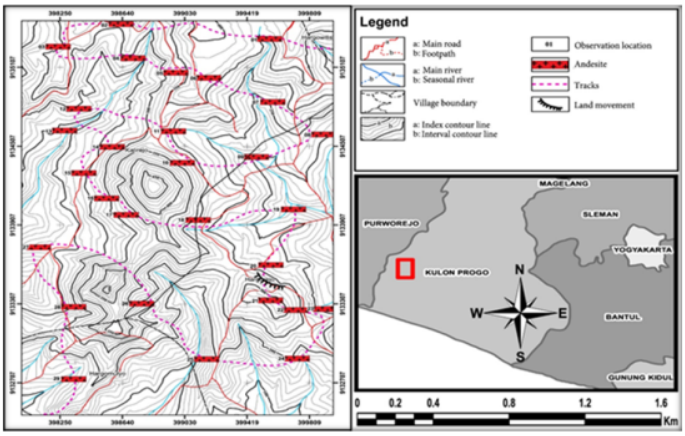

Figure 3. Local Geology Map.

Inversion 2D modeling is done using the smoothness-constrained least square method that is the basis of the RES2DINV algorithm. 2D modeling provides lateral variat of resistivity values but total resistivity values for horizontal directions (Hersir, 2(electrical properties of rocks are influenced by ionic concentration, surface conduction, fluid saturation, porosity, and pore connectivi *al.*, 2014). Inversion is a 2D cross-section resistivity model that provides information on the variation of resistivity value (priso below the measurement point. Based on the results of the inversion shown in Figure 4 obtained resistivity value response (

resistance) with a value of more than 779 Ωm is indicated by purple in the cross-section where there is andesite, the value of r (electrical resistance) with a value of 300-400Ωm is indicated by yellow to orange in the cross-section is weathered andesite.

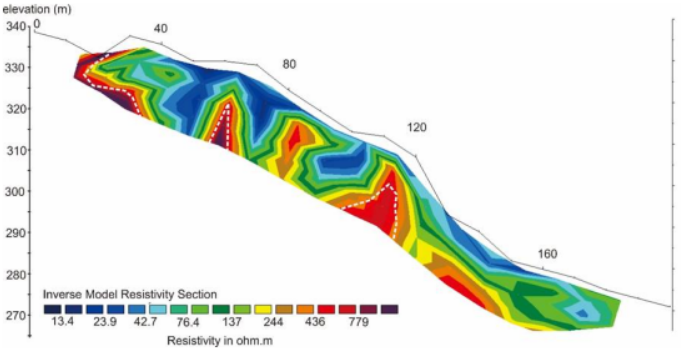

Figure 4. Resistivity Modeling Line Interpretation 1.

Based on the results of the inversion shown in Figure 5 response data obtained resistivity value (electrical resistance) with a more than 1500 Ωm indicated by purple color on a cross-section of fresh Andesite resistivity value (electrical resistance) with a valu 600Ωm indicated by yellow to orange on the weathered Andesite cross-section.

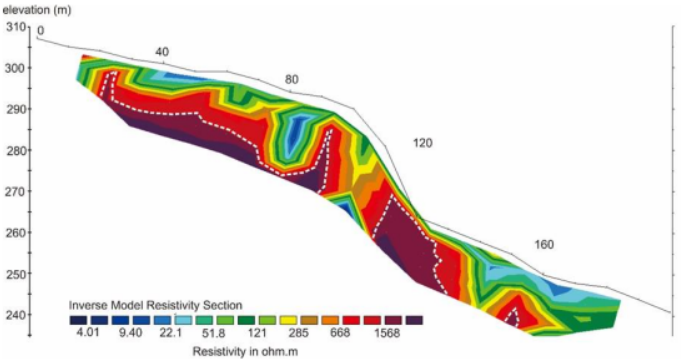

Figure 5. Resistivity Modeling Line Interpretation 5.

This 4th line is a horizontally pointed stretch. Based on the results of inversion shown in Figure 6 obtained the response of r value (electrical resistance) with a value of more than 700 Ωm indicated by purple color on a cross-section that is fresh andesite, r value (electrical resistance) with a value of 300-400 Ωm is indicated by yellow to orange in the cross-section is weathered andesite.

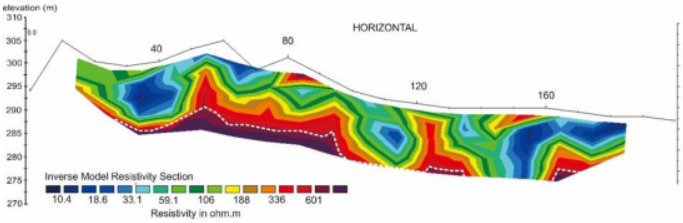

Figure 6. Resistivity Modeling Line Interpretation 4.

Line 3 (Figure 7) is also a horizontally pointed stretch. Based on the inverse shown in Figure 6, the overall response ot andesite, where the resistivity value (electrical resistance) with a value of more than 500 Ωm is indicated in blue to purple. The l visible from about 10m and stretches for 100m, and there is still continuity.

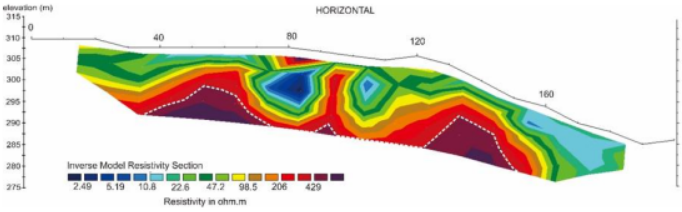

Figure 7. Resistivity Modeling Line Interpretation 3.

Based on the inverse results shown in Figure 8, the overall response obtained is andesite, where the resistivity value (resistance) with a value of more than 500 Ωm is indicated in blue to purple. The andesite is visible from a depth of about 10m and for 80m.

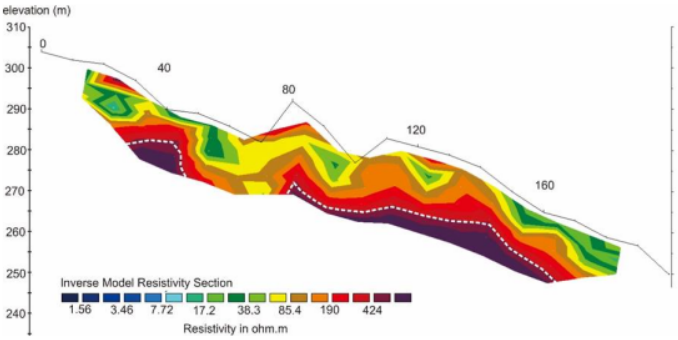

Figure 8. Resistivity Modeling Line Interpretation 2.

3.2. Discussion

Based on data on the distribution of rocks in the research area included in the intermediate igneous rocks, andesite. These intrusions that develop in research areas. Petrography analysis is used to determine the types of minerals in andesite rocks and c which levels of rock changes have changed or not to affect the strength of rocks. The petrography analysis of andesite rocks has a pc texture. Fenokris with crystal size > 0.1 mm consists of plagioclase, pyroxene, hornblende.

Plagioclase is 56%, on Plane Polarized Light (PPL) observation, minerals show colorless, euhedral-subhedral crystal shap hemisphere, low relief. On Cross Polarized Light (XPL) observations of weak birefringence 0.009-0.011 first-order white interferer extinction angle 260, Plagioclase dominated by An 48 labradorite, albeit twin, also Carlsbad-albeit found. The percentage of pyroxen On Plane Polarized Light (PPL) observations, minerals showed grey to brownish color, anhedral-subhedral crystal shape, high reli hemispheres. On Cross Polarized Light (XPL) observations, birefringence is medium 0.037-0.040 second-order, parallel out ar percentage of hornblende is 8%, on Plane Polarized Light (PPL) observations is greyish-brown, high relief indicates weak plec Medium-high replacement with the 2-way angled slit. On Cross Polarized Light (XPL) shows yellowish-brown color, medium r balsam, BF 0.033-0.059, parallel out, long-slow orientation (Prastowo *et al.,* 2019). Based on petrographic analysis data, rocks in the area, including Andesite-Basaltic type and seen from the geography of this rock, is very good without any effect of changes seen pore value of rocks are very small so that it can be used as building supporting materials (Sadjab *et al.,* 2020).

Based on the geoelectric measurement of polished-polished configuration, obtained andesite 3D model as in Figure 9. Bas andesite 3D model tends to spread to the southeast-northwest. The andesite volume of 144,600 m^3. The distribution of andesite i Figure 9 with light blue color, and the position of the data with a red dot is a data point of resistivity measurement. Andesite reso obtained by multiplying the volume by the mass of the andesite type, which is 2.3 tons/m^3. A large amount of andesite resourc research area is 332,580 tons. The result of another research showed Kokap area is dominated by Andesite rock; research was also c about the potential of andesite resources in the kokap area, using a geoelectric method (Purwasatriya, 2013; Giamboro & Hiday Prastowo, 2017). Differences in measurement methods lead to differences in potential resource determination (Triani *et al.,* 20 proves that the high area of Kokap area, Kulon Progo is dominated by andesite rocks. The rocks around Mount Ijo Kokap Kulon I Andesite and Dasit, where dacite is considered to have intruded andesite in the central Miosen period (Irzon, 2018).

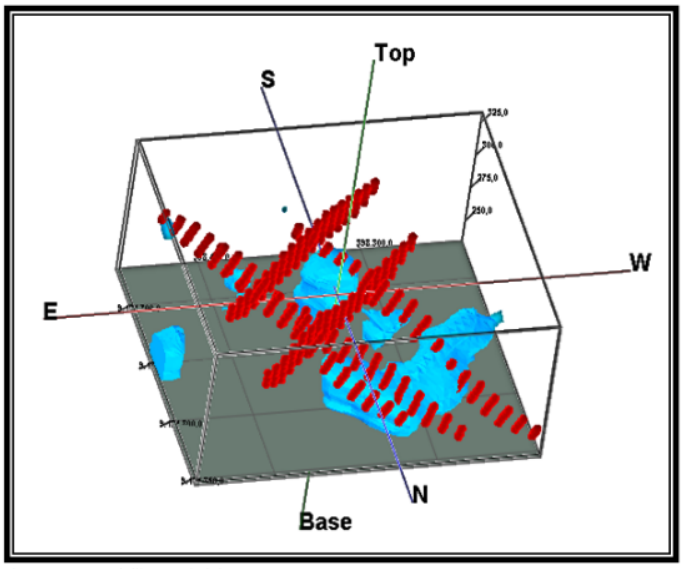

Figure 9. 3D Modelling Resistivity.

4. Conclusion

The working principle of the geoelectric method is done by injecting an electric current into the ground through a pair of e and measuring the potential difference with another pair of electrodes. When an electric current is injected into a medium and the difference (voltage) is measured, the resistance value of the medium can be estimated. Based on geoelectric measurements of th dipole configuration, a 3D model of ndesite tends to spread to the southeast-northwest with an andesite volume of 144,600 m^3.

resources are obtained by multiplying the volume by the density of ndesite, which is 2.3 tons/m^3. Distribution of andesite resistivity 500 m) through a cross-section of 3D stivity models tends to spread flat under the measuring trajectory with a depth of about 10-1 and a resource of about 332.580 tons. The results of other studies show that the Kokap area is dominated by Andesite rocks.

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