

# APPLICATION OF GEOELECTRICAL METHOD FOR GROUNDWATER EXPLORATION IN SUKACAI VILLAGE, JIPUT – PANDEGLANG, BANTEN PROVINCE

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## Abstract

The increasing number of inhabitant in Sukacai village, Jiput – Pandeglang leads to the risen of clean water demand. However, along with the raising of demand, the groundwater availability has decreased. During the dry season, the water quality is poor and the rate of flow tends to be critical. As a consequence, the community is suffering from the scarcity of clean water supply for daily consumption and household necessity. This community service program aims to fulfill the needs of groundwater supply by applying the geophysical method, to recommend the depth of aquifer and construct the well of groundwater. The method is carried out using geo-electrical instruments to reveal the depth of aquifer as the source of groundwater. Another social approach is performed by educating the community about the optimization of well construction, as well as the effect of shallow and deep well construction towards the rate and quality of groundwater. The session has been wrapped with sharing and discussion. As a result, the authors recommend the depth of well construction is approximately 20 m for shallow well and 50 m for moderate well. The moderate well option is more recommended to avoid any contamination of pollution source as well as to maintain the flow rate during dry season.

**Keywords:** Aquifer; Geophysical survey; Groundwater well; Water contamination.

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## 1. INTRODUCTION

The clean water is the source of life for the society. With the increasing number of inhabitant in Indonesia, the necessity of clean water has risen. Meanwhile, the water supply has decreased significantly. The critical condition of clean water is commonly take place during dry season in several areas in Indonesia. The scarcity is suspected caused by the dryness of some springs during dry season and the limited supply of clean water from the government authorities in the restricted areas. Moreover, some groundwater wells have been contaminated and the flow rate was strongly depended on the season. Thus, the groundwater exploration survey is proposed to overcome the scarcity issue of the clean water in the study area.

The area for community service program is located in Pandeglang regency, Banten Province where the local authorities has a partnership agreement with Universitas Trisakti to conduct a community service program in Sukacai Area, Jiput district. The proposed groundwater exploration is suggested to the local authorities to find out the depth of groundwater aquifer. The objective of this program is passed through the engineering solution to discover the depth of confined aquifer with constant flow rate and good water quality without any dependency on the climate. The community is also has lack comprehension about the difference of well depth construction between shallow and deep in relation with groundwater quality and quantity, how to optimize the well

construction and the significance of set up the distance between groundwater well and pollutant sources (such as septic tank and household waste disposal).

## 2. METHOD

The community service program is initiated with geophysical survey (Figure 1), particularly using geo-electrical measurement to investigate the vertical variations in the resistivity of rocks as well as infer the depth of subsurface groundwater (Halik & Widodo, 2008; Kelly, 1977; Kosinski & Kelly, 1981). Geoelectrical methods are commonly implemented for groundwater mapping to investigate the vulnerability of aquifers and shallow aquifers (Naryanto, 2008; Sehad & Aziz, 2016).



Figure 1. Measurement survey of the groundwater depth using geoelectrical method

The heterogeneity of the clay cap strongly affects the vulnerability of aquifers (Kosinski & Kelly, 1981). Since the instrument detects the electrical formation resistivity, the clayish less permeable formation exhibits low resistivity, while the sandy permeable formations showing high resistivity. The data collection is either done with multi electrode systems (CVES) or with an array of fixed electrode configuration. The measurement is carried out by recording the electrical potential as arising from the current input into the

ground (Figure 2) (Broto & Afifah, 2008; Halik & Widodo, 2008; Kanata & Zubaidah, 2008).



Figure 2. The electrical properties which collect the resistivity data of rocks.

Secondly, the obtained data was used to recommend the potential depth of aquifers. Sharing data is performed through meeting session among community service team, local administrator and the society. The program is imposed to the Sukacai villager and cadre of district administrator in the study area. This socialization program was held in the meeting room of district administration office.

## 3. RESULT AND DISCUSSION

This community service program belongs to the multi-discipline activities from the Geological Engineering Study Program, Faculty of Earth Technology and Energy (FTKE), Law, Arts and Design, Economy and Business as well as Medical Faculties (Figure 3). The multi-discipline team promote and offer different activities, such as Medical Faculty has a free consultation and medication, Faculty of Arts and Design trains the community how to recycle the socks for making an adorable dolls and many more. However, our Faculty (FTKE) conducted a geophysical survey to find out the depth of aquifer and overcome the clean water crisis.



Figure 3. Multi-discipline team of Community Service Program, Universitas Trisakti

The main session of socialization has been conducted on 26 July 2018. During the main session, approximately 30 participants yield the meeting room which is welcomed by Mr. Sami'an (Figure 4 and 5). The community service program includes welcome speech from Bapak Sami'an as the local chief of Sukacai village and the elucidation of the groundwater depth based on the geoelectric method. Results were explained to the community through sharing session (Figure 6).



Figure 4. The opening session of community service program as conducted by Mr. Sami'an



Figure 5. The meeting room is yielded by local inhabitant of Sukacai village, with approximately 30 participants join the discussion.



Figure 6. Sharing session for the investigation result

The field survey was carried out on 12 and 21 July 2018. The result survey of geoelectrical measurement reveals that the appropriate depth to construct the wells for groundwater are approximately 20 m for shallow wells and 50 m for moderate well depth (Figure 7). However, it is suggested that moderate well depth is highly recommend to avoid any contaminants from the pollutant sources. Another reason for the recommendation is to maintain the constant flow rate without having dependency against dry season.

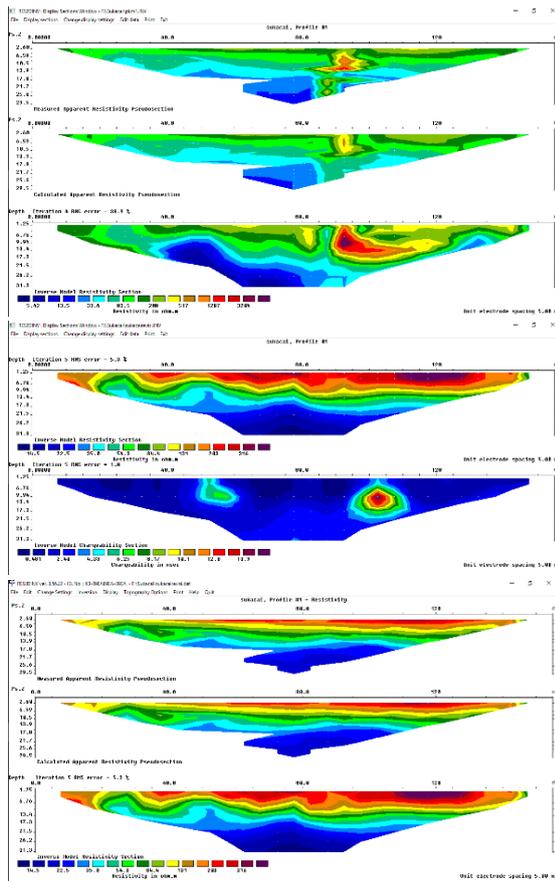


Figure 7. The fathoming result of aquifer depth using geoelectrical method.

Fortunately, many positive responses gained from the society. They are very thankful for the recommendation, skill and fully support the idea to preserved the groundwater quality by disposing the waste properly and set up the septic tank of 10 m away from the well to avoid the pathogenic bacteria which can affect their health.

The team has also educated the society about the appropriate distance between groundwater well and the septic tank location and household waste. The team also requires both authorities and the society to implement the well construction and preserved the quality of ground water by keeping the environment clean from waste disposal and avoid discard the garbage to the river.

#### 4. CONCLUSIONS

1. The geophysical approach using geoelectrical method provides many benefits for the local community. The

suggested depth of aquifer can be applied to construct the groundwater well, overcome the critical source of groundwater quality as well as its quantity. This program is expected solving the scarcity of clean water in Pandeglang Regency, Banten Province.

2. It is suggested to the community to build the groundwater wells in moderately depth of confined aquifer to minimize the contamination from the pollutant source. Meanwhile, the shallow groundwater is still depending on the run off supply and possibly being contaminated by pollutant, since there is no natural filter on the top layer of aquifer.
3. The quality of groundwater is also affected by the human habit on disposing the waste in their surrounding. The socialization approach is expected awaken their awareness to preserved the water quality and being able to consumed.

#### Acknowledgments

The authors would like to thank to the local administrator and the community from Sukacai village, Jiput- Pandeglang, Banten Province for their valuable support and positive responses toward our program. We also gratefully acknowledges Lemdimas and Faculty of Earth Technology and Energy for facilitating us to be more contribute to the society.

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