Interpretation Intrusion of Seawater Using Geoelectricity and Measurement of The Well Water Salinity in Kijang Island, Indragiri Hilir District

Dedi Wijaya, Muhammad Juandi, Rakhmawati Farma
Department of Physics– FMIPA, Universitas Riau
Jl. HR Soebrantas, Km. 12.5, Pekanbaru, 28293, Indonesia
juandi@lecturer.unri.ac.id

Abstract. Investigating seawater intrusion is very important because it covers human life. Generally, people living in coastal areas have difficulty obtaining freshwater. The government needs to help the coastal community by making the well water. The physical parameter that affects the quality of freshwater in coastal areas is salinity. The purpose of this study is to analyze the intrusion of seawater in underground water systems in coastal areas. The research method used is the measurement of geoelectricity and salinity of the well water. The results showed that groundwater aquifers that can be a source of fresh water are at depths ranging from 72.6 meters to 168.6 m. This research shows that the salinity value of the well water is 4 ppt, so it can be classified as freshwater.

1. Introduction
The provision of clean water in coastal areas is very necessary [1,2]. Generally, the provision of clean water is obtained by utilizing the potential for surface water in an area, which is then treated in such a way as to meet health standard requirements [3,4]. However, if surface water in an area is not very economical to develop or conditions where rainfall is relatively small and there is no availability of an aquifer due to topographic conditions and soil types, then an alternative solution to the problem is to utilize the potential of groundwater [5,6].

Groundwater exploration can be carried out at the surface or below the surface. One of the indirect exploration methods for subsurface water is the geoelectric method [7,8]. By using this geoelectric method, an overview of the underground water aquifer will be obtained, so that the determination of the location of the well water is no longer approximate, but precisely carried out above the potential groundwater supply flow. In addition to these uses, groundwater surveys with geoelectric methods can be carried out to determine the aquifer map of groundwater flow in an area that is needed in the management of water supply in an area [9,10].

The investigations of freshwater in the Coastal Zone can be carried out using the Schlumberger rule geoelectric survey and salinity measurements of community well water. The findings in this study can be applied to regions that have the same geographical characteristics.

2. Methods
Systematically, the geoelectric survey steps in data collection consist of preparation, survey and field measurements. The geoelectric measurement used by this Schlumberger electrode configuration method requires 4 electrodes, 2 current electrodes, and 2 potential electrodes, and a maximum span of 400 meters on the surface in a straight horizontal manner. Freshwater that has been found based on
geoelectric results, will then be measured salinity. The results of this measurement will be used for underground water exploration studies to determine the presence of freshwater in coastal areas.

3. Results and Discussion

Based on the results of resistivity data on Kijang Island, Indragiri Hilir Regency with latitude S: 0° 43.917', and Longitude E: 103° 12.795'99 are shown in Figure 1.

Figure 1.

Figure 1 shows the inversion layer model in Kijang Island, Indragiri Hilir District. It can be seen that there are 4 layers of rock. The resistivity values and layer thickness from the first layer to the fourth layer were respectively 105Ωm and 7.6 m, 95Ωm and 55 m, 150Ωm to 300Ωm and 96.3 m to 100 m, 5000Ωm and infinity.

First layer lithology in general, the surface of the earth is always covered by a layer of soil at the top, so that this layer is a cover layer in the form of a layer of peat soil filled with brackish water. The second layer is interpreted as a layer of sandy clay which contains surface water in the form of brackish water. The third layer is interpreted as sandstone in the form of an aquifer. The fourth layer is the innermost layer. The Interpretation of lithology for Kijang Island is shown in Figure 2, that the depth of the bedrock is 158 meters. The presence of underground water in the study area is very large, this is marked by the thickness of the aquifer to reach 100 meters. This large aquifer potential can be used as raw material for clean water supply in Kijang Island, Indragiri Hilir Regency.

The results of salinity measurements from well water samples that have been carried out in Kijang Island, Indragiri Hilir Regency, Riau Province, obtained a salinity value of 4 ppt. The salinity values for freshwater are 0 to 5 ppt. Based on the salinity value of the well water taken from Kijang Island, it can be said that seawater intrusion only enters shallow underground water systems. This is indicated by the results of geoelectric studies that the lithology is brackish water. A deep aquifer system does not occur intrusion. The results of this research can recommend the community to be able to use the well water for consumption purposes.

In terms of hydrogeology, the quantity and quality of groundwater in the study area are strongly controlled by several factors such as rock type, rainfall, and morphology. These factors continuously form a dynamic and integrated system in a groundwater basin, so that if there is a change in these
Factors it will affect the level of groundwater content in the groundwater basin. Of the various types of rock that make up the mapping area, generally, young rocks composed of loose or semi-solid materials, especially relatively coarse contractions, can act as aquifers. In contrast to old rocks that have undergone diagenesis, among others, compression, folding so that they become solid. Graduation is generally low but in weathering zones through fractures, burly, fissures, and cavities of dissolved channels formed later due to geological processes, a limited amount of water can still pass and act as an aquifer or at the same time act as groundwater recharge areas.

Figure 2. The interpretation of the geoelectric data lithology in Kijang Island.

4. Conclusion
The study, which was carried out based on the geoelectric method using the Schlumberger principle and the measurement of the salinity of the well water, has succeeded in explaining the incidence of intrusion in the underground water system on Kijang Island. The lithological structure of the subsurface rocks on Kijang Island can also be shown, and the potential for groundwater in deep aquifer systems can be used for consumption purposes because there is no intrusion.

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