Distribution Of Groundwater Based On The Value Of Water Quality In Jalancagak District, Subang Regency

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Abstract:The water in the earth can be found in the oceans, rivers, lakes, groundwater, rainwater and springs. The difference in the location of water sources will affect the water characteristics of the water. One area that has a large potential for spring is on the slopes of the volcano. The existence of slope morphology due to volcanic activity is estimated to make the study area have many springs with various ways of appearing. This research aims to determine the distribution of areas that have the potential for hot spring based on temperature and salinity. This research was conducted in several steps, such as collection and analysis data. Calculation of distribution EC, TDS, and temperature were performed by using interpolation formula and software Surfer. Cold springs and wells are suitable for consumption because they have TDS values below 500 mg/l. Study of water sources could affect the movement of hot water does not lead to the location of the garden. Hot springs available in Ciater and the distribution could by piping.
Index Terms:groundwater, hot spring, TDS, salinity, volcano

1 Introduction

Clean water is a basic need for humans. Provision of clean water in an area is carried out both now and in the future (Waspodo, 2002). Water is a natural material that is needed for human life, animals, and plants as a medium for transporting food substances, is also a source of energy and various other needs (Arsyad, 1989). Regulation of the Minister of Public Works No. 14/PRT/M/2010 concerning Minimum Service Standards in the Field of Public Works and Spatial Planning states that the average air requirement is 60 litres/person/day to meet its needs. The need for clean water from year to year is expected increase. According to Suripin (2002), in 2000 with a world population of 6,121 billion, 367 km^3 per day of clean air was needed, in 2025 492 km^3 of clean air was needed per day, and in 2100 there were 611 km^3 of clean air per day. Increasing the amount of the population will affect water demand. Without the presence of water there will be a lot of suffering and misery. Surface water is more often used than water. Surface water is more easily obtained and utilised — surface water such as lakes, rivers, reservoirs. Related to the declining quality of surface water, exploration and utilisation of water is used to replace water sources needed from surface water (Wahyono and Wianto, 2008). Groundwater is more protected from various pollutants because the source is in the soil layer (Kuswoyo and Masduqi, 2014). Groundwater is a natural resource that cannot be seen directly because it is present in soil and rocks, but almost all residents use it both for domestic and industrial purposes (Pratitnyo, 2008). Spring is the concentration of groundwater discharge that appears on the surface of the ground as a current from the flow of land (Tolman, 1937). Hot spring usually in the form of hot or warm springs can be a pool or flow into the river. It is formed due to the flow of hot or warm water that flows from below the surface through rock fractures. Hot spring has a temperature above 37'C, above the normal temperature of the human body (Monroe, 2006). One area that has a large potential of springs is the volcano slope area. The differences in slope morphology due to volcanic activity are estimated to make the study area has many springs in various ways of appearance. Classification of springs based on groundwater temperature is divided into cold/normal springs and hot springs. Cold springs are springs whose groundwater has the same temperature as the average air temperature in the local spring environment. Hot springs, i.e. springs whose groundwater has a higher temperature of 6 to 10 degrees Celsius higher than the average air temperature in the local spring environment. Water from springs is heated by natural processes, namely by the existence of geothermal processes related to geothermal under the surface of the land. The purpose of water quality measurement is to determine the quality of groundwater in Jalancagak District, Subang Regency based on the value of EC, TDS, and temperature also see the potential of existing hot water.

2 Methodology

Sampling was carried out in Jalancangak District, Subang Regency. Measurements were taken on July 23, 2018. The equipment needed consists of a Total Dissolved Solid (TDS) meter, topographical maps, GPS and a set of computers equipped with Google Earth I and Surfer applications. The research was conducted in several stages. The steps are taken consist of the stages of secondary data collection and primary data collection. Secondary data collection generally takes the form of maps needed. Topographic, geological, hydrogeological, and earth map. As well as interviews with residents about the presence of hot springs in the measurement location. Primary data collection is TDS meter measurement data with a set of equipment containing EC value data to determine the conductivity of ions having units of ms/cm, TDS is used to measure the total concentration of a solution having units of ppm, and the temperature of springs having units of ° C. According to WHO (World Health Organization), mineral content in water will not affect health as long as the water is still classified as fresh. Even so, WHO set standards for the content of dissolved solids in drinking water which is divided into several level criteria (Table 1).

Table 1 Standart of solid dissolved content in drinking water

TDS content (Mg/l)	Value
< 300	Very good
300-600	Good
600-900	Avaiable to drinking
900-1200	Bad
900-1200	Dangerous

Salinity is the level of salinity or the level of salt dissolved in water. Salinity can also refer to the salt content in the soil, the presence of salt affects the physical properties of the soil including the shape of the soil structure, soil pH and soil permeability (Taylor 1996). The values obtained from the TDS measurement results need to be interpolated so that later maps of the EC, TDS, and temperature will be obtained using the following equation. $\frac{(X-X1)}{(X2-X1)} = \frac{(Y-Y1)}{(Y2-Y1)}$

(1) $Y = Y1 + \frac{(X-X1)}{(X2-X1)}(Y2 - Y1)$

(2) $X = X1 + \frac{(Y-Y1)}{(Y2-Y1)}(X2 - X1)$ (3)

The next step is making a water flow line (flow net) using the Surfer application with the help of the coordinates of the measurement location.

3 Result and Discussion

Water is a resource that is needed by living things both to meet their needs and sustain their lives naturally. The use of water that is universal or comprehensive from every aspect of life becomes increasingly valuable water both in terms of quantity and quality. The higher the standard of living, the need for water will increase (Suriawiria 1996). Water naturally has never been found in a truly pure state. When water vapour condenses in the air and falls on the surface of the earth, the water has absorbed dust or dissolved oxygen, carbon dioxide and various other gases. Thus the water quality will naturally vary in different places and times (KLH 1990). According to Tirtomiharjo and Wibowo (1994), changes in groundwater quality can be seen from the level of groundwater salinity based on chloride ion levels (Cl-) and the conductivity of soil electricity. Research conducted in Jalancagak Subang Regency, West Java, found two types of springs whose characteristics are distinguished by temperature, namely hot springs and cold/normal springs. The conditions of hot springs and cold/normal springs are presented in Table 2 and Table 3.

Table 2 TDS test for cold/normal springs

No	Coordinat	Elevation (m)	EC (ms/cm)	TDS (ppm)	Temperature (°C)
1	6°40'8,48"LS 107°41'29,46"BT	491	162	75	27
2	6°41'42.1"LS 107°39'53.78"BT	636	134	65	26
3	6°41'33.79'L'S 107°39'39.7"BT	628	104	51	26
4	6°42'54.07"LS 107°39'43.26"BT	819	116	56	26
5	6°40'54.65"LS 107°40'35.26"BT	597	186	93	31

Table 3 TDS test for hot springs

No	Coordinat	Elevation (m)	EC (ms/cm)	TDS (ppm)	Temperature (°C)
1	6°40'48.43"LS 107°39'46.66"BT	537	568	276	36
2	6°44'21.93"LS 107°39'16.62"BT	1010	386	1952	36

No	Coordinat	Elevation (m)	EC (ms/cm)	TDS (ppm)	Temperature (°C)
1	6°39'56.43"LS 107°40'57.15"BT	499	48	24	28
2	6°40'2.85"LS 107°41'10.55"BT	500	56	27	28

Table 4 Uji TDS test for wells

TDS (Total Dissolved Solids) is used to measure water purity in units of ppm (parts per million). This unit is used to determine the compound content in a solution that is the content of substances contained in water. The TDS value of the five springs is 75.65.51.56, and 93 ppm, based on SNI 3553: 2015 The maximum TDS standard is 500 Mg/l (1ppm = 1 mg / l) which means the water quality from the spring is very good and based on WHO standardization, the TDS value of springs is classified as an Excel Level because the TDS value is less than 300 mg/l. EC meters are only used to measure the conductivity of ions, but TDS meters are used to measure the total concentration of a solution. From the information above, we can see that the TDS meter is made from the converted EC meter if a high EC value means more ions contained in the nutrient water. EC values were found to be high, namely 162, 134, 104, 116, and 186 ms / cm. 1 spring located in the Seed Ayu Village, the water is flowed using PVC pipes and functioned as a source of community needs for the Ayu Seed Village for drinking, bathing and toilet needs, in addition to that the spring also functions as a swimming pool for recreational residents around. Springs 2 and Springs 3 are located close together which are located on Jalan Cagak, water is multiplied using PVC pipes and functioned as a source of community needs for Jalan Cagak, eye conditions have decreased in discharge compared to a few years before. Water is used for the daily needs of livestock needs. Spring 4 is located in the

village of Cigangkas; from this spring it is channelled to residents using PVC pipes. Spring 5 around PT. Pokka Dima International which is a factory producing processed tea. The TDS values of the two springs are 276 and 1952 ppm, based on SNI 3553: 2015 The maximum TDS standard is 500 Mg / L (1ppm = 1 mg / l) which means that water is not suitable for consumption and based on WHO standards the TDS value of the spring is classified in the Unacceptable Level because the TDS value is more than 1200 mg/ l. EC values were found to be high, namely 568 and 386 ms/cm. Of the two hot springs, only one is utilised, which is located at coordinates 6 ° 44'31.6"S 107 ° 39'09.3"E and elevation 1038, located at the Sariater hot springs used as a hot spring tour. In addition to springs, some wells function the same as springs, which are to meet daily needs — judging from the type of community wells that are classified as open dug wells with a depth of 10-12 meters. TDS tests were performed at the appropriate well location in table 4. The TDS values of the two wells are 24 and 27 ppm, based on SNI 3553: 2015 The maximum TDS standard is 500 Mg / L (1ppm = 1 mg / l) which means the well has very good water quality and based on WHO standards the TDS value of the eye water is classified as an Excel Level because the TDS value is less than 300 mg / l. EC values were found to be sufficient, namely 48 and 56 ms/cm. With a study of several locations of water sources and wells in Jalancagak District, Subang Regency, it is known that hot springs are found at two points. The hot springs in Jalancagak District are estimated only to be located in several points, unlike groundwater that can be predicted in the direction of flow. So it can be said that hot water exploitation cannot be done. To obtain hot water, hot water can be used in Ciater, which is controlled by BLHD by using piping. The following is presented a map of the direction of water flow (flow net), as well as maps of the values of EC, TDS, and Temperature respectively in Figure 1 through Figure 5.

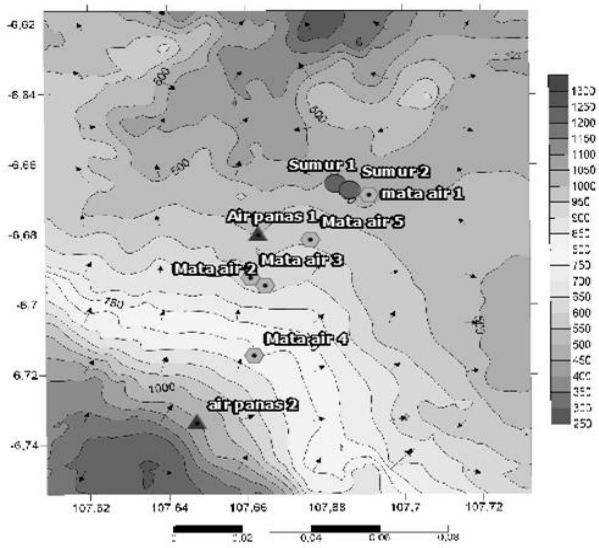

Figure 1 Flownet 2 dimention for spring water

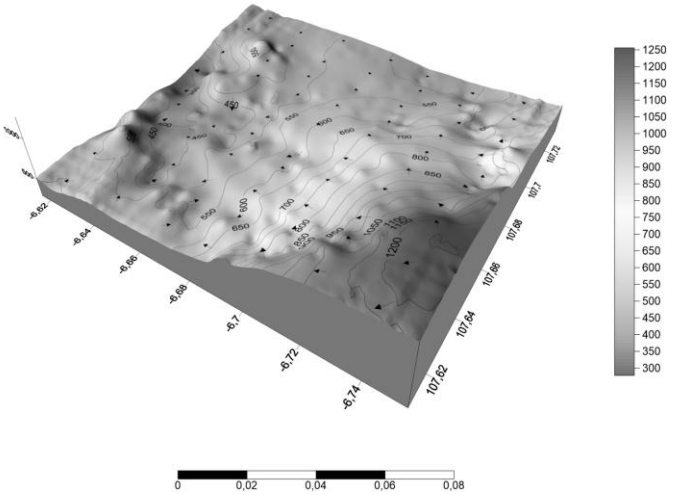

Figure 2 Flownet 3 dimention for spring water

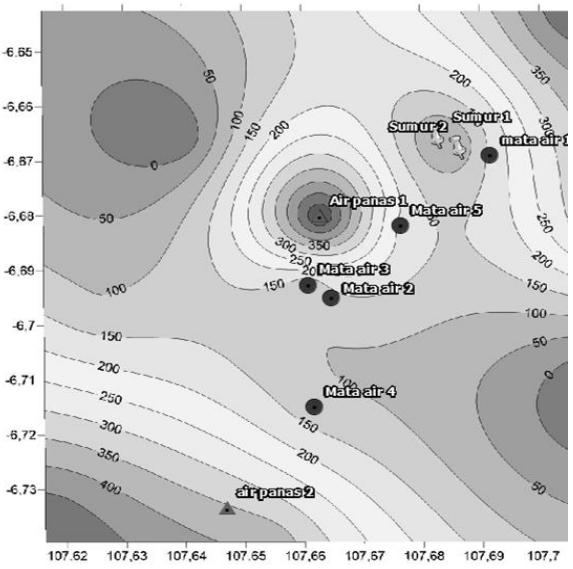

Figure 3 EC measurement map

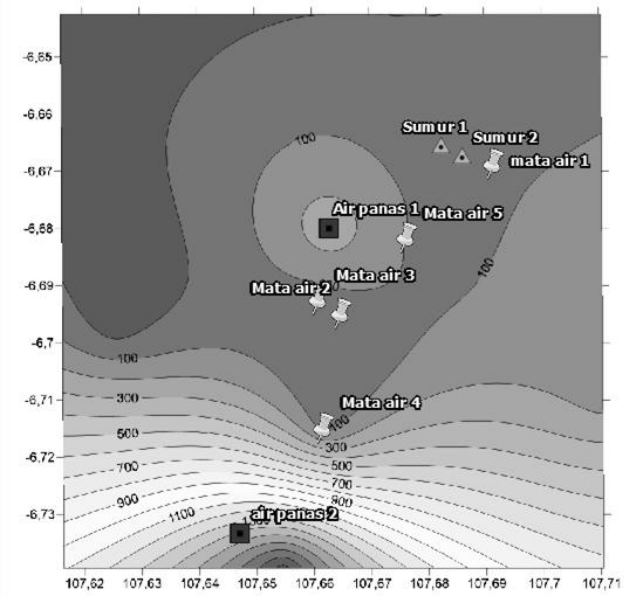

Figure 4 TDS measurement map

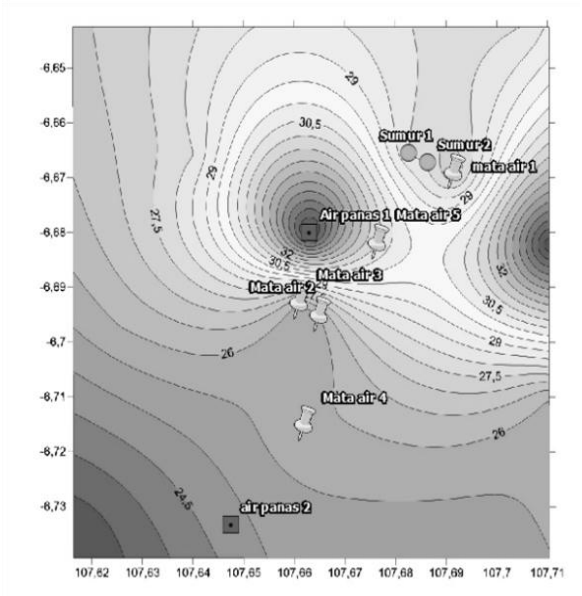

Figure 5 Tempereature measurement map

4 CONCLUSION

Measurements related to water quality based on EC, TDS and Temperature values in Jalancagak Subdistrict, Subang Regency identify at the point of measurement of normal/cold water and wells said to be good for consumption based on WHO and SNI 3553: 2015 for the maximum TDS standard is 500 Mg/l (1ppm = 1 mg/l), hot springs are not able for consumption but good for tourism.

5 REFERENCE

[1] Arsyad, S., 1989. Soil and Water Conservation. IPB Press
[2] Monroe, J.S., 2006. The Changing Earth, Exploring Geology and Evolution. Michigan University.
[3] Ministy of Population and Environmental of Indonesia. 1990. Environmental Quality in Indonesia 1990. PT. Inermasa.
[4] Kuswoyo A. dan Masduqi A. 2014. Mapping the potential of ground water as a source of clean water in the coastal areas of the Batakan regency of the sea land. Journal of Technology and Industry. Vol 3(1): 1-10.
[5] Pratitnyo P. 2008. Aquifer system and groundwater reserves in South Sulawesi province.. Journal of MTG research . Vol 1(1):1-10.
[6] Ministry of Public Works Regulation Number 14/PRT/M/2010 about Minimum Service Standards in the Field of Public Works and Spatial Planning.
[7] SNI 3553:2015 about Mineral Water.
[8] Suripin. 2002. Preservation of Land and Water Resources.ANDI Publisher
[9] Suriawiria U.1996. Water in a healthy life and environment. PT. Alumni
[10] Taylor, S. 1996. Dryland salinity: introductory extension notes. 2nd Ed. Department of Land and Water Conservation.
[11] Tirtomihardjo, H. dan Wibowo, W. 1994. Groundwater Conservation in the Jakarta and Tangerang Region. Directorate of Environmental Geology.
[12] Tolman, C.F. 1937. Ground Water. McGraw-Hill.
[13] Wahyono SC, Wianto T. 2008. Determination of the ground water layer using the Schlumberger geoelectric method in Balangan Regency, South Kalimantan. Journal of Flux Physics .Vol 5(2): 148-164.
[14] Waspodo R.S.B. 2002. Groundwater flow modeling in distressed aquifers using finite difference method in Kertajati District, Majalengka Regency. Journal of Agricultural Engineering. Vol 16 (2): 61-68.
[15] World Health Organization Guidelines for Drinking-water Quality.