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Analysis of Pangkep Regency Groundwater Potential Through the Use of the Overlay Method Geographic Information System

[1*]Nasrul, [2]Muhammad Taufan Nuryadin, [3]Mulianti, [3]Sri Wahyuni Hasrin, [3]Mat Rasul, [4]Ferigo Taufani Tri Hakiki

[1]Geography Education Study Program, Postgraduate, Universitas Negeri Makassar, Makassar, Indonesia
[2]Geography Education Study Program, Postgraduate, Universitas Negeri Malang, Malang, Indonesia
[3]Geography Department, Fakulty of Mathematics and Natural Science, Universitas Negeri Makassar, Makassar, Indonesia
[4]Statistics Department, Postgraduate, Institut Teknologi Sepuluh November, Surabaya, Indonesia

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Corresponding author:
Email: nsrlnasir12@gmail.com
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ABSTRACT

The increase in population results in an increase in the amount of water supply needed to carry out all activities of the population. Groundwater is a very important alternative source, especially during the dry season. This research aims to determine the distribution of groundwater potential in Pangkajene Regency and the islands which can be used as a reference and information regarding areas that have groundwater potential. By using the overlay method through the use of geographic information systems. This method is carried out by scoring each parameter used, namely giving a value and weighting according to the classification of each parameter. The analysis process was carried out with the help of the ArcGIS 10.8 mapping application. Based on the results of the analysis carried out in this research, it was found that Pangkep Regency as a whole has a moderate level of groundwater potential, this can be seen from the percentage of 60.26% of the total area of Pangkajene Regency or around 476.4302954 km2 has groundwater potential. which is being. In this case, the government needs to carry out regular monitoring and evaluation of groundwater conditions in areas with medium potential including Tondong Talassa, Minasa Tene, Pangkajene, and Bungoro sub-districts to ensure that the quality and quantity of groundwater do not decline to low or very low. As well as carrying out detailed exploration and inventory of groundwater potential in areas with high levels such as in the Mandalle, Marang, and Labakkang subdistricts.
Kata Kunci: Groundwater, Overlay, GIS, Pangkep Regency

ABSTRACT

Meningkatnya jumlah penduduk berakibat terhadap bertambahnya jumlah pasokan air yang dibutuhkan untuk melakukan segala aktivitas dari penduduk tersebut. Air tanah menjadi sumber alternatif yang sangat penting, terutama pada musim kemarau. Penelitian ini bertujuan untuk mengetahui sebaran potensi air tanah pada Kabupaten pangkajene dan kepulauan yang dapat menjadi acuan dan informasi mengenai wilayah yang memiliki potensi air tanah. Dengan menggunakan metode overlay melalui pemanfaatan sistem informasi geografis. Metode ini dilakukan dengan melakukan scoring pada setiap parameter yang digunakan, yaitu memberikan nilai dan pembobotan sesuai pengklasifikasian masing-masing parameter. Proses analisis dilakukan dengan bantuan aplikasi pemetaan ArcGIS 10.8. Berdasarkan hasil analisis yang di lakukan penelitian ini memperoleh hasil bahwa Kabupaten Pangkajene Kepulauan secara keseluruhan memiliki potensi air tanah dalam tingkat yang sedang, hal tersebut dapat dilihat dari presentase 60,26 % dari total luas Kabupaten Pangkajene atau sekitar 476,4302954 km2 memiliki potensi air tanah yang sedang. Dalam hal ini pemerintah perlu melakukan pemantauan dan evaluasi berkala terhadap kondisi air tanah di wilayah dengan potensi sedang meliputi Kecamatan Tondong Talassa, Minasa Tene, Pangkajene, dan Bungoro untuk memastikan kualitas dan kuantitas air tanah tidak menurun menjadi rendah atau sangat rendah. Serta melakukan eksplorasi dan inventarisasi potensi air tanah secara rinci di wilayah dengan tingkatan tinggi seperti di wilayah Kecamatan Mandalle, Marang dan Labakkang.
Keywords: Air Tanah, Overlay, SIG, Kabupaten Pangkep

1. INTRODUCTION

The clean water crisis is a serious problem that can become a disaster because water is a basic need that covers the livelihoods of many people, starting from household needs (eating, drinking, washing, and bathing), industry, and agricultural irrigation (Ulfah M et al., 2018). Without this resource, various lives will be threatened with not being able to survive, not only humans but also plants and animals, because water is a basic element for all needs to support life on earth (Widada S. et al., 2017)

The increase in water demand for various needs always increases along with the increase in population in an area, the increasing number of residents will have an impact on the amount of water supply needed to carry out all activities of that population (Irawan et al., 2022). This is made worse by the fact that only 0.7% of the water that can be used by humans to meet their needs is groundwater and surface water (Hendryana, 2004 in Widada S. et al., 2017). Meanwhile, the composition of water on Earth is 70%, but 97% of this water is salt water and the remaining 2.3% is ice in glaciers and polar ice (Lestari & Susanto, 2021). So what humans can use to meet their needs is only 0.7% in the form of groundwater and surface water (Hendryana, 2004 in Widada S. et al., 2017; Nur et al., 2024; Amdah, 2024).

Groundwater is water stored in aquifers, namely water-saturated geological formations that can pass sufficient amounts of water (Hi Manrulu et al., 2018). Meanwhile, surface water is the part of rainwater that does not experience infiltration so it remains on the ground surface (Poedjiastoeti et al., 2017). Of the two types of water, during the dry season, people tend to use groundwater rather than surface water because, during the dry season, the water discharge will decrease and even dry out as a result of prolonged heat and the absence of rain (Widiyanto A et al., 2015; Rusdi et al.,, 2023)

One area that requires groundwater as an alternative to meet the needs of its population is Pangkejene and Islands Regency. This district is located in South Sulawesi Province and is at 11.00' east longitude and 040.40' - 080.00' south latitude and has an area of up to 1,112.29 km² (Sabir et al., 2022). The presence of groundwater in an area is not evenly distributed, an approach that can be used to determine the potential of groundwater in an area is to use a hydrogeomorphological approach. This approach is a good approach in assessing groundwater potential and even more accurately in hydrogeological and environmental sustainability surveys. The variables in this approach are land use, lithology (structure and type of material), and terrain morphology which includes height and slope (Teixeira et al., 2013)

use can cause an increase in surface flow so that water absorption in the soil is reduced (Cahyadi et al., 2012). The intensity of water that enters the ground determines how much groundwater potential there is in an area because infiltration is the starting point for groundwater, land use that can reduce water infiltration into the ground is built-up land (Cahyadi et al., 2012). Apart from that, the geomorphology of an area is also very important in estimating groundwater potential because areas located in highlands create many slopes and geomorphological conditions that cause more movement of rainwater to lower areas (Sastrawan et al., 2022). Relatively sloping topographic conditions can slow down the rate of water, thereby facilitating the process of water infiltration into the soil (Zakhyar F et al., 2024).

Other variables that are also related to estimating groundwater potential are lithology and rainfall. The nature of the constituent media and rock or what is usually called lithology in the form of sand with medium to coarse inter-grain voids has different abilities to pass groundwater, thus affecting groundwater productivity (Vienastra et al., 2020). Meanwhile, the rainfall factor that influences groundwater potential is that high rainfall intensity and short duration have relatively low infiltration. On the other hand, if the intensity is low and has a long duration, there will be more water infiltration into the soil (Pratama et al., 2018). The parameters of several variables from this approach are then combined into one using the overlap or overlay method to obtain the distribution of aquifer potential against groundwater basin parameters to obtain areas that have a distribution of groundwater potential.

This research aims to determine the distribution of groundwater potential in Pangkajene Regency and the islands which can be used as a reference and information regarding areas that have groundwater potential so that the government and residents of Pangkajene Regency and the islands can use the results of this research as a starting point and basis for knowing the area. which has the potential to have groundwater so that it can be used as an alternative water source in efforts to prevent the water crisis.

2. METHOD

The research location for this study was in the Pangkajene and Islands Regency, South Sulawesi. The research locations can be seen in Figure 1 below.

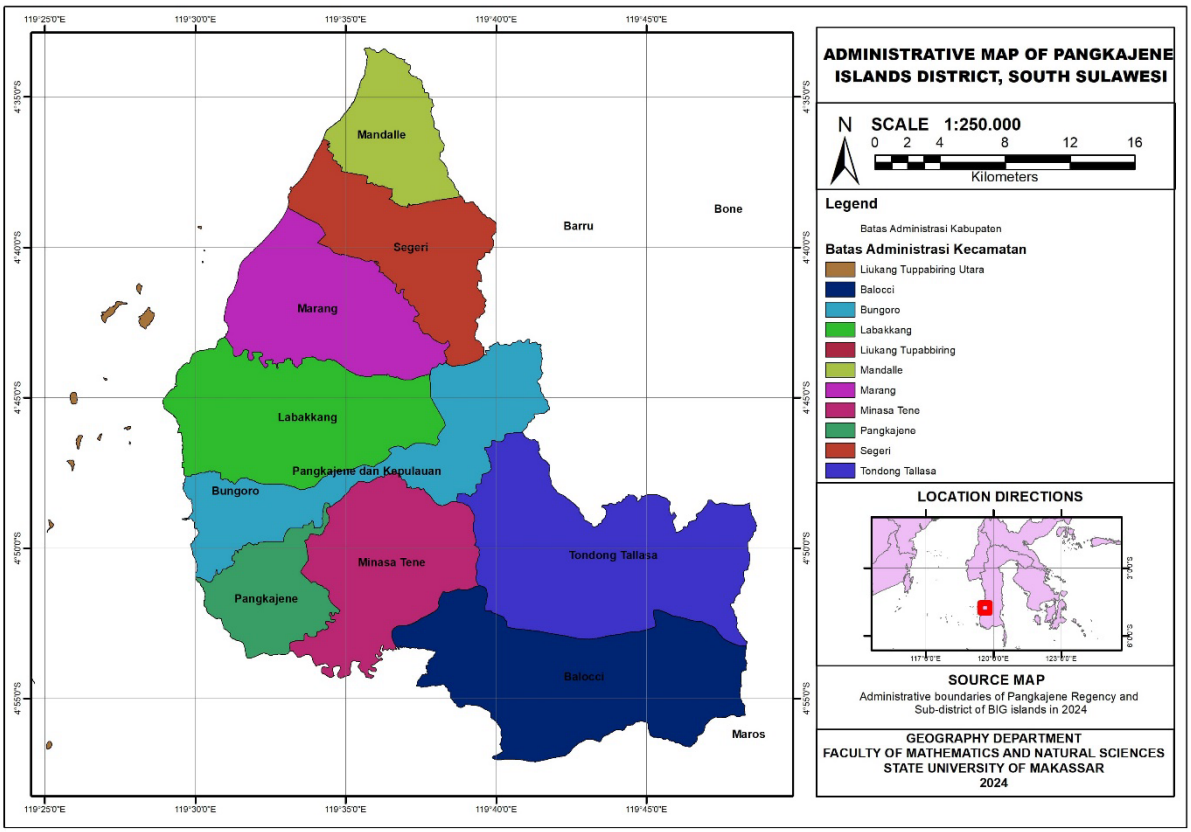

Figure 1. Research Location Map

The method used in this research is the Overlay Method by scoring each parameter used by giving a value and weighting according to the classification of each parameter and then overlaying it using the help of a mapping application, namely ArcGis 10.8. The Overlay method is one of the methods used in spatial analysis, namely the process of combining a digital map with another digital map which will then produce a new digital map based on the attribute data, thereby saving layer displays during the spatial analysis process. (Rahmat Al Fauzi, 2022). This method is used to analyze and integrate (overlap) two or more different spatial data.

This research uses seven types of variables, which will be overlaid. These variables include, Land Use, Slope, Soil Type, Rainfall, Geology, Vegetation Density, and Altitude. The following are the variables used in the research:

Table 1. Determining Variables of Ground Water Potential

Variable	Criteria	Class	Harkat	Score	
Land Use	Jungle		5		10
	Shrubs		4		
	Pond		3		
	Meadow		3		
	Plantation		3	**2**	
	Ricefield		3		
	Rain-Fed Rice Fields		3		
	Moorland/Field		3		
	Vacant land		2		
	Settlements and Places of Activity		1		2
Slope (%)	0 – 8	Datar	5		10
	8 – 15	Sloping	4		
	15 – 25	Somewhat Steep	3	**2**	
	25 – 45	Steep	2		
	>45	Very Steep	1		
Type of soil	Aluvial, hidromorf kelabu,planosol		5		5
	Latosol		4		

	Mediteran,		3	**1**	
	Andosol, podsol, laterik, grumosol, podsolik		2		
	Regosol, Renzina, organosol and litosol		1		1
Rainfall (mm)	>3500	Very high	5		15
	3000 - 3500	High	4		
	2500 - 3000	Currently	3	**3**	
	2000 - 2500	Low	2		
	<2000	Very Low	1		3
Geology	Alluvium Deposits		5		10
	Marine Sedimentary Rocks		4		
	Intermediate and Alkaline Igneous Rocks		3	**2**	
	Volcanic Rocks		2		
	Intrusive Rock		1		2
Density Vegetation	Very Tenuous		1		2
	Tenuous		2		
	Currently		3	**2**	
	sticky		4		
	Very Sticky		5		10
Height Place (mdpl)	0 - 20		5		5
	21 – 50		4		
	51 – 100		3	**1**	
	101 – 300		2		
	>300		1		1

After determining the groundwater potential variable, an overlay process is carried out by classifying weights and values as in Table 1. After the overlay process is carried out, the next step is to calculate the total score of all groundwater potential variables using the following formula:

a. Maximum Score = 65
b. Minimum Score = 13

$$\text{Interval} = \frac{65 - 13}{5} = 10{,}4 = 10 \dots\dots\dots\dots\dots\dots\dots (1)$$

(22-13) + 1 = 10
(32-23) + 1 = 10
(42-33) + 1 = 10
(52-43) + 1 = 10
(62-53) + 1 = 10

So, based on the calculation results above, the criteria for groundwater potential can be identified which can be seen in Table 2 as follows.

Table 2. Groundwater Potential Criteria

No	Groundwater Potential Criteria	Class
1	≤ 22	Very Low
2	23 - 32	Low
3	33 - 42	Currently
4	43 - 52	Hight
5	≥ 53	Very Hight

3. RESULT AND DISCUSSION

A. Result

Based on the classification of groundwater potential variables, the following results were obtained:

1) Land Use

Pangkep Regency consists of several land uses, namely: shrubs, dry land forests, mangrove forests, grasslands, settlements, mining, dry land agriculture, rice fields, and open land. The dominant land uses in the Pangkep Regency area are rice fields and dry land forests.

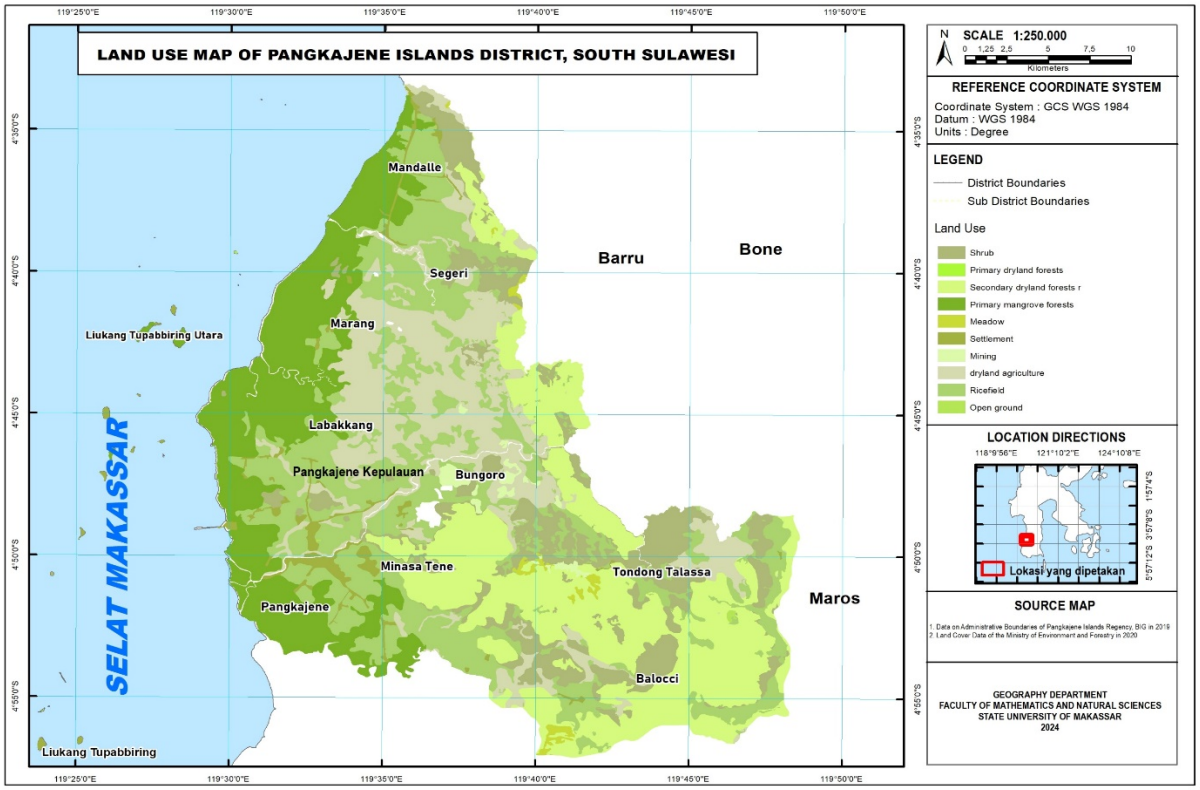

Figure 2. Pangkep Regency Land Use Map

Table 2. Pangkep Regency Land Use

No	Penggunaan Lahan	Wide (Km^2)	Percentage (%)
1	Primary Dryland Forest	0,233363003	0,03%
2	Secondary Dryland Forest	190,8150024	21,67%
3	Primary Mangrove Forest	170,8650055	19,41%
4	Thicket	108,9950027	12,38%
5	Settlement	18,39979935	2,09%
6	Open Land	2,946830034	0,33%
7	Meadow	15,51179981	1,76%
8	Dryland farming	160,4290009	18,22%
9	Ricefield	206,2910004	23,43%
10	Mining	5,933119774	0,67%
	Total	**880,419923 9**	**100,00%**

Source: Data Analysis, 2024

2) Rainfall

Pangkep Regency has varying levels of rainfall in various places, starting from low rainfall levels (2000 – 2500 mm) to medium (2500 – 3000 mm) and high rainfall levels (3000 – 3500 mm). This level of rainfall can be determined after going through the process of interpolating rainfall data from several rainfall stations in Pangkep Regency. Pangkep Regency is dominated by areas with high levels of rainfall.

Table 3. Pangkep Regency of Rainfall

No	Rainfall	Wide (Km^2)	Percentage (%)
1	2000 - 2500 mm	397,381012	49,62%
2	2500 - 3000 mm	387,3840027	48,37%
3	3000 - 3500 mm	16,0720005	2,01%
	Total	**800,8370152**	**100,00%**

Source: Data Analysis, 2024

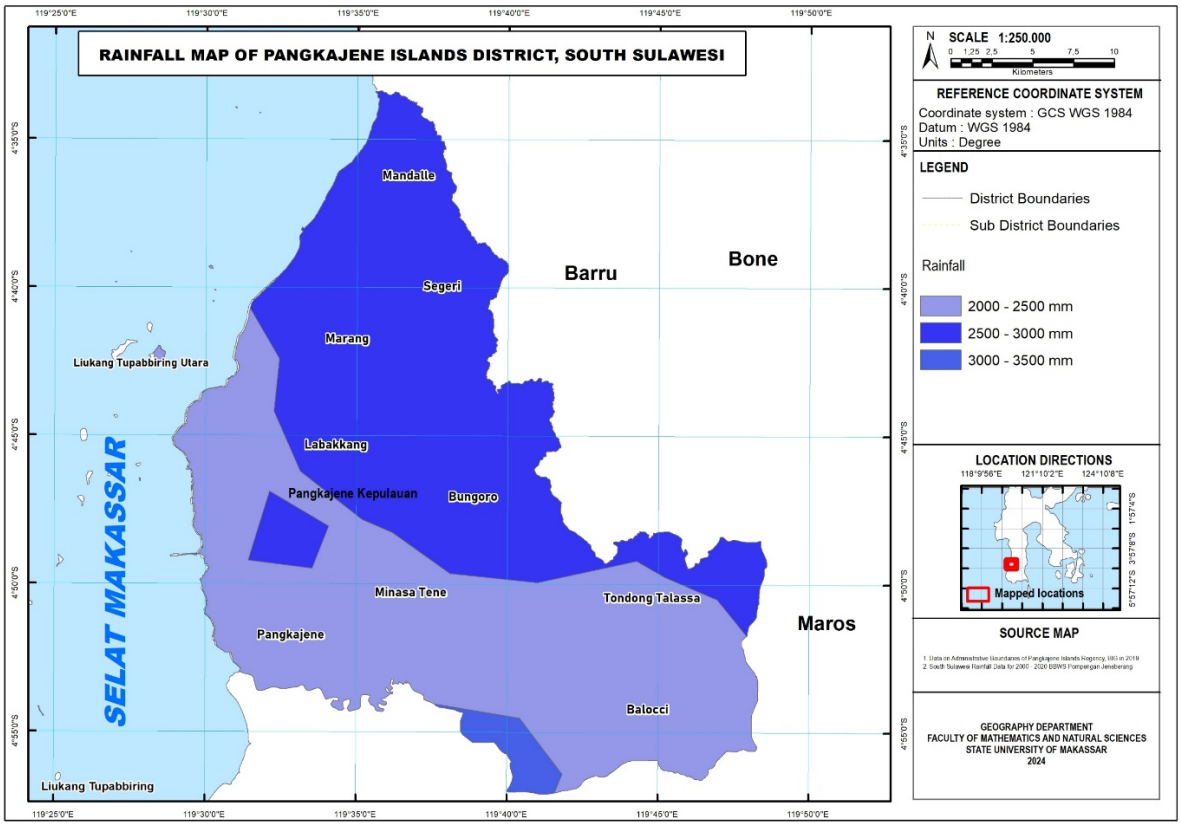

Figure 3. Pangkep Regency Rainfall Map

3) Type of Soil

Pangkaep Regency has various types of soil, where according to the BPN soil type data classification, the types of soil that can be found in Pangkep Islands Regency include Alluvial Hydromorph, Andosol, Latososl, Mediteran, and Regosol. The most common types of soil found are Alluvial and Latosol soil types.

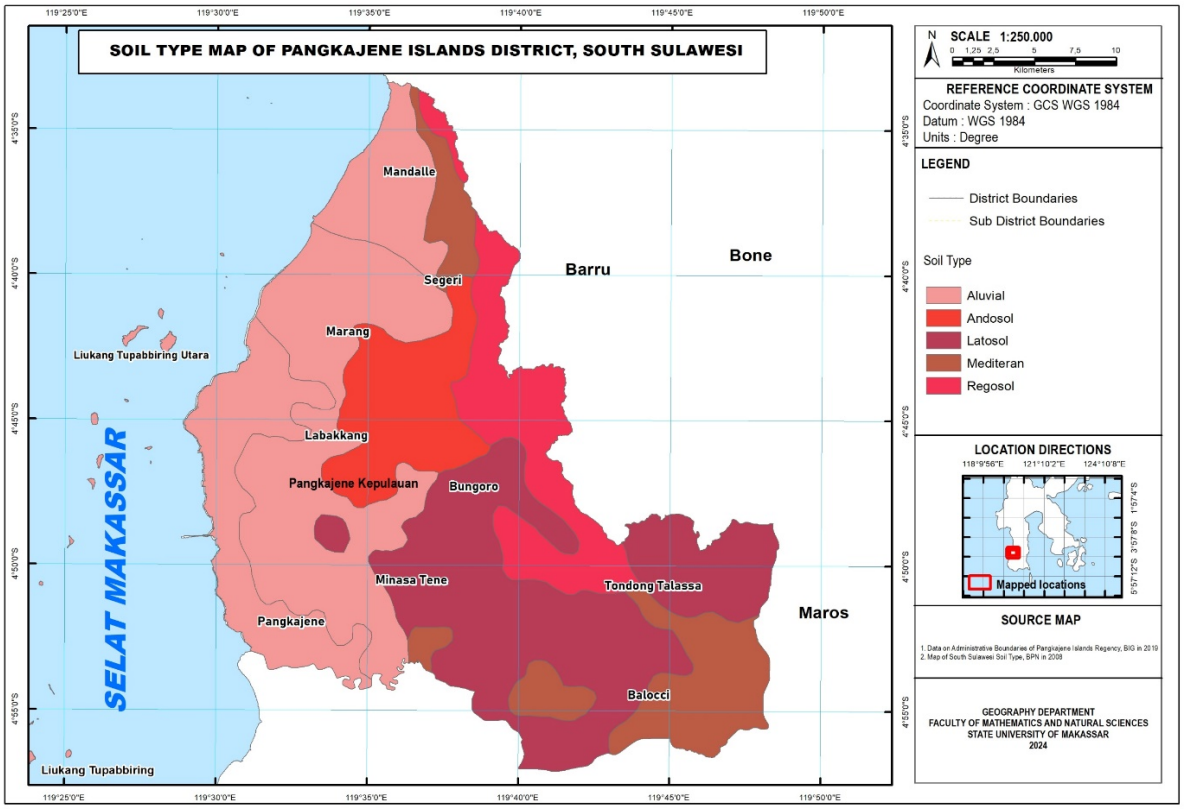

Figure 4. Pangkep Regency Type of Soil Map

Table 4. Pangkep Regency Soil of Type

No	Soil of Type	Wide (Km^2)	Percentage (%)
1	Aluvial	397,5110036	44,65%
2	Andosol	77,99261438	8,76%
3	Latosol	227,7922336	25,59%
4	Mediteran	95,47758915	10,72%
5	Regosol	91,51827285	10,28%
Total		**890,2917136**	**100,00%**

Source: Data Analysis, 2024

4) Geology

Geologically, a number of geological formations or types of rock can be found in Pangkep Regency, including igneous rock formations, volcanic rocks, intrusive rocks, marine sedimentary rocks, alluvium deposits, and intermediates and bases.

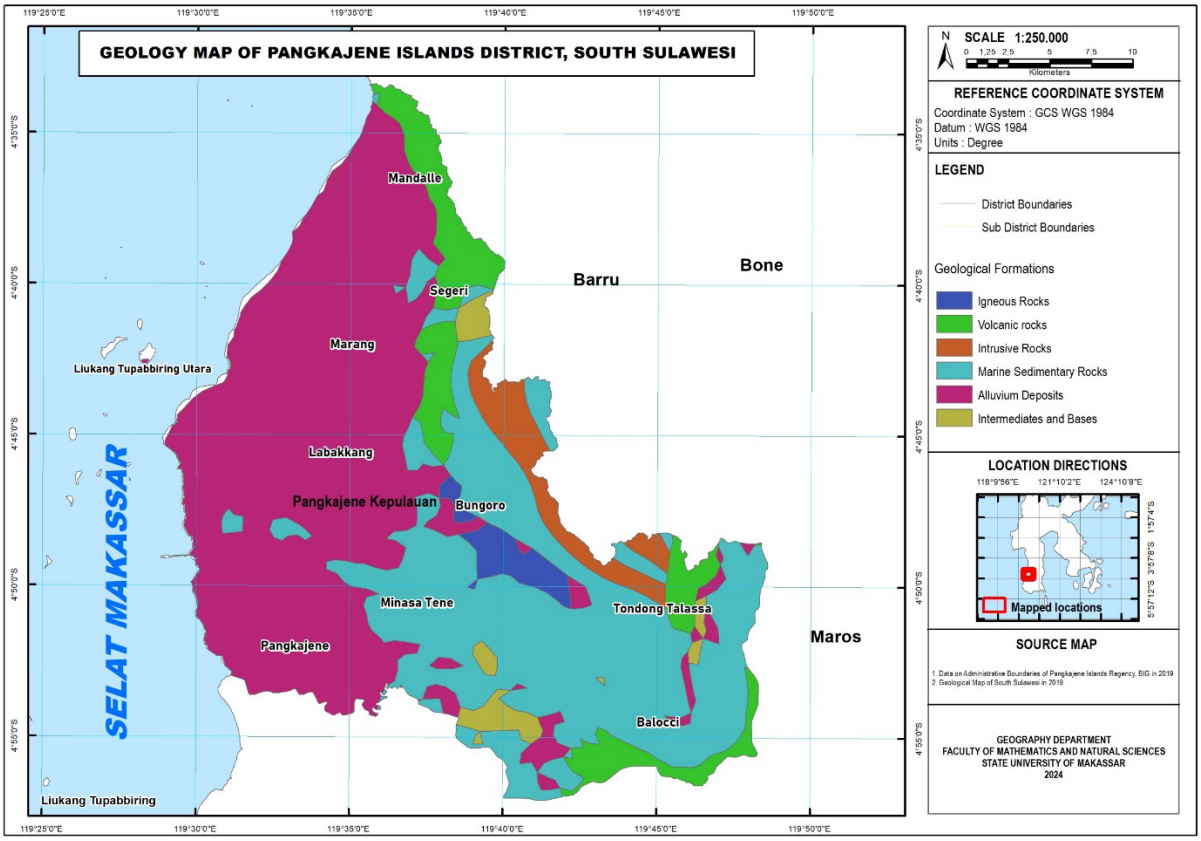

Figure 5. Geologi Map of Pangkep Regency

Table 5. Geologi Formations of Pangkep Regency

No	Geology Formations	Luas (Km^2)	Presentase (%)
1	Intermediet dan Basa	17,25690079	2,16%
2	Batuan Sedimen Laut	275,29599	34,51%
3	Endapan Alluvium	385,256012	48,29%
4	Batuan Intrusif	31,19729996	3,91%
5	Batuan Beku	16,68429947	2,09%
6	Batuan Gunung api	72,12329865	9,04%
Total		**797,8138008**	**100,00%**

Source: Data Analysis, 2024

5) Slope

Pangkep Regency consists of several areas with varying slopes, where there are flat areas with slopes (0 – 8%), sloping areas (8 – 15%), slightly steep (15 – 25%), and steep areas (25 – 45%). %), and very steep areas (>45 %). Most of Pangkep Regency has flat slopes in the eastern part of the Pangkep Regency area.

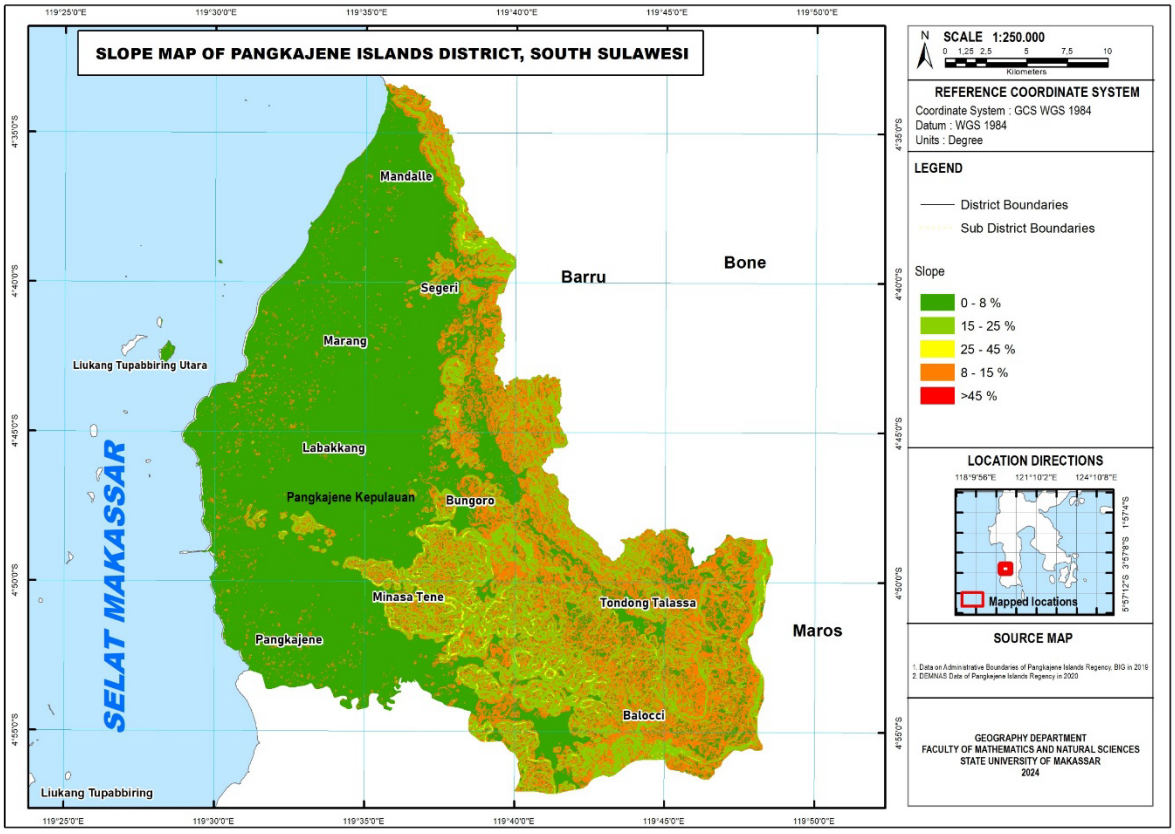

Figure 6. Slope Map of Pangkep Regency

Table 6. Slope of Pangkep Regency

No	Slope	Wide (Km^2)	Percentage (%)
1	0 - 8 %	462,6966113	57,77%
2	8 - 15 %	190,6352309	23,80%
3	15 - 25 %	142,1019128	17,74%
4	25 - 45 %	5,343077526	0,67%
5	>45 %	0,217750349	0,03%
	Total	**800,9945828**	**100,00%**

Source: Data Analysis, 2024

6) Vegetation Density

Pangkep Regency has areas with varying vegetation densities, where there are areas with very sparse to very dense vegetation densities. The area with very sparse vegetation density is located in the eastern part of the Pangkep Regency, while the area with medium vegetation density is located in the western part of the Pangkep Regency area.

Table 7. Vegetation Density of Pangkep Regency

No	Vegetation Density	Wide (Km^2)	Percentage (%)
1	Sangat Rapat	37,0848999	4,62%
2	Rapat	179,3329926	22,32%
3	Sedang	188,1940002	23,43%
4	Renggang	215,7039948	26,85%
5	Sangat Renggang	182,9759979	22,78%
	Total	**803,2918854**	**100,00%**

Source: Data Analysis, 2024

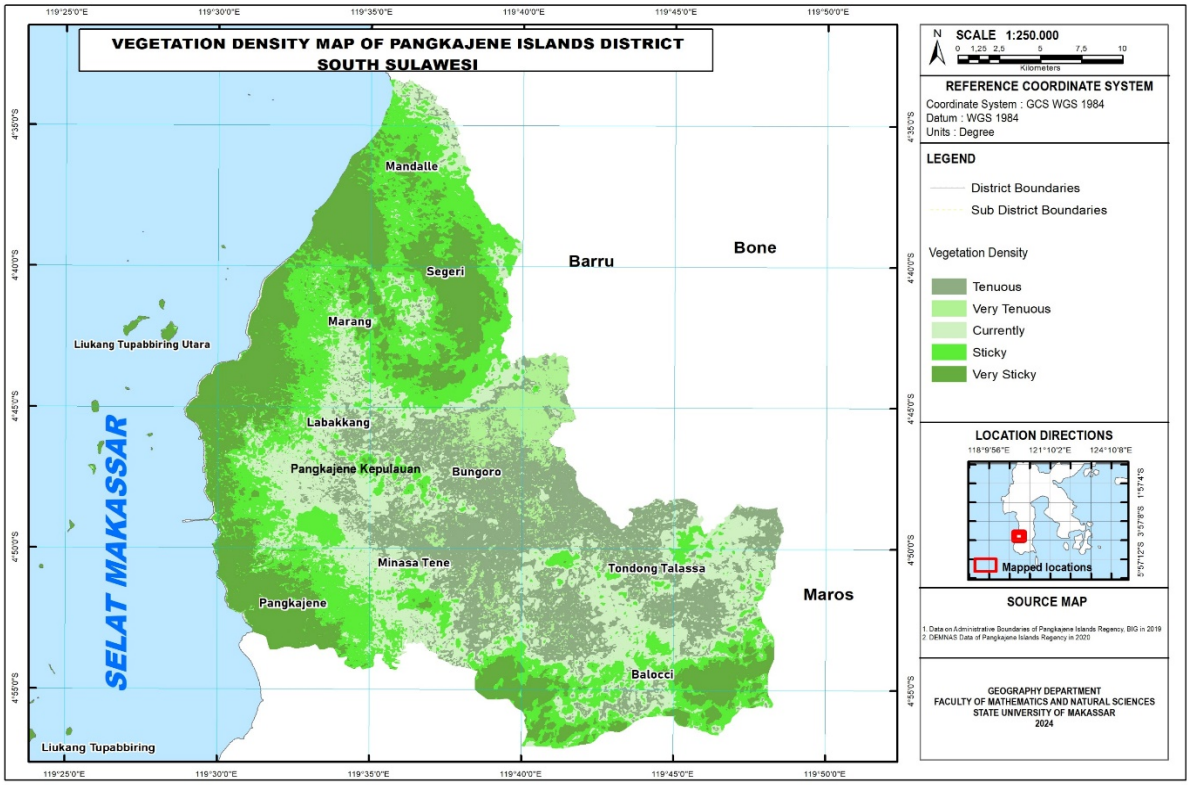

Figure 7. Vegetation Density Map of Pangkep Regency

7) Topography

Pangkep Regency consists of several areas with varying altitudes, where there are areas with altitudes of 0 – 20 meters above sea level, to areas with altitudes >300 meters above sea level. Most of the areas in the southern part of Pangkajene Regency are dominated by altitudes >300 meters above sea level. However, what is more dominant is in the eastern region with an altitude of 0 – 20 meters above sea level.

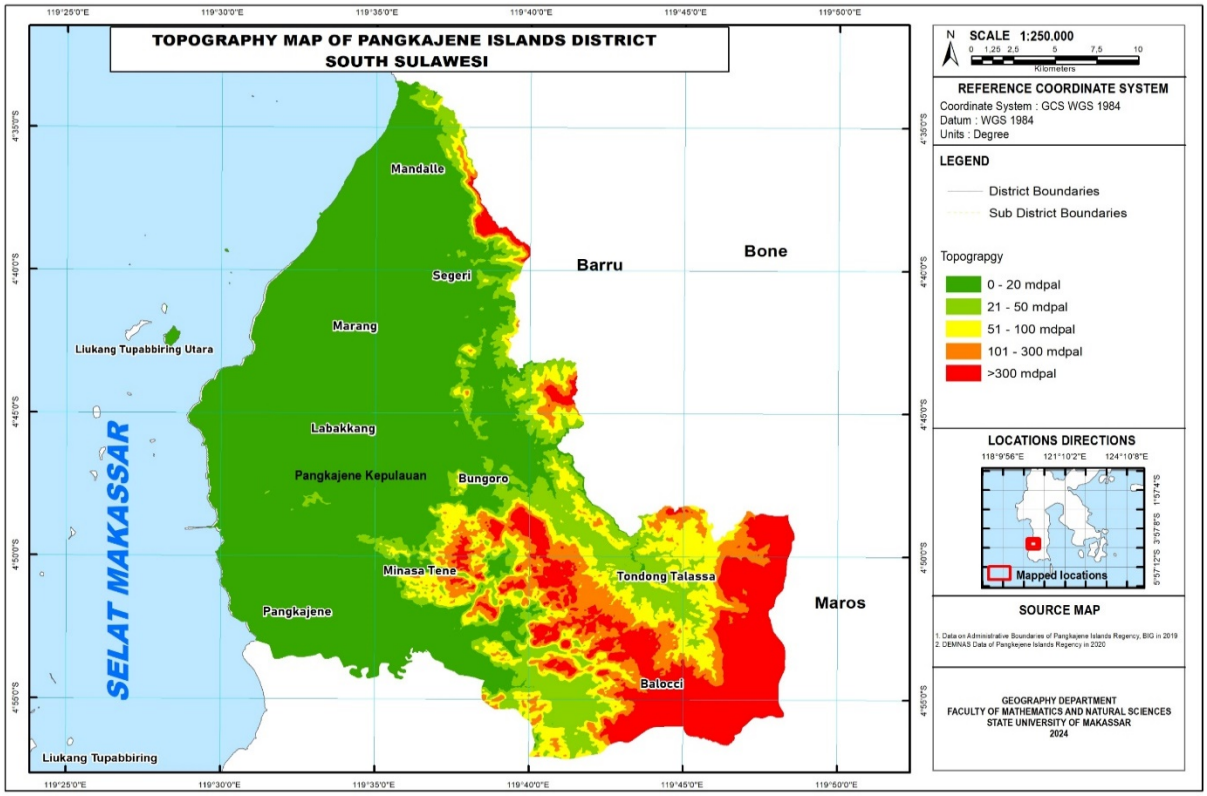

Figure 8. Topography Map of Pangkep Regency

Table 8. Topography of Pangkep Regency

No	Topography	Wide (Km^2)	Persentage(%)
1	0 - 20 mdpal	466,7349854	58,27%
2	21 - 50 mdpal	95,81970215	11,96%
3	51 - 100 mdpal	80,82360077	10,09%
4	101 - 300 mdpal	62,20299911	7,77%
5	>300 mdpal	95,42089844	11,91%
	Total	**801,0021858**	**100,00%**

Source: Data Analysis, 2024

8) Groundwater Potential

Groundwater potential in Pangkep Regency is spread out and divided into several classes, namely: very low groundwater potential, low class, medium class, high class, and very high groundwater potential. Most areas in Pangkep Regency have groundwater potential that is at a moderate level with a percentage of 60.26% of the total existing groundwater potential, or there are around 476.4302954 square kilometers of areas that have groundwater potential at a moderate level.

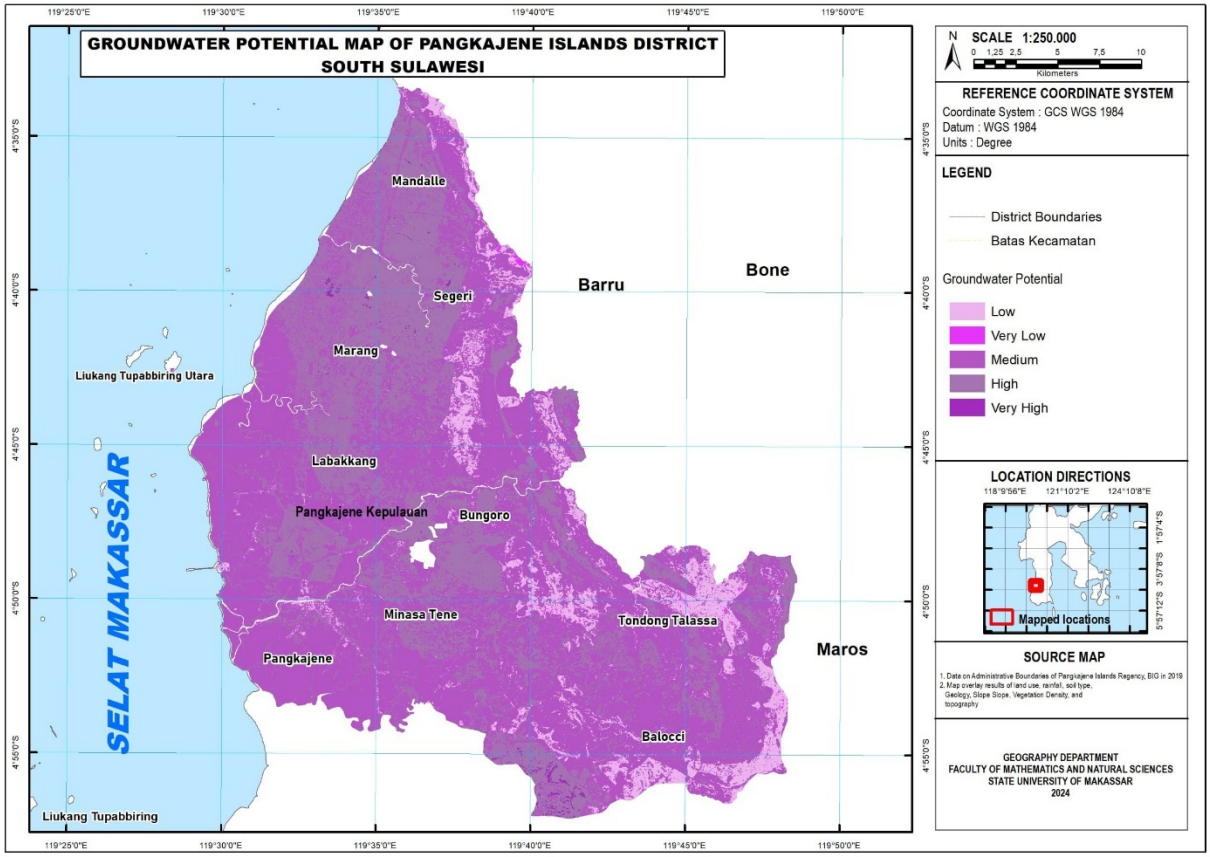

Figure 9. Groundwater Potential Map of Pangkep Regency

Table 9. Groundwater Potential of Pangkep Regency

No	Potensi Air Tanah	Luas (Km^2)	Presentase (%)
1	Rendah	64,19702757	8,12%
2	Sangat Rendah	1,614815277	0,20%
3	Sedang	476,4302954	60,26%
4	Tinggi	245,0674676	31,00%
5	Sangat Tinggi	3,313310467	0,42%
	Total	**790,6229163**	**100,00%**

Source: Data Analysis, 2024

B. Discussion

Pangkep Regency has the potential for groundwater in every region. The groundwater potential map that has been created shows that several sub-districts in Pangkep Regency have different levels of groundwater potential. Based on the results of the analysis that has been carried out, the results obtained are that Pangkep Regency as a whole has a moderate level of groundwater potential, this can be seen from the percentage of 60.26% of the total area of Pangkajene Regency or around 476.4302954 km2 which has high groundwater potential. currently. Meanwhile, areas that have low groundwater potential have a percentage of 8.12%, while very low groundwater potential has a percentage of 0.20% with an area of around 1.614815277 Km2. The high groundwater potential can be seen with a rate of 31.00%, while the level of very high groundwater potential is 0.42%. So it can be seen that the presence of groundwater potential in Pangkep Regency tends to be at low to high levels.

Several areas that have groundwater potential are in the Tondong Talassa, Minasa Tene, Pangkajene, and Bungoro sub-districts. Meanwhile, areas that have low levels of groundwater potential are in the Segeri, Ballocci, and Tondong Talassa sub-districts. Meanwhile, very high groundwater potential is found in the Mandalle, Marang, and Labakkang sub-districts.

The potential presence of air is determined by several variables that can influence, including;

1) Land Use

Land use is an important factor in efforts to analyze groundwater potential in Pangkep Islands Regency. The Pangkajene Regency Land Use Map can be produced by utilizing land cover data from the Ministry of Environment and Forestry. Based on the results of the analysis that has been carried out, it is known that in Pangkajene Regency land use is dominated by rice fields with an area of 206.2910004 Km2 or 23.43% of the total land use of Pangkajene Regency.

Land use greatly influences the groundwater potential in Pangkep Regency. Land use influences infiltration capacity. For example, residential land types will have a low infiltration capacity because the surface material is impermeable to water, which is different from types of bush/shrub land use where infiltration occurs easily (Sulaiman et al., 2017).

2) Rainfall

The average annual rainfall in the Pangkep Regency area is around 2000 mm to 3500 mm/year. Rainfall is a factor that also plays an important role in efforts to analyze groundwater potential in Pangkep Regency. This is because rain is part of the hydrological cycle on the earth's surface. The environment has the same carrying capacity for rainfall, with water absorption becoming greater if the rain occurs over a long period (Kholis & Rendra, 2022).

Based on the rainfall map that has been created using the interpolation method, IDW found that rainfall in Pangkep Regency consists of low rainfall levels (2000 – 2500 mm) to medium (2500 – 3000 mm) and high rainfall levels (3000 – 3500mm). However, it can be seen that the level of rainfall in Pangkajene Regency is dominated by low levels with a percentage of 49.62% or an area of around 397.381012 Km2 of the total area of the region. Rainfall in Pangkajene Regency has a major contribution to recharging the aquifer and increasing groundwater availability. The more rain that reaches the ground surface, the higher the possibility of groundwater formation.

3) Soil Type

Soil is the first medium through which water passes, which can come from surface flows or water that comes from precipitation. Soil types in each region have different conditions, different conditions will cause the soil properties in each region to also be different (Sulaiman et al., 2017). The different soil properties referred to include the infiltration capacity of the soil, as well as the soil's ability to store water. The type of soil in Pangkajene Regency shows a significant relationship with the groundwater potential in the area.

Based on the soil types that have been created using data on world soil types by the National Land Agency (BPN), it can be seen that Pangkajene Islands Regency has various types of soil, namely Alluvial, Andosol, Latosol, Mediteran, and Regosol. Pangkep Regency itself is dominated by Alluvial soil with a percentage of 44.65% or an area of around 397.5110036 Km2. Soil types that have high permeability will cause more water to enter the soil and less water to flow over the surface.

4) Geology

The geological conditions in Pangkep Regency, based on the map that has been made, contain six geological formations, namely igneous rock formations, volcanic rocks, intrusive rocks, marine sedimentary rocks, alluvium deposits, and intermediate and alkaline. Geological conditions will influence existing groundwater levels because lithological or rock characteristics can influence infiltration rates by contributing to grain size, porosity-permeability, and clay minerals in the soil (Yangga, 2016).

The Alluvium deposit formation is the formation that dominates the rock type in Pangkep Regency with a percentage of 48.29% or an area of around 385.256012 Km2 of the entire area. Alluvium was formed in the Holocene age, consisting of mud, sand, and gravel, which is loose material, generally located in areas of flood runoff and riverbanks. Geological conditions in deposit areas generally have a high level of porosity due to the variety of materials carried by river currents. High porosity will cause the level of infiltration in the area to be higher (Sulaiman et al., 2017).

5) Slope

Slope is the next factor considered in analyzing groundwater potential in Pangkep Regency. The slope map was produced using DEMNAS BIG data from Pangkajene Regency. Based on the slope map, it can be seen that Pangkajene Regency is an area that has a variety of slopes. Pangkep Regency is dominated by areas with flat slopes with an area of around 462.6966113 Km2 or a percentage of 57.77% of the total area of Pangkajene Regency. The slope of the slope greatly influences the size of the groundwater potential of an area. If the slope becomes greater, the volume of surface runoff increases and infiltration becomes smaller (Badwi, 2024).

6) Vegetation Density

Kerapatan vegetasi menunjukkan hubungan erat dengan potensi air tanah di wilayah tersebut. Peta Kerapatan vegetasi diperoleh dari data citra satelit sentinel 2. Data citra ini kemudian diolah dengan tahap NDVI untuk mengetahui bagaimana tingkat kerapatan vegetasi Kabupaten Pangkajene. Kerapatan vegetasi berperan penting terhadap potensi air tanah. Oleh karena vegetasi yang rapat dapat mengurangi aliran permukaan, bahkan menambah infiltrasi. Semakin banyak tumbuhan, dan semakin rapat vegetasi suatu wilayah maka sumber air tanahnya juga semakin besar (Baharuddin, 2023)

Kerapatan vegetasi di Kabupaten Pangkajene Kepulauan cukup beragam di beberapa wilayahnya, dimulai dari kerepatan vegetasi sangat renggang, renggang, rapat, sedang, rapat hingga sangat rapat. Dari hasil analisis pada peta tersebut dapat diketahui bahwa pada wilayah ini kerapatan vegetasi didominasi dengan tingkat kerapatan yang renggang dimana memiliki luas sebesar 215,7039948 Km2 atau dengan presentase 26,85 %. Sementara wilayah dengan tingkat kerapatan vegetasi yang sangat rapat hanya 4,62 % atau dengan luas sekitar 37,0848999 Km2.

7) Topography

Altitude is the last factor that is also important in the analysis of groundwater potential in Pangkep Islands Regency. The altitude map or often called a topographic map was produced using DEMNAS BIG data from Pangkajene Regency. From the results of the map analysis, it can be seen that this area is dominated by height (0 – 20 meters above sea level) with an area of around 466.7349854 Km2 or a percentage of 58.27%. Areas with low altitudes, such as coastal plains and valleys, easily fill aquifers and support groundwater availability, whereas areas with higher altitudes, such as hills, tend to have faster surface flow and lower infiltration, so their contribution to groundwater replenishment is greater. limited.

8) Groundwater Potential

In general, groundwater sources in PangkepIslands Regency are still able to meet the needs of the community, both for domestic and agricultural purposes. However, along with the increase in population and the rate of growth, the rate of utilization of the sources also increases (Hikma, 2023). The groundwater potential in Pangkep Regency is in the medium class. This condition must be maintained so as not to reduce the class to low or even very low. The groundwater potential map is the result of an overlay of several variables that influence the condition of groundwater potential in an area, including; Land use, rainfall, soil type, geological conditions, slope, altitude, and vegetation density.

Based on the results of the analysis that has been carried out, it can be seen that the factors that greatly influence the groundwater potential in an area are land use and vegetation density. Land cover influences surface runoff and groundwater recharge. Vegetation inhibits surface runoff, thereby increasing water retention time and increasing infiltration. Built-up land can inhibit surface runoff but does not allow infiltration, so built-up land is not a potential area (Putra, 2018).

4. CONCLUSION

The Pangkep Regency has groundwater potential across its regions, with varying levels of potential in different sub-districts. According to a groundwater potential map, the regency overall has a moderate level of groundwater availability. Specifically, 60.26% of the total area, approximately 476.43 km², is classified as having a high groundwater potential. Areas with low groundwater potential make up 8.12%, while those with very low potential account for 0.20%, covering around 1.61 km². The region with high groundwater potential stands at 31.00%, and very high potential is observed in 0.42% of the area. Overall, the groundwater potential in Pangkep Regency ranges from low to high. Overall, groundwater sources in the Pangkep Regency are currently sufficient to meet the needs of the community for both domestic and agricultural purposes. However, as the population grows and development progresses, the demand for these groundwater sources is also increasing (Hikma, 2023). The groundwater potential in the regency is classified as medium, and it is crucial to maintain this status to prevent it from declining to low or very low levels. The groundwater potential map is derived from the overlay of various factors that affect groundwater conditions in the area, including land use, rainfall, soil type, geological conditions, slope, altitude, and vegetation density.

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