Spring Distribution Mapping in Tembuku District, Bali, Indonesia

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Abstract. In 2019, several villages in Tembuku District experienced a shortage of clean water during the dry season. In general, Tembuku District is located in the highlands, with high rainfall, and as a buffer area for clean water in the Province of Bali, there should be abundant springs. This study aims to spread the springs in Tembuku District in order to know the absolute location of the springs and to know how to use their springs. The method used is descriptive and qualitative, with interviews to find information on the number of springs and field surveys to obtain the absolute location coordinates of the springs using a GPS device. The data analysis method is a qualitative descriptive analysis method that analyzes data to describe the data in real terms. The results obtained from this study there are 9 (nine) springs from 6 (six) villages in Tembuku District, most of which are in the lowlands and buckling slopes with inadequate access. Visually, the springs in Tembuku District have a reasonably large discharge and may be used as a supplier of air for the surrounding area. 6 (six) as drinking water, 3 (three) as irrigation, and 1 (one) as a public bath. From the results of these uses, there are still many springs that have yet to be utilized optimally by village officials and related agencies because the topographical conditions at the location of the springs are on an undulating slope and lower than the Tembuku District area.

Keywords: Spring, Use of Spring, Tembuku District

1. Introduction

Tembuku District consists of 6 (six) villages, namely Peninjoan Village, Jehem, Tembuku, Yangapi, Undisan, and Bangbang Village. In general, the altitude range of the Tembuku District is between 320 – 920 m above sea level or highlands [1]. The slope conditions of Tembuku District are divided into sloping and undulating areas which have However, there are As a conservation and buffer area, the highlands of Tembuku District can supply water to parts of southern Bali. Still, several villages in Tembuku District are experiencing a water crisis [2]. fluvial landforms.

Fulfillment of the clean water needs of the community in Tembuku District is carried out with a piped and non-piped system. The provision of clean water on a small scale in rural areas that are not accessible by PDAMs is partly managed by village institutions (PAMDes). The PDAM carries out the piping system, but there are still villages that the PDAM needs help to reach to distribute clean water.

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The rainfall distribution in Tembuku District is relatively high, covering the north and getting lower towards the region's south. Apart from heavy rainfall, Tembuku is also close to Batur Volcano in Kintamani District and Mount Agung in Karangasem Regency. The entire area of Bangli Regency from the northern part of Bangli City to the north, including Tembuku District, is a water catchment area that fills the Groundwater Basin (CAT) of the Sarbagita Regency/City area, including the southern Bangli Regency (Dep. ESDM). This condition places Tembuku District in an important position in the context of water power and has the potential for scattered springs.

The condition of high rainfall and the origin of the fluvial landform in Tembuku District should be able to save the abundant distribution of springs and can be utilized optimally. Based on this, it is essential to map the distribution of springs in Tembuku District so that it can be used as a reference in community utilization for the fulfillment of clean water in Tembuku District, which is experiencing drought. This study aims to map the distribution of springs and the use of springs in Tembuku District.

2. Methods

The study is located in Tembuku District, Bangli Regency has several stages of study. The first stage of the literature study method is collecting data from reference articles and modules that are relevant to the object of the problem of mapping the distribution of springs. The second stage is the stage of the field observation method using a GPS Handheld tool to get the coordinates of the springs. The observation method is the survey stage for data collection by conducting research directly at the village office in Tembuku District first to find data on the name of the spring, the number of springs, and the location of the springs. After the survey stage to the village office, it was followed by a direct survey to the location of the springs to obtain absolute coordinates of the springs using GPS Handheld. Each of these coordinates is stored and processed at the mapping stage in the ArcGIS mapping application. The third method is interviews with village officials and the community to seek information on the use of springs in Tembuku District. The analysis stage was carried out to determine what caused the drought that hit the village in Tembuku District.

3. Results and Discussion

The Tembuku sub-district is a highland area with an altitude range of 320 – 920 m above sea level [1]. Tembuku District is divided into six villages, including, Tembuku, Yangapi, Undisan, Jehem, Bangbang, and Peninjoan villages. As a conservation and buffer area, the highlands of Tembuku District can supply water to parts of southern Bali. The results are the total number of springs in Tembuku District, which are spread over all villages, including Jehem Village, which has 22 springs. Tembuku Village 16 springs; Yangapi Village 5 springs; Undisan Village 12 springs; Peninjoan Village 14 springs Bangbang Village with 6 springs. Researchers chose to take 1-2 samples of springs to get the distribution of springs in all villages because they saw the recommendations of village officials from potential springs. Each village.

Visually, the spring discharge in the research area has the potential to become a daily water supplier [3], [4],. When viewed from the topography, most springs are located on buckling slopes and in the lowlands, where access to the springs is still relatively inadequate. The steep area makes it difficult to drain water to reach residents' housing with a gravity system. However, most can be with a pump system but must consume more electricity. The second result is knowing the use of springs by interviewing village officials and the community [5].,[6], So there are four categories of use of springs: drinking water, irrigation, religious ceremony facilities, and public baths. Data from field surveys and interviews on the distribution of springs can be seen in Table 1, and the results of visualization into maps can be seen in Figure 1.

Table 1. Distribution of Springs in Tembuku District

No	Village	Spring Name	Coordinate		Utilization	Amount
			X	Y		
1	Jehem	Galiran	115.369486	-8.419846	Drinking Water and Irrigation	2
		Tambahan Kelod	115.370856	-8.467909	Religious Ceremonies and Irrigation	
2	Tembuku	Beji 1	115.382743	-8.439729	Drinking water and irrigation	2
		Beji 2	115.381874	-8.441290	Drinking water and irrigation	
3	Yangapi	Gerubug	115.387397	-8.416773	Irrigation	2
		Bebagan	115.371330	-8.378396	Drinking water	
4	Undisan	Undisan	115.400021	-8.444945	Drinking water	1
5	Peninjoan	Alastapa	115.398700	-8.410616	Religious Ceremonies and Drinking Water	1
6	Bangbang	Dari	115.405556	-8.447222	Drinking water and bath	1
Number of Springs						9

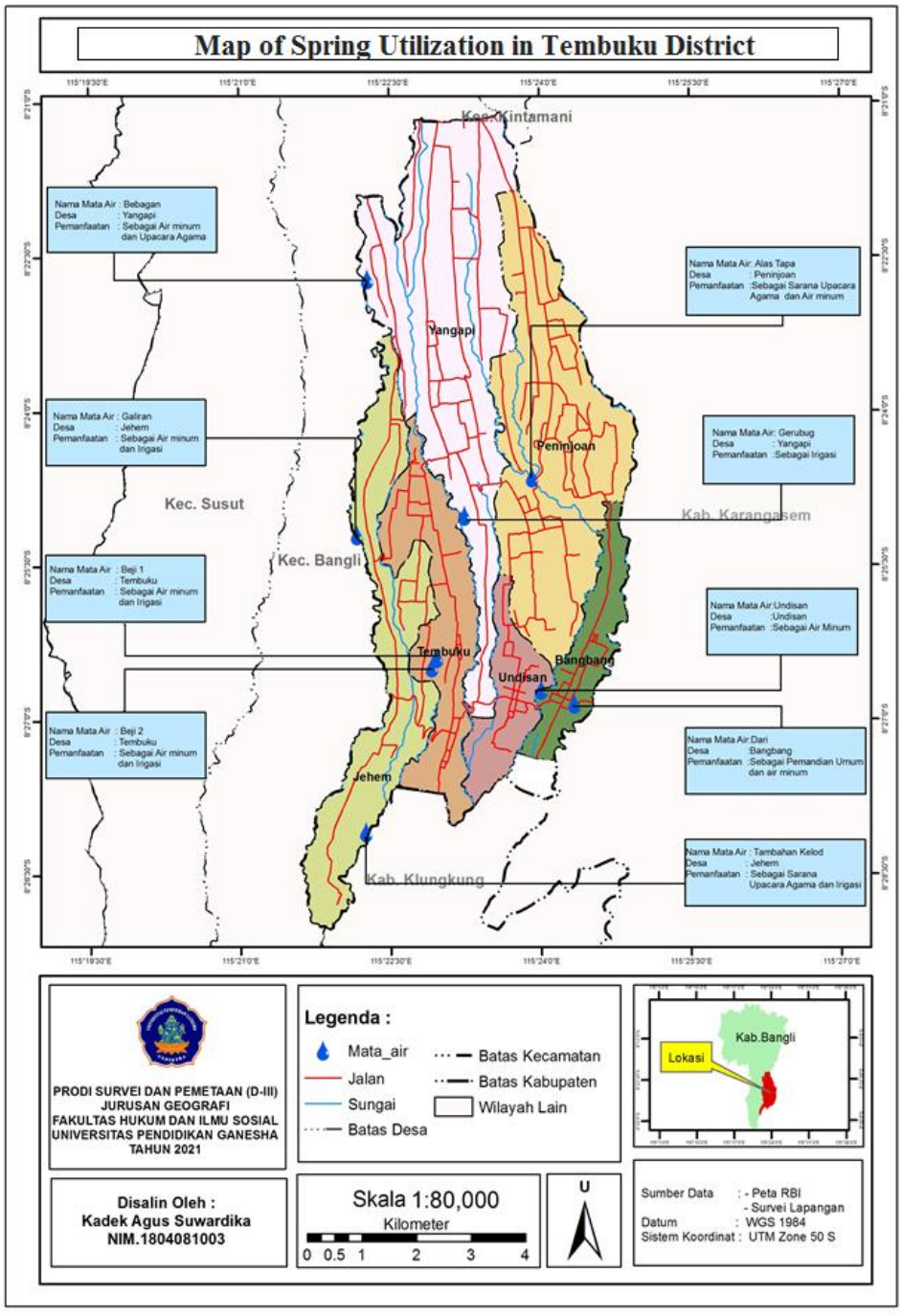

Figure 1. Map of Spring Utilization in Tembuku District

4. Conslussion

The springs in Tembuku District are spread evenly in all villages with their respective numbers, namely, in Jehem Village, there are two springs, namely Galiran Spring and Kelod Supplementary; in Tembuku Village, there are two springs, namely Beji 1 and Beji 2 springs; in Yangapi Village, there are two springs, namely Gerubug and Bebagan springs. In Undisan Village, there is one spring, namely Indian springs. In Peninjoan Village, there is one spring, namely Alastapa spring, and in Bangbang Village, there is one spring, namely spring water. The total number of springs surveyed is nine springs. Of the nine springs, the topography of the springs is mainly in the lowlands, located on buckling slopes and with inadequate access to reach the springs.

Only 30% of springs have been used effectively by village officials, especially PAMDES, and the remaining 70% has yet to be used effectively by village officials or local government. This is due to the topography of the springs on the buckling slopes, lower plains with undulating slopes, and inadequate access From this, it can be concluded that the cause of the drought in several villages in Tembuku District, such as the issues and news in 2019, was not caused by a lack of potential springs but was caused by the ineffective use of village officials and local governments regarding the distribution of springs that have been widely used. Spread in all villages in Tembuku District. Suggestion : 70 percent of the springs in Tembuku District are not utilized and are wasted into the sea. It is hoped that the Bangli Regency drinking water company will take over the management of these water sources and distribute them to other areas that still lack clean water.

5. References

[1] Badan Pusat Stastistika Kabupaten Bangli (2020) 'Kabupaten Bangli Dalam Angka 2020'.

[2] Tribun News Bali. 2019. Musim Kemarau, 6 dari 15 Banjar di Desa Yangapi Bangli Belum Teraliri Air https://bali.tribunnews.com

3] Langgeng, D., Santosa, W. and Si, M. (2006) 'Kajian hidrogeomorfologi mataair di sebagian lereng barat gunungapi lawu', 20(1), pp. 68–85.

[4] Ashari, A. and Widodo, E. (2019) 'Hidrogeomorfologi Dan Potensi Mataair Lereng Baratdaya Gunung Merbabu', Majalah Geografi Indonesia, p. 48. doi: 10.22146/mgi.35570.

[5] Sallata, M. K. (2015) 'Konservasi dan Pengelolaan Sumber Daya Air Berdasarkan Keberadaannya sebagai Sumber Daya Alam', *Info Teknis EBONI*, 12(1), pp. 75–86. *Available at:*

[6] Haryono, E. and Adji, T. N. (2017) 'Geomorfologi Dan Hidrologi Karst'. doi: 10.31227/osf.io/7jtgx.