Assessment of communities’ water springs in Gowa Regency, South Sulawesi Province, Indonesia

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Abstract. Water is a vital component for living, but its distribution is uneven and becomes hard to obtain in some places. Generally, people use water sources from PDAM, rivers, wells, and springs. Springs are often used as a source of water which are used by the community. Unfortunately, the spring and its surrounding area are often disturbed, and their function is changed. Even though several activities have shifted the land cover around the spring area, it affects the spring's water quality. The study aims to find out the condition of the springs which are used by the people at Gowa Regency. The data was collected through a survey, and the spring sampling was carried out purposefully. Furthermore, the data were analyzed descriptively. The study showed that springs are still an important source of water for rural communities. The results showed that the water quality of springs was feasible for household and other purposes. We found that the community seemingly has low awareness of preserving the spring. The area around the spring has been disturbed by community activities that are prone to polluting the springs.

1. Introduction
Spring water is groundwater that emerges naturally at the earth’s surface, it flows in enough volume water to make a poll or stream river. Springs are concentrated discharge of groundwater that emerges on the ground as a water stream [1]. A water spring is a visible flow of water releasing through a natural opening in rock or soil [2]. Similarly, [3] defined spring as a location at the land surface where groundwater discharges from the aquifer, creating a visible flow.

Spring water function as an aesthetic of landscape [4] and support to make unique ecosystem due to became the habitat of flora [4-6] and fauna [7-9]. Besides that, [10] and [11] stated that water springs have an essential role in human life and culture for long decades. It can be seen from the existence of an ancient legend (myth) about the spring [12]. Historical evidence also showed that humans in the past built their settlements around springs [13, 14]. In addition, some villages and towns have been built and developed around the springs [11, 15, 16].

In Indonesia, people have used water springs to fulfill their needs, such as drinking water [17, 18], household [19-21], agriculture [20-24], livestock [22, 25, 26], and fishery [22, 23]. Springs also have been used for tourism [27-29], small industry [22, 30], and big industry, such as bottled spring water industry [31]. Another form of spring usage in Indonesia is as a sacred place and it plays a role in cultural rituals [20, 32, 33].
In some places, springs were found well maintained and preserved due to the various forms of utilization and the importance of the role of springs to human life [20]. However, a huge number of springs were poorly maintained and threatened its water quality due to natural factors and human activities [10, 34]. Therefore, this study aims to determine the condition of the springs used by the community in Gowa Regency, South Sulawesi Province.

2. Method

2.1. Research location
The study was conducted in several hamlets, administratively located at six villages in three sub-districts, Gowa district, South Sulawesi province. Namely (1) Parangtanggayya hamlet, Sicini Village, (2) Pallantikang hamlet and (3) Gallang hamlet, Bilanrengi village, Parigi sub-district, (4) Tonasa village and (5) Malino village, Tinggimoncong sub-district, (6) Ma’lenteng hamlet, Erelembang village, (7) Balangbuki hamlet, Tonasa village, Tombolopao sub-district. The data was taken in August 2020.

2.2. Materials
This study used a pH meter, TDS meter, thermometer, roll meter, smartphone (stopwatch and GPS), and tally sheet.

2.3. Procedure

2.3.1. Data collection. This study used secondary and primary data, which was collected using several methods. Secondary data consisted of preliminary data about water springs, which is used by the community. Furthermore, primary data about the physical and chemical parameters of the springs’ water, and the environmental condition around the springs, were collected through surveys and observations. We also collected primary data by interviewing nine key informants to gather information about the location of the springs, the ownership, and the management of the springs.

2.3.2. Method. Preliminary data related to location of water spring that was used by community in several villages in Gowa regency, South Sulawesi province were collected from Balai Pengelolaan Daerah Aliran Sungai dan Hutan Lindung (BPDAS-HL) Jeneberang Walanae, Dinas Pekerjaan Umum Kabupaten Gowa, and Balai Besar Wilayah Sungai (BBWS) Pompengan-Jeneberang Kabupaten Gowa. The data was selected purposively to choose water springs samples. The snowball sampling method was used to interview key informants to gather location information of springs’ water.

Data of springs’ water conditions were collected through surveys and direct measurements on various physical parameters of water quality, it refers to [35]. This study measured physical parameters of water such as (1) odor were measured organoleptically, by taking and smelling water from each spring sample, (2) water turbidity was measured visually, and it was classified into three categories, namely clear, slightly cloudy, and cloudy, (3) water temperature was measured using a water temperature, and (4) total dissolved solids (TDS) was measured using a TDS meter.

In addition, current water discharge was measured using the volumetric method. Water discharge of springs was measured directly by holding the flow of water in a mineral water bottle. We recorded the time consumption of the water to fill the bottle. The flow rate of the springs is classified based on Meinzer's spring classification [36].

Other physical parameters, such as water availability throughout the year and estimation of water discharge changes, also were collected. This information was collected through interviews with key informants. Data regarding the condition of the surrounding environment is also collected through direct observation, for instance, altitude, the status of spring location, type of land use, condition of land cover, and vegetation that grows around the springs.

In addition, information about water spring ownership and its management of the springs by the local community was also gathered, including the various forms of use of the springs and conservation efforts.
undertaken by the local community. This information was collected through observations and interviews with key informants.

2.3.3. Data analysis. Data of water discharge were analyzed using the volumetric method, according to the formula (1):

$$ Q = \text{Water volume} / \text{time} $$

Remark: $Q =$ water discharge

Data from the survey, observation, and interviews were tabulated and analyzed descriptively. Water quality data were analyzed descriptively by comparing data within the requirement of regulations. We used physical and chemical parameters listed in several regulations to analyze water quality as drinking water. It refers to [37], [38], and [39]. In addition, [40] was also used to compare water quality from springs for tourism activities. The comparison of the quality of the springs can be seen in table 1.

Table 1. The water physical and chemical examination of the spring water.

| No. | Parameters       | Unit                | Water quality standards for tourism | Water quality standards for drinking water |
|-----|-----------------|---------------------|-------------------------------------|---------------------------------------------|
|     |                 |                     | Class II                           | Class I                                     |
| A   | Physics         |                     | GR 22/2021¹                      | HMR 32/2017³                              |
| 1   | Temperature     | °C                  | Deviation 3                        | 15 - 35                                    |
| 2   | Smell           | organoleptic        | (--)                               | (--)                                       |
| 3   | Taste           | organoleptic        | (--)                               | (--)                                       |
| 4   | Clarity         | m                   | 1.6                                | (--)                                       |
| 5   | Total Dissolved | Solids (TDS)        | 1000                               | 1000                                       |
| B   | Chemicals       |                     | GR 22/2021¹                      | HMR 492/2010⁴                             |
| 1   | pH              |                     | Deviation 3                        | 6 - 9                                      |

Sources:
¹Government Regulation Number 22/2021 [37]
³Health Ministry Regulation Number 32/2017 [40]
⁴South Sulawesi Governor Regulation Number 69/2010 [39]
⁵Health Ministry Regulation Number 492/2010 [38]

3. Results and Discussion

3.1. Water springs characteristic

Results of observations on water springs characteristic area according to the altitude, mean discharge, Meinzer classification, variability of discharge, water level, and permanence of springs in the study site are shown in table 2.

Table 2. General characteristics of freshwater springs at the research location.

| Name of springs       | Name of hamlets /village/sub-district. | Latitude and Longitude | Altitude (m. asl) | Mean discharge (m³/s) | Meinzer Classification | Discharge variability at dry season | Water level (cm) | Permanence |
|-----------------------|----------------------------------------|------------------------|-------------------|-----------------------|------------------------|-------------------------------------|------------------|------------|
| Kayu Arraya           | Parangtangayaya/ Siciu/ Parigi          | 05° 19’ 12,687” LS     | 997,6             | 0.013                 | IV                     | 30%                                | 4                | Perennial  |
|                       |                                        | 119° 48’ 8,685” BT     |                   |                       |                        |                                    |                  |            |
|                       |                                        |                        |                   |                       |                        |                                    |                  |            |
| Panyangkalang         | Pallantikang/ Bihanrengi/ Parigi        | 05° 18’ 1,584” LS      | 902,2             | 0.003                 | V                      | 0%                                 | 8                | Perennial  |
|                       |                                        | 119° 50’ 46,696” BT    |                   |                       |                        |                                    |                  |            |

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It can be seen that the springs in the study area are located at 900-1598 meters above sea level. The springs have various discharges, and the community utilized springs that flow throughout the year.

3.2. Water quality
This study also observed various physico-chemical parameters that can indicate the quality of water emitted by springs. The results of observations regarding the physical and chemical parameters of freshwater springs at the study site can be seen in table 3.

Table 3. Physico-chemical quality of water springs at the study site.

| Name of springs | Smell         | Clarity | Temperature (°C) | TDS (ppm) | pH       |
|----------------|---------------|---------|------------------|-----------|----------|
| Kayu Arraya    | No smell      | Clear   | 23° - 25°        | 10        | 7.5 – 7.8|
| Panyakalang    | No smell      | Clear   | 24° - 25°        | 63        | 7.3 – 7.6|
| Gallang        | No smell      | Clear   | 23° - 26°        | 36        | 7.8 – 8.0|
| Tonasa         | No smell      | Clear   | 23.1             | 25        | 6.7      |
| Lembah Biru    | No smell      | Clear   | 21.6             | 58        | 9        |
| Lembah Ungu    | No smell      | Clear   | 24.6             | 51        | 8.7      |
| Patene         | No smell      | Clear   | 21.6 – 22.6      | 19        | 8        |
| Usman          | No smell      | Clear   | 23 – 23.5        | 31        | 7.5 – 7.8|
| Bontotanga     | No smell      | Slightly cloudy | 24.6      | 29        | 8.0      |
| Samaenre       | No smell      | Clear   | 19.5 – 21.1      | 44        | 8        |
In general, table 3 shows that the water flowing from the springs used by the community has good quality and condition, and it is was suitable for prolonged use.

3.3. Utilization, utilization technology, and management of springs
This research observed utilization and management of springs, application of technology, and condition around the water spring. The result of the study shows in table 4.

| Name of springs | Status of area | Ownership | Land use type | Condition of land cover | Vegetation around the springs | Utilization and management | Threat |
|-----------------|----------------|-----------|---------------|------------------------|--------------------------------|-----------------------------|--------|
| Kayu Arraya     | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Big trees such as banyan, ficus, jabon. Mixed garden of corn, combined with coffee, and cocoa, or combined with trees such as bayam jawa and toona. | Drinking, households, used by two hamlets (Parangtangganyya and Pattiroang). Reservoirs used house foundation. Water distributed to residents’ houses using pipe | Mixed garden, fields, pesticides, and fertilizers |
| Pannyangkalang  | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Bauhinia, gmelina, and sengon. Mixed garden: coffee, mahogany, beechwood gmelina, maha’, durian, bayam jawa, dedak, and cocoa. | It was used for drinking but now for agriculture | Mixed garden, fields, pesticides, and fertilizers |
| Gallang         | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Bamboo, pine, ficus, cempaka, breadfruit, and Indian-coral tree. Mixed garden: coffee, bamboo, banana, pine, ficus, cempaka, Indian-coral, and wohá’. | Drinking, MCK, agriculture. Used by 2 hamlets (Gallang and Pallantikang). Reservoir using box construction with lid, support by NGO. Retribution for maintenance and apparatus | Mixed garden, pesticides and fertilizers |
| Tonasa          | Outside protected area | Private | Areal for Other Purpose (APL) | Rarely | Fields: carrot fields, green onion fields, banana, bamboo, and shrub. | Households, agriculture | Fields, pesticides and fertilizers |
| Lembah Biru     | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Secondary forest, mixed garden. Bamboo, pine, banyan, ficus, cabbage, tomato chili, and sweet potato. | Tourism (swimming pool), household | Landslide |
| Lembah Ungu     | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Pine tree, pakis fern, ficus, bamboo, and coffee. | Tourism, household, Reservoir using construction and pipeline for distribution | |
| Pa’tene         | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Pine, suren toona tree, ficus, and banyan. | Low discharge, only for 7 households in the rainy season but 2 households in the dry season | |
### 3.4. Quality of springs water

According to [37], the quality of water springs used by the community was feasible for drinking water usage based on some parameters. The water fulfilled physical standards (temperature, clarity, smell, taste, and TDS) and chemical standards (pH) that are required by regulation to use as drinking water (water quality class I) or another purpose such as a water recreation infrastructure/facilities, fish, farming, and irrigating crops (water quality class II, III and IV). The water of springs also fulfilled water quality standards according to [40] regarded using water objects for tourism. However, according to [39] and [38] one spring has an alkalinity level above the threshold.

### 3.5. Utilization of water springs

Springs play an important role in communities' lives at the research location. Springs are the main source of clean water for the communities. People in this area use the springs' water for drinking water, household, drinking water for livestock, and irrigating agricultural and plantation.

The research location has high rainfall with undulating contours, so it has many springs. However, several factors have influenced the community in choosing a spring as a water source. Firstly, continuity of water availability throughout the year is fundamental and it becomes a concern for the community in selecting springs. Residents preferred to search and use springs that flow throughout the year and ignore springs that only flow during the rainy season. It can be seen that residents used water springs with small discharges (e.g., springs with discharges classified as class VIII) and decreased discharge during the dry season but flows throughout the year.

Secondly, the distance from springs to residential areas. Residents choose to use springs that are closer to their homes than those that are farther away. Mainly found on residents who used springs on their initiative and used private infrastructure. Utilization of springs near people's homes will reduce costs, for instance, buying of hose/pipe to drain water. In addition, residents will ease to control, maintain and clean pipe and water spring infrastructure.

Thirdly, the amount of water discharge. If there are several springs with different discharges, residents will choose springs within enormous water discharge than springs within slight water discharge. However, in spring with low discharge and insufficient to fulfill the residents' needs, they sometimes gathered water from several springs into one large reservoir. The size of the spring discharge

| Name of springs | Status of area | Ownership | Land use type | Condition of land cover | Vegetation around the springs | Utilization and management | Threat |
|-----------------|----------------|-----------|---------------|-------------------------|-------------------------------|-----------------------------|--------|
| Usman           | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Salak, banana pandanus, ficus, banyan, fern, pine, spurge, toona suren, and bayam jawa. | There are 4 springs, using separately for a mosque, springs owners house, a relative of springs owner, and community | Reservoir using plastic sheeting |
| Bonto-tanga     | Outside protected area | Private | Areal for Other Purpose (APL) | Medium | Eucalyptus, clove, tea, coffee, pine, banana, and empty land. | Using until 2007. Now, only for agriculture. It was abandoned because the community used another spring. | Fields, mixed garden, pesticides, and fertilizers Not maintained and dirty |
| Samaenre        | Outside protected area | Private | Areal for Other Purpose (APL) | Rarely | Carrot fields, green onion, elephant grass, and potato. | Used by 3 hamlets (Balangbuki, Mangottong, Buki), agriculture Reservoir using box construction with lid, support by NGO | fields, pesticides, and fertilizers |
also affects utilization and the number of residents who utilized the spring. Springs with small discharges only have limited use forms, such as drinking water and household needs (cooking, bathing, and washing). This type of spring has a limited use that can only be utilized for a few households. Otherwise, springs with more significant discharges have more diverse forms of utilization. This spring type can be used for more households. Springs with more significant discharges are also used for various purposes, such as drinking, cooking, washing, bathing, livestock, watering crops and agricultural plant, irrigation, and tourism.

Another factor is the physical quality of water springs. Residents used simple standards to examine the physical quality of water springs. They used visual parameters by looking at the appearance of water and the organoleptic method by using their sense of taste. Residents will prefer to use springs with good physical quality, such as clean, colorless, odorless, and free from rubbish. The water of springs with a cloudy appearance or changing color will be avoided.

3.6. Utilization technology (water reservoir and distribution)
Residents in the study area used various levels of technology in utilizing springs. The simplest level is the direct use of water flow from springs without technology. In this case, the water from the spring is used directly without a reservoir, or the water is directly utilized for various needs. Good water quality and large discharge make the water usable without going through the processing and purification process. This simplest utilization was found in the Lembah Biru spring. The hotel used water of spring directly to fulfill their swimming pool.

The next level is using traditional technology. Residents flow the water that originated from the spring using bamboo sticks. The water is stored in a simple temporary reservoir made of only plastic tarpaulin, and then the water flows using a hose to residents’ homes. Like the simplest water utilization, traditional water distribution and storage technology are generally employed if the distance between the springs and residents’ homes are relatively close.

In addition, water utilization has also been carried out using several technologies that are still relatively simple. In this case, residents dam or collect water with various levels of technology. There are various forms of buildings that are used to stem the springs. The simplest form is residents just build a wall like a house foundation that cuts off the water flow. This wall dammed the water flow of the river from the spring on one side. Furthermore, the water flows through a simple pipe system to people’s homes. The next level of technology is utilizing a simple water reservoir, such as a reservoir in the form of container construction with a lid. These reservoir buildings have various sizes. Based on observations, larger storage structures are generally found in reservoirs built from NGO or government funds.

3.7. Management of spring waters
Utilization of springs requires reasonable management efforts to ensure sustainable use of springs. The management of springs and their water utilization includes several factors, namely (1) regulation of utilization, maintenance, protection, and preservation of natural resources, both water sources (i.e., springs) and rivers where water flows from springs, as well as the environment around the spring, (2) regulation of utilization and maintenance of water storage and distribution facilities, (3) regulation of water distribution and allocation and (4) management including organization/institution, and human resource.

At the research location, the management of springs can be classified as traditional to complex management. The criteria of classifications are shown in table 5.
Table 5. Management classification of spring waters in Gowa Regency.

| Management types | Criteria of classification |
|------------------|---------------------------|
|                  | Organization | Regulation | Apparatus | Leader |
| Traditional      | -           | Informal agreement | -         | -      |
| Simple           | -           | Informal agreement | -         | √      |
| Moderate         | -/√         | Informal/formal agreement | √         | √      |
| Complex          | √           | Formal        | √         | √      |

Remarks: - = not exist
√ = exist

The first type of traditional management is found in private management. In this management model, regulation of utilization and improvement of infrastructure facilities is only carried out privately.

The following form of traditional management is found in springs used communally by only a few households (< 10 families). In this management of the springs, there has not been any arrangement for utilization, maintenance for infrastructure, or systematized water distribution. This second type of traditional management also did not have a person in charge who is responsible for managing springs. Consequently, maintenance of infrastructure facilities is only carried out on personal initiative or based on a mutual agreement done informally. Distribution and the amount of water per household usage are also approved based on agreement and mutual understanding. Families who are running out of water can directly distribute water to their homes, so it can be said that this management requires a high level of tolerance, awareness, and kinship.

The third spring management can be classified as simple management, found in water springs for more households. The number of families that using the springs can reach from one to several hamlets. In simple management like this, management is still carried out by mutual agreement between hamlet or village communities. There is no spring management device or organization, so it requires the role of community leaders. Community leaders act as motivators, regulators, and managers.

The fourth form of spring management found in the research location is classified as moderate management. There is no institutional structure in the management of springs, but the only apparatus appointed by community initiative. Apparatus originated from community members and community leaders, but the number is limited according to the workload necessities in managing and maintaining water distribution facilities and reservoirs. They are in charge of regulating water distribution and maintain infrastructure and facilities.

The fifth form is still classified as moderate management, but this form is slightly more advanced than the four previous management forms. There is an institutional organization, but the structure and working methods are still relatively simple. This type has been sufficiently organized so that the manager holds greater responsibility than the other members. They are responsible for maintaining the condition of infrastructure and the streamlined distribution of water. They also act as initiators to mobilize the community to repair damaged facilities. In this form of management, the managers collect retribution used to maintain the facilities and reward the apparatus. This form can be found in the management of springs that receive assistance from NGOs or other donor agencies.

Another form is the management carried out by institutions that are classified as complex management. It is covered a large area, and its management is well structured. This kind of management is found in springs managed by local government-owned enterprises (PDAMs), which utilize springs as a source of raw materials. In this management, the community acts as the user while the government (PDAM) acts as a provider, such as maintaining the condition of the springs, assembling infrastructure, and distributing water.

3.8. Conservation and protection of springs and their environment

Many people do not realize that springs as one of the natural resources which is a vital component for human life. For rural communities who live in areas with abundant water, the vital role of springs is often overlooked. Springs and its water that generated by the springs is often considered as common resources and gifts of nature, which can be used freely without time and quantity restrictions.
The use of springs is often not supplemented by efforts to protect and preserve the springs and the surrounding environment. Similarly, this phenomenon is also found in the study site. The low level of public awareness of springs can be seen from the lack of resident concern toward the springs, which cannot be used anymore due to reduced discharge, dry up prematurely, or even permanently. Residents who use the springs prefer to find other springs rather than conserve the damaged springs.

The community seems to emphasize utilization without paying attention to the protection and preservation of springs and the surrounding environment. This condition is reflected in the management of springs, which emphasizes efforts to build and maintain infrastructure to ensure water availability and increase water discharge. However, they have less effort to maintain environmental conditions that can support water availability from springs.

The lack of attention and efforts to preserve the springs and its environment occurs in some management. For example, at the simplest level or in traditional management, we find poorly maintained and dirty springs. Residents seemingly shift the environment around the springs. Even though residents still use the springs. Furthermore, worse conditions can be found in springs that are not used. Abandoned springs are often not appreciated for their benefits. Though, abandoned springs play an essential role in irrigating vegetation and agricultural plants or crops or as a source of groundwater recharge that will spread out next spring.

Unfortunately, the lack of efforts to maintain the sustainability of springs and the surrounding environment is also seen in the management of springs with an institutional structure. Although the management has been organized and covers a broader scale, the management pattern is still emphasized on efforts to utilize water. For example, management used advanced technology and built better infrastructure to increase the utilization of water discharge. Management is also more focused on efforts to maintain this infrastructure. However, the community often neglects to maintain the condition of the springs to keep the water continues to flow with good quality. It can be seen that land cover change in the spring environment on a broader scope, for example, forests conversion into agriculture. People who utilize the spring are often unaware that spring is an essential ecosystem. Various information about springs, for example, each spring has its distinct characteristics, even from nearby springs, has not yet reached the public. Generally, the community did not realize that each spring is different and has physical and chemical characteristics. This kind of important information is often not recognized by the public so that people still carried out activities that cause changes to the springs and the surrounding environment. The community also does not realize that the existence and sustainability of springs are very dependent on the quality of the surrounding environment. They do not recognize that changes in the environment around the springs can threaten the sustainability of the springs. They were also not aware that using pesticides to increase the yield of agriculture affects the spring water because those activities pollute the water and damage their health. The various problems mentioned above require serious management efforts to solve these problems. These efforts can be made through increasing public awareness about the vital role of springs and the conservation environment around springs, especially elucidate community that a series of natural factors are interrelated or affect the springs. In addition, it is necessary to educate the public about items that can threaten the springs, such as the impact of using chemicals on the quality of the springs, which will affect their health due to consume spring water.

Based on field observations, a water storage building will protect water from garbage, litter, dirt, and animal disturbance. Meanwhile, other opened water springs storage were more easily contaminated with garbage. On the other hand, land cover and land use around springs threatened the water quality due to pesticides. Table 3 shows that most of the environment around the springs is threatened by mixed garden and agriculture activities.

Furthermore, another problem is the inadequacy of specific regulations concerning spring water. Indonesia already has several regulations to protect the environment, forests, natural resources, and water. These rules [41-44] and other regulations at lower levels, such as regulations at the regional level. However, compared to other countries such as Poland [45] and Florida-USA [46], these regulations purposed to protect enormous scope, not specifically protecting spring water. There are few specific
regulations regarding springs and low concrete actions to protect and conserve springs at the site level. Therefore, we need to introduce laws that protect springs and increase efforts to protect and conserve springs at the site level.

4. Conclusion
Springs play an essential role in human lives. Therefore, people used springs in various forms, traditions of utilization, and management. However, people often ignore the sustainability of the springs. It can be seen from the neglect of the springs, the existence of various activities that affect the springs and environment around the springs, and the lack of conservation efforts to preserve the springs.

People often do not realize that various forms of activities carried out in order to fulfill their daily needs, such as clearing forest land into agricultural and plantation, as well as the use of pesticides, fertilizers, and other chemicals to increase agricultural yields, have a negative impact on the sustainability and quality of springs. Therefore, it is necessary to increase public awareness about the vital role of springs and the various threats that can arise from community activities. Increasing public awareness through counseling and conservation education lets people learn and add insight about the environment and the preservation of resources closely related to their lives.

Furthermore, Indonesia has several environmental regulations which is related to the spring water. These regulations need to be informed to the community to elucidate that springs water are important and need to be protected. Besides that, these regulations were general environment protection that mentioned general water springs. Therefore, we also recommended proposing specific regulations related to water springs, such as village regulation that can regulate usage, protection, and conservation of the spring waters and its surrounding environment in the local region.

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