Perceptions of rural communities towards sustainable water supply in arid tropical regions Indonesia

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Abstract. Public perception of the fulfillment of clean water needs will depend on a number of factors, including social, economic, cultural and community habits. This research was conducted in Nekmese Village in Kupang Regency, East Nusa Tenggara Province. This village is one of the villages that has not received good clean water services, even though this village has sufficient availability of clean water throughout the season. This study aims to examine the perception of rural communities in the provision of sustainable clean water. Data collection is done by observation and survey by interview and questionnaire. The results showed that 41% of respondents felt they were insufficient in providing clean water, while the other 59% felt they were insufficient. This fact is supported by the data on the use of clean water on average by 40 Lpcd. For the sustainability of clean water supply, the results of the study show positive perceptions from the community, but contrary to wasteful measures in water use, maintenance of water sources and participation in water supply in his village. This could be due to the low level of public education, and lack of hearing about information about clean water. The research recommends increasing the awareness and participation of the community in the provision of sustainable clean water.

Key words: Community participation, Community perception, Indonesia, Rural water, Semi-arid.

1. Introduction

Provision of clean water for the community is still a serious problem that has not been completely resolved in some countries in the world, including in the Indonesian region [1]. In accordance with the National Development Planning Agency (BAPPENAS) republic of Indonesia report in 2018 that around 72 million Indonesians have difficulty in getting access to safe water, especially in rural communities [2]. The limitations of rural clean water infrastructure can affect human life, economic productivity and overall quality of life. According to Government Regulation of the Republic of
Indonesia No. 122 of 2015 [3], clean water needs can be obtained from rivers, rainfall, surface water, or ground water. Technical requirements for good drinking water supply if they meet three conditions, namely: the availability of water in sufficient quantities to meet daily needs, the quality of water that meets the Minister of Health Regulation No. 492 of 2010 (drinking water quality requirements) [4], and continuity in the sense that water is always available when needed [3,4].

The community as clean water users is the party that feels the most, whether or not the availability of clean water is sufficient to meet their daily needs. This condition will depend on the social, economic and cultural conditions of each community. The World Health Organization (WHO) and the Indonesian government requires that clean water services to the public meet the quantity and quality requirements. The quantity requirement is clean water use of 60 Lpcd for rural communities [5, 6]. For quality requirements, clean water must meet water requirements that are tasteless, colorless and odorless while meeting chemical, physical and biological requirements [4]. The next important thing about the provision of clean water is the problem of the sustainability of clean water supply. Many clean water facilities are built using large funds but can only function in a short time, and subsequently damaged due to various factors. Likewise, potential water sources in a number of areas that can no longer be used now because they are poorly maintained.

This research was conducted in one village in the province of East Nusa Tenggara (NTT), Indonesia, namely the village of Nekmese in Kupang Regency. Although this area has a tropical climate that is as dry as elsewhere in NTT which is dry [7], but it has sufficient clean water potential throughout the year. Potential water sources in the village are Manusraen springs with a discharge capacity of around 4.2 L / sec, and Oemakhitu springs with a capacity of 14 L / sec, besides that there are other springs that are difficult to reach. To get the water, some people take it directly to the water source or buy it in a pick-up or tank truck. In addition to springs, in some village areas there are also limited number of dug wells. However, the availability of sufficient water has not been matched by the availability of sufficient clean water infrastructure to serve the needs of the community. From the explanation above, it becomes an interesting reason for the writer to study this research.

2. Method
Research data collection was carried out by survey using questionnaires and interviews. In-depth observations on the object of research were also carried out to determine the habits of the community in the provision of sustainable clean water. The sample in this study was 59 householder from 590 households in the Nekmese village. Based on livelihood, respondents consisted of 50 householder were farmers, 7 entrepreneurs, and 2 civil servants. Based on the level of education, respondents consisted of: 4 people who never attended school, 24 people graduated from elementary school, 14 people graduated from junior high school, 14 people graduated from high school and 3 graduates. Data analysis was performed with descriptive statistics to find out the average value and the percentage of relevant data. Analysis using Microsoft Exel by Windows.

3. Research location
Nekmese Village is located in the Amarasi Selatan sub-district, Kupang Regency, East Nusa Tenggara Province, Indonesia. Astronomically located at coordinates 10º14'38"- 10º14'41" South Latitude 123º51'47 "- 123º54'04" East Longitude (Figure 1),
This village is in the highlands with elevations of 280 to 600 meters above sea level. The area of 4700 Ha which is hilly and slightly flat overall. The total population in 2018 is 2338 people consisting of 1163 men and 1175 women. The number of households is 590. The village of Nekmese consists of five hamlets, 10 RW and 20 RT. The main livelihoods of the population are farming and raising livestock. As with other areas in NTT, the rainy season lasts for three to four months a year, and the remaining eight to nine months is a long dry season [8, 9].

4. Results and disscuss

4.1. Water and its use

The main water sources used by the community are dug wells and springs. The distribution of dug wells that can be accessed is spread in some areas in hamlets 4 and 5, while the majority of the community utilizes springs as the main water source. As stated earlier that the capacity of water discharge available in this village is 18.2 L/sec, sufficient to meet the daily needs of the population which only reaches around 3 to 4 Lpcd. The community gets clean water by taking it directly to a water source (dug wells or springs) or buying it through the service of a pick-up cars that serves clean water in a 40 liter container. Access to water sources is quite difficult because they have to go through terrain with mountainous topography. Springs are at an elevation of 334 m above sea level, while resettlement at a minimum elevation of 441 m above sea level. The community must travel a distance of about 2 to 7 km to reach the water source with poor road access. Utilization of clean water for household needs is for cooking, washing, need for bathing, latrines, and other household activities. Some activities are carried out at home and some are done at water sources (washing and bathing).

The results of the study obtained data that about 53% of respondents obtained clean water through a combination of buying a pickup car, taking it to a well or a dug well. Furthermore, as many as 17% of respondents obtain clean water by buying it from pickup cars, 22% from dug wells, and around 8% from springs. This condition shows that although water is abundant in existing springs, due to difficult access, only a few people rely on springs as a place to collect water (Table 1).

From Table 1, the study found that groups of people who use springs and dug wells as a source of clean water are 100% of the people who work as farmers, and earn less than one million rupiah. This
condition shows that rural communities with low incomes only expect from cheap water sources to be able to meet their needs [6, 10].

Table 1. The water source used and the respondent's income level is based on the water source.

| Description | Springs | Dug wells | Buy on cars | pickup | Combinations (springs, dug wells and / or buys) |
|-------------|---------|----------|-------------|--------|------------------------------------------------|
| Percentage of usage (%) | 8% | 22% | 17% | 53% | |
| Level of income of respondents | Consists of: 8% of respondents' income < Rp. 1 million | Consists of: 22% of respondents' income < Rp. 1 million | Consists of: 5% of respondents' income < Rp. 1 million and 12% of respondents income of Rp. 1 million - Rp. 2.5 million | Consists of: 5% of respondents' income > Rp. 2.5 million | 20% of income of Rp. 1 million - Rp. 2.5 million, and 27% of respondents income < Rp. 1 million. |
| Source: Results of research analysis (2019) |

The amount of cost used by the community to buy clean water from a pickup car is an average of Rp. 153,158 per month. This is supported by data obtained through interviews with pickup drivers who sell clean water, that in one day they can sell clean water ranging from 8 to 12 times, and even then cannot serve all the people, even though there are five pickup car units serving the sale. One transport of one pickup car can carry 40 containers of clean water (800 liters total) with a selling price of Rp. 50 thousand. The income of the water sellers from selling clean water ranges from Rp. 400 thousand to Rp. 600 thousand per day.

4.2. Public perceptions about meeting the needs of sustainable rural clean water

The amount of community clean water usage based on research is 40 Lpcd. This amount is relatively small compared to the standard of clean water use of rural communities according to WHO and Indonesian government standards which reached 60 Lpcd [5, 6]. The low amount of community clean water usage is due to the fact that some of the bathing and washing activities (42% of respondents) are not carried out at home but are carried out at water sources (wells or springs). While the use of clean water at home is only for cooking, drinking and toilet. This is in line with other data from this study regarding the adequacy of the amount of clean water obtained, where 59% of respondents said that the water obtained was not enough to meet their daily needs, while only 41% of respondents stated that it was sufficient (Table 2).

Furthermore, a study of public perceptions regarding wasteful or not attitudes in the use of clean water. 52% of respondents said they had never used water wastefully, and 48% were wasteful. Wasteful attitude is characterized by the use of water that exceeds the capacity or reasonable limits, or allowing clean water to be wasted without being used properly.
### Table 2. Public perception of the adequacy of clean water needs

| Description                     | Adequate clean water |  |
|--------------------------------|----------------------|---|
|                                | Yes                  | No |  |
| **Percent age**                | 41%                  | 59%|  |
| **Level of income of respondents** |                      |    |  |
| a. < 1 million rupiah          | 20%                  | 46%|  |
| b. 1 - 2 million rupiah        | 17%                  | 14%|  |
| c. > 2.5 million rupiah        | 3%                   | 0% |  |
| **Educational level of the respondent** |                    |    |  |
| a. Never school                | 3%                   | 3% |  |
| b. Primary school              | 20%                  | 20%|  |
| c. Junior secondary school     | 10%                  | 15%|  |
| d. Senior high school          | 3%                   | 20%|  |
| e. Graduate                    | 3%                   | 2% |  |

Source: Results of research analysis (2019)

About efforts to conserve and preserve the environment, especially in water resources areas. 46% of respondents said they had taken actions that did not support conservation efforts. The action taken was to have cut down trees, opened agricultural land without control in the area around the water source. Whereas 54% of respondents said never. When asked about the invitation to reforest in the water source area, 94% of respondents said they agreed, and only 6% of respondents said they disagreed. Furthermore, 98% of respondents do not yet have infiltration wells as one of the water conservation measures in their homes, and only 2% have infiltration wells. Questions about involvement in efforts to provide clean water in the village, 61% of respondents said they had never been involved, and only 39% said they had been involved. Their involvement in the form of community service is to clean the reservoir, help with the network system, etc. (Table 3)

### Table 3. Community perception of conservation and meeting sustainable water needs

| Description                                                      | Yes | No  |  |
|-----------------------------------------------------------------|-----|-----|---|
| Wasteful / not in the use of water                              | 48% | 52% |  |
| Actions that support conservation efforts around water sources  | 54% | 46% |  |
| Call for reforestation in water source areas                    | 94% | 6%  |  |
| Involvement in the provision of clean water in the village      | 39% | 61% |  |
| Have received information about clean water                     | 24% | 76% |  |
| Public optimism for the government's efforts to provide clean water | 98% | 2%  |  |

Source: Results of research analysis (2019)
Wasteful attitude, cutting down trees, opening new land in the area around the water source, the absence of infiltration wells, the low participation in the provision of clean water, can be related to the knowledge obtained by the community who are generally low educated [2]. Also supported by the fact that 76% of respondents had never received information about clean water, and only 24% of respondents had received. However, almost all respondents (98%) showed an optimistic attitude towards the government's efforts in providing clean water (Table 3). This shows that the community is very concerned about every effort made to be able to provide access to clean water that is appropriate to meet their daily needs.

Furthermore, all communities are also willing to be involved in the operation and maintenance of a sustainable water network system by being willing to pay a number of costs as a responsibility. The amount of contribution between Rp. 25 thousand to Rp. 100 thousand per month, with an average of Rp. 32,931.00 per month to get clean water services near their homes through public hydrants (shared use) and water supply can be sustainable.

5. Conclusion

This research concludes as follows:

1) Community perception about meeting the needs of clean water for daily needs, related to community activities in utilizing clean water that is not entirely carried out at home, but also carried out at the water source, because there is no clean water network available near community settlements. 59% of respondents feel that the current supply of clean water is not enough, and only 41% feel that it is enough. This is evidenced by the average use of clean water which only reaches 40 Lpcd.

2) Public perception about the provision of sustainable clean water in general shows positive things, although a number of things regarding wasteful attitudes of water usage, lack of participation in water source conservation activities and the provision of clean water need to be improved.

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