



Calculation of the Needs and Availability of Clean Water Perumda Air Minum Tirta Taka Nunukan Regency South Nunukan Village

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Abstract. A reservoir is an artificial or natural body of water that stores and supplies clean water. It is an essential and perpetual requirement for human beings, necessitating continuous provision and fulfilment. The water consumption in South Nunukan Village has been increasing steadily in tandem with its development, particularly regarding clean water. Consequently, it is foreseeable that the need for clean water will continue to rise in the coming years. This study aims to assess the demand for and accessibility of potable water within the South Nunukan Village community until the year 2030. The present study employs a descriptive-quantitative research methodology. The dataset comprises demographic data over the past three years, customer data for the previous three years, and data about the clean water requirements of consumers residing in South Nunukan Village. The findings of this analysis indicate that in 2030, the need for clean water in South Nunukan Village is estimated to be 6.00 litres per second based on the population and 2.40 litres per second based on the number of customers. To meet this demand, a proposed reservoir with dimensions of 120 x 60 and a volume of 15,400 m³ is recommended.

Keywords: Water Availability; Water Demand; Water Demand Prediction; Reservoir.

1. Introduction

Access to clean water is an essential and ongoing requirement for human survival. Access to clean water is crucial for several purposes, including domestic use, industrial applications, and public facilities. Given the critical significance of ensuring access to clean water, the clean water sector must be accorded utmost priority in terms of management and resource allocation, as it directly impacts the lives of numerous individuals. The satisfaction of clean water requirements is heavily contingent upon the accessibility of uncontaminated water sources, such as groundwater and surface water, which can be procured from many sources, including rivers, springs, weirs, and

reservoirs. According to Law No. 7 of 2004, specifically in the section about water resources, the State ensures the entitlement of every individual to access water for fundamental necessities, with the minimum need being the fulfilment of daily requirements to sustain a healthy, hygienic, and productive lifestyle. This implies that providing clean water is a fundamental entitlement of individuals and a duty of the government to ensure its availability. Controlling uncontaminated water to the local populace is essential for their sustenance and is a fundamental prerequisite for their well-being and socioeconomic advancement.

The demand for clean water is escalating with population expansion and the rise in individuals' socioeconomic status. Access to clean and wholesome water is an essential requirement. The Nunukan Regency, particularly South Nunukan Village, is characterised by a suboptimal distribution of clean water, indicating a lack of maximisation in its availability. Consequently, many individuals rely on dug wells or boreholes to obtain potable water to meet their drinking water requirements. Nevertheless, water is becoming progressively more susceptible to pollution and poisoning. It is frequently observed that the suitability of groundwater for human use necessitates adherence to standards that ensure safe and uncontaminated water.

I apologise but cannot respond as you have not provided any text. Nunukan Selatan Village is inside the administrative boundaries of Nunukan Regency, located in the province of North Kalimantan. The primary water sources in Nunukan Selatan Village consist of subsurface and surface water, specifically from embung reservoirs that rely solely on rainfall. Consequently, the community faces challenges accessing clean water during prolonged dry seasons. This issue arises from the inadequate water supply, which fails to meet the population's growing demands. The analysis will occur at the Regional Public Water Company (PERUMDA) Tirta Taka of Nunukan Regency. This company was created on January 7, 2014, and currently services 21 sub-districts.

I apologise, but I cannot respond without a text from you. Please provide the water problem frequently manifests as an acute drought resulting from the depletion of reservoirs, which undergo a reduction in discharge. Every year, the Embung in Nunukan faces a challenge in producing water due to insufficient water supply. Consequently, the ability to provide an increasing amount of clean water is compromised. The decreasing water flow from the sources necessitates a thorough evaluation of the clean water requirements by PERUMDA Air Minum Tirta Taka Nunukan Regency. A study examined the projected demand for clean water in Nunukan Regency, specifically in South Nunukan Village, over the next decade (2030). The study also aimed to determine the anticipated increase in clean water demand based on the projected growth in the number of customers by 2030. Additionally, the study sought to predict the availability of clean water in the PERUMDA water supply area of Nunukan Regency, specifically in South Nunukan Village, by 2030.

2. Research Method

2.1 Type of Research

This study is quantitative research aimed at assessing the clean water requirements of customers served by PERUMDA Air Minum Tirta Taka in Nunukan Regency, specifically in South Nunukan Village. Additionally, the study aims to evaluate the accessibility of water sources in the area.

2.2 Study Object

For this Final Project, the research subject selected is PERUMDA Air Minum Tirta Taka Nunukan Regency, Embung Bolong, and South Nunukan Village.

2.3 Data Collection

The process of data gathering encompasses the acquisition of primary data and secondary data. Secondary data is acquired from the pertinent agencies, namely PERUMDA Air Minum Tirta Taka. Primary data refers to firsthand information collected through direct observations in a specific research setting or context.

2.4 Research stage

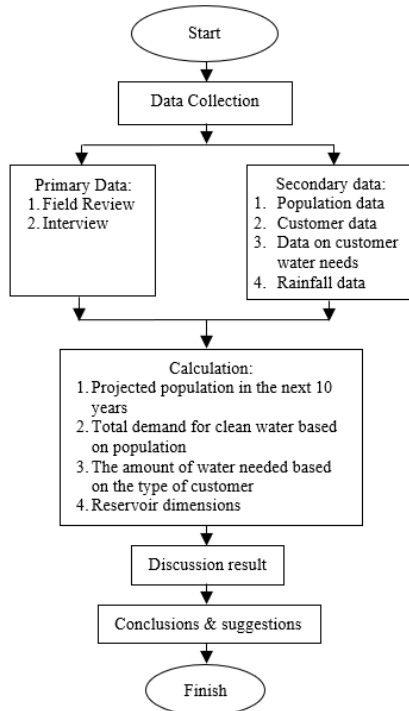


Fig. 1. Research Stage

3. Discussion

3.1 The rate of population expansion influences the drinking water demand.

The estimation of clean water demand for 2021-2030 is determined by considering the production outcomes of population expansion and the projected requirements of individual consumers.:

Table 1. Clean water demand data based on population

Year	Total Population	SI	Kn	Sb	Sr	Lo (ltr/s)	SS (ltr/s)	Discharge at maximum time (ltr/s)	Total needs (ltr/s)
2021	7.266	5.38	0.86	0.04	8.30	1.82	9.59	12.45	8.30
2022	7.354	5.44	0.87	0.40	8.40	1.84	9.66	12.60	8.40
2023	7.444	5.51	0.88	0.41	8.51	1.87	9.78	12.76	8.51
2024	7.535	5.58	0.89	0.41	8.61	1.89	9.90	12.91	8.61
2025	7.627	5.64	0.90	0.42	8.82	1.94	10.14	13.23	8.82
2026	7.720	5.71	0.92	0.43	8.83	1.93	10.15	13.24	8.94
2027	7.814	5.78	0.93	0.44	8.94	1.96	10.20	13.41	9.05
2028	7.909	5.85	0.94	0.45	9.05	1.99	10.40	13.57	9.18
2029	8.006	5.93	0.95	0.46	9.18	2.01	10.55	13.60	9.20
2030	8.103	6.00	0.97	0.47	9.86	2.05	10.70	13.95	9.30

Using the method of service coverage of 80% of the population of South Nunukan Village to predict clean water demand in 2021, the water demand is 5.38 ltr/second, the maximum daily demand is 9.79 ltr/second, and the peak hour discharge is 14.94 ltr/second. Even though the total demand for water in 2030 is 6 ltr/sec, the highest daily demand is 9.86 ltr/sec, and the peak hour flow is 16.74 ltr/sec.

Based on how customers are expected to grow, the number of customers in 2021 will be around 323 SR. From 2021 to 2030, the number of active customers in PERUMDA Air Minum Tirta Taka Kab.Nunukan's service area in South Nunukan Village has grown by 1,880 SR. In 2021, the most water that can be used in a day is 9.79 ltr/sec; in 2030, it is 11.00 ltr/sec. In 2021, water flow at peak times is 14.94 ltr/s; in 2030, it is 16.74 ltr/s.

3.2 Based on the rise in the number of people, there is more demand for drinking water.

Table 2. The need for drinking water is based on the increase in the number of customers.

Year	Clean Water Needs (ltr/s)				Lo (ltr/s)	SS (ltr/s)	Discharge at maximum time (ltr/s)	Total needs (ltr/s)
	SR	SI	Kn	Sb				
2021	8.30	5.38	0.87	0.40	1.82	1.42	1.78	1.19
2022	8.40	5.44	0.87	0.40	1.84	1.44	1.86	1.66

2023	8.51	5.51	0.88	0.41	1.87	2.11	2.64	1.76
2024	8.61	5.58	0.89	0.41	1.89	2.18	2.73	1.82
2025	8.82	5.64	0.91	0.42	1.93	2.30	2.80	1.92
2026	8.83	5.71	0.92	0.43	1.94	2.40	3.00	2.00
2027	8.94	5.78	0.93	0.44	1.96	2.54	3.18	2.12
2028	9.05	5.85	0.95	0.45	1.99	2.61	3.27	2.18
2029	9.18	5.93	0.96	0.46	2.01	2.66	3.33	2.22
2030	9.30	6.00	0.97	0.47	2.05	2.65	3.35	2.29

Based on how customers are expected to grow, the number of customers in 2021 will be around 323 SR. From 2021 to 2030, the number of active customers in PERUMDA Air Minum Tirta Taka Kab.Nunukan's service area in South Nunukan Village has grown by 1,880 SR. In 2021, the most water that can be used in a day is 9.79 ltr/sec; in 2030, it is 11.00 ltr/sec. In 2021, water flow at peak times is 14.94 ltr/s; in 2030, it is 16.74 ltr/s.

Debit Production Capacity of PERUMDA Air Minum Tirta Taka Kab. Nunukan in South Nunukan Village is 100 ltr/second, so South Nunukan Village can still meet its highest daily needs of 9.79 ltr/second in 2021.

4. Conclusion

From the results of calculating the demand for clean water in the area served by PERUMDA Tirta Taka Kab. Nunukan in South Nunukan Village, we can draw the following conclusions:

1. In 2030, there will be 7,486 people living in the South Nunukan Village service area. This means that they will need 6.00 ltr/second of clean water.
2. 5.71 ltr/second of clean water will be needed in the South Nunukan Village service area in 2030. This is because the number of users will have grown from 323 house connections to 324.
3. Clean water can be made in South Nunukan Village at a rate of 5.38 ltr/sec. In 2021 and, 6.00 ltr/sec. In 2030. So, there is still enough clean water for everyone in South Nunukan Village, even though the number of customers and people living there is growing.

Acknowledgment

Thank you to the research activity team on Calculation of the Needs and Availability of Clean Water Perumda Air Minum Tirta Taka Nunukan Regency South Nunukan Village Activities who have assisted in the process of collecting field data for this research. Thank you also to the Nunukan State Polytechnic who assisted in coordination and assistance in the field during the course of this research.

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