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Analysis of the Price of Summary Water Disposal at the Kampung Kasai Derawan Islands Berau District

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Abstract: Raw water is water that can be derived from surface water sources, groundwater reservoirs and/or rainwater that is used as raw water for drinking water. Raw water that has passed through a process with a certain intake system and is stored in as clean water and when continued with the process of the Drinking Water Supply System (SPAM) then will produce water ready for use by the community. The presence of clean water in a region becomes very important given the very dynamic community activity. To meet the need for clean water, the population of a region can rely on water from direct water sources such as surface water and rainwater because both sources of water are easily accessible even though most of them are polluted either directly or indirectly by human activity itself. Therefore, an in-depth analysis of effective clean water management strategies is needed to address the shortage of supply during the rainy season in the villages. Research methods carried out using a cost estimate analysis of clean water supply. The pumping tests were conducted continuously for a certain time and when the pumping test was felt sufficient, where the groundwater surface position was relatively stable at a certain depth, then the pump was shut down. In the case of the 24-hour pumping testing, a constant flow of 2.32 Lt/second was obtained

Keywords: clean water, clean water supply system

INTRODUCTION

Clean water is one of the most vital basic human needs to maintain health, hygiene, and sustainability (Fauzi, 2004). In the study area, Kasai village is a fishing village that continues to grow from the abandoned village (pre madya) to the growing village (madya). Along with that growth, demand for supplies and clean water continues to increase as the population grows. The need for clean water reached its peak when the rainy season arrived, causing huge pressure on the supply of clean water resulting in insufficient water supply for the daily needs of the population. The presence of clean water in an area is becoming crucial given the very dynamic community activity. To meet the need for clean water, the inhabitants of an area can rely on water from direct water sources such as surface water and rainwater because both sources of water are easily accessible even though most of them are polluted either directly or indirectly by human activity itself (Mokogintam, et al., 2014).

The above-mentioned issues call for a thorough analysis of effective clean water management strategies to address supply shortages during the drought season in the villages. Thus, this research will make an important contribution to finding solutions to maintain adequate clean water availability for rural communities, as well as supporting sustainable development in the future. Taking into account the urgency and complexity of the problem, the study aims to investigate various strategies for managing clean water resources that can be applied to address supply shortages during the rainy season in rural areas. Through a holistic and interdisciplinary approach, this research is expected to make a significant contribution to improving the availability and accessibility of clean water for rural communities, as well as in efforts to maintain the sustainability of the living environment.

Providing clean water infrastructure is one of the most important responsibilities of the government in order to ensure the availability of clean water for the inhabitants of a rural area (PP 16, 2005; DPU, 2006). In this connection, the district government through the Drinking Water District Company (PDAM) is seeking to have a water treatment facility, which can guarantee the availability of clean water for the community.

METHODOLOGY

The research was carried out in the River Stream District near Kasai Village. As a preliminary step, a location survey was conducted to find out the state of nature, water and society. Visits and interviews with the villagers were conducted in order to get to know the state of this river stream region. For other data will be taken from the relevant agencies located in Kampung Kasai, Derawan Island and Berau district.

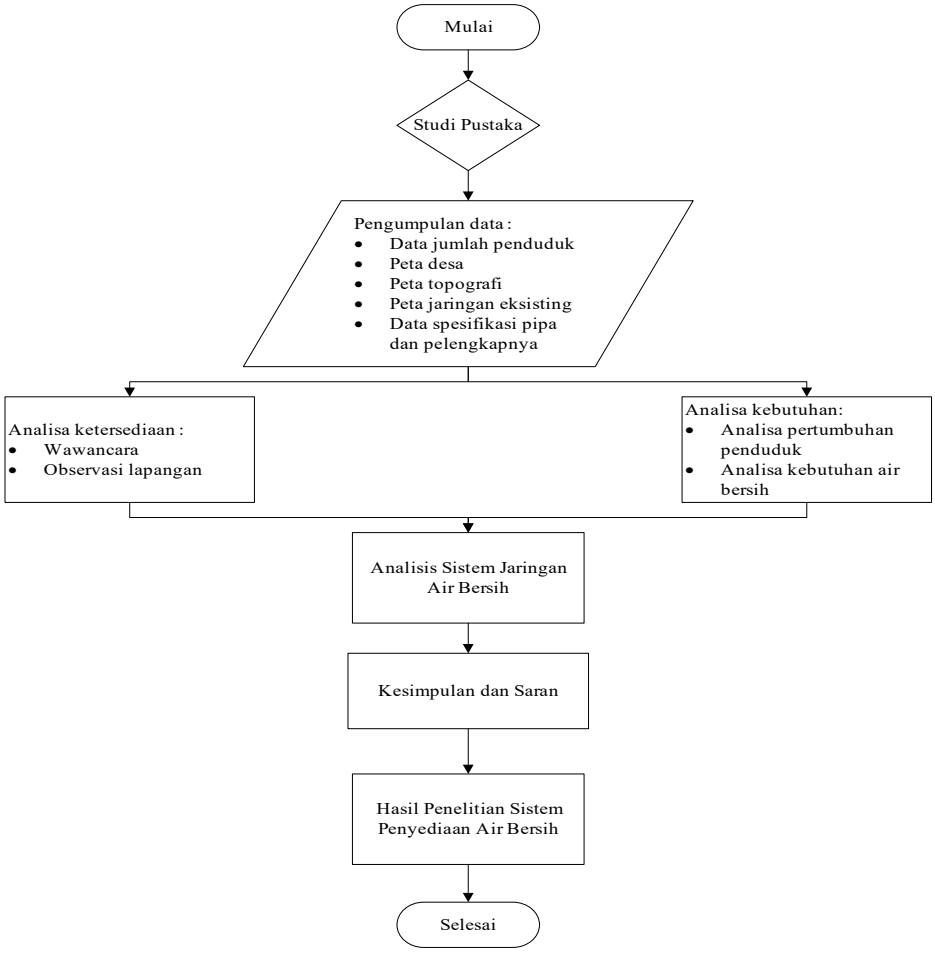

Figure 1. Flow Diagram

Research methods conducted with Field Survey: Conduct field surveys to collect data on the condition of clean water supply, availability of water resources, and water consumption patterns in rural areas during the rainy season.

Interviews: Conducting interviews with relevant stakeholders such as local communities, farmers, well owners, and local governments to understand their perceptions and experiences regarding the shortage of clean water supply and water management strategies that have been implemented.

Data Analysis: Analyses data obtained from field surveys and interviews to identify the factors causing the shortage of clean water supply and to analyse the cost, quality and timing of the clean water system supply.

Case studies: conducting case studies in some rural areas that successfully address water shortages in the rainy season with effective water management strategies, to gain insight into best practices that can be applied in other regions.

The analytical methods used are population projection analysis, analysis of discharge measurement at the absorption wells, water needs analysis and water loss analysis (Tangkudung, et al., 2019).

RESULT AND DISCUSSION

Analysis of the condition of clean water supply during the rainy season

In this study, a pumping test was carried out at the site of the well after a resting period of ± 24 hours to the drill well to be pumped. In the case of a 24 hour nonstop pumping testing, a constant outlet of 2 liters/dl was obtained. The pumping tests were conducted from March 5, 2024 to March 11, 2024 using the constant rate test method using the pumps available at the test site.

The pumping tests are carried out continuously for a certain period of time and when the pumping test feels sufficient, where the groundwater surface position experiences relatively stable conditions at a certain depth, then the pump is shut down (Taju, et al., 2017). From the data processing results obtained from the graph of the relationship between the time towards the decline and the rise of the groundwater surface, obtaining from the pumping test and recovery test, it was found that:

From the available data, we know:

ΔS (m) Surge = 35.6 m

Q = 2.32 liters / second = 0.00232 m3/second

b (akifers) = total screen = 21 m

From the pumping tests carried out obtained the relationship between time and decrease of the surface of the water as in figure 2.

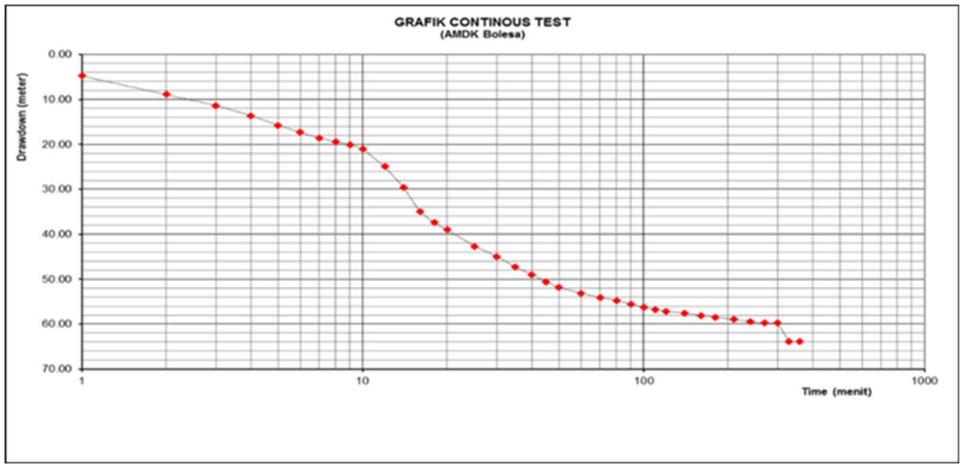

Figure 2. Drawdown test Graphs

Figure 3. SV and CV comparison graph

Factors Causing Lack of Clean Water Supply

Calculation of water requirements in Kasai Village is projected for the next 20 years. The results are as in the table 1:

Table 1. Water requirements and forecasts for the next 20 years

No.	Tahun	Kebutuhan Air Rata-rata (Qr)		Kebutuhan Air Hari	Fhmaks = 1,12 - 1,15	Kebutuhan	Fqpeak = 1,2 - 1,5
		M3//hari	L/det	M3//hari	L/det	M3//hari	L/det
1	2023	34	0,40	39	0,46	51	0,59
2	2024	145	1,68	167	1,93	218	2,52
3	2025	159	1,84	182	2,11	238	2,76
4	2026	201	2,33	231	2,67	301	3,49
5	2027	210	2,44	242	2,80	316	3,65
6	2028	277	3,21	319	3,69	416	4,81
7	2029	310	3,58	356	4,12	464	5,37
8	2030	343	3,97	394	4,56	514	5,95
9	2031	404	4,68	465	5,38	606	7,02
10	2032	442	5,12	508	5,88	663	7,68
11	2033	481	5,57	553	6,40	722	8,35
12	2034	521	6,03	599	6,94	782	9,05
13	2035	562	6,51	647	7,49	844	9,76
14	2036	685	7,93	788	9,12	1.028	11,90
15	2037	735	8,50	845	9,78	1.102	12,76
16	2038	785	9,09	903	10,46	1.178	13,64
17	2039	798	9,23	917	10,62	1.197	13,85
18	2040	810	9,38	932	10,78	1.215	14,07
19	2041	823	9,52	946	10,95	1.234	14,29
20	2042	836	9,67	961	11,12	1.254	14,51
21	2043	849	9,82	976	11,30	1.273	14,73

From the pumping test results obtained constant output data of 2.32 Lt/second. Then if you compare with the need for clean water in 2023 and the continuously rising forecast for the next 20 years, then in the fourth year there is already a shortage of clean water, as in the table 2.

Table 2. Disaggregate water requirements by water supply

No.	Tahun	Kebutuhan Air Rata-rata (Qr)		Kebutuhan Air Hari	Fhmaks = 1,12 - 1,15	Kebutuhan	Fqpeak = 1,2 - 1,5	Supplay	Surplus / Defisit	Keterangan
		M3//hari	L/det	M3//hari	L/det	M3//hari	L/det	L/det		
1	2023	34	0,40	39	0,46	51	0,59	2,32	1,92	Surplus
2	2024	145	1,68	167	1,93	218	2,52	2,25	0,57	Surplus
3	2025	159	1,84	182	2,11	238	2,76	2,18	0,35	Surplus
4	2026	201	2,33	231	2,67	301	3,49	2,12	(0,21)	Defisit
5	2027	210	2,44	242	2,80	316	3,65	2,05	(0,38)	Defisit
6	2028	277	3,21	319	3,69	416	4,81	1,99	(1,21)	Defisit
7	2029	310	3,58	356	4,12	464	5,37	1,93	(1,65)	Defisit
8	2030	343	3,97	394	4,56	514	5,95	1,87	(2,09)	Defisit
9	2031	404	4,68	465	5,38	606	7,02	1,82	(2,86)	Defisit
10	2032	442	5,12	508	5,88	663	7,68	1,76	(3,35)	Defisit
11	2033	481	5,57	553	6,40	722	8,35	1,71	(3,86)	Defisit
12	2034	521	6,03	599	6,94	782	9,05	1,66	(4,37)	Defisit
13	2035	562	6,51	647	7,49	844	9,76	1,61	(4,90)	Defisit
14	2036	685	7,93	788	9,12	1.028	11,90	1,56	(6,37)	Defisit
15	2037	735	8,50	845	9,78	1.102	12,76	1,51	(6,99)	Defisit
16	2038	785	9,09	903	10,46	1.178	13,64	1,47	(7,62)	Defisit
17	2039	798	9,23	917	10,62	1.197	13,85	1,43	(7,81)	Defisit
18	2040	810	9,38	932	10,78	1.215	14,07	1,38	(7,99)	Defisit
19	2041	823	9,52	946	10,95	1.234	14,29	1,34	(8,18)	Defisit
20	2042	836	9,67	961	11,12	1.254	14,51	1,30	(8,37)	Defisit
21	2043	849	9,82	976	11,30	1.273	14,73	1,26	(8,56)	Defisit

Some of the things to bear in mind to keep water clean are:

a. Water leakage in the pipe is suppressed to the minimum possible by performing periodic / routine maintenance

b. Water usage as needed

c. Volume of reservoir padding is designed with projected needs up to the next 20 years

Cost, Quality and Time Analysis

The clean water management and supply plan in Kasai Village consists of:

a. existing wells

b. reservoirs (new)

c. transmission pipes

d. distribution pipes

e. home connections (new)

As for the water flow scheme is as show in Figure 4.

a. Analyze the results of the cost-benefit analysis of the various water management strategies that have been evaluated.

b. Present information on the quality or effectiveness of each strategy, as well as the time required for implementation and its impact on the availability of clean water.

Figure 4. Clean water supply flow scheme in Kasai Village

The clean water network plan in Kasai Village needs to be implemented so that clean water services can be available with optimum availability. Moreover, the cost budget plan is presented in table 3.

Table 3. Cost Budget Plan

No	Item	Vol	Unit	Unite Price	Price amount
1	Procurement and installation of pumps	1	Unit	15.000.000	15.000.000
2	Reservoir construction				
	a Ground cleaning	16	m2		-
	b Ground cleaning	0,8	m3	1.355.520	1.084.416
	c K-250 Concrete	5,6	m3	1.485.480	8.318.688
	d Concrete reinforcment	784	Kg	25.644	20.104.878
	e Formwork	40	m2	158.200	6.328.000
	f Get valve outflow	1	Bh	6.033.140	6.033.140
	g Get drain valve	1	Bh	6.033.140	6.033.140
	h Elbow 90°	2	Bh	189.390	378.780
3	Acquisition and installation of transmission pipes				
	a Soil excavation	554	m3	62.000	34.348.000
	b Backfilling soil	554	m3	23.000	12.742.000
	c Procurement and installation of 3" PVC pipes	1108	m	148.790	164.859.320
	d Elbow 3"	6	Bh	189.390	1.136.340
	e Tee Socket 3"	10	Bh	97.170	971.700

4	Procurement and installation of distribution pipes					
	a	Soil excavation	2135	m3	62.000	132.370.000
	b	Backfilling soil	2135	m3	23.000	49.105.000
	c	Procurement and installation of 2" PVC pipes	4270	m	139.200	594.384.000
	d	Elbow 2"	4	Bh	143.390	573.560
	e	Tee Socket 2"	8	Bh	81.070	648.560
5	Home Connection					
	a	Water meter	1104	Bh	258.390	285.262.560
		Total				1.339.682.082
		Tax 11%				147.365.029
		Total Price				1.487.047.111

CONCLUSIONS

The current state of affairs is the provision of clean water using water tanks which are quite expensive while not being able to serve throughout the year due to the constraints of the existing clean water system.

Based on the results of the analysis, the researchers suggested to maintain the well water drain conditions to remain optimal, then it is necessary to protect the area around the water source (forest conservation) and if further increased water needs are needed, then the addition of wells for supply to the reservoir to be distributed to the population.

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