Utilization of Kalimati Raw Water to Provide Drinkable Water: A Feasibility Study

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ABSTRACT: Clean water is an essential necessity for all life forms. With rapid urbanization, the demand for water is increasing while water resources are diminishing, necessitating the exploration of alternative water sources. Communities often resort to river water, which is increasingly contaminated due to daily domestic activities, thereby necessitating water treatment for safe consumption. To address this, the government has established Regional Drinking Water Companies (PDAM) and Drinking Water Supply Systems (SPAM) to convert raw water into potable water. Part of the effort to supply potable water was the construction of Long Storage Kalimati in Sidoarjo Regency, however its utilization remains suboptimal, with several areas still relying on groundwater despite its deteriorating quality. This study investigates community willingness to pay for PDAM services and transition to potable water sourced from Long Storage Kalimati. Data were collected through questionnaires and interviews. Logistic regression analysis revealed that certain occupations and higher income levels tend to increase willingness to pay for PDAM, while increased utility expenses correlate with greater willingness. High bottled water consumption increases the desire to switch to drinking water because it reduces dependence on bottled water. To enhance community acceptance, author recommends improving water treatment processes, educating residents about water contaminants, providing government subsidies, and implementing supportive regulations. These strategies aim to improve access to clean water and enhance community health and well-being.

KEYWORDS: dam, drinking water, raw water, willingness to pay

I. INTRODUCTION

Clean water is a fundamental requirement for sustaining all life forms. As urban areas expand, the demand for water increases while its availability diminishes, necessitating the exploration of alternative water sources. Communities often resort to river water as the alternative source, which is increasingly becoming more of a problem with the rise of pollution from daily activities, such as washing, bathing, cooking, and other domestic uses. Therefore, water treatment is crucial to ensure water safety and quality.

The government has established Regional Drinking Water Companies (PDAM) as part of efforts to meet public water needs. Drinking Water Supply Systems (SPAM) are developed to treat raw water into potable water. Raw water sources include springs, surface water (such as lakes, rivers, reservoirs), groundwater (wells), and rainwater. Suitable water sources are selected on consideration of quantity, quality, continuity, and accessibility is based on considerations of quantity, quality, continuity, and accessibility. After the treatment of raw water into potable water, according to water quality standards as stipulated in Ministerial Regulations No.2 of 2023, water is then distributed to served areas to ensure equitable access to clean water (Permenkes Nomor 2, 2023).

In an effort to supply clean and reliable water to the residents, the government of Sidoarjo Regency constructed Kalimati Long Storage as part of the Drinking Water Supply System (SPAM), however it remains underutilized to this day. The water from Long Storage Kalimati is not fully utilized to meet clean water demands, especially in three districts of Sidoarjo that continue to rely on groundwater as their primary water source, despite its declining quality. Hence, the implementation of SPAM is necessary to treat raw water and distribute it to the community in compliance with water quality standards. This study aims to assess community's willingness to pay for PDAM and transition to potable water from Long Storage Kalimati.

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II. MATERIALS AND METHODS

This study employed a quantitative approach to gain direct insights into field conditions, using data collected through questionnaires and interviews. Questionnaire variables included income, utility expenses (water and electricity), types of water used for kitchen and direct consumption purposes, daily water needs, and willingness to estimate water tariff payments. Data collection spanned 5 months from January 2024, analyzed using logistic regression (Nalendra et al., 2021).

III. RESULTS AND DISCUSION

Results of logistic regression analysis indicates that occupation type and income significantly influence community willingness to pay for PDAM. Certain occupational groups tend to be less willing to pay for PDAM compared to those with stable employment (Trunfio et al., 2022).Conversely, higher individual incomes correlate with increase willingness to pay for PDAM. This trend is attributed to the prevalence of entrepreneurs and traders using substantial water volumes for business activities, hence preferring groundwater. However, there remains potential for personal usage to transition to PDAM services (Alvizuri-Tintaya et al., 2023). Utility expense variables for water and electricity showed a positive relationship with willingness to pay for PDAM, indicating that higher individual expenditures on utilities correspond with greater willingness to pay for PDAM services (Kmieciak, 2020).

Based on these findings, efforts are needed to increase community willingness, such as enhancing water treatment quality, educating about water contaminants, providing government subsidies, and supportive regulations. These measures aim to improve access to clean water and support public health and welfare (Majuru et al., 2016).

A. Figures

Coefficient Significance Tests

Independent Variable X	Regression Coefficient b(i)	Standard Error Sb(i)	Wald Test of H0: β(i) = 0		Odds Ratio Exp(b(i))
			Z-Statistic	P-Value	
Intercept	0.84815	0.44650	1.900	0.05749	2.33531
Pekerjaan	-1.33062	0.47043	-2.829	0.00468	0.26431
Pendapatan	-0.76723	0.32284	-2.376	0.01748	0.46430
Pengeluaran_Fasilitas	0.75934	0.36811	2.063	0.03913	2.13687

Figure 1. Significance Test of Coefficients on Community Willingness to Pay for PDAM
Source: Questionnaire, 2024

Coefficient Significance Tests

Independent Variable X	Regression Coefficient b(i)	Standard Error Sb(i)	Wald Test of H0: β(i) = 0		Odds Ratio Exp(b(i))
			Z-Statistic	P-Value	
Intercept	2.15037	0.94363	2.279	0.02268	8.58803
Pendapatan	0.47940	0.40616	1.180	0.23787	1.61511
Pengeluaran_Fasilitas	-0.49980	0.43551	-1.148	0.25112	0.60665
Air_Kemasan	-0.95639	0.26279	-3.639	0.00027	0.38428
Air_Isi_Ulang	-0.02787	0.06820	-0.409	0.68279	0.97251

Figure 2. Significance Test of Coefficients on Community Readiness to Switch to Bottled Water
Source: Questionnaire, 2024

IV. CONCLUSIONS

Overall, utility expenditure variables significantly influenced willingness to pay for PDAM, whereas occupation and income variables showed varied impacts. Community readiness to switch to potable water is influenced by high bottled water consumption and the use of groundwater for cooking and direct consumption purposes. Measures to enhance community acceptance include improving water treatment processes, education, government subsidies, supportive regulations, and effective public campaigns, all contributing to government efforts to improve overall community health and welfare (Bowman et al., 2023).

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