

## ANALYSIS OF FACTORS CAUSING THE LOW SUBSCRIPTION LEVEL OF PDAM TIRTA SARI IN BINJAI CITY

Feby Melanie<sup>1</sup>, Ruri Prihatini Lubis<sup>2</sup>, Dasar Martinus Sembiring<sup>3</sup>, Said Iqbal Zaini<sup>4</sup>, Sahri Muda<sup>5</sup>,  
Rudi Iskandar<sup>6</sup>, Ade Farnan Saragih<sup>7</sup>, Suangro L.H. Sitanggang<sup>8</sup>

<sup>1,2</sup> Dosen Magister Perencanaan Wilayah dan Kota, Universitas Pembangunan Panca Budi Medan, Indonesia

<sup>3,4,5,6,7,8</sup> Mahasiswa Magister Perencanaan Wilayah dan Kota, Universitas Pembangunan Panca Budi Medan

Email : [febymilanie@dosen.pancabudi.ac.id](mailto:febymilanie@dosen.pancabudi.ac.id)<sup>1</sup>, [ruriprihatinilubis@dosen.pancabudi.ac.id](mailto:ruriprihatinilubis@dosen.pancabudi.ac.id)<sup>2</sup>,  
[martinusgurkie79@gmail.com](mailto:martinusgurkie79@gmail.com)<sup>3</sup>, [saidiqbal648@gmail.com](mailto:saidiqbal648@gmail.com)<sup>4</sup>, [sahrimudahrp@gmail.com](mailto:sahrimudahrp@gmail.com)<sup>5</sup>,  
[rudibaros889@gmail.com](mailto:rudibaros889@gmail.com)<sup>6</sup>, [adefarnansaragih@yahoo.co.id](mailto:adefarnansaragih@yahoo.co.id)<sup>7</sup>, [suangparsaroan81@gmail.com](mailto:suangparsaroan81@gmail.com)<sup>8</sup>

Received : 30 August 2025

Published : 01 January 2026

Revised : 10 September 2025

DOI : <https://doi.org/10.59733/besti.v3i4.157>

Accepted : 25 September 2025

Publish Link : <https://bestijournal.org/index.php/go>

### Abstract

The low level of drinking water subscriptions at PDAM Tirta Sari in Binjai City is a problem that needs to be studied to determine the causal factors. This study aims to analyze the factors that most influence the low interest of the people of Binjai City in subscribing to PAM. The method used is a weighting and ranking analysis of several hypotheses related to tariffs, water quality, service continuity, network coverage, and the availability of alternative water sources. The results of the analysis indicate that the mismatch between PDAM Tirta Sari Binjai City's tariffs and the quality of services provided is the most dominant factor influencing the low level of subscriptions at PDAM Tirta Sari Binjai City. This factor is ranked first with the highest total value. Other factors that also influence are low water pressure, limited distribution network coverage, and the existence of alternative water sources, while the quality of PDAM Tirta Sari Binjai City's water sourced from the Bingai River Watershed (DAS) has the lowest influence compared to other factors.

**Keywords :** *PDAM Tirta Sari, Binjai City, water tariffs, service quality, subscription rate, environment*

## I. INTRODUCTION

### 1.1. Background

Clean water is a basic human need that plays a vital role in supporting the health, well-being, and productivity of the community. The Indonesian government, through various regulations, has emphasized that the provision of safe and sustainable drinking water is part of a public service that must be fulfilled by local governments through the Tirta Sari Regional Drinking Water Company (PDAM) in Binjai City. The existence of PDAM is expected to ensure adequate, equitable, and affordable access to clean water for all levels of urban society. However, in practice, PDAM subscription rates remain relatively low in several areas, including Binjai City. This situation indicates a gap between the availability of piped drinking water services and public interest in becoming PDAM customers. This low consumer base not only limits access to safe, clean water for the community but also impacts the financial performance and operational sustainability of PDAM Tirta Sari, Binjai City.

Several factors are suspected to be responsible for the low subscription rate of PDAM Tirta Sari in Binjai City. These factors include the quality and continuity of water services, tariff affordability, initial installation costs, limited distribution networks, and public perception and trust in PDAM Tirta Sari services in Binjai City. Furthermore, the availability of alternative water sources such as drilled wells or groundwater pumps, which are considered more practical and economical, also influences the public's decision not to become PDAM Tirta Sari customers in Binjai City. Based on these conditions, a comprehensive study is needed to identify and analyze the factors contributing to the low level of consumer adoption at PDAM Tirta Sari in Binjai City. This analysis is expected to provide a clearer picture of the problems faced and serve as a basis for formulating effective strategies and policies to increase the number of customers, improve service quality, and support the achievement of sustainable drinking water access for the people of Binjai City.

## **1.2. Formulation of the problem**

Based on the research background, the problems formulated in this research are as follows:

- What factors cause the low subscription rate of PDAM Tirta Sari Kota Binjai Kota Binjai.
- Which factor is the most dominant factor influencing people's decision not to subscribe to PDAM Tirta Sari Kota Binjai?
- How do the aspects of tariffs, water quality, service continuity, and network coverage influence public interest in subscribing to PDAM Tirta Sari, Binjai City?
- Efforts by PDAM Tirta Sari Binjai City and the Binjai City Government to improve the environmental quality of the main raw water source in this case the Bingai River Watershed (DAS).

## **1.3. Research purposes**

- Analyzing the factors that cause the low subscription rate of PDAM Tirta Sari, Binjai City
- Formulate policy recommendations and service improvement strategies to increase the number of consumers of PDAM Tirta Sari, Binjai City , Binjai City.

## **1.4. Benefits of research**

- Providing input to PDAM Tirta Sari Kota Binjai and the Binjai City Government in improving service quality, expanding networks, and developing more effective tariff policies and marketing strategies.
- Adding to the treasury of knowledge in the field of regional and urban planning and public service management, particularly regarding the provision of piped drinking water services.
- To be a reference for further research that discusses the factors that influence the level of public service consumers.

## **II. LITERATURE REVIEW**

### **2.1 Piped Drinking Water Service Concept**

Piped drinking water services are the provision of clean water through a network of pipes from water sources to homes or customers in accordance with public service standards that emphasize the availability of safe, sustainable, and equitable clean water for the community (Fauzi & Iskandar, 2019). Piped drinking water managed by the Water Company (PDAM) is expected to meet quality indicators, namely being free from physical, chemical, and microbial contaminants and meeting health standards (WHO, 2017). Continuity of flow, water pressure, and service coverage are important aspects in assessing the effectiveness of PDAM services.

### **2.2 Factors Affecting Water Consumer Levels**

Several studies have identified the main factors that influence the level of clean water service consumers, including:

- Water Tariff

Water tariffs, both usage rates and connection fees, are charges imposed on customers based on the volume of use. According to Susanti and Hartono (2018), tariffs deemed too high compared to the public's purchasing power will reduce customer interest.

- Water Quality

Water quality encompasses physical, chemical, and microbiological variables. The better the water quality provided by the water utility (PAM), the more likely people are to choose that service (Putri & Saputra, 2020). Clear, odorless, and drinkable water supports long-term customer decisions.

- Continuity of Service

Continuity or consistency of water flow at all times significantly impacts customer satisfaction (Kusuma & Rahmat, 2019). Frequently interrupted service or unstable water pressure can cause people to stop using a service or become less interested in becoming new customers.

- Network Coverage

Network coverage refers to the availability and distribution of water supply (PAM) pipes in residential areas. According to Prasetyo (2021), network inequality, particularly in outlying areas or densely populated areas, is a major obstacle for communities connecting to PAM services.

- Alternative water sources

In the case of certain conditions where city residents still use other water sources such as groundwater or surface water ( *Groundwater* ; Sutanto, R. (2005). The general form of these water sources is open wells, drilled wells or directly from rivers, lakes, reservoirs or rainwater reservoirs.

**2.3 Previous Research**

Some studies relevant to this topic include:

- Rachmad, E., Sodri, A., & Wardhana, YMA (2025) discussed the factors that influence the low utilization of piped water networks, including the use of groundwater and community behavior that impacts the low level of piped water consumers in urban areas (Duren Sawit, Jakarta).
- Palinggi, Y., & Ningrum, NWA (2025) evaluated the factors that influence the demand for PAM water connections (e.g. income, household needs) which are closely related to the low level of PAM water consumers.
- Raudatul Janah, Agus Sya'bani Arlan & Mahdalina (2024) in a study in Balangan Regency stated that water quality has a significant effect on the perceptions of PAM Lampihong customers.
- Prasetyo (2021) found that network expansion and service continuity had a significant positive effect on the number of PAM customers in urban areas.

**III. RESEARCH METHOD**

**3.1 Types of research**

The qualitative descriptive research method used manual field research using questionnaires for the respondents we determined , spread across 5 (five) sub-districts in Binjai City . Another method was library research, collecting references from books, journals, archives, and documents from the internet .

**3.2 Location and Time of Research**

The research location is Binjai City, and the research time is from 22 to 24 December 2025.

**3.3 Research Variables**

- Variables that influence (X) :
  1. Water tariff
  2. Water quality
  3. Continuity of service
  4. Network coverage
  5. Alternative water sources
- Affected variables (Y) :

1. rate of PDAM Tirta Sari, Binjai City

Code	Variables	Key Indicators
X1	Water rates	Affordability of rates, suitability of rates to quality, installation costs
X2	Water quality	Clarity, smell, taste, fit for consumption
X3	Continuity of service	Flow smoothness, frequency of disturbances, water pressure
X4	Network coverage	Network availability, ease of connection, distribution equality
X5	Alternative water sources	Other water sources are easy and cheap, traditions and customs are passed down from generation to generation, cleaner and safer

Table 1. Research Indicators

**3.4 Research Hypothesis**

The hypothesis is formulated in the form of a statistical hypothesis as follows:

1. H<sub>1</sub> : Water tariffs have a significant impact on PAM subscription rates
2. H<sub>2</sub> : Water quality has a significant impact on the level of PAM subscriptions
3. H<sub>3</sub> : Continuity of service has a significant impact on PAM subscription levels
4. H<sub>4</sub> : Service network coverage has a significant impact on PAM subscription levels.
5. H<sub>5</sub> : Alternative water sources have a significant impact on PAM subscription rates

**3.5 Analysis Method**

The analytical method used to examine the factors impacting the level of water utility subscriptions in Binjai City is based on field data obtained through a questionnaire for the five factors mentioned above. These factors will be scientifically analyzed to identify those that significantly influence them.

The theory we use to analyze the research data is as follows:

- a. Calculating the sample population size using the Slovin Formula, a formula for calculating the minimum sample size when the behavior of a population is not precisely known. This Slovin formula is commonly used in survey research, where the sample size is usually very large, requiring a formula to obtain a small sample that is representative of the entire population.

$$n = \frac{N}{1+Ne^2}$$

- b. Using a Likert Scale to measure the attitudes, opinions and perceptions of people or groups of people towards a phenomenon that occurs (Sugiyono (2014: 132) in this case we will submit a statement based on 5 (five) influencing factors:

X1..... Whare :

- n = Number of samples
- N = Population size
- e = error rate (%)

No.	Statement	Strongly Agree (SS)	Agree (S)	Doubtful (RR)	Don't agree (TS)	Strongly Disagree (STS)
1.	.....					
2.	.....					
3.	.....					

Next, determine the weight for each answer option:

- a. Score 1 STS
- b. Score 2 TS
- c. Score 3 RR
- d. Score 4 S
- e. Score 5 SS

After that, we calculate the Impact Value of each statement using the following formula:

$$I = I = \frac{\sum Rn.Jp}{Sn} \times 100 \%$$

- Where:
- I = Impact value
  - Rn = Assessment range 1 to 5
  - Jp = Number of raters
  - Sn = Maximum score = 5n
  - n = Number of samples

Next, we determine the Impact Value status based on the interpretation criteria score interval as follows:

- a. 0% – 19.99% = Very no impact (STB)
- b. Figure 20% – 39.99% = No impact (TB)
- c. The number 40% – 59.99% = Neutral (N)
- d. 60% – 79.99% = Impact (B)
- e. 80% – 100% = Very impactful (SB)

Next, calculate the weight of each statement so we can draw a conclusion about the existing phenomenon.

c. Respondent identity

- 1. Gender:  Male  Female
- 2. Age :  <20  21–30  31–40  41–50  >50
- 3. Last education:  Elementary school  Middle school  High school  Diploma  Bachelor's degree
- 4. Current water usage status:
  - Customer of PDAM Tirta Sari, Binjai City
  - Not a customer of PDAM Tirta Sari, Binjai City

#### IV. ANALYSIS AND DISCUSSION

##### 4.1 GENERAL DESCRIPTION

PAM Kota Binjai , also known as PDAM Tirta Sari Kota Binjai , is a Regional Drinking Water Company tasked with providing clean water for the residents of Binjai City . This PDAM was established as a local government effort to meet the need for healthy drinking water for the residents of Binjai City. Based on the official report of the Binjai City Regional Government, the coverage of drinking water access through the Tirta Sari City Water Company (PDAM) is still relatively low. The number of residents accessing PAM water until 2023 is 12,952 household connections out of a total population of 303,272 people in Binjai City (Binjai in Figures 2023, BPS Binjai City), or still around 19% of the total population (Source: PDAM Tirta Sari Binjai City 2024) , far below the target set in the regional development plan. This indicates that the majority of residents are still not served by the PAM network and are likely still dependent on alternative water sources.

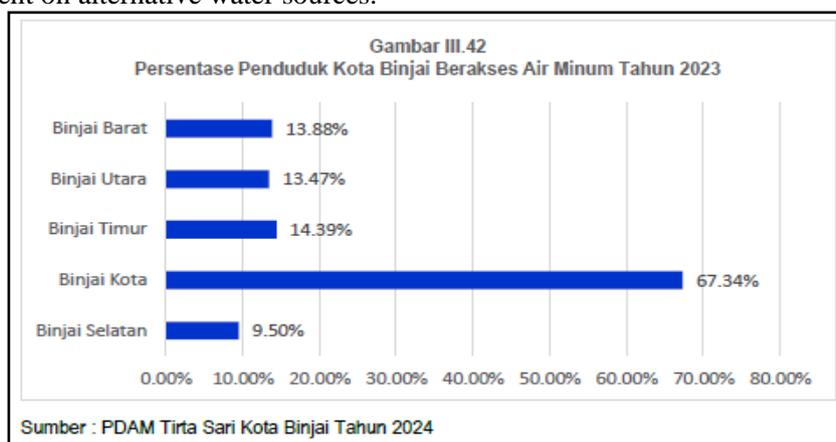


Figure 1. Percentage of Binjai City Population with Access to PDAM Tirta Sari, Binjai City, 2023

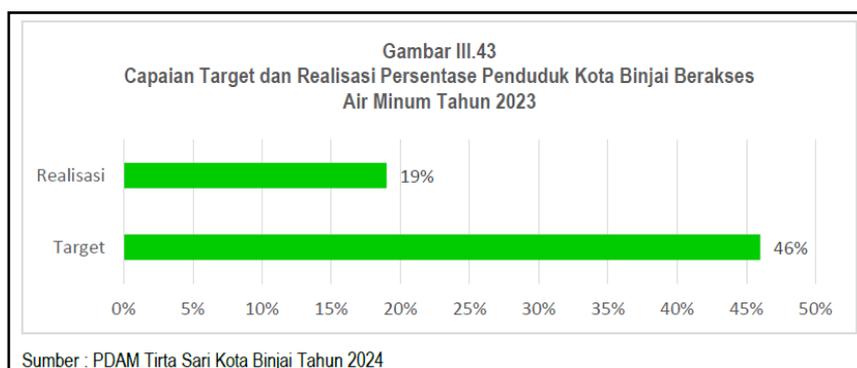


Figure 2. Realization of PDAM Tirta Sari Customers in Binjai City 2023

##### 4.2 DISCUSSION ANALYSIS

In analyzing the factors that influence or impact the PAM subscription rate in Binjai City, we determined the number of respondents to whom we would ask their opinions regarding the hypothesis we were studying. The population size we determined was 100 with a margin of error of 10%. Therefore, the number of representative respondents obtained based on the Slovin Formula is:

$$n = \frac{100}{1 + (100 \times 0,1^2)}$$

*n = 50 respondents*

Analysis of the questionnaire results using the Linkert Scale is as follows:

**ANALYSIS OF FACTORS CAUSING THE LOW SUBSCRIPTION LEVEL OF PDAM TIRTA SARI IN BINJAI CITY**

Febby Melanie et al

1. Variable X1: Water tariff

No	Statement regarding PDAM Tirta Sari, Binjai City	PERCEPTION						TOTAL SCORE				
		SS	S	RR	T	ST	n	S	S	RR	TS	ST
					S	S		x5	x4	x3	x2	x1
1	Water rates are unaffordable for my income	6	17	12	11	4	50	30	68	36	22	4
2	Water rates do not match the quality of service provided	15	28	2	3	2	50	75	112	6	6	2
3	The cost of installing the connection is too expensive	12	15	14	5	4	50	60	60	42	10	4

2. Variable X2: Water Quality

No	Statement regarding PDAM Tirta Sari, Binjai City	PERCEPTION						TOTAL SCORE				
		SS	S	RR	T	ST	n	SS	S	RR	T	ST
					S	S		x5	x4	x3	x2	x1
1	PAM water is often cloudy	6	8	11	16	9	50	30	32	33	3	9
2	PAM water still smells	5	8	13	15	9	50	25	32	39	30	9
3	The quality of PAM water is no better than well water	6	10	11	15	8	50	30	40	33	30	8

3. Variable X3: Continuity of service

No	Statement regarding PDAM Tirta Sari, Binjai City	PERCEPTION						TOTAL SCORE				
		SS	S	RR	T	ST	n	SS	S	RR	T	ST
					S	S		x5	x4	x3	x2	x1
1	PAM water often experiences disruptions	10	15	12	8	5	50	50	60	36	16	5
2	PAM water pressure is too low	19	18	8	2	3	50	95	72	24	4	3
3	No outage notification	17	14	16	2	1	50	85	56	48	4	1

**ANALYSIS OF FACTORS CAUSING THE LOW SUBSCRIPTION LEVEL OF PDAM TIRTA SARI IN BINJAI CITY**

Feby Melanie et al

4. Variable X4: Network coverage

No	Statement regarding PDAM Tirta Sari, Binjai City	PERCEPTION						TOTAL SCORE				
		SS	S	RR	T S	ST S	n	SS	S	RR	T S	ST S
								x5	x4	x3	x 2	x1
1	There is no PAM network in the area where I live	10	12	8	1 1	9	5 0	50	48	24	2 2	9
2	There is no network addition process yet	9	11	16	9	5	5 0	45	44	48	9	5
3	Has not yet reached all areas of Binjai City	14	15	13	5	3	5 0	70	60	39	1 0	3

Variable X5: Alternative water sources

No	Statement regarding PDAM Tirta Sari, Binjai City	PERCEPTION						TOTAL SCORE				
		SS	S	RR	TS	S T S	n	SS	S	RR	T S	ST S
								x5	x4	x3	x 2	x1
1	There are other cheap water sources besides PAM	12	13	6	11	8	5 0	60	52	18	2 2	8
2	We have been using well water for generations.	8	15	9	12	6	5 0	40	60	45	2 4	6
3	In my area there are not many PAM customers	16	11	8	11	4	5 0	80	44	24	2 2	4

Next, calculate the impact weight using the formula:

$$I = I = \frac{\sum Rn.Jp}{Sn} \times 100 \%$$

Where:

I = Impact value

Rn = Assessment range 1 to 5

Jp = Number of raters

Sn = Maximum score = 5 x n = 250

n = Number of samples = 50

Calculate the weight and ranking of the scores of each hypothesis:

No.	Hypothesis with the Most Influential Statement	Weight (%)					Tot al	Ran kin g	Res ult
		S S	S	RR	TS	STS			
1	Water Tariffs: PAM tariffs do not match the quality of service provided.	30	44.8	2.4	2.4	0.8	80.4	1	SB
2	Water Quality: The quality of PAM water is no better than well water.	12	16	13.2	12	3.2	56.4	5	N
3	Continuity of Service: PAM water pressure is too low	38	28.8	9.6	1.6	1.2	79.2	2	B
4	Network Coverage: PAM has not yet reached all areas of Binjai City	28	24	15.6	4	1.2	72.8	3	B
5	Alternative Water Sources: In my area there are not many customers of PDAM Tirta Sari Kota Binjai	32	17.6	9.6	8.8	1.6	69.6	4	B

Hypothesis Ranking Results:

1. Water tariffs that do not align with service quality significantly impact the low subscription rate of PDAM Tirta Sari in Binjai City. Continuity of service, network coverage, and alternative water sources also significantly influence the low subscription rate of PDAM Tirta Sari in Binjai City.
2. Water quality does not affect the low subscription rate of PDAM Tirta Sari Kota Binjai, this means that the quality of the raw water source is still suitable (PPID Kota Binjai, 2024, Environmental Quality Index (IKLH), Water Response Index is at a moderate level). Thus, it means that the quality of raw water sourced from the Bingai River Watershed must be maintained or improved by reforestation, prevention of environmental pollution, both from industrial waste and household waste .

## V. CLOSING

### 5.1 CONCLUSION

Based on the results of the weighting and ranking analysis of the factors that influence the low level of consumers of PDAM Tirta Sari Kota Binjai in Binjai City, it can be concluded that the discrepancy between PDAM Tirta Sari Kota Binjai's tariffs and the quality of services provided is the most dominant factor, thus indicating that public perception of service costs that are not commensurate with the quality of service greatly influences the decisions of PDAM Tirta Sari Kota Binjai consumers. Other contributing factors include the relatively low water pressure at PDAM Tirta Sari in Binjai City, the limited reach of the distribution network, and the availability of alternative water sources still widely used by the community. Meanwhile, water quality at PDAM Tirta Sari in Binjai City was assessed as having the least influence compared to other factors. Overall, these results indicate that the main problem lies not only in technical aspects, but also in the quality of service perceived by customers.

### 5.2 SUGGESTION

Based on these conclusions, it is recommended that PDAM Tirta Sari Binjai City evaluate its tariff policy to make it more appropriate to the quality of service provided to customers. In addition, it is necessary to improve the quality of service by improving the pressure and continuity of water flow, as well as expanding the reach of the distribution network so that it can reach all areas of Binjai City. PDAM Tirta Sari Kota Binjai is also expected to increase public trust by providing more responsive service to customer complaints and conducting outreach on improving the quality of its water. With comprehensive improvements in tariffs and services, it is hoped that public interest in PDAM Tirta Sari Kota Binjai will increase.

## REFERENCES

- BPS Kota Binjai (2023), Kota Binjai Dalam Angka 2023, Kota Binjai
- Palinggi, Y., & Ningrum, N. W. A. (2025) Analisis Faktor-Faktor yang Mempengaruhi Permintaan Sambungan Air Minum pada PDAM Tenggarong Seberang. E-Jurnal Unikarta
- Pemerintah Kota Binjai (2024) Laporan Pertanggungjawaban Walikota Binjai Tahun Anggaran 2023
- Pemerintah Kota Binjai (2024), Pejabat Pengelola Informasi dan Dokumentasi, Laporan Tahunan Indeks Kualitas Lingkungan Hidup Tahun 2024
- Rachmad, E., Sodri, A., & Wardhana, Y. M. A. (2025) Strategies for Accelerating Sustainable Drinking Water Pipeline Utilization (Studi ini membahas faktor-faktor yang memengaruhi rendahnya pemanfaatan jaringan air perpipaan (piped water) termasuk penggunaan air tanah dan perilaku masyarakat yang berdampak pada rendahnya tingkat konsumen air perpipaan di wilayah Duren Sawit, Jakarta). Lampung Agri Journal
- Sugiyono & Dewancker (2020) Investigating Community Preferences in Fulfilling Domestic Water Needs to Improve Public Water Service Provision
- Sugiyono. (2018). "Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D". Bandung: Alfabeta"
- Sumbawa & Suwardi (2024) Analisis Faktor-Faktor yang Mempengaruhi Kesiediaan Membayar Pelanggan PDAM Menang terhadap Jasa Lingkungan. (Penelitian ini melihat faktor-faktor yang memengaruhi kesiediaan pelanggan membayar layanan PDAM, yang dapat berkontribusi pada rendahnya minat konsumen bila kesiediaan membayar rendah). Sumbawa Journals
- Undang-undang No.17 Tahun 2019 tentang Sumber Daya Air
- Undang-undang RI No.25 Tahun 2009 tentang Pelayanan Publik