COMMUNITY'S WILLINGNESS TO PARTICIPATE IN WASTEWATER MANAGEMENT IN ACEH

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Abstract

Communal wastewater treatment plants (WWTPs) have been established in the Province of Aceh, mostly in Banda Aceh City as the capital and other parts of the province, to address significant environmental risks posed by wastewater originating from domestic activities. However, limited coverage, poor effluent quality, and insufficient community involvement persist. This research assesses public participation and willingness to engage in wastewater management practices. A quantitative survey was conducted with 148 Banda Aceh and Aceh Barat respondents, selected through multi-stage random sampling. The first stage in respondent selection is based on area. Banda Aceh City, the provincial capital, was chosen as the initial location for the respondents' residence, followed by Meulaboh as the regency capital. The second stage involves respondents who have household businesses (which generate domestic waste, in this case, owners of laundry and vehicle washing businesses) and those who do not have businesses. The survey explored respondents' perceptions of environmental pollution, awareness of wastewater regulations, and their readiness to participate in management efforts. The findings reveal that 77.7% of respondents are willing to join in wastewater management initiatives, with 52.21% expressing a willingness to attend community meetings and 18.14% agreeing to pay fees for communal WWTP services. Key factors influencing participation include awareness of environmental issues, positive perceptions of communal WWTPs, and the belief that the government should provide wastewater treatment infrastructure. The study concludes that increasing public awareness and involving communities in policy formulation is crucial for improving wastewater management in Aceh. These insights can guide local governments in developing effective regulations and fostering sustainable community engagement in environmental protection efforts, potentially leading to a healthier and more sustainable environment for the people of Aceh.

Keywords: *public participation, willingness to participate, wastewater management*

Introduction

Wastewater can originate from domestic sources (household activities, hotels, offices, restaurants, and schools) and industrial and agricultural activities. Wastewater should be treated before being discharged into water bodies. Domestic sewage, which consists of non-toilet wastewater (grey water) and toilet wastewater (black water) generally undergoes two different processes in Indonesia. Non-toilet wastewater is typically discharged directly into drainage channels, which flow into water bodies (rivers or other surface waters). Toilet wastewater is usually collected in septic tanks and periodically transported to Fecal Sludge Treatment Plants

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(FSTPs). The issue here is surface water pollution caused by untreated non-toilet wastewater.

One solution that has begun to be implemented in Banda Aceh to address the issues above is the operation of communal Wastewater Treatment Plants (IPAL). These on-site treatment facilities process non-toilet and toilet wastewater from several households within a residential area (hamlet/village). Decentralized wastewater treatment systems have been shown to provide immediate solutions in areas lacking proper government infrastructure, emphasizing the importance of local involvement in wastewater management (Swan et al., 2023). Approximately 50 communal WWTPs have been built in Banda Aceh. These plants, which are designed to serve specific residential regions, face significant challenges, including limited coverage, poor effluent quality, technical and operational issues, and inadequate community involvement and management practices (Harahap et al., 2021; Rohendi et al., 2021; Syah et al., 2024). These communal Wastewater Treatment Plants (WWTPs) in Banda Aceh are constructed in slum areas (as per the Decree of the Mayor of Banda Aceh). However, ideally, all houses and buildings that generate wastewater should control pollutant levels before discharging wastewater into water bodies.

In addition to domestic wastewater, attention must be given to household and more extensive industrial activities that can potentially contribute to water pollution. More prominent industries should have dedicated wastewater treatment plants (WWTPs) because the characteristics of their wastewater may differ and require different treatment stages.

Law Number 32 of 2009 on Environmental Protection and Management, Article 69, paragraph 1, the letter states, "Everyone is prohibited from committing acts that result in pollution and/or environmental damage," and Article 20, paragraph 3 states, "Everyone is allowed to dispose of waste into the environmental media with the conditions: a. Meeting environmental quality standards; b. Obtaining a permit."

Government Regulation Number 22 of 2021 on the Implementation of Environmental Protection and Management, Article 129 (1) states that the Government and/or Regional Governments shall provide facilities and infrastructure for controlling water pollution, which are provided for wastewater sources from households and runoff or non-point sources. Thus, it is clear that the government holds the authority in this matter. The government's role includes providing necessary infrastructure, enforcing regulations, and promoting community participation. Law No. 17 of 2019 on Water Resources discusses community participation in Chapter XI on Community Participation. Meanwhile, the Regional Government must formulate the derivatives of the Government Regulation. In this case, the Province of Aceh must draft a Qanun on wastewater management as an Enabling Environment to manage domestic (and industrial) wastewater. Qanun in Aceh refers to special regional regulations that govern various aspects of Acehnese society, including implementing Islamic Sharia law, as part of the special autonomy granted to the province. There are two main types of Qanun in Aceh: Aceh Qanun, which is applicable throughout the entire province and regulates general governance and social life, and Regency/City Qanun, which applies only to specific regencies or cities within Aceh and governs local administration and community life at a more localised level. These Qanun have a legal status equivalent to regional regulations in other Indonesian provinces but are unique in their requirement to be based on Islamic law and Sharia principles, reflecting Aceh's special autonomous status.

Studies show that engaging communities in water infrastructure development and oversight strengthens social bonds and encourages deeper community investment in these systems (Kelly et al., 2018). When local leaders and experts serve on water committees, they create effective structures for community input, helping ensure water management decisions align with local community needs (Kelly et al., 2018). Current water conservation policies highlight how crucial citizen involvement is for protecting water resources, with strong communication strategies playing a key role in connecting government officials with community members (Gibson et al., 2021).

Local involvement has become increasingly important as communities face growing challenges from climate change and water scarcity. This is especially true in rural areas, where community participation in water project planning and implementation is crucial for maintaining reliable access to clean water (Rankoana, 2020). When community members help monitor and assess water projects, these initiatives are more successful because they better match local circumstances (Maritim & Boit, 2008). Including historically excluded groups in these processes helps address past inequities in water resource management (Boakye & Akpor, 2012).

The Integrated Water Resources Management (IWRM) framework promotes collaboration among stakeholders - from residents to businesses and government bodies (Elfithri et al., 2019) (Elfithri et al., 2019). This comprehensive strategy tackles water management issues while encouraging sustainable practices considering environmental and socioeconomic factors (Elfithri et al., 2019). The emergence of partnerships between public entities, private organizations, and communities has proven effective in improving water service delivery and long-term sustainability (Sharma & Nayak, 2013).

Despite these advances, implementing meaningful public participation remains challenging. Many areas lack clear community engagement procedures, leading to the ineffective involvement and confusion (du Toit & Pollard, 2008). Water management organizations must establish detailed guidelines for public involvement to ensure community perspectives shape decision-making confusion (du Toit & Pollard, 2008). Establishing trust between communities and water authorities is particularly critical, especially following water quality incidents (Bratanova et al., 2013).

The study by Robina-Ramírez & Sañudo-Fontaneda (2018) conducted in South Africa, which aimed to measure community involvement in water services, it was found that involving the community in water management can significantly improve water services. The success of community-based wastewater treatment plants (WWTPs) is contingent upon the active involvement of the community in their management. This positive outcome underscores the potential for significant improvement in wastewater management when communities are actively engaged. (Ristiawan et al., 2019).

The study by Lai et al.(2017) in Malaysia on Non-Revenue Water (NRW) concluded that inadequate community participation in NRW management is due to low public knowledge and awareness of NRW issues. According to Stoutenborough & Vedlitz (2014), the public is willing to participate in government programs for water management when there are environmental problems (but what if they have not yet perceived ecological problems—which often is too late when people realize that there is an issue?).

To achieve environmental health through effective wastewater management, it is necessary to study the community's willingness

to participate in wastewater management. This is needed to understand the community's knowledge and perceptions of wastewater management and their willingness to ensure that the implementation steps of wastewater management can proceed smoothly. This study aims to determine the levels of community willingness to participate in wastewater management in Aceh to formulate policy implementation strategies for wastewater management, thereby providing crucial insights for effective policy formulation and implementation.

Research Methodology

This study employs a quantitative survey method to assess the community's willingness to participate in domestic waste management in Aceh. The research instrument is a brief questionnaire about respondents' characteristics and willingness to participate. The questions include the respondents' willingness to engage in wastewater management and the forms of participation they are willing to undertake (if they are willing to participate).

The survey designed to evaluate community willingness to participate in wastewater management in Aceh comprises three sections:

1. Section 1: Socioeconomic Attributes
   This component gathers demographic data from participants, encompassing age, gender, educational attainment, occupation, income, and ownership of a wastewater-generating firm.
2. Section 2: Perspectives on the Environment and Wastewater
   This part comprises inquiries regarding respondents' perspectives on water pollution, their understanding of wastewater regulations, and their views on the need to treat wastewater before disposal.
3. Section 3: Willingness to Participate in Wastewater Management
   The concluding section evaluates respondents' readiness to participate in wastewater management initiatives, encompassing their concurrence with proposed regulations (Qanun), involvement in community meetings, and the different types of engagement they are prepared to undertake, including fee payment or reporting pollution incidents.

This study was conducted over approximately eight months, from March 2022 to September 2022.

Sampling Method and Respondent Selection

The respondents comprised 148 individuals from Banda Aceh City and West Aceh Regency. The sampling technique used was multi-stage random sampling, which consisted of two main stages for selecting respondents:

Stage 1: Geographic Clustering Respondents were initially selected based on geographic location. Banda Aceh City (the provincial capital) and Meulaboh in West Aceh Regency (the regency capital) served as the primary clusters. As the provincial capital, Banda Aceh is a key area for Aceh, representing a major urban centre with diverse commercial activities. In contrast, Meulaboh is a representative example of a smaller city within the province, providing a valuable comparison for studying wastewater management practices in different urban contexts.

Stage 2: Business and Non-Business Categories Within each geographic cluster, respondents were further categorised into three groups: owners of laundry businesses, owners of vehicle washing businesses, and individuals without businesses. Each category was proportionally represented across sub-districts (e.g., four respondents per sub-district in Banda Aceh and specific allocations in West Aceh), ensuring a diverse and representative sample within each cluster.

The selection of laundry businesses and vehicle washing businesses for this study is based on several key factors:

1. Prevalence in the Area: Laundry and vehicle washing businesses are commonly found in Banda Aceh City and Meulaboh, representing typical commercial activities in these regions. Their widespread presence ensures a sufficient sample size for the study.
2. Wastewater Characteristics: Both types of businesses generate wastewater similar in composition to domestic sewage. Laundry businesses produce detergents, surfactants, and organic matter, while vehicle washing businesses generate wastewater with oils, greases, and cleaning agents. These components are commonly found in household wastewater, making the study's findings relevant to broader wastewater management practices.
3. Environmental Impact: The wastewater from these businesses can have significant environmental impacts if not properly treated. By focusing on these businesses, the study aims to address familiar sources of pollution and provide insights into effective wastewater treatment solutions that can be applied to both commercial and domestic settings.

The distribution of respondents is described below:

Respondents who own laundry businesses:

- Banda Aceh City: 36 individuals (divided into nine sub-districts, with four respondents in each sub-district in this category)
- West Aceh Regency: 10 individuals (Samatiga Sub-district: 7 individuals, Johan Pahlawan Sub-district: 3 individuals)

Respondents who own vehicle washing businesses:

- Banda Aceh City: 36 individuals (divided into nine sub-districts, with four respondents in each sub-district in this category)
- West Aceh Regency: 10 individuals (Samatiga Sub-district: 7 individuals, Johan Pahlawan Sub-district: 3 individuals)

Respondents who do not own businesses:

- Banda Aceh City: 36 individuals (divided into nine sub-districts, with four respondents in each sub-district in this category)
- West Aceh Regency: 20 individuals (Samatiga Sub-district: 10 individuals, Johan Pahlawan Sub-district: 10 individuals)

Results and Discussion

Characteristics of Respondents

Respondents were asked about their characteristics in the first part of the questionnaire. Table 1 presents the data on the respondents' age and gender. The minimum age of the respondents in this study is 20, the maximum age is 64, and the average age of all respondents is 41.72.

Table 1. Age and Gender of Respondents

Characteristics	Respondent Data
Minimum age (years)	20
Maximum age (years)	64
Average age (years)	41.72
Male (%)	57.43
Female (%)	42.57

The respondents' dominant education levels are high school graduates (63 individuals) and bachelor's degree/DIV holders (45). Table 2 shows the subsequent education levels.

Table 2. Respondent Education

Education	Number of Respondents
No formal education	0
Did not complete elementary school	0
Completed elementary school	6
Completed junior high school	6
Completed high school	63
Diploma (D1-D3)	27
Bachelor's degree/DIV	45
Master's degree	0
Doctorate (PhD)	1
Total	148

The data is categorised into seven groups based on respondents' main occupations. As detailed in Table 3, the most common occupation among respondents is entrepreneurship, with 69 individuals. Among the 138 respondents, 46 own laundry businesses and another 46 own vehicle-washing businesses. This indicates that while the primary occupation listed is the leading job of the respondents, a significant portion (two-thirds) are also business owners.

The income of respondents is divided into six categories, with the most dominant being below Rp. 2,000,000 (45 individuals). Table 4 presents the breakdown of the number of respondents by income category.

Table 3. Respondents' Occupations

Occupations	Number of Respondents
Civil Servants/Police/Military	25
Farmers/Fishermen/Artisans	4
Private Sector Employees	10
Entrepreneurs	69
Homemakers	33
Nurses/Doctors/Midwives	5
Others	2
Total	**148**

Table 4. Respondent Income

Income	Number of Respondents
Up to IDR 2,000,000	45
IDR 2,000,001 - Rp 4,000,000	31
IDR 4,000,001 - Rp 6,000,000	27
IDR 6,000,001 - Rp 8,000,000	13
IDR 8,000,001 - Rp 10,000,000	8
Above IDR 10,000,000	24
Total	**148**

The respondents who own businesses, totaling 92 individuals, were also asked about their businesses' turnover, and the results can be seen in Table 5.

Table 5. Business Turnover of 92 Respondents

Descriptions	Turnover (Rupiah/month)
Minimum	3,000,000
Maximum	20,000,000
Average	10,100,000

Respondents' Perceptions of the Environment and Domestic Wastewater Management

In the second part of the questionnaire, respondents were asked ten questions regarding their perceptions of the environment and wastewater management. Among these ten questions, four were explicitly directed at business-government respondents. The responses to the questions in the second part of the questionnaire are described as follows:

1. In response to the question, "What do you think about the environmental conditions in your area regarding water pollution?" the majority of respondents answered "Good," accounting for 74% (see Figure 1).

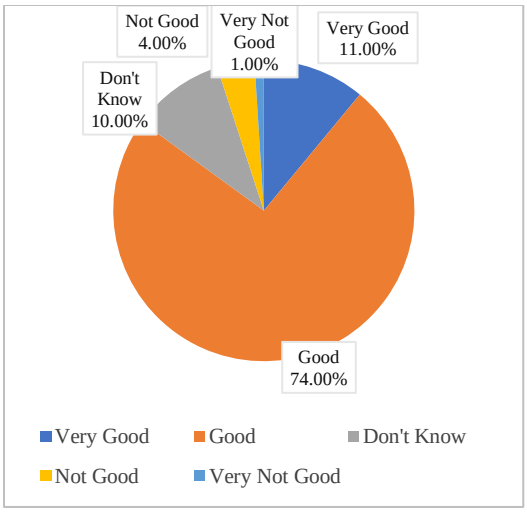

Figure 1. Environmental Conditions According to Respondents

2. In response to the question, "How do you agree with the statement: Wastewater from the business you run can pollute the environment?" (specifically for the 92 business owners), the majority of respondents answered "Agree," accounting for 60.87% (see Figure 2).

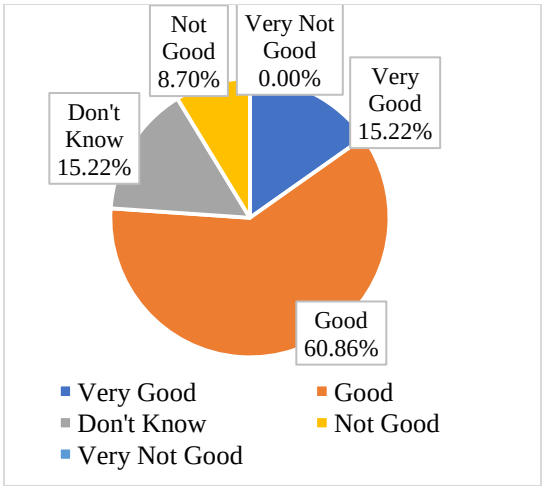

Figure 2. Respondents' Businesses Can Pollute the Environment

3. In response to the question, "How do you agree with the statement: Household wastewater (including faecal waste) must be treated before being discharged into the environment?" the majority of respondents answered "Agree," accounting for 66.98% (see Figure 3).

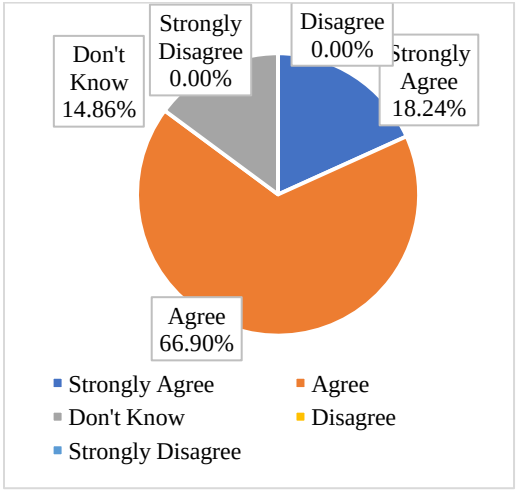

Figure 3. Household Wastewater (Including Fecal Waste) Must Be Treated

4. In response to the question, "How do you agree with the statement: Wastewater from all types of businesses/industries/activities must be treated before being discharged into the environment?" (specifically for business owners), the majority of respondents answered "Agree," accounting for 73.91% (see Figure 4).

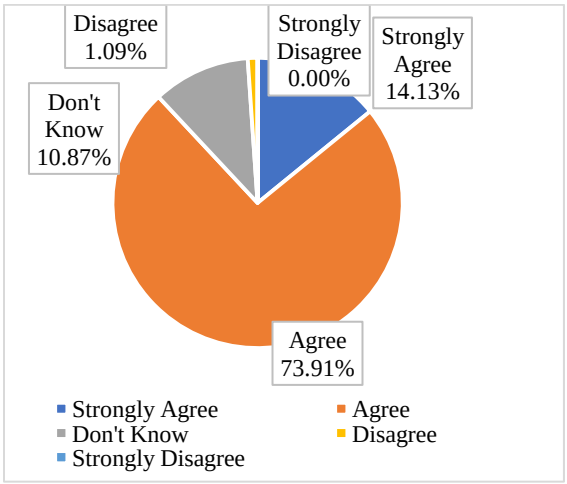

Figure 4. Wastewater from All Types of Businesses/Industries/Activities Must Be Treated

5. In response to the question, "Do you think there are regulations governing wastewater in general?", the majority of respondents answered "Don't Know," accounting for 52.7%, while 45.27% answered "Yes" (see Figure 5).

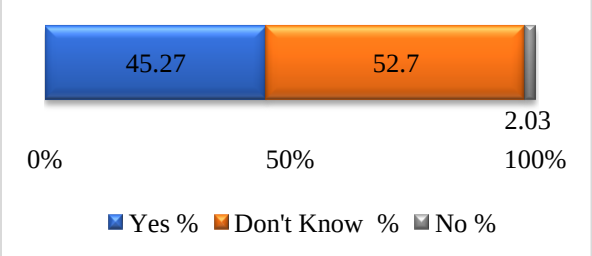

Figure 5. The existence of Regulations Governing Wastewater

6. In response to the question, "Do you think there are regulations governing wastewater from businesses like yours?" (specifically for the 92 business owners), the majority of respondents answered "Don't Know," accounting for 57.61% (see Figure 6).

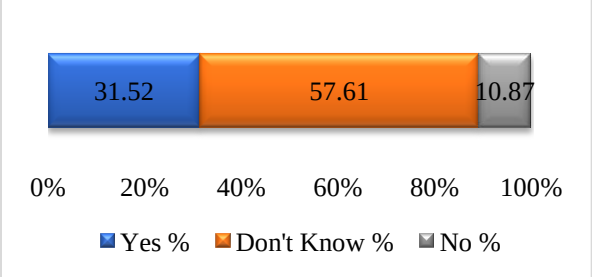

Figure 6. Existence of Regulations Governing Wastewater from Businesses

7. In response to the question, "Who do you think should provide facilities for household wastewater treatment?" the majority of respondents answered "Government," accounting for 89.87% (see Figure 7).

8. In response to the question, "Who do you think should provide facilities for wastewater treatment from a business/industry?" (specifically for the 92 business owners), the majority of respondents answered "Government," accounting for 80.43% (see Figure 8).

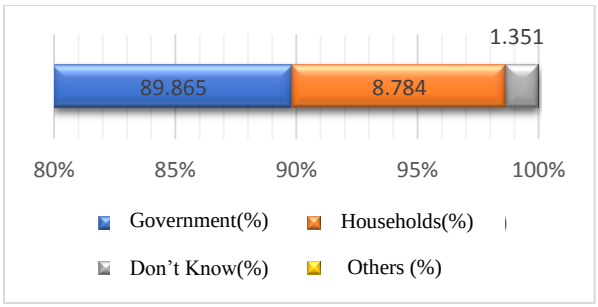

Figure 7. Who Should Provide Household Wastewater Treatment Facilities

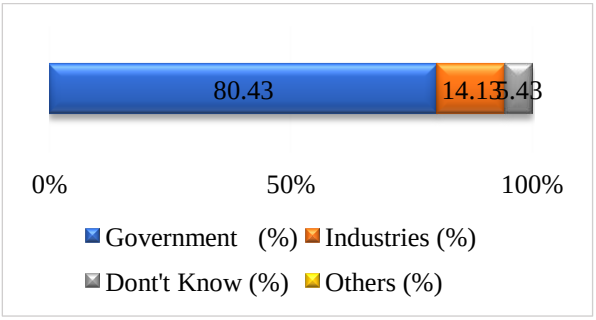

Figure 8. Who Should Provide Wastewater Treatment Facilities for Businesses/Industries

9. In response to the question, "Do you agree with the construction of Communal Wastewater Treatment Plants (WWTPs) in your residential/business area?" the majority of respondents answered "Agree," accounting for 67.57% (see Table Figure 9 and Figure 8).

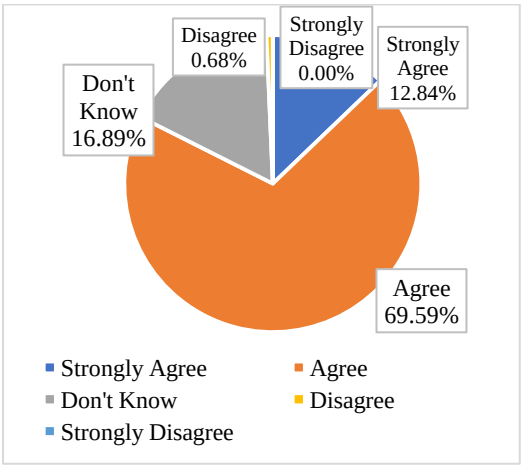

Figure 9. Agreement on the Construction of Communal Wastewater Treatment Plants in Residential/Business Areas

10. In response to the question, "Do you think Communal Wastewater Treatment Plants (WWTPs) have a positive impact on the environment?" the majority of respondents answered "Agree," accounting for 66.89% (see Figure 10).

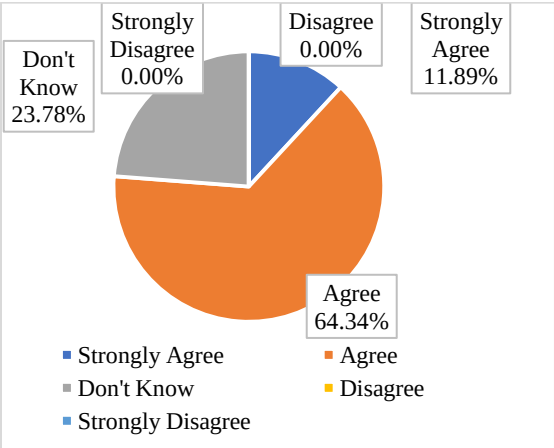

Figure 10. Communal Wastewater Treatment Plants Have a Positive Impact on the Environment

Level of Community Willingness to Participate in Domestic Wastewater Management

In the third part of the questionnaire, respondents were asked eight questions regarding their willingness to participate in wastewater management. The first seven questions provided response options across five levels of agreement/willingness, and the final question asked about the forms of participation respondents were willing to undertake. Respondents could choose more than one answer to this question based on their willingness. The responses to the questions in the third part of the questionnaire are described as follows:

1) In response to the question, "Do you agree if the government issues a Qanun regulating wastewater management in your city/district?" the majority of respondents answered "Agree," accounting for 79.05% (see Figure 11).

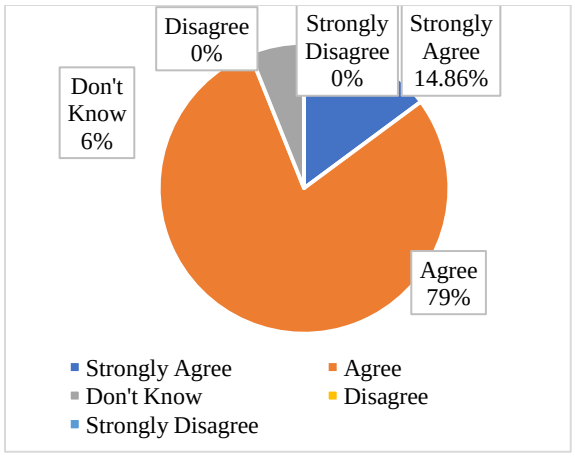

Figure 11. Agreement on Government Issuing a Qanun Regulating Wastewater Management in the City/District

2) In response to the question, "Do you agree if the Qanun regulating wastewater management includes sanctions for residents/businesses/industries that pollute the environment?" the majority of respondents answered "Agree," accounting for 76.35% (see Figure 12).

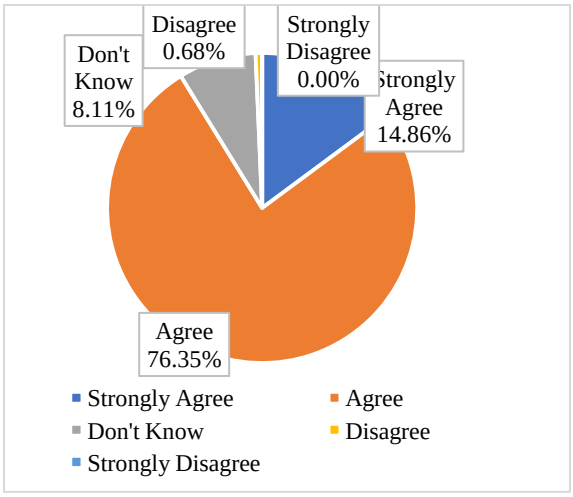

Figure 12. Agreement on Including Sanctions in the Qanun Regulating Wastewater Management

3) In response to the question, "If the Qanun states that every household (including homes with home industries) must be connected to communal wastewater treatment plants (IPAL), do you agree?" Most respondents answered "Agree," accounting for 70.27% (see Figure 13).

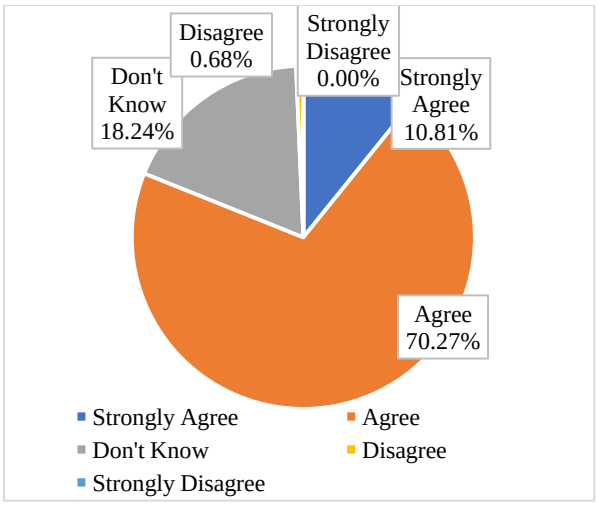

Figure 13. Every Household Must Be Connected to Communal Wastewater Treatment Plants

4) In response to the question, "If the Qanun states that every business/industry must independently treat its wastewater before discharging it into the environment, do you agree?" the majority of respondents answered "Agree," accounting for 57.43% (see Figure 14).

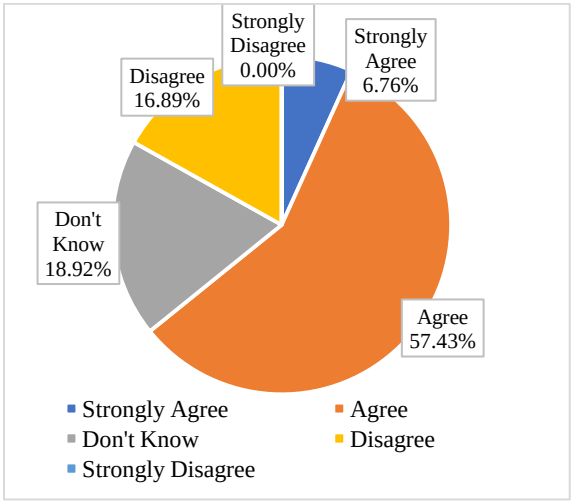

Figure 14. Businesses/Industries Must Independently Treat Their Wastewater

5) In response to the question, "If residents are invited to participate in the drafting of the Qanun by contributing ideas (e.g., through village meetings), do you agree to attend?" the majority of respondents answered "Agree," accounting for 89.86% (see Figure 15).

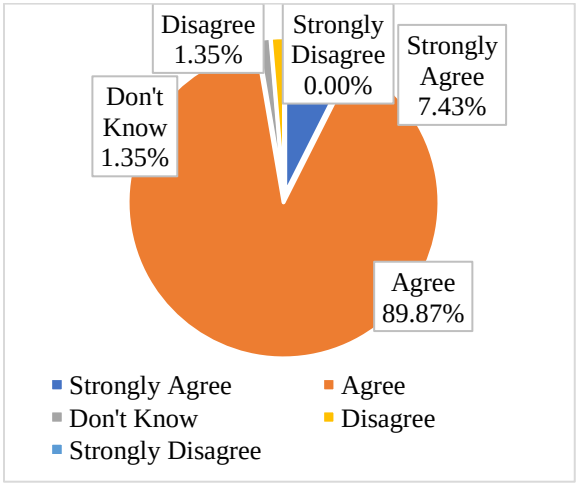

Figure 15. Agreement to Attend Meetings for Drafting the Wastewater Management Qanun

6) In response to the question, "If residents are invited to participate in the drafting of the Qanun by contributing ideas through an online questionnaire, do you agree to fill out the questionnaire?" the majority of respondents answered "Agree," accounting for 85.81% (see Figure 16).

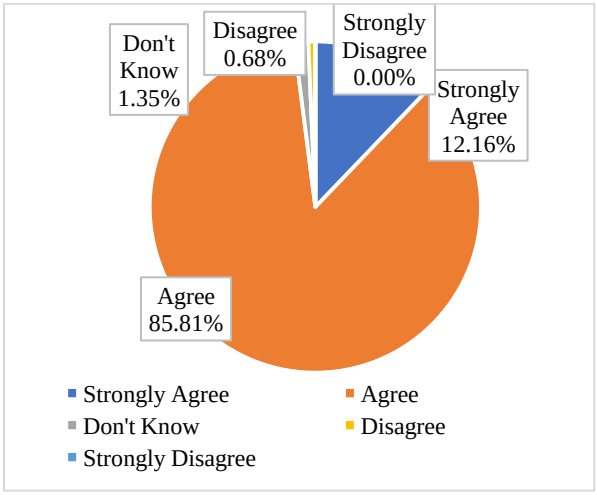

Figure 16. Agreement to Fill Out Online Questionnaire for Drafting the Wastewater Management Qanun

7) When asked, "How willing are you to participate in wastewater management in your city/district?" Most respondents

answered "Willing," accounting for 77.7% (see Figure 17).

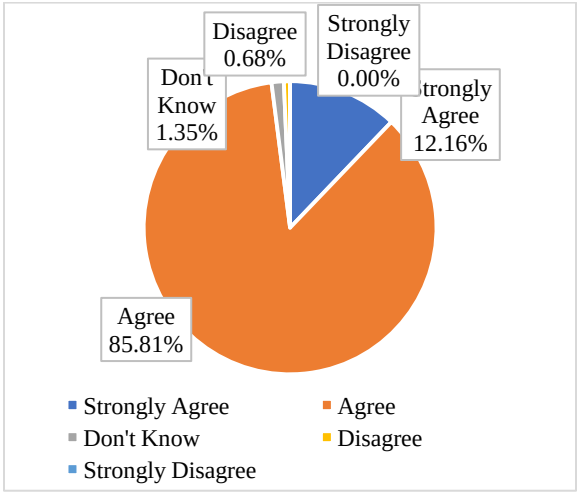

Figure 17. Willingness to Participate in Wastewater Management

8) In response to the question, "In what ways are you willing to participate in wastewater management? (Multiple answers allowed)", Most respondents chose the option "A" (see Table 5). The provided response options are as follows:
   A. Attending community meetings related to wastewater management.
   B. Becoming a supervisor/manager in wastewater management activities (e.g., managing communal wastewater treatment plants).
   C. Facilitating wastewater inspectors to test the wastewater quality you discharge into the environment.
   D. Paying fees (e.g., communal wastewater treatment plant fees if your house is connected to one).
   E. Paying fines.
   F. Willingly having your business license suspended/revoked.
   G. Reporting pollution occurring in the environment to the authorities.
   H. Reporting pollution caused by people/entities you know to the authorities.
   I. Am willing to be a witness if there is a report of pollution by certain parties.

Table 5. Forms of Willingness to Participate in Wastewater Management

Response Options	Percentage of Respondents (%)
A	79.73
B	6.08
C	8.78
D	27.70
E	8.11
F	4.05
G	10.14
H	5.41
I	2.70

The percentages shown in Table 5 indicate the proportion of respondents who selected each specific option out of the total number of respondents (148). For example, 79.73% of respondents indicated their willingness to attend community meetings related to wastewater management (Option A). This means that out of the 148 respondents, approximately 118 individuals chose this option. Similarly, the other percentages reflect the number of respondents who selected each respective option.

Factors Influencing Community Willingness to Participate in Domestic Wastewater Management

The research results indicate that the community's willingness to participate is relatively high: 20.27% of the 148 respondents answered "Very Willing," and 77.70% answered "Willing."

Based on the analysis of respondents' answers, several factors likely contribute to the high willingness to participate in wastewater management in Aceh:

1. Level of Awareness and Knowledge
   One of the main factors influencing willingness to participate is the community's awareness and knowledge about the

importance of wastewater management. In the questionnaire, most respondents demonstrated a good understanding of environmental pollution caused by wastewater.

- 66.98% of respondents agreed that household wastewater should be treated before being discharged into the environment, and 60.87% of business owners agreed that their businesses could pollute the environment.
- This indicates that awareness of the negative impacts of wastewater can increase the community's willingness to engage in wastewater management.

2. Positive Perception of Communal Wastewater Treatment Plants (IPAL):
   - The majority of respondents (82.43%) agreed with the construction of communal wastewater treatment plants in their area.
     Most respondents (78.33%) also believed that communal wastewater treatment plants positively impact the environment.
   - A positive perception of communal wastewater treatment plants can increase the community's willingness to participate in their management.
   - Public engagement is critical in contemporary wastewater management. Gen emphasises that public knowledge about wastewater systems is essential for fostering engagement, which benefits both the public and wastewater managers (Gen, 2010). The lack of public understanding can hinder the acceptance and implementation of innovative wastewater management practices, as noted by Prouty et al., who argue that stakeholder involvement is crucial for the sustainability of wastewater systems (Prouty et al., 2017).
3. Understanding of Government Responsibility:
   - Respondents stated that the government should provide wastewater treatment facilities, both for households (89.87%) and businesses/industries (80.43%) (Figures 3 and 4).
   - The community's trust that the government will provide wastewater treatment facilities can enhance their willingness to participate, possibly because the community's role is seen as supporting the government rather than being the primary actor.

These factors contribute to the community's high willingness to participate, as reflected in the research findings. However, further efforts are needed to translate this willingness into active participation in wastewater management practices.

Based on these research findings, local governments could immediately prepare policies and regulations (e.g., Qanun) related to wastewater management at the provincial or city/regency level. However, it should be noted that the public is more likely to embrace public policies if they can participate in the formulation process, even if their proposals (aspirations or desires) are not fully met. (Golubovic, 2010).

Furthermore, the research findings indicate that there is still a lack of awareness or knowledge among the community regarding regulations related to wastewater or the necessity of treating wastewater before it is discharged into the environment. The success of wastewater management systems often hinges on the community's willingness to engage in the planning and maintenance processes, which can be bolstered by educational initiatives that raise awareness about the benefits of participation (Hidayat et al., 2023). Therefore, environmental

education and information about water management programs must be effectively disseminated to the public (Ahmed et al., 2020). Awareness and attitudes towards environmental conservation also play a critical role in shaping willingness to participate in wastewater management. Studies have shown that households with positive environmental attitudes are more likely to engage in water conservation practices and express a willingness to pay for improved wastewater services (Munusami et al., 2016). In particular, the perception of health risks associated with wastewater flooding has been linked to a higher willingness to invest in wastewater system upgrades (Veronesi et al., 2014). This education can be conducted through activities to raise awareness and build capacity to enhance the community's willingness to participate in Aceh's sustainable water resource management—specifically, wastewater management.

Socioeconomic factors, including education level and income, further affect individuals' willingness to engage in wastewater management. Higher educational attainment correlates with a greater likelihood of accepting recycled wastewater usage, indicating that education can enhance understanding and acceptance of wastewater management practices. (Jaafar et al., 2023). Additionally, household characteristics, including income and family size, influence economic considerations, such as the willingness to pay for wastewater treatment improvements. (Ezebilo, 2013).

Effective community engagement, public knowledge, and positive social perceptions are essential for fostering participation in wastewater management initiatives. Policymakers and practitioners must address these factors to enhance community involvement and ensure the sustainability of wastewater management systems.

Conclusions

Based on the research findings and discussion, several conclusions can be drawn as follows:

1. The community (business and non-business owners) is highly willing to participate (20.27% very willing, 77.7% willing).
2. The community (business and non-business owners) is highly willing to participate (20.27% very willing, 77.7% willing).
3. Factors influencing the willingness to participate include:
   a. The level of awareness and knowledge of the community;
   b. Positive perceptions of communal wastewater treatment plants (IPAL Komunal)
   c. The perception that the government is responsible for providing wastewater treatment facilities.
4. The government needs to pay attention to the factors influencing community willingness to participate in wastewater management, particularly in raising awareness and understanding of environmental issues, to ensure the success of wastewater management programs in Aceh.

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