Community Perception In Domestic Wastewater Treatment To Reduce River Pollution : A Study In Rw 09 Kotalama Village, Kedungkandang Subdistrict, Malang City

Jenvia Rista Pratiwi*, Bakhrul Mukhid Fadilah* Ramadani, and *Esty Adelin* Tambunan

Department of Civil Engineering and Planning, Faculty of Engineering, Universitas Negeri Malang, Indonesia

Abstract. The basic human need is for clean water, essential for daily needs such as drinking, cooking, and industrial processing. This makes the function of water not only economic but also social. The domestic water demand in Malang will reach 1304 liters/second in 2023. However, the current condition of the Brantas River has a pollution index value classified as "lightly polluted", so domestic wastewater treatment management is needed. The role of the community is very influential in domestic wastewater treatment to reduce the pollution of the Brantas River. This can also support the Regional Government Work Plan of Malang City in 2023. The steps taken are to determine the status of domestic wastewater treatment and to analyze the perceptions of the community along the Brantas River. The data collection method used a questionnaire with purposive sampling with the number of respondents with similar characteristics. The results showed that the level of education of the community had a better influence, but did not affect the good behavior of domestic wastewater treatment. The community still discharges domestic wastewater into the river. The community's domestic wastewater treatment behavior is influenced by their knowledge and attitude toward the existing drainage system in their house.

1 Introduction

The Brantas River, located in East Java, Indonesia, is the longest river on the island, stretching approximately 320 km and draining an area of over 11,000 km2[1]. This river is a crucial water source for various purposes, including irrigation, domestic water supply, and industrial use. However, the Brantas River Basin faces significant water quality and pollution control challenges. The sources of pollution in the Brantas River include domestic wastewater, industrial wastewater, agricultural runoff, and solid waste[2].

Domestic wastewater treatment is an essential aspect of reducing river pollution. The community's perception of domestic wastewater treatment can play a significant role in the success of such initiatives. Domestic wastewater is one of the main contributors to the

* Corresponding author: jenvia.rista.ft@um.ac.id

pollution in the Brantas River. Proper management of domestic wastewater is essential for reducing pollution and ensuring the sustainability of water resources in the basin[3]. In urban areas like Malang, Indonesia, decentralized wastewater treatment systems, such as anaerobic baffled reactors, have been implemented to improve domestic wastewater treatment[4]. The local government has also regulated the installation of wastewater treatment systems in industries to reduce pollution from industrial sources[5].

To address the water quality and environmental management issues in the Brantas River Basin, the Indonesian government has implemented PERMENLHK Policy No. 68 about Domestic Wastewater Quality Standards. This policy emphasizes the importance of domestic wastewater management systems (SPALD S) and centralized domestic wastewater treatment in reducing pollution and protecting water resources[3]. The requirements for household wastewater disposal include not polluting water sources, not causing odors, and not polluting the land surface. The solid waste must be appropriately managed so as not to cause odor and not spoil the land surface and groundwater. Grey water contains chemicals used in household activities and must be treated so as not to pollute and not endanger health and the environment [6].

The success of domestic wastewater management initiatives in the Brantas River Basin depends on the perception and participation of the community. Public understanding of the importance of proper wastewater treatment and their willingness to participate in such initiatives can significantly impact the success of these programs. Education and awareness campaigns are essential for improving public perception and encouraging participation in domestic wastewater management efforts[4]. This journal will focus on the community's perception of domestic wastewater treatment in RW 09 Kotalama Village, Kedungkandang Subdistrict, Malang City. The study will aim to understand the community's perception of domestic wastewater treatment and how it affects their willingness to participate in such initiatives. The study will also explore the challenges faced by the community in implementing domestic wastewater treatment and how these challenges can be addressed. The journal will provide insights into the importance of community perception in domestic wastewater treatment and how it can be used to reduce river pollution.

2 Materials and Methods

This research was carried out by dividing two work packages (WP), including:

1. Identify the conditions of domestic wastewater processing in communities along the Brantas River (WP1).
2. Analyze the problem of community behavior towards the domestic wastewater treatment system in communities along the Brantas River (WP2).

2.1 Work package 1

The condition of domestic wastewater processing can be determined by observation in the Brantas River Watershed area and interviews. Apart from that, an analysis of the water quality of the Brantas River was also carried out based on PERMEN LHK No. 68 2016 concerning Domestic Wastewater Quality Standards. Water samples were taken from domestic wastewater in RW 09, Kotalama Village. The samples were then analyzed for physical and chemical parameters and photographs of the research location. The physical parameters of the water analyzed are pH, BOD, COD, TSS, oil and fat content, ammonia, and total coliform, as stated in Appendix 1 PERMEN LHK No. 68 of 2016 concerning Domestic Wastewater Quality Standards. The results of the analysis of parameters that exceed the maximum permitted threshold as stated in PERMEN LHK No. 68 2016

concerning Domestic Wastewater Quality Standards study the extent of deviation from the established quality standards.

2.2 Work package 2

The population in this study was the people of RW 9, Kotalama Village, Kedungkandang District, Malang City. Determination of the sample size using the sample probability method. This method uses specific considerations to obtain a representative sample from a population, providing the ability to generalize a population [7]. The characteristics of respondents were people who had lived permanently for more than 20 years and were familiar with the waste processing system in their area. In measuring the number of samples in this study, the researcher used Slovin's formula with a standard error of 5% or 0.05. The total population in RW 9 Kotalama Village, Kedungkandang District, Malang City, is 489 houses. This formula was used to determine the number of samples from the population by the following equal (1),

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

Where n is the number of population, N is the population, and e is the standard error using 5% or 0.05. Based on the calculation of the Slovin formula, the result obtained was 25 respondents from different houses. The research instrument for WP 2 uses a questionnaire that is interviewed. After that, the data was analyzed using Excel. The questionnaire collected information about domestic wastewater treatment and its existing condition.

3 Result and discussion

3.1 Characteristics of respondents

Table 1. Characteristics of respondents

Characteristics of respondents	N	Prosentase (%)
Education		
Out of School	2	8
Elementary school	12	48
Middle school	5	20
Senior high school	6	24
Total	**25**	**100**
Number of Families		
Less than 4 people	7	28
4-6 people	15	60
7-9 people	3	12
Total	**25**	**100**

Productive age begins at the age of 15-65, when a person can still work to produce goods or services to meet both their own needs and the needs of society, people of productive age can become capital in development [8]. The age of the respondents in this study falls into the effective category, in the 25-65 age range. The older a person is, the better his mental development process, but at a certain age, the increase in this development process is not as

fast as when he was a teenager; with increasing age a person can have an impact on the rise of knowledge gained, but at certain ages or towards old age the ability to accept or remember an understanding will decrease[6].

Table 1 shows that the highest level of education is primary school for 12 respondents (48%), secondary school for 6 respondents (24%), middle school for 5 respondents (20%) and not in school for 2 respondents (8%). The economic conditions of each family may influence the level of education. As the respondents are the head of the family or the eldest member in the house, the level of education affects the family's understanding and perception of domestic wastewater treatment and its possible impacts. The higher the level of education, the better the knowledge of domestic wastewater treatment, not only as a cause of a dirty environment but also as a cause of polluted river water [9]. Regardless of their education level, all respondents want a healthy and safe living environment from disasters. In addition, they will comply with the government's policies if they receive the correct information and guidance from the relevant government, so they have no objection to cooperating in creating a healthy and clean residential environment.

Based on Table 1, the number of family members in a house is 4-6 persons for up to 15 respondents (60%), less than 4 persons for up to 7 respondents (28%), and 7-9 family members for up to 3 respondents (3%). The number of family members is related to the amount of domestic wastewater produced. The area is a densely populated settlement with no green open spaces, high building density and high population density. These results are in line with several previous studies, which state that densely populated settlements have a wastewater treatment system that drains or discharges their waste into rivers, gutters or backyards without first treating the waste, the rest being treated by filtering or separating solid and liquid waste [10].

3.2 Respondent Knowledge

Table 2. Respondent's knowledge of domestic wastewater regulations

Respondent's knowledge	N	Prosentase (%)
Domestic wastewater regulations		
know	9	36
Not knowing	16	64
Total	**25**	**100**
Opinion on the discharge of domestic wastewater into the river		
Agree	22	80
Disagree	5	20
Total	**25**	**100**

Based on Table 2. It was found that 9 respondents (36%) knew the regulations related to domestic wastewater treatment, while 16 respondents (64%) did not know the rules related to domestic wastewater treatment. Of the 9 respondents who knew, 5 respondents knew thoroughly and 4 respondents knew partially. This indicates that they also need help understanding the definition of domestic wastewater. Most people know domestic wastewater is from household activities that are no longer needed, such as water used after washing clothes, washing dishes, cooking, human waste, and used bathing water that is dirty and cannot be reused. Community knowledge of domestic wastewater management is shallow, as the community is unaware of the administration, sources, and impacts of domestic wastewater itself. The public health center or related agencies only provide advice to the local

RT and RW without involving the wider community, except for advice on dengue fever, malaria, and so on, so that community ignorance of domestic wastewater becomes commonplace [11,12].

The community's ignorance of domestic wastewater management regulations affects their opinions and behavior when discharging domestic wastewater into the river. Table 2. shows that as many as 20 respondents (80%) agree with discharging domestic sewage into the river, while 5 respondents (20%) disagree. However, based on the interview results, the community tends to act. Knowledge coexists with attitudes, behavior, and education, where a good education gives an individual broader and more appropriate expertise and insight. However, this does not exclude the possibility that individuals with low levels of education do not know, as education is not only provided in formal schools but can also be obtained through non-formal education. A person's knowledge about an object has two positive and negative aspects [12]. Respondents with poor knowledge about domestic wastewater management can be caused by a lack of understanding and information about domestic wastewater management from the definition, source, and impact on environmental pollution. Thus, it impacts their opinions related to the behavior they have been doing for almost their entire life.

3.3 Community disposal of domestic wastewater

Table 3. Type of domestic wastewater discharge

Type of domestic wastewater discharge	Respondent	
	N	**Prosentase (%)**
Outlet to river	25	100%
Open outlet	0	0%
Outlet is infiltration into the ground	0	0%
Total	**25**	**100%**

Based on Table 3 all respondents (100%) discharge domestic wastewater directly into the river. This is undoubtedly related to Table 2, which shows the lack of public knowledge about domestic wastewater management in accordance with current regulations. The community's ignorance has led to the emergence of behavior that justifies the disposal of domestic wastewater directly into the river without prior treatment. In addition to dumping domestic wastewater into the river, the community also participates in dumping solid waste into the river. This is done because there are no temporary shelters (TPS). TPS is where waste is transported before it is moved to either the recycling or processing sites.

When domestic wastewater is discharged directly into a river without proper treatment, it can cause significant damage to the river ecosystem. A study of the effects of wastewater discharge on microbial dynamics and pathogenicity in a river ecosystem found that although self-purification processes can restore some microbial diversity, the effects of direct wastewater discharge are irreversible, resulting in long-term damage to the ecosystem[13]. presence of untreated domestic wastewater in rivers can increase the risk of waterborne diseases for communities that depend on the river for various purposes, such as drinking water, bathing, and irrigation. Over 80% of illnesses and 50% of child deaths worldwide are linked to poor water quality, highlighting the importance of tackling domestic wastewater pollution[14]. Domestic wastewater contains various pollutants, including nutrients, organic matter, and pathogens, which can cause environmental pollution when discharged into rivers. This pollution can harm aquatic life such as fish, amphibians, and invertebrates, and the overall ecological balance of the river ecosystem[15].

3.4 Domestic wastewater quality in RW 09

Table 4. Domestic wastewater quality

Indicator	unit	Quality Standart	MUH-1	MUH-2
NH3	mg/L	10	0,3174	0.2954
Total coliform	cfu/100mL	3000	2080	1480
pH		6-9	6.86	6.93
Oil&Grease	mg/L	5	1.5	1
COD	mg/L	100	34.59	23.9
BOD	mg/L	30	12.09	7.54
TSS	mg/L	30	28	8.8

Sampling domestic wastewater from the discharge pipe leading directly to the river will affect the river water quality. Table 4 shows that the NH3 content is 0.2954-0.3174. The total coliform in the river water is 1480-2080. The pH of the river water is 6.86-6.93. The oil and grease content is 1-1.5. COD content is 23.9-34.59. BOD content is 7.54-12.09. TSS content is 8.8-28. The overall quality test of domestic wastewater in RW 9, Kotalama Urban Village, Kedungkandang Subdistrict, Maang City is still below and around the quality standard. This may be due to the fact that the survey was only carried out in 1 CU, so the results were below the quality standard. However, this does not rule out the possibility of continuous accumulation that may cause pollution of the river water quality.

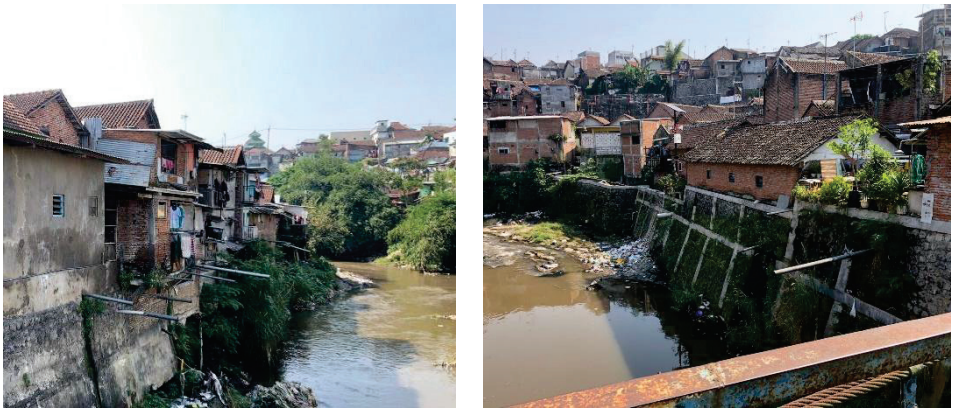

Fig. 1. Existing condition of domestic wastewater

A study on the contribution of domestic wastewater to the water quality of the Brantas River in Malang City, Indonesia, analyzed the relationship between various pollutants and water quality parameters. The study found that the effluent organic matter (EfOM) from domestic wastewater significantly impacted the river's water quality [16]. Another study focused on the impact of various pollutants, including domestic wastewater, on river water quality. The research used a pollution model to understand the relationship between batik waste, domestic waste, and water quality in the Premulung River. The results showed the significant impact of domestic wastewater on the overall water quality of the river[17].

Direct sewage discharge can cause irreversible environmental damage and affect microbial dynamics and pathogenicity in river ecosystems. While self-purification processes can restore some microbial diversity, the effects of direct wastewater discharge are long-lasting and cannot be fully reversed[13]. The improper disposal of domestic wastewater can

have indirect effects on human health. The degradation and pollution of water bodies such as rivers can lead to the contamination of drinking water sources and the spread of water-borne diseases, ultimately affecting the well-being of communities[14].

4 CONCLUSION

The characteristics of the community in RW 9 Kotalama Urban Village, Kedungkandang Subdistrict, Malang City, with most of the population having a middle school education level, leads to ignorance of information on good domestic wastewater management. The community is unaware of the regulations on domestic wastewater management in the Environmental Law. This ignorance leads to a wastewater treatment system discharging directly into the river through pipes without prior management. Although the domestic wastewater they produce does not exceed the quality standards, if it continues to accumulate, it will cause river water pollution and harm the community itself. Nevertheless, the community wants to keep its environment clean and healthy by often carrying out community service activities. It is recommended that future researchers analyze a suitable wastewater management system that the community can use given the lack of land as it is classified as a densely populated settlement. In addition, it can also provide socialization information on how to manage domestic wastewater in accordance with government regulations. Universitas Negeri Malang is fully supporting this research through an internal research grant. We received population data from BPS Malang City, which helped us to determine the number of samples. The author would like to thank all those who have supported this research.

References

1. M. Roestamy and M. Ali, Environment, Development and Sustainability **24**, 11514 (2022)
2. K. E. R. P. and R. Schuyler Houser* and Maurits Willem Ertsen, **3**, 22 (2021)
3. U. S. A. for International and Development or the United States Government, 11 (2021)
4. B. Achmad, R. Usman, E. F. President, J. Tirta, P. C. Lecturer, I. Address, J. No, and I. Telp, 7 (2003)
5. A. Bhat, **1**, 201 (2008)
6. A. E. Suoth1 and Ernawita Nazir1, **10**, 80 (2016)
7. Sugiyono, *Metode Penelitian Kuantitatif Kualitatif Dan R&D* (Alfabeta, Bandung, 2013)
8. D. Sains, K. Dan, P. Masyarakat, and F. E. Manusia, 100 (2014)
9. R. Putri, 79 (2017)
10. J. C. C. Mende, V. A. Kumurur, and I. L. Moniaga, 1. J. C. C. Mende, V. A. Kumurur, and I. L. Moniaga, 7, 395 (2015) **7**, 395 (2015)
11. B. H. Wahyu Hardi Cahyono1), Wahyu2), Siti Aisyah3), **7**, 50 (2011)
12. A. A. Akbar, H., Sarman, S., Gebang, Promotif Preventif **3**, 22 (2021)
13. Y. Xie, X. Liu, H. Wei, X. Chen, N. Gong, and S. Ahmad, Scientific Reports 1 (2022)
14. L. Lin, H. Yang, and X. Xu, **10**, (2022)
15. Sami Ullah Bhat and Umara Qayoom, 19 (2021)
16. S. Arum, A.P. I., D. Harisuseno, **10**, 84 (2019)
17. D. S. Handayani. 2020 Rezagama, A., E. Sutrisno, 10 (2020)