

Sanitation facility mapping at Kalideres District, West Jakarta

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Sanitation facility mapping at Kalideres District, West Jakarta

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Abstract. Poor sanitation has various impacts on human health, such as the risk of contracting diseases like diarrhoea, typhoid, polio, and worm infections. The government has set targets in the National Medium-Term Development Plan (RPJMN) 2020 - 2024, with the goal of achieving 90% access to proper sanitation, including 15% of households having access to safe sanitation, and reducing the rate of open defecation to 0% by the end of 2024. The objective of this mapping is to recommend wastewater sanitation technologies in Tegal Alur Subdistrict. Data collection will be carried out through interviews and questionnaires, determining the number of respondents using the Slovin formula. Interviews and questionnaires will be conducted in 4 densely populated neighbourhoods (RW) with a high rate of open defecation, namely RW 01, RW 02, RW 03, and RW 13. Based on the results of interviews and questionnaires, 71% of the population in Tegal Alur Subdistrict have toilets, but only 24% have septic tanks, leading to environmental pollution due to wastewater discharge. The type of septic tank used is individual septic tanks, and 88% of the population in Tegal Alur has never desludged their septic tanks. The condition of wastewater sanitation in Tegal Alur Subdistrict can be described as poor, characterized by a lack of septic tanks to manage wastewater, resulting in wastewater pollution of the environment, which can lead to various diseases.

1. Introduction

Sanitation is one of the environmental issues still faced by many cities in Indonesia. In general, sanitation access in Indonesia has significantly increased from 24% in 1993 to 80.29% [1]. Poor sanitation has adverse effects on human health, such as causing diseases like diarrhoea, typhoid, polio, and parasitic infections. Therefore, there is a need to improve clean and adequate sanitation services and reduce the practice of open defecation to 0%.

Indonesia is estimated to represent about 6% of the world's water resources, indicating that the country has a relatively abundant supply of water. However, the reality is that many regions in Indonesia, such as East Nusa Tenggara, Java, Bali, and Sulawesi, are experiencing a shortage of clean water supply. Nearly 65% of river water in Indonesia is heavily polluted [2-3]. This is indeed a very concerning situation because poor water quality threatens the health of the population using it. River water is the primary source of clean water for a significant portion of Indonesia's population. Regarding this



pollution issue, the main source of river water pollution in Indonesia actually comes from household or domestic waste, rather than industrial waste. This further underscores the correlation between water quality and the quality of sanitation, where water quality is determined by the quality of sanitation practices.

The water pollution levels in major cities in Indonesia, particularly in Jakarta, have shown a concerning upward trend, leading to high levels of contamination in both groundwater and surface water. This pollution is primarily caused by anthropogenic activities that generate liquid waste, as well as communities discharging their wastewater directly into bodies of water, including reservoirs, ponds, channels, rivers, and the sea. Additionally, a significant contributing factor is the uncontrolled disposal of domestic wastewater from households into rivers or its seepage into the ground [4].

The government has established the National Medium-Term Development Plan (RPJMN) 2020 - 2024, with one of its targets being 90% access to proper sanitation, including 15% of households having safe sanitation access, and achieving a 0% rate of Open Defecation (OD) by the end of 2024. The government, specifically the Ministry of Public Works and Housing (Kementerian Pekerjaan Umum dan Perumahan Rakyat or PUPR), is striving to promote safe sanitation access through the construction of Centralized Domestic Wastewater Management Systems (SPALD-T) and Decentralized Domestic Wastewater Management Systems (SPALD-S).

Indonesia is committed to achieving the Sustainable Development Goals (SDGs), including SDG number 6, which aims to ensure access to clean and sustainable water and sanitation for all. SDG number 6 has a broad impact on health, human life, and environmental preservation. The primary objective of SDG number 6 is to ensure that everyone has affordable and reliable access to clean water supply, as well as equal access to improved sanitation, including proper toilets and sanitation facilities. Improving sanitation is a crucial step in preventing diseases and maintaining environmental hygiene.

Kalideres District as one district in West Jakarta that have high residents and consider as most dense area in Jakarta Province, intersected by the Semongol River and Apuran River. In high density areas, it is assumed that there is a lack of access to proper sanitation. The mapping of sanitation condition existing is needed before doing the sanitation planning in Kalideres District.

2. Methods

2.1. Data collection methods

A sample refers to a subset of characteristics from a population that is used for research purposes [5]. The sample should accurately represent and be valid in measuring the variables of interest. The determination of the sample size in this mapping is done using the Slovin formula, which is as follows:

- n : Number of samples
- N : Population size of the planning location's neighborhood
- E : Error Tolerance Limit

$$\eta = \frac{N}{1 + Ne^2} = \frac{69.332 \text{ population}}{1 + (69.332 \text{ population} \times 0,1^2)} = 99,8 \text{ (rounded to 100)} \quad (1)$$

From the calculation using the Slovin formula, the determined sample size to be used is 100 individuals in priority sub-district distributed across all RW's in the sub-district.

2.2. Data analysis methods

The evaluation of the existing condition is conducted through a site survey using data from the Community-Based Total Sanitation (STBM) which consists of four criteria: Permanent Healthy Toilet (JSP), Semi-Permanent Healthy Toilet (JSSP), sharing, and open defecation (OD). The data sought is related to sanitation-related disease cases. Data on diseases related to sanitation are useful in identifying the consequences of poor environmental sanitation and serve as a standard for determining priority

locations. The questionnaire data that collected then be analysed by categorizing responses to observe the percentage of each response from the respondents.

3. Results and Discussions

3.1. Selection of priority areas

The selection of priority areas in Kalideres District is due to its inclusion in the long-term development project of the Jakarta Sewerage System (JSS), which is scheduled for construction between 2031 and 2050. Kalideres district has been chosen as a main focus because it has a large population and high population density. Furthermore, at the neighborhood level, Tegal Alur was selected as a priority area based on the recommendation of Kalideres District due to its high OD number. Tegal Alur is also a priority area for sanitation development within Kalideres District.

One of the challenges faced by the community in this area is sanitation issues, particularly wastewater sanitation. Many residents of Tegal Alur practice OD without having proper septic tanks, resulting in the disposal of wastewater into open channels. By choosing Tegal Alur as a priority subdistrict, it is hoped that the environmental quality and public health can be improved.

3.2. Data collection

The researcher conducted data collection starting with secondary data. The required secondary data includes administrative areas, topography, population density figures, the progress of Community-Led Total Sanitation (STBM), and the percentage of waterborne disease cases.

Secondary data is necessary to determine the priority locations or RW in Tegal Alur Sub-District by examining the progress of STBM, which indicates the percentage of households with access to toilets (sanitation coverage) and the number of individuals still practicing open defecation. The table presenting the STBM progress data in Tegal Alur Sub-District can be found in Table 1.

Table 1 Data of community-led total sanitation (STBM) in 2023 [6].

No	RW	Number of Families	Sanitary Toilet (KK)						
			JSP	%	JSSP	Sharing	%	OD	%
1	1	1,849	980	53%	0	758	59%	111	6%
2	2	1,824	863	47%	0	845	54%	121	7%
3	3	2,557	1,270	50%	0	1,119	56%	169	7%
4	4	342	183	54%	0	153	55%	5	1%
5	5	1,012	720	71%	0	292	71%	0	0%
6	6	1,106	836	76%	0	270	76%	0	0%
7	7	1,413	981	69%	0	425	70%	7	0%
8	8	1,040	744	72%	0	264	75%	33	3%
9	9	2,674	1,434	54%	0	1,178	56%	62	2%
10	10	826	691	84%	0	135	84%	0	0%
11	11	1,526	994	65%	0	509	67%	23	2%
12	12	2,119	1,235	58%	0	934	56%	20	1%
13	13	492	325	66%	0	115	77%	52	11%
14	14	340	300	88%	0	40	88%	0	0%
15	15	1,323	861	65%	0	447	66%	15	1%
16	16	330	288	87%	0	42	87%	0	0%
Total		20,773	12,705		0	7,526		618	3%

3.3. Data analysis of questionnaires

Interviews and questionnaires need to be conducted to obtain primary data on the existing sanitation conditions, clean water usage, ownership of toilets or septic tanks, waste management conditions, and

the economic conditions of the community. Interviews and questionnaires can also help identify the current sanitation issues faced by the planning area.

In the sanitation infrastructure mapping in Kalideres District, it is conducted in Tegal Alur Sub-District because Tegal Alur Sub-District has poor sanitation conditions, as indicated by the high number and percentage of OD practices, as shown in Table 1. Tegal Alur Sub-District consists of 16 RWs. The selected RWs for prioritized interviews and questionnaires are those with poor sanitation access, marked by the presence of households without toilets or septic tanks, leading to OD practices.

Based on the selection criteria for RW, as indicated by the percentage of open defecation in Table 1, 4 priority RWs have been chosen for interviews and questionnaires. RWs that were not selected as priorities are those with relatively good sanitation conditions, showing a smaller percentage of open defecation compared to the 4 priority RWs. The total number of respondents required to complete the questionnaire is 100 respondents, divided among 4 RWs, namely RW 01, RW 02, RW 03, and RW 13 in Tegal Alur Sub-District, which have the highest average OD number.

Wastewater sources in Tegal Alur Sub-District are generated from activities such as dishwashing, laundry, bathing, urination, and defecation. Figure 1 displays the number of sanitation facilities (bathroom/toilet) owned by residents in Tegal Alur Sub-District per household. It is evident that 29% of the residents in Tegal Alur Sub-District do not possess private sanitation facilities. For those without private sanitation facilities, communal facilities are typically available for shared use by multiple families. Access and availability of toilet represent a key external or environmental factor [7]. The lack of toilets can lead to diseases like diarrhoea, especially in young children, indirectly contaminating food or beverages [8]. Globally, diarrhoea remains one of the biggest health issues in developing countries as the morbidity and mortality rates due to diarrhoea are still high [9].

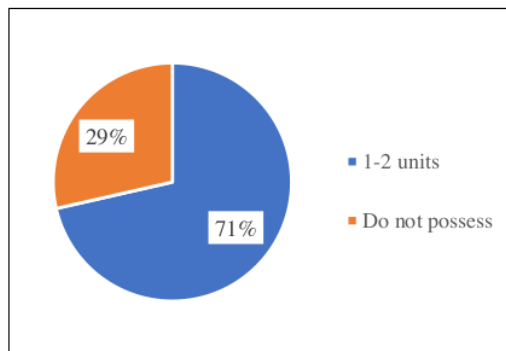


Figure 1. The number of sanitation facilities (MCK).

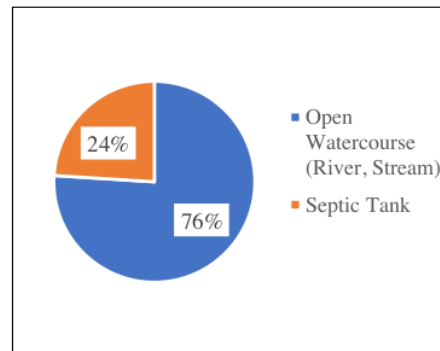


Figure 2. MCK drainage system.

Residents of Tegal Alur who do not have septic tanks discharge wastewater from their bathroom, toilet, and kitchen (MCK) to Kali Semongol and Kali Apuran through pipes connected from the toilet to the river. Factors influencing open defecation such as economic status, land ownership, and toilet ownership [10]. According to Indonesia National Standards (SNI) 2398-2017 regarding the procedures for planning septic tanks with advanced treatment, septic tanks should be constructed with a distance of > 10 meters from water sources [11]. Septic tanks located close to water sources have the potential to cause groundwater contamination due to E. coli [12]. Faecal contamination leads to waterborne diseases and the presence of pathogenic bacteria [13]. The majority of residents who have septic tanks use individual septic tank systems. Figure 2 illustrates the flow of wastewater from the toilet, and Figure 3 illustrates the types of septic tanks used by the residents in Tegal Alur Sub-District.

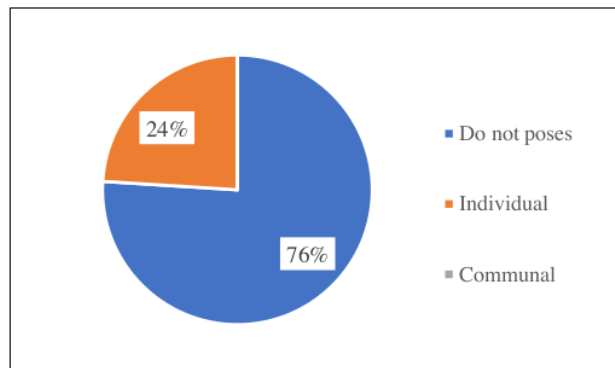


Figure 3. Types of septic tanks.

Each septic tank will experience an increase in volume as it continuously fills with wastewater from MCK. Septic tanks should be desludged at least every three years to prevent soil or groundwater pollution. The deterioration of groundwater quality is also caused by poor sanitation, such as septic tank effluent leakage [14]. This contamination is indicated by the presence of *Escherichia coli* in groundwater originating from septic tank waste [15]. Figure 4 shows the frequency of septic tank emptying among residents of Tegal Alur Sub-District, indicating that residents have never desludged their septic tanks, posing a potential environmental pollution risk.

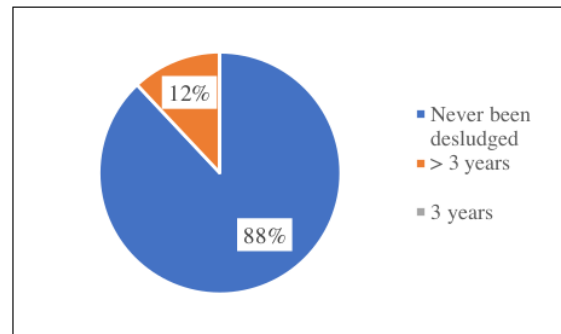


Figure 4. Frequency of septic tank desludging.

4. Conclusion

The wastewater sanitation condition in Tegal Alur Sub-District can be characterized as poor due to the presence of residents practicing OD, indicated by the fact that some individuals lack proper septic tanks for their toilets, resulting in wastewater being discharged into water bodies. Tegal Alur Sub-District is intersected by the Semongol River and Apuran River, which serve as disposal points for residents living along their banks to release wastewater. The study reveals significant sanitation issues in Tegal Alur Sub-District, especially in wastewater management and individual hygiene. Some residents have septic tanks but neglect maintenance, risking leakage and disease. To address this, the author proposes maintaining and upgrading septic tanks, raising community awareness, and establishing communal septic networks to prevent pollution and support government environmental goals.

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