Enrichment
Journal of Multidisciplinary Research and Development

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Enrichment: Journal of Multidisciplinary Research and Development

PERFORMANCE ANALYSIS AND OPERATION AND MAINTENANCE COST REQUIREMENTS FOR RAPAK DI DRAINAGE

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ABSTRACT

Inadequate drainage infrastructure often leads to waterlogging during rainfall, emphasizing the need for urgent repairs. This study assesses the performance condition of the Rapak Dalam Drainage system using a quantitative and qualitative approach, including field observations, direct measurements, and hydrological data analysis. The findings indicate that the drainage system is rated at a "Good" performance level, with a functional capability of 80.56%. Although the system effectively manages water in most areas, certain components require immediate repairs to maintain optimal functionality. To enhance drainage performance, this study recommends routine inspections, timely maintenance, and sediment management to prevent blockages. Additionally, upgrading drainage infrastructure, optimizing water flow through improved design, and implementing community-based maintenance programs are suggested to ensure long-term efficiency. These measures will help mitigate flooding risks and improve urban water management in Samarinda.

Keywords: *drainage infrastructure; drainage system condition; performance; maintenance*

INTRODUCTION

Road drainage is a vital component of urban infrastructure that drains rainwater and prevents inundation and flooding (Aranda et al., 2023). The efficiency of a good drainage system is necessary to ensure the comfort and safety of road users, as well as to protect the road structure from damage caused by water. Samarinda City, which is the capital city of East Kalimantan Province, has high rainfall intensity and geographical conditions that are prone to flooding (Asnar, 2023; Kusumo et al., 2023; Sundari, 2020). Therefore, an effective Drainage system is urgently needed to overcome this problem.

The consequences of ineffective drainage systems extend beyond localized flooding. Urban development is significantly impacted, as persistent waterlogging deteriorates road networks, weakens building foundations, and disrupts transportation and commercial activities (Fletcher et al., 2015). Additionally, stagnant water contributes to public health risks, serving as a breeding ground for disease-carrying mosquitoes and increasing the incidence of vector-borne diseases such as dengue fever and malaria (Dickson-Gomez et al., 2023). A study by Khansa et al. (2020) found that poor drainage management in Jakarta exacerbated urban flooding, leading to increased economic losses and long-term infrastructural damage. Similarly, Purwanto & Lestari (2019) emphasized that blocked drainage channels in Bandung significantly reduced system efficiency, necessitating frequent emergency interventions. These findings underscore the critical role of proactive drainage maintenance and planning in ensuring urban resilience.

One of the main factors affecting the performance of the drainage system is the operation and maintenance activities that are carried out. Inadequate operation and maintenance can lead to decreased Drainage system capacity, sediment buildup, and damage to Drainage components (Francisco et al., 2023; Pochwat, 2025). Several studies, provide examples of how good operation and maintenance can improve Drainage system effectiveness (Nur, 2022; Nur et al., 2021; Nur, Hatta, et al., 2020; Nur, Suriamihardja, et al., 2020). Therefore, assessment of Drainage operation and maintenance activities becomes very important to ensure that the system can function properly and sustainably (Liu et al., 2025; Wang et al., 2024; Yamashita et al., 2024).

This study aims to assess the performance of the Drainage system on Jalan Rapak Dalam Samarinda City. This assessment includes identification of existing problems and evaluation of the current performance of the Drainage system. The research by Saragi et al. (2023) and Arnbjerg-Nielsen et al. (2013) provide guidance on cost analysis and budget planning for Drainage maintenance. Thus, the results of this study are expected to provide appropriate recommendations for the repair and improvement of the performance of the Drainage system.

Through quantitative and qualitative approaches, this research will collect data from various sources to provide a comprehensive picture of the condition and needs of the Drainage system on Jalan Rapak Dalam. Quantitative data will be obtained through direct field measurements and hydrological analysis, while qualitative data will be obtained from interviews with relevant parties and literature studies. International journal by Fletcher et al. (2015) provides an overview of various terminologies and approaches in sustainable drainage management. With this research, it is hoped that the problem of inundation and flooding in the Jalan Rapak Dalam area can be minimized, thus creating a more comfortable, safe and sustainable environment for the people of Samarinda City.

This research is also supported by various relevant case studies, by Nur, Hatta, et al. (2020), which provides insight into preliminary modeling of current and bathymetry characteristics at the confluence of the Mahakam River and Karang Mumus River. The findings show significant variations in current depth and velocity at different points of the river confluence, which is relevant for understanding the dynamics of Drainage systems in complex areas. In addition, the study by Nur, Suriamihardja, et al. (2020) highlights the type of mixing at the confluence based on tidally influenced temperature and salinity distribution, which can provide insights into water mixing dynamics relevant for water quality management in Drainage systems.

While previous studies have examined drainage system performance and maintenance in Indonesian cities like Semarang, Surabaya, and Medan, a critical gap remains in the specific, localized analysis of drainage challenges within Samarinda City, particularly on Jalan Rapak Dalam. This research uniquely addresses this gap by providing a detailed performance assessment of the existing drainage system on Jalan Rapak Dalam, integrating channel condition assessments with waterworks evaluations to determine operation and maintenance cost requirements. This granular approach, focusing on a specific urban road segment within Samarinda, offers novel insights into the interplay between drainage infrastructure, local hydrological conditions, and maintenance practices. The study's contribution lies in its development of targeted recommendations for optimizing drainage performance on Jalan Rapak Dalam, informing more effective and sustainable urban drainage management strategies tailored to the unique challenges of this rapidly developing area.

This study aims to assess the performance condition of the drainage system on Jalan Rapak Dalam, Samarinda, by evaluating its functional capability, identifying key deficiencies, and recommending targeted improvements. Using a quantitative and qualitative approach, data were collected through field measurements, hydrological analysis, and stakeholder interviews. The findings of this study will provide practical recommendations for improving drainage performance, including routine inspections, optimized maintenance schedules, and sediment management strategies. Additionally, this research highlights the need for integrated urban water management approaches to ensure the long-term sustainability and efficiency of drainage systems in Samarinda and other rapidly developing urban areas.

METHOD

This study employs a descriptive quantitative approach to assess the performance of the Rapak Dalam drainage system in Samarinda City and determine its maintenance needs. Data collection involved literature review, field observations, primary surveys, and secondary data analysis. The literature review provided theoretical references, while field observations documented drainage conditions, including sediment buildup, structural integrity, and flow efficiency, using checklists and photographic records.

Primary data were collected through walk-through surveys, where channel dimensions, flow velocity, and sediment levels were measured using laser distance meters and portable flow meters. Structured interviews and surveys were conducted with local authorities, drainage workers, and residents to understand operational challenges. Secondary data, such as historical rainfall records (2013–2023) and original drainage design specifications, were obtained from BWS Kalimantan IV Samarinda and the East Kalimantan Bina Marga Office to compare planned versus actual drainage performance.

For data validation, findings from field surveys, interviews, and secondary sources were cross-verified using triangulation techniques. Repeat surveys at selected sites ensured measurement accuracy, while statistical validation assessed reliability. The data were analyzed using Condition Index (CI) and Function Index (FI) calculations, benchmarked against Indonesian National Standards (SNI) and Permen PU No. 13/PRT/M/2012. The results guided recommendations for routine maintenance, sediment control, and infrastructure improvements, contributing to better drainage management in Samarinda.

RESULTS AND DISCUSSION

Drainage Performance Analysis

Channel Condition Assessment

In the channel aspect, the assessment is carried out by examining the condition of the wet cross section, berm, channel embankment, and the overall condition of the channel. This assessment aims to assess the function and performance of the channels in the Rapak Dalam Drainage Area as a whole.

Table 1. Assessment of Channel Condition Based on Wet Cross Section, Berm, and Embankment on Drainage Rapak Dalam Kec. Loa Janan

Channel Type	Channel Name	Registration Number	Channel Length (m)	Wet Cross Section				Berm			Embankment		
				Upstream (P1)	Center (P2)	Downstream (P3)	P1	Left (P1)	Right (P2)	P2	Left (P1)	Right (P2)	P3
2	3	4	5	6	7	8	9	10	11	12	13	14	15
Area Jln Harun Nafsi STA 0+000 - 0+050													
OPEN DRAINS	DRAINAGE		50	1	2	1	1.33						
Area Jln Harun Nafsi STA 0+050 - 0+100													
OPEN DRAINS	DRAINAGE		50	1	3	1	1.67						
Area Jln Harun Nafsi STA 0+100 - 0+150													
OPEN DRAINS	DRAINAGE		50	2	1	1	1.33						
Area Jln Harun Nafsi STA 0+150 - 0+200													
OPEN DRAINS	DRAINAGE		50	1	2	2	1.67						
Area Jln Harun Nafsi STA 0+200 - 0+250													
OPEN DRAINS	DRAINAGE		50	3	1	2	2.00						
Area Jln Harun Nafsi STA 0+250 - 0+300													
OPEN DRAINS	DRAINAGE		50	1	2	1	1.33						
Area Jln Harun Nafsi STA 0+300 - 0+350													
OPEN DRAINS	DRAINAGE		50	2	2	2	2.00						

Channel Type	Channel Name	Registration Number	Channel Length (m)	Wet Cross Section				Berm			Embankment		
				Upstream (P1)	Center (P2)	Downstream (P3)	P1	Left (P1)	Right (P2)	P2	Left (P1)	Right (P2)	P3
2	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Area Jln Harun Nafsi STA 0+350 - 0+400													
OPEN DRAINS	DRAINAGE		50	1	1	2	1.33						

Based on the channel condition assessment, the analysis of the data provided for the Drainage channels on Harun Nafsi Road shows that there is significant variation in the condition of the Drainage infrastructure as illustrated through performance indices ranging from 1.00 to 3.00. Channels with an index of 1.00 indicate excellent condition with minimal maintenance requirements, signifying high effectiveness in water flow management. In contrast, channels with an index of 3.00 indicate severe deterioration, requiring immediate repair or rehabilitation measures to avoid more serious problems such as flooding or further damage to infrastructure. Most channels have an index between 2.00 to 2.67, indicating moderate deterioration and requiring moderate maintenance to maintain optimal Drainage performance.

Table 2. Calculation of Condition Index and Weight of Channel Function

			Channel Function Description (%)	Channel Condition Index Calculation		Channel Function Description
			P1 Wet Cross Section	Wet Cross Section (W1) (weight = 3)	Channel Condition Index	
2	*3*	*5*	*6*	*9 = 3 x (6)*	*12 = (9+(10)+(11)/ Total Weight*	*13*
Area Jln Harun Nafsi STA 0+000 - 0+050 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+050 - 0+100 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,67	5,00	1,67	83%
Area Jln Harun Nafsi STA 0+100 - 0+150 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+150 - 0+200 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,67	5,00	1,67	83%
Area Jln Harun Nafsi STA 0+200 - 0+250 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,00	6,00	2,00	75%
Area Jln Harun Nafsi STA 0+250 - 0+300 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+300 - 0+350 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,00	6,00	2,00	75%
Area Jln Harun Nafsi STA 0+350 - 0+400 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+400 - 0+450 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%

Area Jln Harun Nafsi STA 0+450 - 0+500 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,00	3,00	1,00	100%
Area Jln Harun Nafsi STA 0+500 - 0+550 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+550 - 0+600 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+600 - 0+650 (Open Channel) OPEN DRAINS	DRAINAGE	50	3,00	9,00	3,00	50%
Area Jln Harun Nafsi STA 0+650 - 0+700 (Open Channel) OPEN DRAINS	DRAINAGE	50	3,00	9,00	3,00	50%
Area Jln Harun Nafsi STA 0+700 - 0+750 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,00	6,00	2,00	75%
Area Jln Harun Nafsi STA 0+750 - 0+800 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 0+800 - 0+850 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,00	6,00	2,00	75%
Area Jln Harun Nafsi STA 0+850 - 0+900 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,00	6,00	2,00	75%
Area Jln Harun Nafsi STA 0+900 - 0+950 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,67	5,00	1,67	83%
Area Jln Harun Nafsi STA 0+950 - 1+000 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 1+000 - 1+050 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,67	8,00	2,67	58%
Area Jln Harun Nafsi STA 1+050 - 1+100 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,67	8,00	2,67	58%
Area Jln Harun Nafsi STA 1+100 - 1+150 (Open Channel) OPEN DRAINS	DRAINAGE	50	2,67	8,00	2,67	58%
Area Jln Harun Nafsi STA 1+150 - 1+200 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%
Area Jln Harun Nafsi STA 1+200 - 1+250 (Open Channel) OPEN DRAINS	DRAINAGE	50	1,33	4,00	1,33	92%

Area Jln Harun Nafsi STA 1+250 - 1+300 (Open Channel)	DRAINAGE	50	3,00	9,00	3,00	50%
OPEN DRAINS						

The Drainage System along Harun Nafsi Road shows variations in condition and performance in different sections, as indicated by the calculated condition index. The index ranges from 1.00 to 3.00, where a lower index indicates better condition and higher functionality. A section with an index of 1.00 is in excellent condition, indicating 100% functionality and effectively managing water flow without significant impediments. This optimal performance indicates that the section requires minimal maintenance.

In contrast, sections with an index of 3.00 are in poor condition, operating at only about 50% of their functionality. This severe degradation significantly impacts their effectiveness, highlighting the urgent need for immediate repair or rehabilitation to prevent potential safety hazards and environmental issues, such as increased flood risk and property damage.

Parts with an index between 2.00 and 2.67, which represents moderate damage, function at 58% to 75% capacity. These areas require regular maintenance and moderate repairs to restore full functionality and prevent further deterioration.

Overall, although most of the Drainage system along Harun Nafsi Road is functioning adequately, some areas require urgent attention to ensure the reliability and effectiveness of the system, especially during periods of high rainfall. Continuous monitoring and regular evaluation is advised in all sections to detect and address emerging issues in a timely manner, ensuring the Drainage system remains efficient and effective.

Waterworks Condition Assessment

In the aspect of waterworks, the assessment is carried out by examining the condition of the Floor/Foundation, Walls, Wings, Sluice gates, and the overall condition of the waterworks. The data displayed is summarized in the table which ,includes the type of channel, the name of the waterworks, the type of building structure, as well as the main components such as floors/foundations, walls, wings, sluice gates, and building condition parameter values (B).

Table 3. Condition of Water Buildings in Drainage Channels

Channel Type	**Name of Water Building**	**Registration Number**	**Type of Building Structure**	**Water Building Condition**							**Ket**
				Floor/Foundation	Wall/Tile	Box Cover	Berm	Inlet and oulet		B	
2	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
	STA 0+000										
OPEN DRAINS			Concrete	1,00	1,00	1,00	1,00	0,00		1,00	
	STA 0+050										
OPEN DRAINS			Concrete	1,00	1,00	1,00	1,00	0,00		1,00	
	STA 0+100										
OPEN DRAINS			Concrete	2,00	1,00	1,00	1,00	0,00		1,25	
	STA 0+150										
OPEN DRAINS			Concrete	1,00	2,00	1,00	2,00	0,00		1,50	
	STA 0+200										
OPEN DRAINS			Concrete	3,00	1,00	1,00	1,00	0,00		1,50	
	STA 0+250										
OPEN DRAINS			Wood	1,00	1,00	1,00	1,00	0,00		1,00	
	STA 0+300										

OPEN DRAINS		Concrete	2,00	1,00	1,00	1,00	0,00	1,25
	STA 0+350							
OPEN DRAINS		Wood	1,00	2,00	1,00	1,00	0,00	1,25
	STA 0+400							
OPEN DRAINS		Wood	2,00	1,00	1,00	1,00	0,00	1,25
	STA 0+450							
OPEN DRAINS		Land	1,00	1,00	1,00	1,00	0,00	1,00

Table 3. Condition of Water Buildings in Drainage Channels (continued)

Channel Type	Name of Water Building	Type of Building Structure	Water Building Condition	Ket	No.	Channel Type	Name of Water Building	Type of Building Structure
			Floor/Foundation	Wall/Tile				
2	*3*	*5*	*6*	*7*	*1*	*2*	*3*	*5*
OPEN DRAINS		Concrete	2,00	1,00	1,00	2,00	0,00	1,50
	STA 0+550							
OPEN DRAINS		Concrete	2,00	1,00	1,00	1,00	0,00	1,25
	STA 0+600							
OPEN DRAINS		Concrete	1,00	1,00	1,00	1,00	0,00	1,00
	STA 0+650							
OPEN DRAINS		Wood	1,00	1,00	1,00	1,00	0,00	1,00
	STA 0+700							
OPEN DRAINS		Wood	1,00	1,00	1,00	1,00	0,00	1,00
	STA 0+750							
OPEN DRAINS		Wood	1,00	1,00	1,00	2,00	0,00	1,25
	STA 0+800							
OPEN DRAINS		Wood	2,00	1,00	1,00	1,00	0,00	1,25
	STA 0+850							
OPEN DRAINS		Concrete	2,00	1,00	1,00	1,00	0,00	1,25
	STA 0+900							
OPEN DRAINS		Wood	1,00	1,00	1,00	2,00	0,00	1,25
	STA 0+950							
OPEN DRAINS		Concrete	1,00	1,00	1,00	1,00	0,00	1,00
	STA1+000							
OPEN DRAINS		Wood	2,00	1,00	1,00	1,00	0,00	1,25
	STA 1+050							
OPEN DRAINS		Wood	1,00	1,00	1,00	1,00	0,00	1,00
	STA1+100							
OPEN DRAINS		Wood	1,00	1,00	1,00	1,00	0,00	1,00
	STA 1+150							
OPEN DRAINS		Concrete	2,00	1,00	1,00	1,00	0,00	1,25
	STA1+200							
OPEN DRAINS		Wood	1,00	1,00	1,00	2,00	0,00	1,25
	STA 1+250							

OPEN DRAINS	-	1,00	1,00	1,00	1,00	0,00	1,00
STA1+300							

Based on the data in Table 3. Based on the analysis of the open drains condition table, it can be seen that the types of structures used vary, namely concrete, wood, and earth. Concrete structures dominate some segments and tend to have higher condition values (column B) of 1.25 to 1.50, indicating conditions that require further attention or evaluation. Meanwhile, timber structures are used more frequently in many locations with more stable condition values ranging from 1.00 to 1.25, indicating reasonably good condition. Earthen structures are only used at STA 0+450, while at STA 1+250 there is no description of the type of structure.

The condition assessment of water structures covers several aspects, such as floors/foundations, walls/roofs, box covers, berms, and inlets and outlets. The values for these aspects generally ranged from 1.00 to 2.00, with 1.00 indicating standard or good condition. In some locations, such as STA 0+100, STA 0+500, and STA 0+800, there is a value of 2.00 on the floor/foundation which indicates that there are parts that require more attention.

Overall, the condition of the open drains can be said to be quite good, with the majority of total values (column B) being at 1.00. However, some segments with values of 1.25 to 1.50 need more attention, especially on concrete structures that show variations in condition. Further maintenance or evaluation recommendations need to be made, especially on segments with a floor/foundation value of 2.00 to ensure the function and durability of the channel remains optimal.

Table 4. Calculation of the Condition and Function Index of Water Buildings in Deep Rapak Drainage

			Water Building Condition	**Condition Index Calculation Water Buildings**		
Channel Type	**Channel Name**	**Channel Length (m)**	**B**	**Building Water (weight = 4)**	**Index Building Condition**	**Building Function (%)**
			Water Buildings	**7 = 4 x (6)**	**8 = 7 / weight**	
2	*3*	*5*	*6*	*7*	*8*	*9*
	STA 0+000					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA 0+050					
OPEN DRAINS		50	1	4.00	1.0	75%
	STA 0+100					
OPEN DRAINS		50	1	5.00	1.3	69%
	STA 0+150					
OPEN DRAINS		50	2	6.00	1.5	63%
	STA 0+200					
OPEN DRAINS		50	2	6.00	1.5	63%
	STA 0+250					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA 0+300					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 0+350					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 0+400					
OPEN DRAINS		50	1	5.00	1.3	69%
	STA 0+450					
OPEN DRAINS		50	1	4.00	1.0	75%
	STA 0+500					
OPEN DRAINS		50	2	6.00	1.5	63%
	STA 0+550					
OPEN DRAINS		50	1	5.00	1.3	69%

	STA 0+600					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA 0+650					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA 0+700					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA 0+750					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 0+800					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 0+850					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 0+900					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 0+950					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA1+000					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 1+050					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA1+100					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA 1+150					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA1+200					
OPEN DRAINS		50	1	5.00	1.3	94%
	STA 1+250					
OPEN DRAINS		50	1	4.00	1.0	100%
	STA1+300					

Water Buildings are 1.0 to 1.5, with a value of 1.0 indicating a fairly good condition, while values of 1.3 and 1.5 indicate a condition that requires more attention. Of the 26 STAs analyzed, the condition of water structures that received an index of 1.0 dominated, especially at STAs such as 0+000, 0+250, 0+650, 0+700, 0+950, 1+050, 1+100, and 1+250, with Building Function reaching 100%.

However, some segments show a decline in performance, such as STA 0+100, 0+150, 0+200, 0+500, and 0+550, where the building condition index reaches 1.3 to 1.5. This is directly proportional to the function of the building which drops to 63% to 69%, indicating a decrease in performance or damage that needs to be followed up. Overall, the condition of the open drains can be categorized as quite good, as most of the condition index values are still in the 1.0-1.3 range with building functions close to 100%. However, segments with an index of 1.5 require further maintenance or evaluation to optimize their function.

Drainage Network Condition Assessment

The assessment of the condition of the Drainage network on Harun Nafsi Road was carried out using two main parameters, namely the Condition and Function Index, which were applied to the channels and water structures. The combined results of these two parameters provide a comprehensive picture of the overall performance of the Drainage network.

Table 5. Calculation of Drainage Network Index on Jalan Harun Nafsi Kelurahan Rapak Dalam

Channel Type	Channel Name	Channel Length (m)	Channel Condition Index	Channel Weight	Total Channel Condition Index	Channel Function
2	*3*	*5*	*6*	*7*	*8 = (6) x (7)*	*9*
Area Jln Harun Nafsi STA 0+000 - 0+050						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	1.00	**80,56%**
Area Jln Harun Nafsi STA 0+050 - 0+100						

Channel Type	Channel Name	Channel Length (m)	Channel Condition Index	Channel Weight	Total Channel Condition Index	Channel Function
2	*3*	*5*	*6*	*7*	*8 = (6) x (7)*	*9*
OPEN DRAINS	DRAINAGE	50	1.67	2.00	1.00	
Area Jln Harun Nafsi STA 0+100 - 0+150						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	1.00	
Area Jln Harun Nafsi STA 0+150 - 0+200						
OPEN DRAINS	DRAINAGE	50	1.67	3.00	2.00	
Area Jln Harun Nafsi STA 0+200 - 0+250						
OPEN DRAINS	DRAINAGE	50	2.00	3.00	1.00	
Area Jln Harun Nafsi STA 0+250 - 0+300						
PRIMARY CHANNEL	DRAINAGE	50	1.33	2.00	2.00	
Area Jln Harun Nafsi STA 0+300 - 0+350						
PRIMARY CHANNEL	DRAINAGE	50	2.00	3.00	1.00	
Area Jln Harun Nafsi STA 0+350 - 0+400						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	3.00	
Area Jln Harun Nafsi STA 0+400 - 0+450						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	2.00	
Area Jln Harun Nafsi STA 0+450 - 0+500						
OPEN DRAINS	DRAINAGE	50	1.00	1.00	2.00	
Area Jln Harun Nafsi STA 0+500 - 0+550						
OPEN DRAINS	DRAINAGE	50	1.33	1.00	2.00	
Area Jln Harun Nafsi STA 0+550 - 0+600						
OPEN DRAINS	DRAINAGE	50	1.33	1.00	1.00	
Area Jln Harun Nafsi STA 0+600 - 0+650						
OPEN DRAINS	DRAINAGE	50	3.00	2.00	2.00	
Area Jln Harun Nafsi STA 0+650 - 0+700						
OPEN DRAINS	DRAINAGE	50	3.00	1.00	2.00	
Area Jln Harun Nafsi STA 0+700 - 0+750						
OPEN DRAINS	DRAINAGE	50	2.00	2.00	2.00	
Area Jln Harun Nafsi STA 0+750 - 0+800						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	3.00	
Area Jln Harun Nafsi STA 0+800 - 0+850						
OPEN DRAINS	DRAINAGE	50	2.00	1.00	2.00	
Area Jln Harun Nafsi STA 0+850 - 0+900						
OPEN DRAINS	DRAINAGE	50	2.00	2.00	2.00	
Area Jln Harun Nafsi STA 0+900 - 0+950						
OPEN DRAINS	DRAINAGE	50	1.67	2.00	2.00	
Area Jln Harun Nafsi STA 0+950 - 1+000						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	2.00	
Area Jln Harun Nafsi STA 1+000 - 1+050						
OPEN DRAINS	DRAINAGE	50	2.67	2.00	2.00	
Area Jln Harun Nafsi STA 1+050 - 1+100						
OPEN DRAINS	DRAINAGE	50	2.67	2.00	2.00	
Area Jln Harun Nafsi STA 1+100 - 1+150						
OPEN DRAINS	DRAINAGE	50	2.67	2.00	2.00	
Area Jln Harun Nafsi STA 1+150 - 1+200						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	2.00	
Area Jln Harun Nafsi STA 1+200 - 1+250						
OPEN DRAINS	DRAINAGE	50	1.33	2.00	2.00	
Area Jln Harun Nafsi STA 1+250 - 1+300						
OPEN DRAINS	DRAINAGE	50	3.00	2.00	2.00	
AMOUNT		**1300**		**50.00**	**9.00**	**0.18**

Drainage network performance assessment aims to provide an overview of the network's ability to regulate water or water management in a primary network area. This assessment includes an evaluation of the physical condition and function of channels, water structures, and protective embankments. Based on the results of the assessment, the performance of the Drainage network is classified into four categories according to the criteria of Permen PU No. 13/PRT/M/2012, namely Good, Less, Poor, and Not Functioning.

Network performance in the Good category indicates that the Drainage network functions optimally in regulating water management in most or all reclamation areas. This condition is achieved if the functional level of the network is more than 80%, indicating that the channels, water structures and protective embankments are in good physical condition and can function optimally. This category reflects the efficiency of water management that supports the sustainability of the Drainage area.

Network performance in the Less category reflects that the network is only able to regulate water in part of the reclaimed area, with the functional level of the network ranging from 40% to 80%. In this category, there is damage to protective embankments or other components that require rehabilitation to improve performance. Conversely, if the functional level of the network is in the range of 20% to 40%, the network falls into the Poor category, indicating significant damage affecting large parts of the reclaimed area, requiring extensive repairs to return to optimal functioning. Networks with functional levels below 20% fall into the Not Functioning category, where severe damage causes the system to fail to regulate water effectively.

Poor network performance indicates that the Drainage reclamation network is not functioning because the channels and buildings are in a damaged condition. In this case, they are in such a state of disrepair that they are unable to regulate water management in the reclaimed area.

Table 7. Results of Rapak Dalam Drainage Performance Assessment Based on Condition Index and Network Function

No.	Drainage Area Name	Area (Ha)	Channel Condition Index	Network Function	Recommendation / Action	Network Performance
1	2	3	4	5	6	7
1	Rapak Dalam Drainage	-	1,78	80,56%	Routine Maintenance	Good

Based on the results of the Rapak Dalam Drainage network performance assessment, it shows that the Rapak Dalam Drainage network on Jalan Harun Nafasi in Loa Janan sub-district has a Channel Condition Index of 1.78 and a network function level of 80.56%. Based on the criteria of Minister of Public Works Regulation No. 13/PRT/M/2012, this network falls into the Good category, which indicates the network's ability to regulate water management in most reclaimed areas despite damage to some components. This damage, if not addressed, can potentially reduce the network's overall efficiency.

CONCLUSION

In conclusion, the performance analysis of the drainage network on Rapak Dalam, Jalan Harun Nafsi, Loa Janan District, reveals a channel condition index of 1.78, resulting in a network function level of 80.56%. According to Permen PU Number 13/PRT/M/2012, the drainage network is categorized as being in good condition, effectively regulating water across most of the reclaimed area. Nevertheless, identified component damage risks the system's long-term efficiency. A proactive and targeted approach is essential to address these concerns and ensure the continued optimal functionality of the drainage system. It is recommended that a routine inspection schedule be implemented, with inspections conducted quarterly to monitor key indicators such as sediment accumulation, structural integrity of concrete channels and waterworks, vegetation overgrowth obstructing flow, and signs of water leakage or ponding.

Maintenance interventions should be prioritized based on the condition index, with immediate desilting of channels exceeding a condition index of 2.0 to restore flow capacity, and prompt repair or reinforcement of concrete structures exhibiting cracks or damage, particularly at specific STAs identified in the assessment. Furthermore, vegetation removal and embankment stabilization should be undertaken in areas displaying signs of erosion or instability. To ensure a holistic approach, community engagement through awareness programs is crucial to prevent improper waste disposal into the drainage system, a major contributor to blockages. Ultimately, maintaining and improving the drainage system on Jalan Rapak Dalam is not merely about preventing localized flooding; it directly contributes to the long-term economic stability, public health, and environmental sustainability of Samarinda City. Proactive management strategies, informed by data-driven insights and supported by community participation, will safeguard infrastructure investments and enhance the quality of life for residents by reducing flood risks, improving sanitation, and promoting a more resilient urban environment. Neglecting these measures would lead to escalating maintenance costs, increased flood damage, and a decline in the area's overall livability, negatively impacting the community's social and economic well-being.

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