Evaluation of Quality, Quantity, and Continuity of Temporary Waste Collection Points (TPS) in Samarinda City Using AHP and TOPSIS Methods

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Abstract. Urban waste management systems critically depend on Temporary Waste Collection Points (TPS). However, in Samarinda City, many TPS fail to meet established standards, necessitating a comprehensive evaluation of their quality, quantity, and continuity. This study aims to assess TPS in Samarinda City using the Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods. We evaluated 82 identified TPS using a score-based assessment system for multiple sub-criteria. Results were categorized based on reference scores: 0.67-1.00 (suitable), 0.33-0.66 (moderately suitable), and 0-0.32 (unsuitable). Findings reveal that only a tiny fraction of TPS meet suitability criteria: 7 TPS for quality, 22 for quantity, and merely 1 for continuity. These results provide crucial guidance for municipal authorities in implementing necessary improvements, including relocation, expansion, capacity and facility enhancements, aesthetic upgrades, and TPS-type replacements. This research establishes a robust foundation for enhancing Samarinda City's waste management system, emphasizing TPS infrastructure development.

Keywords: Evaluation, Suitability criteria, Temporary Waste Collection Points (TPS).

1 Introduction

Waste management has become an urgent environmental issue in developing countries like Indonesia. Inefficient waste management is often characterized by ineffective waste collection, limited transportation coverage, and inadequate waste disposal [1]. This improper management poses risks to human health and the environment, leading to water, soil, and air pollution [2, 3]. Low public participation also contributes to problems such as waste accumulation at Temporary Collection Points (TPS) and Final Disposal Sites (TPA) beyond their capacity [4]. In Samarinda, this issue is exacerbated by a lack of public awareness about the importance of proper waste disposal and sorting. This condition is evident from the significant waste accumulating along waterways and drainage channels. Additionally, open burning of waste remains a common practice [4].

The region's population growth and economic advancement will increase the amount of waste generated [5]. According to data from the East Kalimantan Department of Population, Women's Empowerment, and Child Protection, Samarinda's population reached 856,360 with a density of 1,168.43 people/km² in 2023 and an annual growth rate of 1.87%. According to data from the National Waste Management Information System (SIPSN), Samarinda's annual waste generation has increased significantly. In 2022, the waste generated reached approximately 214,347.89 tons per year, rising by 2.75% to 218,799.98 tons the following year. This condition makes waste management in Samarinda an increasingly pressing issue, as population growth leads to a proportional increase in waste generation.

In Samarinda, the institution responsible for waste management activities is the City Environmental Agency. Waste management includes waste collection, containment, and disposal at TPA. One of the key activities in waste management is waste collection at TPS, which serves as an intermediary between waste sources and subsequent waste transportation and processing [6]. Due to limited resources, waste collection begins at the TPS rather than directly from sources such as households or public facilities. Public participation in bringing waste to TPS is expected to reduce the government's burden. Understanding the existing conditions of Temporary Collection Points (TPS) is crucial in creating effective and sustainable waste management strategies. From this understanding, practical waste management scenarios can be formulated, including infrastructure development plans, facility improvements, and optimization of waste management and handling practices. Research conducted in Bandung assessed 44 TPS using 17 criteria, finding enhancements needed to meet standards [7].

A key challenge in Samarinda is optimizing the placement of TPS while considering city aesthetics and waste capacity requirements. Appropriate TPS placement can minimize negative visual impacts in urban areas while ensuring that each TPS can handle the increasing waste volume. Additionally, an ideal number of TPS and the frequency of waste collection should be considered to balance waste management efficiency and urban aesthetics. By taking these aspects into account, it is expected that a TPS management system can be designed to effectively contain and process waste and enhance the aesthetic quality of residential areas.

2   Material and Methods

This study was conducted across all Temporary Storage Sites (TPS) in 10 sub-districts in Samarinda City, East Kalimantan, which consists of 83 TPS. Data collection took place from March to May 2024, with the intention of evaluating the quality, quantity, and continuity of existing TPS within the area. The TPS locations included in this study were selected based on data obtained from the Environmental Agency (DLH) of Samarinda City. All TPS listed in this dataset were included in the study, except for a few that were not found, to provide a comprehensive overview of TPS conditions in Samarinda City.

For data analysis, the methods used were the Analytic Hierarchy Process (AHP) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The AHP

method aids decision-making by combining qualitative and quantitative factors in com-
plex issues. It employs a comprehensive, logical, and structured approach, making it
well-suited for addressing multi-criteria problems [8]. The Technique for Order of Pref-
erence by Similarity to Ideal Solution (TOPSIS) is a multi-criteria decision-making ap-
proach that ranks options by measuring their closeness to ideal and anti-ideal solutions.
Known for its simplicity and efficiency, TOPSIS allows straightforward alternative as-
sessment based on relative performance through a transparent mathematical process. It
applies to numerical data with criteria weights determined by either data or expert judg-
ment [9, 10].

AHP determines the weights of criteria and sub-criteria, while TOPSIS ranks alter-
natives based on their similarity to the ideal solution. In the AHP method, pairwise
comparison matrices were created for the specified criteria—quality, quantity, and con-
tinuity. Assessments were conducted using a comparison scale (e.g., 1-9 scale) to de-
termine the relative importance of each criterion. The criterion weights were then cal-
culated using the AHP method, involving a normalization process to ensure that the
total weights were summed to 1. Subsequently, the TOPSIS method was employed to
rank the TPS. A decision matrix was constructed based on the data collected for each
TPS alternative and evaluated criteria. This decision matrix was then normalized to
obtain the relative values of each alternative. Weights for each alternative were calcu-
lated based on the criterion weights derived from the AHP analysis. Positive ideal (A+)
and negative ideal (A-) solutions were then identified based on each criterion's optimal
and worst values. Finally, the distance of each alternative from the positive and negative
ideal solutions was calculated to determine how close each TPS was to the perfect con-
dition. The preference value for each TPS was computed using the TOPSIS formula,
ranking TPS based on their relative performance against the evaluated criteria.

The criteria and sub-criteria used in this study were collected based on several as-
sessments, as outlined in the following Table 1.

Table 1. TPS Criteria Evaluation Source

No	Criteria	Sub-Criteria	Criteria Source
1	Quality	Aesthetics and Structural Integrity of TPS Building	PerMen PUPR No. 03/PRT/M/2013*
		Distance to Residential Area	PerMen PUPR No. 03/PRT/M/2013*
		Road Access	PerMen PUPR No. 03/PRT/M/2013*
		Truck Parking Area	Tchobanoglous & Kreith (2002)
		Does Not Obstruct Traffic	PerMen PUPR No. 03/PRT/M/2013*
2	Quantity	House Coverage	PerMen PUPR No. 03/PRT/M/2013*
		Initial Storage Capacity	PerMen PUPR No. 03/PRT/M/2013*
		Supporting Facilities	Damanhuri & Padmi (2019)
		Land Area	PerMen PUPR No. 03/PRT/M/2013
		Waste Category Facilities <5 Types	PerMen PUPR No. 03/PRT/M/2013
3	Continuity	20-Year Storage Capacity	PerMen PUPR No. 03/PRT/M/2013*
		Type of TPS	PerMen PUPR No. 03/PRT/M/2013*
		Non-Permanent Container Construc-tion Type	PerMen PUPR No. 03/PRT/M/2013
		Mixed Waste and Sorted Waste Dis-posal Area	Tchobanoglous & Kreith (2002)

The criteria and sub-criteria used to assess TPS (Temporary Waste Collection Point) locations in Samarinda City are given varied ratings depending on their condition. Based on the feasibility analysis, they will be categorized into suitable, moderately suitable, and unsuitable, depending on the final accumulated score and assigned weights. The higher the weight, the greater the importance of the criteria and sub-criteria, thereby impacting the feasibility results. Additionally, the higher the individual sub-criteria scores, the better the condition of the TPS. The feasibility categories can serve as a reference for prioritizing potential improvements. The sub-criteria for TPS evaluation, along with assigned scores and weights, are detailed in the following Table 2.

Table 2. TPS Sub Criteria Assessment and Scoring

No	Criteria	Weight	Sub-Criteria	Weight	Sub-Criteria Assessment	Score
1			Aesthetics and Strength of TPS Building	0.48	Very Poor	1
					Poor	2
					Fair	3
					Good	4
					Very Good	5
2			Distance to residential area	0.26	Adjacent to a residential area	1
					Close to residential area	2
					Reasonably far from residential area	3
					Far from residential area	4
					No residential area nearby	5
3	Quality (Q)	0.65	Road Access	0.14	It is difficult for garbage trucks to access	1
					Slightly challenging for trucks to access	2
					Reasonably accessible by garbage trucks	3
					Accessible by garbage trucks	4
					It is very accessible by garbage trucks	5
4			Truck Parking	0.07	No truck parking	1
					Narrow truck parking	2
					Adequate truck parking	3
					Spacious truck parking	4
					Very spacious truck parking	5
					Can accommodate more than one truck	6
5			Does Not Obstruct Traffic	0.04	Significantly obstructs traffic	1

No	Criteria	Weight	Sub-Criteria	Weight	Sub-Criteria Assessment	Score
					Obstructs traffic	2
					Slightly obstructs traffic	3
					It does not significantly obstruct traffic	4
					Does not obstruct traffic	5
6			Household Coverage	0.50	Approximately 100 households	1
					Approximately 200 households	2
					Approximately 300 households	3
					Approximately 400 households	4
					Approximately 500 households	5
					Can handle more than 600 households	6
7			Initial Storage Capacity	0.26	Insufficient	1
					Poor	2
					Fair	3
					More than sufficient	4
	Kuantitas (K)	0.23			Very sufficient	5
8			Supporting Facilities	0.13	No supporting facilities	1
					Container base or building present	2
					Container base, building, and other facilities	3
9			Land Area	0.07	Narrow (≥ 50 m²)	1
					Fairly Spacious (≥ 100 m²)	2
					Spacious (≥ 150 m²)	3
					Very Spacious (≥ 200 m²)	4
10			Facility to separate waste into at least five types	0.03	No waste separation facility	1
					Facility for 1-2 types of waste	2
					Facility for 3-4 types of waste	3
					Facility for five types of waste	4
					Facility for more than five types of waste	5
11		0.12		0.56	1 - 5 years	1

No	Criteria	Weight	Sub-Criteria	Weight	Sub-Criteria Assessment	Score
	Kontinuitas (C)		20-Year Storage Capability		5 - 10 years	2
					10 - 15 years	3
					15 - 20 years	4
12			Type of TPS	0.26	Illegal/Nonexistent	1
					Wood	2
13			Non-permanent container	0.12	Plastic	3
					Concrete	4
					Container	5
					None (permanent/fixed)	1
					Not very easy to move	2
					Fairly easy to move	3
					Easy to move	4
					Very easy to move	5
14			Area for mixed and sorted waste unloading	0.06	There is no specific unloading area	1
					Inadequate area for mixed and sorted waste	2
					Adequate area for mixed and sorted waste	3
					Sufficient area for mixed and sorted waste	4
					Adequate area for mixed and sorted waste	5

Each existing TPS will be evaluated based on scores for each sub-criterion, aiding the government in development actions such as relocation, expansion, capacity and facility upgrades, aesthetic improvements, or TPS-type replacement. These scores provide a clear guide to areas needing attention and improvement.

All TPS units are assessed using a reference score (Ci), where scores closer to 1 indicate better suitability. However, some scores may be near one due to a consistently low rating, so focusing on absolute values is essential. This approach helps the government identify TPS units needing special attention and prioritize improvements, providing an objective perspective on TPS suitability and development needs in Samarinda.

The quality, quantity, and continuity assessment results are represented by scores, which are classified into three suitability categories for TPS. The TPS score categories are as follows:

- Suitable (0.6 – 1.00): TPS units in this range meet almost all criteria well, showing good condition, accessibility, capacity, and facilities. They provide optimal long-term service without significant upgrades.
- Moderately Suitable (0.33 – 0.62): TPS units meet most criteria but require improvements in accessibility, capacity, or facilities for better daily operations.

- Unsuitable (0 – 0.32): TPS units here fail to meet most criteria, showing poor condition, limited accessibility, and inadequate facilities, needing significant improvements or replacement.

3   Results

The Temporary Disposal Sites (TPS) condition reflects their integrity, usage level, and lifespan. A TPS in a suboptimal condition can worsen its impact and reduce its storage capacity. Based on survey results, the condition of TPS locations in Samarinda is illustrated in the following figure (Fig. 1).
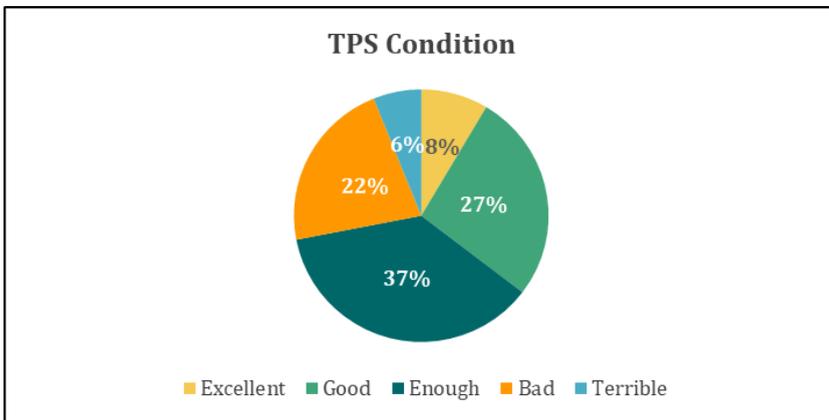

Fig. 1. Distribution Percentage of Samarinda City TPS Conditions in 2024

The type of Temporary Disposal Site (TPS) plays an essential role in urban waste management, as it determines the most effective waste transport method for each type. Different types of TPS have advantages and disadvantages; for instance, mobile TPS units, like containers, facilitate waste collection using arm-roll trucks but are more susceptible to damage and rust. Mobile TPS units are also easier to replace when damaged than fixed TPS types. On the other hand, fixed TPS units, like concrete ones, are more resistant to environmental conditions. Based on survey results, the TPS types in Samarinda are shown in the following figure (Fig. 2).
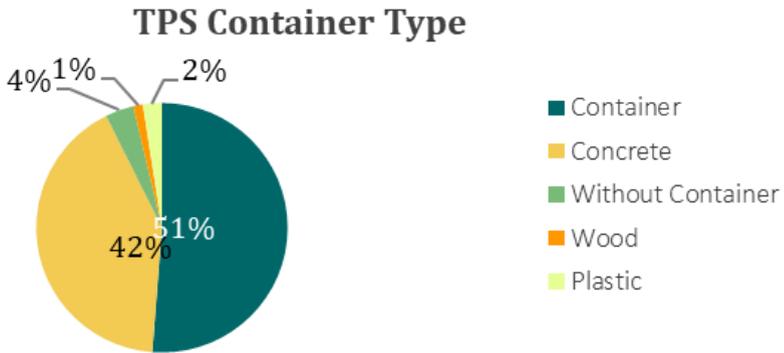
TPS Container Type

Container
Concrete
Without Container
Wood
Plastic

51%
42%
4% 1%
2%

Fig. 2. Percentage Distribution of TPS Types in Samarinda City in 2024

Another consideration for TPS is the structure of the covering building. This condition refers to TPS units with a complete structure and a roof. The number of TPS units equipped with buildings in Samarinda is illustrated in the figure below (Fig. 3).
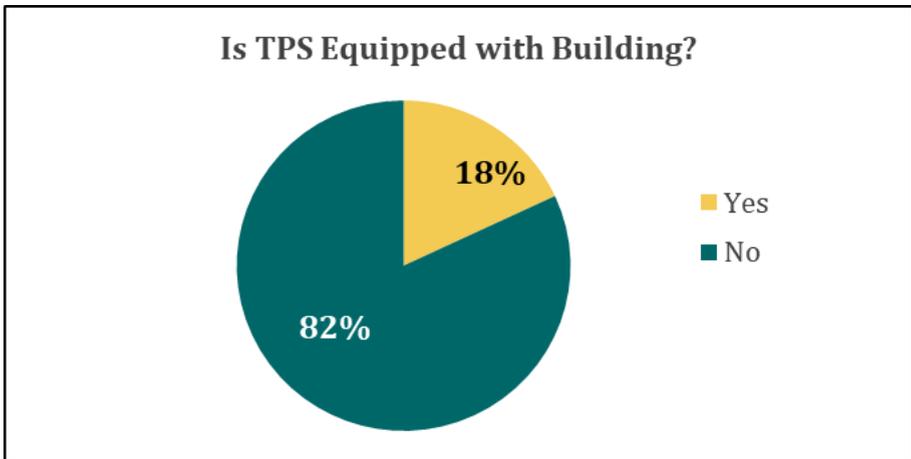

Is TPS Equipped with Building?

18%
82%

Yes
No

Fig. 3. Percentage Distribution TPS equipped with Building in Samarinda City in 2024

The surrounding environment of a TPS affects the impact it generates, making it essential to avoid areas prone to pollution, such as forest vegetation areas and waterfronts. The effect of TPS extends beyond environmental pollution, potentially causing social and health issues, primarily if located too close to residential areas. Areas with public facilities like parks, hospitals, and places of worship are susceptible to waste pollution, as they shape public perception of urban cleanliness. Therefore, assessing suitable environments for TPS placement in Samarinda is necessary, as illustrated in the figure below (Fig. 4).
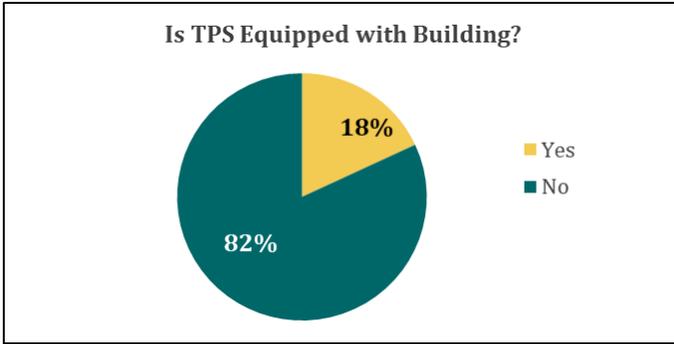
Fig. 4. Percentage Distribution Condition near TPS in Samarinda City in 2024

In Samarinda, the issue of unregistered or "wild" TPS has become a serious concern for both the government and the community. Unregistered TPS are unofficial and uncontrolled waste disposal locations that often arise due to inadequate TPS facilities or excessive distance from official TPS. Unregistered TPS frequently leads to various environmental issues, such as water and soil pollution from unmanaged waste, as well as unpleasant odors that disrupt the comfort of nearby residents. Additionally, unregistered TPS become breeding grounds for disease vectors like flies and rats, posing health risks to the community. The following is a field survey report on unregistered TPS in Samarinda.

Fig. 5. Unregistered TPS Found in Samarinda City in 2024: (a) Unregistered TPS Jl. Samarinda - sanga-sanga, Kec. Palaran (b) Unregistered TPS Jl. Teuku Umar, District. Kunjang River (c) Unregistered TPS Jl. Juanda 6, Kec. Samarinda City (d) Unregistered TPS Jl. Padat Karya-Pinang Seribu, North Samarinda

To quantify our evaluation, we need to find the contribution of each criterion for our evaluation. To see the weight of each sub-criteria, we calculated the pairwise comparison matrix of each sub-criteria to each other to find the degree of relation. We used the normalization calculation to see the weight percentage for each sub-criteria with the calculation explained in the Tables below.

Table 3. Quality Pairwise Comparison Matrix and Normalization

	Pairwise Comparison Matrix					Normalization					
	Quality (Q)										
Criteria	Aesthetics and Strength (EK)	Dis-tance (J)	Road Access (AJ)	Park-ing (P)	Place-ment (PE)	Criteria	EK	J	AJ	P	PE	Avr
EK	1	3	5	6	7	EK	0.54	0.64	0.52	0.39	0.32	0.48
J	0.33	1	3	5	6	J	0.18	0.21	0.31	0.33	0.27	0.26
AJ	0.20	0.33	1	3	5	AJ	0.11	0.07	0.10	0.20	0.23	0.14
P	0.17	0.20	0.33	1	3	P	0.09	0.04	0.03	0.07	0.14	0.07
PE	0.14	0.17	0.20	0.33	1	PE	0.08	0.04	0.02	0.02	0.05	0.04
SUM	1.84	4.70	9.53	15.33	22.00							1.00

Table 4. Quantity Pairwise Comparison Matrix and Normalization

	Pairwise Comparison Matrix					Normalization					
	Quantity (Q)										
Criteria	Household Coverage (CR)	Initial Capacity (KA)	Supporting Facility (FP)	Area (LL)	Waste Categorization (SP)	Criteria	CR	KA	FP	LL	SP	Avr
CR	1	3	5	7	9	CR	0.56	0.64	0.52	0.43	0.36	0.50
KA	0.33	1	3	5	7	KA	0.19	0.21	0.31	0.31	0.28	0.26
FP	0.20	0.33	1	3	5	FP	0.11	0.07	0.10	0.18	0.20	0.13
LL	0.14	0.20	0.33	1	3	LL	0.08	0.04	0.03	0.06	0.12	0.07
SP	0.11	0.14	0.20	0.33	1	SP	0.06	0.03	0.02	0.02	0.04	0.03
SUM	1.79	4.68	9.53	16.33	25.00							1.00

Table 5. Continuity Pairwise Comparison Matrix and Normalization

	Pairwise Comparison Matrix				Normalization					
	Continuity (C)									
Criteria	20-Year Storage (KP)	TPS Type (JT)	TPS Permanence (JP)	Unloading Area (AP)	Criteria	EK	J	AJ	P	Avr
KP	1	3	5	7	KP	0.60	0.66	0.54	0.44	0.56
JT	0.33	1	3	5	JT	0.20	0.22	0.32	0.31	0.26
JP	0.20	0.33	1	3	JP	0.12	0.07	0.11	0.19	0.12
AP	0.14	0.20	0.33	1	AP	0.09	0.04	0.04	0.06	0.06

	Pairwise Comparison Matrix									
		Continuity (C)					Normalization			
Criteria	20-Year Storage (KP)	TPS Type (JT)	TPS Permanence (JP)	Unloading Area (AP)	Criteria	EK	J	AJ	P	Avr
SUM	1.68	4.53	9.33	16.00						1.00

In evaluating Temporary Waste Disposal Sites (TPS) in Samarinda, the assessment re-
sults are based on various criteria such as quality, quantity, and continuity, which are
presented as scores. These scores are then classified into three categories based on value
intervals, each reflecting the suitability level of the TPS.

Table 6. TPS Interval Classification

Interval Classification	Score
Suitable	0,63 – 1,00
Moderately Suitable	**0,33 – 0,62**
Unsuitable	0 – 0,32

Table 7. TPS Evaluation Results

Sub-District	Criteria	Quality (Q)		Quantity (K)		Continuity (C)	
	Weight	0,65		0,23		0,12	
	Description	Reference Score (Ci)	Rank	Reference Score (Ci)	Rank	Reference Score (Ci)	Ranking
	TPS PERUM BPK	0.63	11	0.93	1	0.02	51
	TPS PERUM H. SALEH	0.44	45	0.73	6	0.03	17
	TPS KOLONG JEMBATAN MAHULU	0.60	19	0.69	10	0.03	17
Loa Janan Ilir	TPS HARAPAN BARU	0.38	57	0.69	10	0.03	40
	TPS TANI AMAN	0.49	40	0.72	8	0.11	3
	TPS HOS COKROMINOTO	0.37	62	0.65	33	1.00	1
	TPS TK. LABBAIKA	0.21	76	0.69	10	0.02	63
	TPS SMAN 4 (SEBRANG)	0.51	37	0.69	10	0.02	63
	TPS SAGARA	0.48	43	0.59	43	0.03	25
	TPS PETI KEMAS DALAM	0.35	66	0.59	43	0.03	17
Palaran	TPS PASAR PALARAN	0.38	55	0.58	47	0.03	40
	TPS HANDIL BAKTI	0.64	10	0.58	47	0.02	63
	TPS STADION PALARAN	0.58	20	0.60	41	0.02	50

Sub-District	Criteria	Quality (Q)		Quantity (K)		Continuity (C)	
	Weight	0,65		0,23		0,12	
	Description	Reference Score (Ci)	Rank	Reference Score (Ci)	Rank	Reference Score (Ci)	Ranking
	TPS GOTONG ROYONG	0.37	58	0.58	47	0.02	59
Samarinda Ilir	TPS PASAR KEHEWANAN	0.37	63	0.60	42	0.03	40
	TPS JELAWAT GG.10	0.40	54	0.58	47	0.03	10
	TPS JELAWAT GG.10	0.37	58	0.62	35	0.03	25
	TPS LUMBA-LUMBA	0.79	3	0.51	72	0.02	51
	TPS RS. ISLAM	0.37	60	0.58	47	0.02	59
	TPS PUSKESMAS	0.44	46	0.59	43	0.02	51
	TPS PELABUHAN	0.43	49	0.68	22	0.08	7
Samarinda Kota	TPS KOLONG JEMBATAN ARIF RAHMAN HAKIM	0.51	35	0.67	23	0.03	25
	TPS MILONO	0.51	32	0.67	23	0.11	5
	TPS HARMONIKA	0.61	16	0.67	23	0.03	10
	TPS BALAI KOTA DEPAN	0.49	39	0.31	78	0.02	77
	TPS BALAI KOTA DEPAN LAP. TENIS	0.28	67	0.31	78	0.02	77
	TPS TEMPEKONG	0.22	72	0.74	5	0.03	25
	TPS PASAR RAJAWALI	0.37	64	0.47	74	0.02	63
Samarinda Seberang	TPS 3R DAENG MANGKONA	0.60	18	0.62	40	0.03	9
	TPS PASAR KOMURA	0.09	82	0.00	82	0.02	59
	TPS FOLDER AIR HITAM	0.52	31	0.58	47	0.06	8
	TPS RINGROAD II	0.15	78	0.58	47	0.02	63
	TPS TANJAKAN BUKIT PINANG	0.14	81	0.58	47	0.02	63
	TPS PERBATASAN SMD-TGR	0.49	42	0.54	70	0.03	40
Samarinda Ulu	TPS PEMANCINGAN	0.62	14	0.58	47	0.02	63
	TPS GRAHA INDAH	0.43	48	0.62	35	0.03	25
	TPS STAND OJEK	0.37	64	0.51	72	0.02	63
	TPS KUBURAN CINA	0.22	70	0.58	47	0.03	25
	TPS KUBURAN PASUNDAN	0.43	51	0.58	47	0.03	40
	TPS SIMPANG 4 SIRAJ SALMAN	0.38	56	0.58	47	0.03	25

Sub-District	Criteria	Quality (Q)		Quantity (K)		Continuity (C)	
	Weight	0,65		0,23		0,12	
	Description	Reference Score (Ci)	Rank	Reference Score (Ci)	Rank	Reference Score (Ci)	Ranking
	TPS JUANDA 2	0.37	61	0.58	47	0.02	63
Samarinda Utara	TPS BATU LUMPANG	0.20	77	0.31	77	0.02	63
	TPS MAN 1	0.23	69	0.58	47	0.03	25
	TPS DLH KOTA SAMARINDA	0.52	28	0.58	47	0.03	17
	TPS TRI SARI	0.52	30	0.58	47	0.03	17
	TPS TAMAN CERDAS	0.58	24	0.58	47	0.02	59
	TPS ANGGUR (AKPER)	0.43	49	0.58	47	0.03	17
	TPS TALANG SARI DEPAN	0.21	75	0.69	10	0.02	63
	TPS PASAR HEWAN	0.84	1	0.69	10	0.11	6
	TPS SMPN 19	0.80	2	0.73	6	0.11	3
	TPST KOREM LEMPAKE	0.21	74	0.69	10	0.11	2
	TPS BATU CERMIN	0.61	15	0.69	10	0.02	63
	TPS PINANG SERIBU	0.42	53	0.69	10	0.00	81
	TPS BAYAM	0.51	33	0.69	10	0.02	51
	TPS PADAT KARYA	0.57	25	0.69	10	0.03	40
	TPS BENGKURING	0.51	36	0.69	10	0.03	17
	TPS KANDANG SAPI	0.58	23	0.77	4	0.03	17
	TPS PANJAITAN II (GG. AYU)	0.61	17	0.87	3	0.02	48
	TPST PM NOOR	0.76	4	0.93	1	0.02	48
Sambutan	TPS PELITA 7	0.66	9	0.67	23	0.02	51
	TPS MAKROMAN	0.63	11	0.67	23	0.02	51
	TPS TELKOM SAMBUTAN	0.48	44	0.36	76	0.01	79
	TPS GUNUNG MANGAH	0.58	22	0.67	23	0.03	10
	TPS PASAR BUAH	0.27	68	0.44	75	0.03	25
	TPS PELITA 8	0.62	13	0.70	9	0.03	25
	TPS SINDANG SARI	0.49	41	0.31	78	0.00	80
	TPS PELITA 4	0.42	52	0.67	23	0.03	40
	TPS PERUM ARISCO	0.75	5	0.67	23	0.03	10
	TPS PUPR PROVINSI	0.75	6	0.67	23	0.02	51

Sub-District	Criteria	Quality (Q)		Quantity (K)		Continuity (C)	
	Weight	0,65		0,23		0,12	
	Description	Reference Score (Ci)	Rank	Reference Score (Ci)	Rank	Reference Score (Ci)	Ranking
	TPS SUNGAI KAPIH	0.44	47	0.67	23	0.02	51
Sungai Kunjang	TPS DEPAN DPRD PROV	0.58	21	0.62	35	0.03	40
	TPS PASAR KEDONDONG	0.22	70	0.62	35	0.03	25
	TPS ADAM MALIK	0.22	72	0.58	47	0.03	25
	TPS PERGUDANGAN	0.49	38	0.58	47	0.03	25
	TPS LOA BAKUNG	0.52	27	0.64	34	0.03	10
	TPS PERUM PEMDA	0.66	8	0.58	47	0.02	63
	TPS EKONOMI	0.67	7	0.62	35	0.03	10
	TPS GG. SUBUR	0.15	79	0.58	47	0.02	63
	TPS PERUM GAKUM	0.15	80	0.12	81	0.00	81
Sungai Pinang	TPS PELITA	0.51	34	0.53	71	0.03	25
	TPS GERILYA (DEPAN LAP. BOLA)	0.52	28	0.58	46	0.03	25
	TPS RAJAWALI	0.53	26	0.57	69	0.03	10

The highest quality score among TPS sites is held by TPS Pasar Hewan, with a rating of 0.84. Although imperfect, it excels in aesthetics and building durability (score: 5), is located at a fair distance from residential areas (score: 4) and offers adequate road access. However, the site's limited truck parking (score: 3) and minor traffic disruptions could be improved by expanding parking and better traffic management around the TPS. Conversely, TPS Pasar Komura has the lowest quality score of 0.09, mainly due to poor aesthetics and building durability (score: 1). Despite excellent access, the sub-criteria's low weight (0.14) limits its impact on the total score. Improving TPS Pasar Komura would require significant renovations, potentially relocating it further from residential areas, providing adequate parking, and implementing traffic engineering to minimize disruptions.

TPS PM NOOR ranks highest with a score of 0.93, primarily because of its wide household coverage and substantial initial storage capacity, effectively supporting waste management. However, all TPS sites, including TPS PM NOOR, scored 1 for waste sorting facilities, indicating a lack of separation facilities and an urgent need for improvement to promote recycling and waste sorting. TPS Perum BPK also ranks high (score: 0.93) with similar sub-criteria ratings. On the other hand, TPS Pasar Komura scores the lowest in quantity, with minimal household coverage, insufficient initial capacity, inadequate facilities, and a lack of waste sorting options. This low rating reflects its limited waste handling and sorting efficiency.

TPS HOS Cokrominoto achieved a perfect continuity score of 1, with a high-capacity storage lifespan of 15–20 years and durable concrete materials (score: 4). However, the permanence of concrete limits flexibility in TPS relocation and the lack of a waste unloading area hinders future

waste separation efforts. TPS Pinang Seribu and TPS Perumahan Gakum rank lowest in continuity, both scoring one across all sub-criteria, indicating limited long-term storage capacity, inadequate construction materials, no permanent containment, and lack of a waste unloading area, making them unfit for long-term operation without substantial improvements.

4   Conclusions

In conclusion, evaluating Temporary Waste Collection Points (TPS) in Samarinda City reveals significant quality, quantity, and continuity disparities across various sites. While some TPS, such as TPS Pasar Hewan, TPS PM NOOR, and TPS HOS Cokrominoto, demonstrate strong performance in criteria like structural integrity, capacity, and long-term viability, others like TPS Pasar Komura, fall short due to poor infrastructure, limited capacity, and inadequate facilities. The findings highlight the need for targeted improvements in TPS infrastructure, including enhanced accessibility, increased storage, facility upgrades, and better placement strategies. This assessment provides essential guidance for municipal authorities, emphasizing the importance of investing in TPS infrastructure to support efficient and sustainable waste management in Samarinda. Further research is needed to identify and evaluate the most effective strategies for improving and developing multiple TPS sites that require enhancement.

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