International Journal of Technology, Engineering and Computer
https://journal.globalacademic.id/index.php/ijtec
Volume 01 Number 01 April 2025

IJTEC
ISSN : XXXX XXXX

Parking Space Management at Teras Mahakam Park, Samarinda City

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Citations: Athallah, Muhammad Zen Nabil., Tukimun, Tukimun., & Eswan, Eswan., (2025). Parking Space Management at Teras Mahakam Park, Samarinda City. *International Journal of Technology, Engineering and Computer*, 1(1), 43-48.

Academic Editor:

Received: 13 March 2025 Accepted: 16 April 2025 Published: 30 April 2025

Abstract: Parking is one of the transportation infrastructures that must be managed properly to meet the need for proper and adequate parking spaces. One of the transportation infrastructures is providing parking, both on-street parking and off-street parking. The Teras Mahakam Park area is one of the most popular tourist areas visited by tourists and residents of Samarinda City. Along with the increase in the population of Samarinda City and the number of tourists visiting the Teras Mahakam Park Area, the impact on the reduction of parking lots. The purpose of this study was to analyze the need for parking space at the Teras Mahakam Park on RE Martadinata Road. The research method used is the descriptive quantitative method. The results show that the area of the research area used for parking is 830 m² and the need for parking is greater than the availability of parking. It is obtained that the existing conditions of parking for cars and motorbikes experience a shortage every year in the next 5 years and the addition of Parking Space Requirements (KRP) every year which does not include the addition of new parking lots.

Keywords: Parking; Parking Space Management; Teras Mahakam Park

1. Introduction

Parking is one of the essential transportation infrastructures (Dobrzański et al., 2023) that must be well-managed to adequately and sufficiently fulfill the need for parking space (Athallah et al., 2023; Wang, 2012). It is a transportation facility providing parking areas, both on-street parking and off-street parking (Simićević & Milosavljević, 2023). The significant increase in vehicle ownership coupled with dense population growth can lead to a continually increasing demand for available parking land (Qin et al., 2022; Wardhana, 2017). Teras Mahakam Park (Rafiatul & Widodo, 2026) is a highly popular tourist area visited by both tourists and residents of Samarinda City (Utami et al., 2025). Along with the rise in the number of Samarinda City residents and tourists visiting the Teras Mahakam Park Area, the available land for parking, both for two-wheeled and four-wheeled vehicles, is decreasing (Athallah et al., 2023). Based on the problems explained above, the author hopes that an analysis of parking space requirements will serve as a guideline for regulating parking land use, which can be utilized by the Samarinda City Government. Therefore, the author has undertaken research entitled 'Parking Space Management at Teras Mahakam Park, Samarinda City.

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2. Materials and Methods

2.1. Study Area

In this research, the author employs a descriptive quantitative research design (Sugiyono, 2019). This study utilizes a quantitative descriptive method focused on analyzing parking space requirements within the study area. Generally, data collection is a systematic process of gathering and measuring information about the variables under investigation, addressing the research questions, testing hypotheses, and evaluating the results. In this study, data collection techniques use quantitative methods implemented through closed observation and interviews (Sugiyono, 2017).

The population for this study comprises all visitors driving cars or motorcycles who stop or park their vehicles around the Teras Mahakam Park. The research was conducted in the park's parking area, which has a total parking space of 830 m². The layout map can be seen in Figure 1. The research was carried out on Monday, January 20, 2025, and Saturday, January 25, 2025, over a 5-hour period each day, starting from 16:00 to 21:00 WITA (Central Indonesian Time). The parking observation survey was conducted by recording the license plate numbers of vehicles entering and exiting the off-street parking area every hour, categorized by vehicle type. Recording these license plate numbers served to differentiate between individual vehicles, whether four-wheeled or two-wheeled."

The parking configurations for cars and motorcycles in the Taman Teras Mahakam area are as follows:

1. Based on location: Car and motorcycle parking will be designated as off-street parking (located outside the roadway).
2. Based on parking stall design: Parking within the Taman Teras Mahakam area will utilize 45-degree angle parking and 90-degree perpendicular parking for both motorcycles and cars.

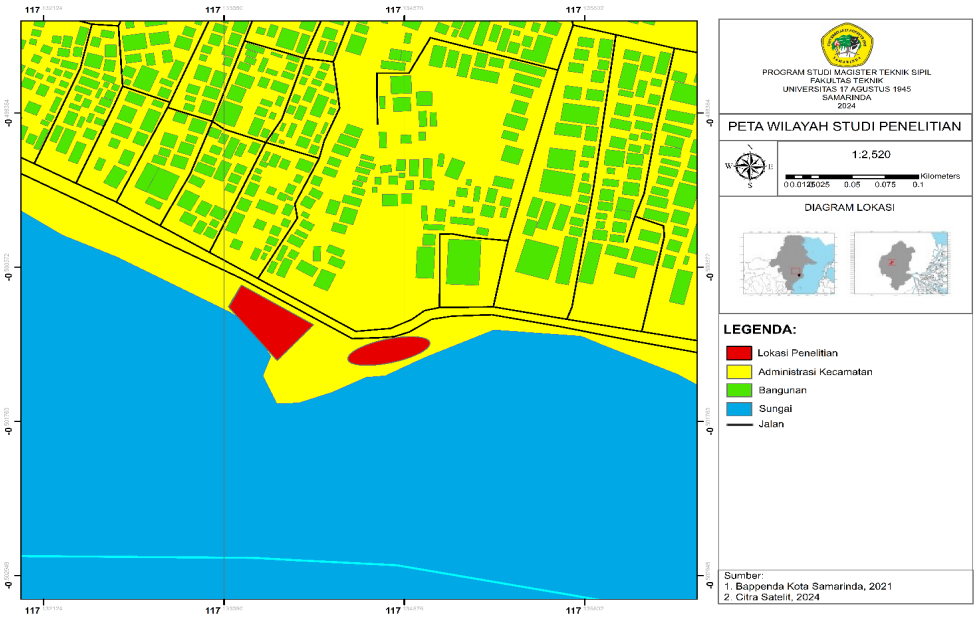

Figure 1. Study Area

2.2. Research Method

Based on the analysis results, the parking space requirements for the Teras Mahakam Park area could be determined. The analysis methodology applied in this study is as follows:

1. Parking Space Requirements Analysis Based on Land Use

   Land use analysis was obtained through field observation of Parking Space Units (SRP) along RE Martadinata Road, Samarinda City, specifically within the National Road Section in Teluk Lerong Ilir Subdistrict. To determine parking requirements based on visitor numbers to recreational areas, an analysis method of two-wheeled and four-wheeled vehicle visitors was applied. The objective of this

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parking space requirement analysis is to identify the parking space needed for the area. The formulas used to calculate parking space requirements are as follows:

$$KRP = \frac{Y \times D}{T} \quad (1)$$

Where:

KRP	= Parking Space Requirement (vehicles)
Y	= Number of Parked Vehicles per Unit Time
T	= Survey Duration (hours)
D	= Average Parking Duration (hours)

2. Analysis of Parking Space Requirements Based on Parking Standards

Parking standards for recreational areas depend on the required number of Parking Space Units (SRP). The following outlines the parking space requirement standards for recreational facilities in the Teras Mahakam Park area:

Table 1. Standard Parking Space Requirements in Recreation Areas

Total area (100 m^2)	50	100	150	200	400	800	1.600	3.200	6.400
Parking space requirement (SRP)	103	109	115	122	146	196	295	494	892

Source: Parking Facility Planning and Operation Guidelines, 1998

The dimensions of a Parking Space Unit (SRP) defined by its core length and width measurements form the basis for determining SRP standards, categorized for three vehicle types. The specific SRP determinations for these categories are provided in the following table:

Tabel 2. Determination of Parking Space Units (SRP) Based on Vehicle Type

No.	Vehicle Type	Parking Space Unit (m^2)	Area (m^2)
1	Class I Passenger Cars	2,30 x 5,00	11,5
2	Class II Passenger Cars	2,50 x 5,00	12,5
3	Class III Passenger Cars	3,00 x 5,00	15
4	Bus / Truck	3,40 x 12,50	43,5
5	Motorcycle	0,75 x 2,00	1,5

3. Analysis of Parking Space Needs Based on 5-Year Parking Projections

Parking space requirements were studied to determine future parking needs. The 5-year projection for required parking space was estimated by analyzing visitor growth trends at the recreational site, with the assumption that this growth corresponds proportionally to the number of parked vehicles both motorcycles and cars. The formula used to calculate parking space requirements is as follows:

$$P_n = P_o(1 + r)^n \quad (2)$$

Where:

Pn	= Number of Vehicles in Year n
Po	= Initial Vehicle Count
r	= Visitor Growth Rate (%)
n	= Projection Year (years from baseline)

Subsequently, the annual visitor growth ratio must first be calculated using the following formula:

$$r = \left(\frac{P_n}{P_o}\right)\left(\frac{1}{n}\right) - 1 \quad (3)$$

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3. Results

3.1. Parking Space Requirements Analysis Based on Land Use

Parking space requirements can be determined based on total parked vehicle volume and average parking duration, as well as through total site area and building floor area. These calculated requirements are essential for determining the number of off-street parking spaces needed. The table below presents the parking space requirement calculations for the study location. As shown in the Parking Space Requirement (KRP) table for Teras Mahakam Park, the maximum total parking space requirement was calculated at 11 vehicle equivalents. Meanwhile, the existing parking capacity was documented at 216 vehicle spaces, comprising 191 motorcycle units and 25 car units.

Table 3. Parking Space Requirements Analysis Based on Land Use

No.	Vehicle Type	Day, Date	Number of Vehicles	Survey Duration (Hours)	Average Duration (Hours)	Parking Space Requirement (Vehicles)
1	Motorcycle	Monday, January 20, 2025	104	5	0.51	11
		Saturday, January 25, 2025	87	5	0.53	9
	Average Motorcycle Parking Space Requirement					**10**
2	Car	Monday, January 20, 2025	15	5	0.48	1
		Saturday, January 25, 2025	10	5	0.28	1
	Average Car Parking Space Requirement					**1**
	Total Parking Space Requirement					**11**
	Existing Parking Space Capacity					**216**

Source: Analysis Results, 2025

3.2. Analysis of Parking Space Needs Based on 5-Year Parking Projections

A parking space requirement projection analysis for 2023–2027 was conducted to determine future parking needs. This 5-year forecast estimated parking space demand by analyzing visitor growth trends at the recreational site, assuming direct proportionality between visitor numbers and parked vehicles (both motorcycles and cars). The percentage growth rates of parked vehicles in Samarinda City used for this projection are presented below.

As indicated in the parking space requirement projection table for Teras Mahakam Park, the Parking Space Requirement (KRP) increases annually, necessitating additional parking land. Comparative analysis of parking requirements versus static capacity reveals an annual deficit in parking provision for both motorcycles and cars.

Table 4. Projected Parking Space Needs in the Taman Teras Mahakam Area, Samarinda Year 2023 – 2027

No.	Vehicle Type	Year	Parking Space Needs	Static Capacity (SRP)	Difference
1	Motorcycle	2025	191	105	-86
		2026	204		-99
		2027	218		-113
		2028	233		-128
		2029	249		-144
2	Car	2025	25	16	-9
		2026	27		-11
		2027	29		-13

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2028	31	-15
2029	33	-17

Source: Analysis Results, 2025

3.3. Analysis of Parking Space Requirements Based on Parking Standards

In calculating these parking space requirements, the values can be expressed in SRP (Parking Space Units) and square meters (m²), with SRP magnitudes determined according to Table 1 and Table 2. The provision of required parking spaces must be evaluated based on the actual site conditions, provided they comply with established standards. The Parking Space Requirement Standard for Recreation Areas specifies an 830 m² parking area. The tables detail that a total area of 800 m² has a minimum SRP (Parking Space Unit) of 196 SRP, while a 1,600 m² area has a minimum SRP of 295 SRP. Therefore, determining the required SRP necessitates using the following interpolation formula. The calculated parking space requirement for the Taman Tepian Pesut Mahakam Area using interpolation yields 200 SRP. Consequently, the parking space requirement analysis shows a deficit of 11 vehicle SRP. The required parking area to be provided is calculated as follows:

Motorcycle

Given :

Parking space requirement = 11 (peak day)
Maximum number of vehicles = 104 (peak day)
SRP Motorcycle = 0,75 x 2,00 m^2 = 1,5 m^2

Question :

The amount of SRP meets = ?
Parking space requirement = number of KRP x maximum number of KDR x SRP Motorcycle
= 11 x 104 x 1,5 = 1.716 m^2
The amount of SRP meets = 1.716 m2 : 1,5 m^2 = 1.144 m^2

Car

Given :

Parking space requirement = 1 (peak day)
Maximum number of vehicles = 15 (peak day)
SRP Car = 2,30 x 5,00 m^2 = 11,5 m^2

Question :

The amount of SRP meets = ?
Parking space requirement = number of KRP x maximum number of KDR x SRP Car
= 1 x 15 x 11,5 = 172,5 m^2 ~ 173 m^2
The amount of SRP meets = 173 m2 : 11,5 m^2 = 15,04 m^2 ~ 15 SRP

Based on the parking space requirement calculations for the Taman Teras Mahakam Area – covering both motorcycles and cars – the results indicate that demand exceeds existing parking capacity. The corridor study requires a total parking area of 830 m², equivalent to 200 SRP (Parking Space Units). According to these figures:

a. Motorcycles require 1,144 SRP of parking space,
b. Cars require 15 SRP of parking space.

However, the available capacity only provides:

a. 105 SRP for motorcycles,
b. 16 SRP for cars.

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4. Discussion

Although the snapshot demand (11 vehicles) is far below the nominal supply (216 spaces), the static capacity and projected growth reveal a looming shortfall. The lot's static capacity (121 spaces total) is already less than half of the observed 216-vehicle turnover. Under current usage patterns and assuming continued population and visitor growth, both motorcycle and car parking will become inadequate each year over the next five years. In other words, the analysis predicts that parking needs will exceed availability under existing conditions. This indicates that additional parking facilities must be planned. The results underscore the importance of expanding on-site parking as Samarinda's tourism and urbanization increase.

5. Conclusions

Based on the results of the discussion, several conclusions were obtained which can then be given to the related parties. The following is the conclusion of the study "Parking Space Management at Teras Mahakam Park, Samarinda City" is the Parking Space Needs (KRP) obtained the availability of existing parking spaces of 216 vehicles consisting of 191 motorcycles and 25 cars. With a static capacity of only 105 SRP available for motorcycles and a parking capacity of 16 SRP for cars. The results of parking needs are greater than the availability of parking obtained from the existing conditions of car and motorcycle parking experiencing a shortage every year in the next 5 years and the addition of Parking Space Needs (KRP) every year which requires the addition of new parking areas.

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