Evaluation of Paid Parking Performance at Station Bojonggede

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ABSTRACT

The Bojonggede station parking lot is currently less efficient because it does not have enough land for parking needs. So this research aims to determine the capacity of parking space requirements at Bojonggede station. In this research, the characteristic SRP method is used (Volume, Accumulation, Duration, Turn Over, Index). In this research, it is the performance management of paid parking. Data collection was carried out using a survey method over a period of 12 hours and running for fifteen days, with the data taken being data on vehicle entry and exit times to determine the characteristics of the parking lot. The results of this research are that the existing capacity of motorbike parking spaces at Bojonggede station is 300 SRP with an area of 715m² which cannot accommodate parked motorbikes, with the research results getting an index figure of more than 100%, namely parking turnover of 217% at peak hours. The result of the SRP requirement that must be provided by the management is 448 slots to accommodate motorbikes. There are additional official signs from PT. KAI, for example with no parking signs in the parking circulation area, has added parking officers to arrange and position motorbikes, so that parking circulation can be facilitated.

Keywords: parking; parking space unit (SRP); parking space requirements; parking capacity; Bojonggede Station.

INTRODUCTION

Parking is a place where vehicles stop temporarily for a long or short period of time (Ahmam Birka, 2014), Parking is a temporary state of not moving a vehicle (Directorate General of Land Transportation, 1996), parking is a state of not moving a motorized vehicle which can be is the beginning of a journey with a certain period of time (Joko Suprianto, 2015), With the increase in activity that occurs, it must be balanced with increased services, as well as optimal management of facilities and infrastructure, including parking management (Amanullah DR, 2020). Parking is a condition that is not moving a vehicle that is not temporary and the driver leaves the vehicle including the need to pick up and drop off people or goods, parking facilities are the most important part of the land transportation system. Parking facilities are also a major support for certain activities (Hobbs FD, 1979).

Managing motorized vehicle parking during peak hours and regular hours requires a different approach due to varying traffic volumes. Utilizes sensors to detect parking space availability and provides real-time information to drivers via the application (L OT et.al, 2023); (Hijriah H et.al, 2024); (Syaiful S et.al, 2024). An application that allows drivers to reserve a parking space before arriving at their destination, thereby reducing the time searching for a parking space. Providing parking areas on the outskirts of the city where drivers can park their vehicles and continue their journey by public transportation. Designate certain areas with parking restrictions during peak hours to facilitate traffic flow (Syaiful S et.al, 2024); (Syaiful S et.al, 2024); (Syaiful S et.al, 2022); (Syaiful S, Rusfana H, 2022); (Syaiful S, Pratama Y, 2019).

Educate the public about the importance of wise parking use and compliance with regulations. Cooperate with shopping centers, office buildings and other public facilities to utilize their parking spaces efficiently (Syaiful S, Haryadi D, 2019); (Syaiful S et.al, 2020); (Syaiful S et.al, 2021); (Syaiful S, Fadly A, 2020). By implementing these methods and strategies, it is hoped that motor vehicle parking management can run more efficiently both during peak and regular hours, thereby reducing congestion and increasing the comfort of road users (Syaifl S et.al, 2021); Syaiful S, Rendi A, 2021); (Syaiful S, Irbah AF, 2021); (Syaiful S et.al, 2022); (Syaiful S et.al, 2021).

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Sustainable parking is a parking system that not only meets current parking needs but also contributes to better overall traffic management and has a positive impact on the environment and community. To achieve orderly traffic through sustainable parking. Place parking facilities in strategic locations, close to activity centers but also considering accessibility and traffic flow. Design a parking layout that makes entry and exit easier, reduces time searching for a parking space, and prevents congestion around the parking area (Syaiful S et.al, 2022); (Syaiful S et.al, 2022); (Syaiful S et.al, 2023). Using parking attendants and CCTV to monitor and ensure compliance with parking regulations, prevent illegal parking and reduce potential conflicts. Incorporate elements of green space and recreation areas in parking lot design to improve environmental quality (Mudjanarko SW, Falani AZ, 2023); (Syaiful S et.al, 2023); (Pratama FA et.al, 2023).

Adjust parking planning based on changing traffic patterns, city developments, and new technology. By paying attention to these aspects, sustainable parking will not only support orderly traffic but also contribute to a cleaner environment, reduced emissions and improved quality of life for city residents (Syaiful S et.al, 2023); (Syaiful S et.al, 2023); (Syaiful S, Suherman S, 2024).

RESEARCH METHODS

The research was carried out at Bojonggede Station, Bojonggede District, Bogor Regency. The research was carried out within 4 months, starting from August 1 2022 to November 30 2022. Time. This research was carried out for four weeks, in one week the research was carried out in four days, namely Monday, Tuesday, Wednesday, Thursday at 06.00 – 18.00 WIB, below can be seen in Figure 1 and figure 2 of the research location.

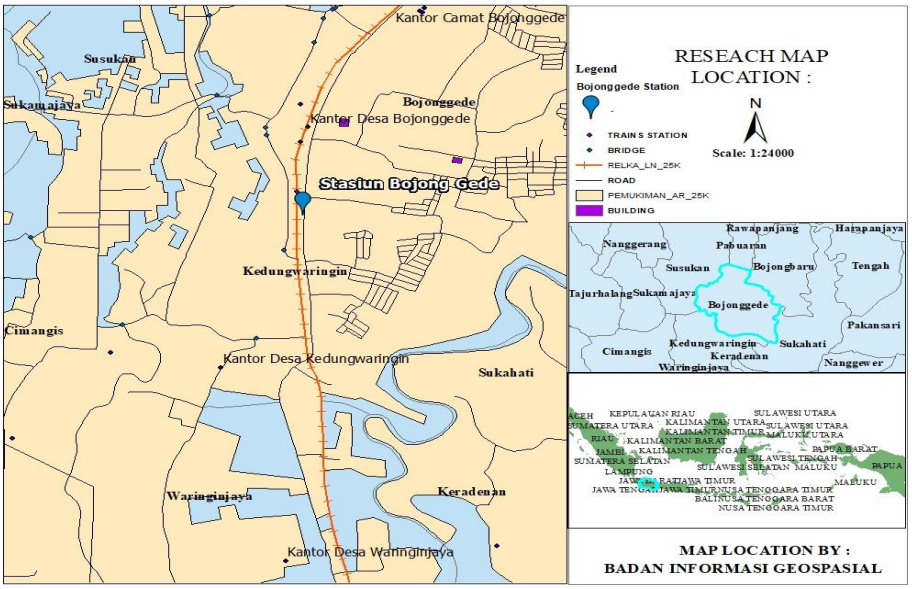

Figure 1. Location research

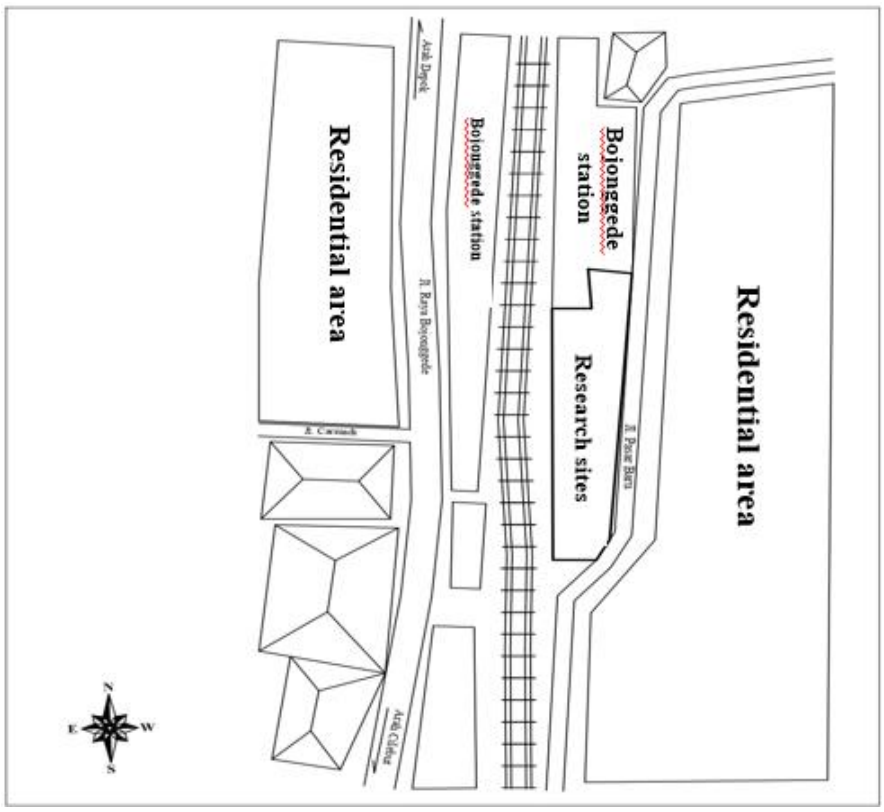

Figure 2. Layout of the research location

Research methods

Data collection was carried out using primary data.

1. Primary data in the form of vehicle number plate data and matching times between vehicle entry and exit using a formula approach equation will obtain parking characteristic results
2. The data above is then grouped into time unit groups, namely 15 minutes, then calculate the number of vehicles according to the time interval group and to obtain the correct figure for parking space requirements, look for the long parking time interval group that has the highest number of parked motorbikes. The selected and appropriate figures for parking space requirements are used to calculate parking space requirements using a formula approach from the Technical Guidelines for the Implementation of Parking at the Directorate General of Land Transportation, Number 272/KH.105 (1996).
3. Primary data, namely the number of vehicles in a day and the number of parking spaces available and the parking area, number of officers, and the parking system at Bojonggede Bogor station. calculated using the equation and the Directorate General of Land Transportation, Number 272/KH.105 (1996). Resulting in parking problems and capacity, movement patterns, and parking arrangements.
4. Data processing with the Microsoft Excel program. Research flow figure 3 below.

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Figure 3. Flow diagram

RESULTS AND DISCUSSION

Based on research I have conducted at Bojonggede Station, the parking requirements at Bojonggede Station are not able to accommodate vehicles that will be parked. The number of parking spaces for motorbikes is 300 SRP from a parking area of 450 m2.

Vehicle Registration When Entering and Exiting

Volumes

Parking volume is the number of vehicles parked at the study location during a certain period, in this case, the calculation is grouped at every 15 minutes. The packing volume at the research location during the 12 hours of observation is as shown in table 1 below:

Table 1. Motorcycle Parking Volume

No	Date and time	Time	Number of vehicles
1	Monday, September 19 2022	06:00 - 18:00	651

2	Tuesday, September 20 2022	06:00 - 18:00	521
3	Wednesday, September 21 2022	06:00 - 18:00	532
4	Thursday, September 22 2022	06:00 - 18:00	515
5	Monday, September 26 2022	06:00 - 18:00	511
6	Tuesday, September 27 2022	06:00 - 18:00	517
7	Wednesday, September 28 2022	06:00 - 18:00	507
8	Thursday, September 29 2022	06:00 - 18:00	511
9	Monday, 03 October 2022	06:00 - 18:00	510
10	Tuesday, 04 October 2022	06:00 - 18:00	501
11	Wednesday, 05 October 2022	06:00 - 18:00	503
12	Thursday, 06 October 2022	06:00 - 18:00	512
13	Monday, October 10, 2022	06:00 - 18:00	507
14	Tuesday, October 11 2022	06:00 - 18:00	511
15	Wednesday, October 12 2022	06:00 - 18:00	551

Based on table 1 above, it can be seen that the maximum volume of motorbike parking occurred on Monday with a total of 651 vehicles.

Matching Incoming and Outgoing Vehicle Data

Parking Accumulation

Parking accumulation is the number of vehicles parked in an area at a certain time. Peak parking times and the number of parked vehicles can be obtained from the parking accumulation results. The data obtained for fifteen days was recorded by recording the number of vehicles entering and leaving and then grouped into 15minute time intervals, to obtain the percentage distribution of vehicles entering and exiting and parking accumulation figures. Based on the parking accumulation table and the number of entry and exit points for passenger motorbikes at Bojonggede Station, it can be seen that the distribution of the number of vehicles available for each 15minute survey interval can be seen in table 2 as follows:

Table 2. Parking Accumulation

No	Date and time	Maximum Accumulation (vehicle)	Peak Hours (WIB)
1	Monday, September 19 2022	528	15:00 - 15:14
2	Tuesday, September 20 2022	486	13:00 - 13:14
3	Wednesday, September 21 2022	344	15:00 - 15:14
4	Thursday, September 22 2022	464	12:45 - 12:59
5	Monday, September 26 2022	436	15:45 - 15:59
6	Tuesday, September 27 2022	428	15:30 - 15:44
7	Wednesday, September 28 2022	430	15:45 - 15:59
8	Thursday, September 29 2022	431	15:45 - 15:59
9	Monday, 03 October 2022	466	13:00 - 13:14
10	Tuesday, 04 October 2022	405	15:45 - 15:59

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11	Wednesday, 05 October 2022	428	12:45 - 12:59
12	Thursday, 06 October 2022	452	11:45 - 11:59
13	Monday, October 10, 2022	417	15:00 - 15:14
14	Tuesday, October 11 2022	465	14:30 - 14:44
15	Wednesday, October 12 2022	508	15:00 - 15:14

Parking duration

Parking duration is the time span for a vehicle to park in a place (in hours). Based on the research results above, it was found that the average parking duration with a time interval of 0.25 hours can be seen in table 3 as follows:

Table 3. Parking Duration

No	Date and time	Observation time (WIB)	Maximum Duration (hours)	Minimum Duration (hours)	Average Duration (hours)
1	Monday, September 19 2022	06:00 - 18:00	12.00	02.08	06.53
2	Tuesday, September 20 2022	06:00 - 18:00	11.59	02.33	07.22
3	Wednesday, September 21 2022	06:00 - 18:00	07.38	02.47	05.57
4	Thursday, September 22 2022	06:00 - 18:00	11.55	02.04	08.04
5	Monday, September 26 2022	06:00 - 18:00	11.50	02.06	08.07
6	Tuesday, September 27 2022	06:00 - 18:00	11.52	02.09	08.04
7	Wednesday, September 28 2022	06:00 - 18:00	11.45	02.03	08.22
8	Thursday, September 29 2022	06:00 - 18:00	11.57	02.00	08.36
9	Monday, 03 October 2022	06:00 - 18:00	11.27	02.10	08.14
10	Tuesday, 04 October 2022	06:00 - 18:00	11.53	02.00	06.30
11	Wednesday, 05 October 2022	06:00 - 18:00	11.46	02.38	07.08
12	Thursday, 06 October 2022	06:00 - 18:00	11.22	04.02	08.35
13	Monday, October 10, 2022	06:00 - 18:00	11.57	02.00	07.13
14	Tuesday, October 11 2022	06:00 - 18:00	11.34	02.14	06.36
15	Wednesday, October 12 2022	06:00 - 18:00	11.38	02.04	06.38
		Max			12.00
		Average			08.36
		Min			04.02

From table 3 above, it can be seen that the maximum maximum duration occurred on Monday 19 September 2022 at 12:00hours. The maximum average duration occurred on Thursday 29 September 2022 at 08:36 hours, and the minimum duration occurred on Thursday 06 October 2022.

Turn Over Parking Turnover

Parking turnover shows the level of use of one parking space which is obtained from the comparison between the number of parked vehicles and the number of available parking capacity spaces,

Table 4. Turn Over Parking

No	Date and time	Parking Capacity (SRP)	Parking volumey (vehicle)	Parking Turn Over
1	Monday, September 19 2022	300	651	217,00
2	Tuesday, September 20 2022	300	521	173,67
3	Wednesday, September 21 2022	300	532	177,33
4	Thursday, September 22 2022	300	515	171,67
5	Monday, September 26 2022	300	511	170,33
6	Tuesday, September 27 2022	300	517	172,33

7	Wednesday, September 28 2022	300	507	169,00
8	Thursday, September 29 2022	300	511	170,33
9	Monday, 03 October 2022	300	510	170,00
10	Tuesday, 04 October 2022	300	501	167,00
11	Wednesday, 05 October 2022	300	503	167,67
12	Thursday, 06 October 2022	300	512	170,67
13	Monday, October 10, 2022	300	507	169,00
14	Tuesday, October 11 2022	300	511	170,33
15	Wednesday, October 12 2022	300	551	183,67
	Max			217,00
	Average			177,31
	Min			167,00

From table 4 above, it can be seen that the motorbike parking turnover rate with the highest value is 217.00%, the average value is 177.31%, and the minimum value is 167%. This shows that the parking performance of motorbikes is quite high, exceeding 100% lift.

Parking Index

Parking performance can also be seen based on parking index numbers. Parking index is the percentage of the number of parked vehicles occupying a parking area with the number of parking spaces available in that parking area. The parking index after going through the calculation stage is in table 5 as follows:

Table 5. Parking Index

No	Date and time	Parking Capacity (SRP)	Parking Accumulation (Maximum)	Parking Index (%)
1	Monday, September 19 2022	300	528	176,00
2	Tuesday, September 20 2022	300	486	162,00
3	Wednesday, September 21 2022	300	344	114,67
4	Thursday, September 22 2022	300	464	154,67
5	Monday, September 26 2022	300	436	145,33
6	Tuesday, September 27 2022	300	428	142,67
7	Wednesday, September 28 2022	300	430	143,33
8	Thursday, September 29 2022	300	431	143,67
9	Monday, 03 October 2022	300	466	155,33
10	Tuesday, 04 October 2022	300	405	135,00
11	Wednesday, 05 October 2022	300	428	142,67
12	Thursday, 06 October 2022	300	452	150,67
13	Monday, October 10, 2022	300	417	139,00
14	Tuesday, October 11 2022	300	465	155,00
15	Wednesday, October 12 2022	300	508	169,33
	Max			176,00
	Average			148,62
	Min			114,67

From table 5 above, the motorbike parking index that occurs at the maximum value is 176.00%, the average value is 148.62%, and the minimum value is 114.67% (based on maximum accumulation). From the parking index value obtained, it is stated that the demand for parking spaces is greater than parking capacity because it has an index value of more than 100%.

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Analysis of Parking Space Needs

Parking Space Requirements

From the results of calculations using this formula, a recapitulation of parking space requirements (Z) at Bojonggede Station is obtained as shown in table 6 as follows:

Table 6. Parking Space Requirements

No	Date and time	Survey Length (hours)	Parking Volume (vehicle)	Average Duration (hours)	Parking Space Requirements
1	Monday, September 19 2022	12	651	06.53	448,11
2	Tuesday, September 20 2022	12	521	07.22	383,80
3	Wednesday, September 21 2022	12	532	05.57	316,54
4	Thursday, September 22 2022	12	515	08.04	415,43
5	Monday, September 26 2022	12	511	08.07	414,76
6	Tuesday, September 27 2022	12	517	08.04	417,05
7	Wednesday, September 28 2022	12	507	08.22	424,19
8	Thursday, September 29 2022	12	511	08.36	439,46
9	Monday, 03 October 2022	12	510	08.14	419,90
10	Tuesday, 04 October 2022	12	501	06.30	325,65
11	Wednesday, 05 October 2022	12	503	07.08	358,81
12	Thursday, 06 October 2022	12	512	08.35	439,47
13	Monday, October 10, 2022	12	507	07.13	365,89
14	Tuesday, October 11 2022	12	511	06.36	337,26
15	Wednesday, October 12 2022	12	551	06.38	365,50
		Max			448,11
		Average			391,45
		Min			316,54

From table 6 above, it shows that the greatest need for parking space for motorbikes at Bojonggede Station occurs on Monday, September 19, 2022, amounting to 448.11 ~ 448 SRP.

Parking Space Requirement Standards

Table 7. Parking space capacity requirements

No	Date and time	Parking Space Requirements	Parking Space Capacity	Parking Space Requirements difference (+/-)
1	Monday, September 19 2022	448	300	-148,11
2	Tuesday, September 20 2022	384	300	-83,80
3	Wednesday, September 21 2022	317	300	-16,54
4	Thursday, September 22 2022	415	300	-115,43
5	Monday, September 26 2022	415	300	-114,76
6	Tuesday, September 27 2022	417	300	-117,05
7	Wednesday, September 28 2022	424	300	-124,19
8	Thursday, September 29 2022	439	300	-139,46
9	Monday, 03 October 2022	420	300	-119,90
10	Tuesday, 04 October 2022	326	300	-25,65
11	Wednesday, 05 October 2022	359	300	-58,81
12	Thursday, 06 October 2022	439	300	-139,47
13	Monday, October 10, 2022	366	300	-65,89
14	Tuesday, October 11 2022	337	300	-37,26

15	Wednesday, October 12 2022	365	300	-65,50

Note: (+) = Parking space capacity is still sufficient

(-) = Parking space capacity does not meet

Table 7 above shows the value of parking space requirements based on the formula approach (Equation 7) which is greater than the static capacity. If the value of parking space requirements is determined based on the maximum accumulation that occurs (field survey results), then the parking space requirements for static capacity require additional space for the parking area.

CONCLUSION

Based on the results of the survey and data analysis carried out, several conclusions were obtained relating to the capacity of motorbike parking spaces at Bojonggede station, as follows: 1). The capacity of motorbike parking at Bojonggede station is 300 SRP with a parking area of 450 m². 2). The maximum parking accumulation is 448 vehicles with an average parking duration of 12:00 hours on the peak day, namely Monday 19 September 2022. during the fifteen survey days. The maximum parking volume was 651 vehicles with a maximum accumulated vehicle parking of 528 vehicles which occurred on Monday 19 September 2022. The highest motorbike parking turnover at Bojonggede station reached 217.00%, this shows that parking performance is quite high. The capacity of motorbike parking spaces at Bojonggede station cannot meet existing parking needs. This is shown by looking at the parking index exceeding 100%.

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