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Integrated Parking Spaces Arrangement in Commercial Areas (Case Study: Cirebon City)

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Abstract

The effect of on street parking in urban commercial areas can cause a degradation of road performance. Therefore, the development of an integrated parking system is crucial to be carried out in commercial areas so that the performance of road sections does not degrade and does not cause heavy congestion. This study aims to provide recommendations for integrated parking locations based on existing parking conditions in the study area, so that they can be integrated and combined in one location. The method used is a primary survey that refers to the guidelines of the Indonesian Road Capacity Manual (IRCM) 1997 in analyzing traffic performance, and refer to the Guidelines for the Implementation of Parking Facilities 1997 in analyzing parking conditions. Meanwhile, for recommendations in determining alternative parking locations using SWOT analysis. The result of this research is the proposed location for integrated parking at Pasar Balong with the recommendation of a 4-floor building. The SWOT analysis showed that its strengths are its strategic location and high parking demand, its weaknesses are land limitations and lack of integrated parking management, its opportunities are potential for revenue and increased traffic flow, and its threats are resistance from local businesses and significant investment needs. The implication of this study is to provide a solution to the problem of roadside parking in commercial areas that interfere with traffic flow, improve the efficiency and accessibility of parking facilities for the community, and become a reference for further research on integrated parking management in other commercial areas.

Keywords : Integrated Parking, Parking Arrangement, On-Street Parking

INTRODUCTION

On-street parking is a parking lot that uses the street. On-street parking is one of the main problems besides traffic congestion in Indonesia. Many road sections that should be used for vehicular traffic are converted into parking spaces, which in turn affects the performance of the road section (Farhan, Hariani, and Lumtunnanie 2023). One study has shown that the presence of on-street parking can reduce road capacity by up to 20% and significantly increase the possibility of traffic accidents (Yu and Bayram 2021). For that reason, urban planners and transportation authorities must carefully evaluate the balance between the benefits of on-street parking and its damaging impact on overall system performance and safety. Effective roadside space management, including the strategic allocation of space for various uses such as parking, unloading, and public transport can be an important strategy to improve the overall efficiency and safety of the transportation network (Jaller, Rodier, and Zhang 2021). To address these issues, a comprehensive and integrated approach to parking management is needed, by combining various strategies and solutions based on specific needs (Fajar & Djunaedi, 2020), (Rahmawati & Dimyari, 2018), (Buldakov et al, 2020). Thus, integrated parking arrangements in commercial areas can

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be one of the solutions because they are more accessible, sustainable, and well integrated into the general transportation network (Atmojo et al. 2021).

Integrated parking is a parking system that is integrated and also combined with a payment system and a parking area that already uses machines (Purnomo et al. 2020). The use of this system proves to be safer because the entry and exit of vehicles is regulated by the machine with the use of the ticketing process. And vehicle placement can use sensors to indicate the remaining available parking in the parking lot According to Irmscher (Qi, Liu, and Zhang 2010). Integrated parking management is a solution that can be applied to solve the complex parking problems in commercial areas today (Roza, Guvil, and Birman 2018). With an integrated parking space arrangement, problems that commonly occur such as traffic congestion, difficulty in finding parking, illegal parking, and retribution leakage can be reduced (Ayyub et al. 2021). There are several types of integrated parking spaces including public parking spaces in open spaces, above-ground parking spaces, underground parking spaces, semi-automated parking spaces, parking spaces with mechanical systems, automated parking spaces with racking systems, and automated parking spaces with pallet transfer systems. Examples of the use of integrated parking in Indonesia can be seen in several big cities such as Jakarta, Surabaya, and Bandung. This integrated parking lot aims to overcome the problem of traffic congestion and lack of parking spaces in the city center. For example, the Integrated Parking Blok M, Jakarta location combines parking facilities with bus terminals, MRT stations, and shopping centers. This makes it easier for public transport users to park their vehicles and continue their journey by mass transportation. Integrated Parking Terminal 3 Soekarno-Hatta Airport, Tangerang This parking facility is integrated with the airport terminal and provides easy access for passengers to park their vehicles and continue their air journey. Integrated Parking Surabaya Plaza, Surabaya This location offers parking facilities that are integrated with shopping centers and easy access to public transportation, facilitating visitors to shop and do activities in the city center without worrying about parking. Previous research conducted by Parmar, Das, and Dave (2020) This study evaluates the effectiveness of the integrated parking system in Jakarta in reducing traffic congestion and improving the comfort of public transportation users. The results of the study show that integrated parking is able to reduce the number of private vehicles on the road and increase the use of public transportation.

The arrangement and management of integrated parking spaces in commercial areas is an important aspect of urban development, as it has a direct impact on traffic flow, accessibility, and general efficiency of high-density areas (Andretha and Handayeni 2018). One of the main challenges is the limited availability of parking lots which can cause congestion, illegal parking, and disruption to the nearby road network (Wati and Kartikasari 2020).

According to (Ayu, Hasanuddin, and Alfiah 2022) which analyzes on-street parking arrangements in commercial areas stated that the existing condition of the parking space at the research site has problems in each segment and there is a discrepancy between the existing condition and the guidelines for the provision of parking facilities. The need for parking at the research site is based on the highest accumulation of parking with the standard parking space for each type of vehicle, which is 1124 m2 and other research conducted by Ghassani and Hermanu (2023) which analyzes parking needs and on-street parking arrangements with the aim of finding recommendations for suitable parking arrangements. Researchers have explored various approaches, including the use of simulation tools and the application of parking standards set by Indonesia's Directorate General of Land Transportation. For example, a study of parking characteristics in a hospital parking lot found that the existing layout and capacity did not meet users' needs, leading to complaints and inconvenience (Dianawati and Kristianto 2019). However, an analysis of the Motorcycle parking lot at Abu Bakar Ali in Yogyakarta identified

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problems with the manual parking system, which resulted in longer parking times and inefficient utilization of available space (Manukhina 2018).

The 1996 technical guidelines for parking facility management provide a framework for designing and managing parking facilities, including the 1997 Indonesian Road Capacity Manual (MKJI) to calculate parking demand and capacity (Rizky, Murtiono, and Nurhidayati 2022). By applying this guideline, the researchers have been able to develop and simulate an improved parking layout, leading to a significant reduction in the time it takes for vehicles to enter and exit the parking area (Kong, Li, and Zhang 2018). For example, a study on Motorcycle parking design at Rusunawa Penjaringan Sari 3 in Surabaya used the 1997 MKJI standard to optimize the parking layout (Steven, Willis, and Christine Sembiring 2021). The researchers designed four alternative parking layouts and compared them using a simulation approach (Oemar and Dani 2021). The results showed that the average time for residents to park and leave the parking area has dropped from 56.118 seconds to as low as 17.242 seconds (Geng and Cassandras 2013). The integration of the 1997 MKJI guidelines into the design and management of parking facilities has proven to be an effective strategy for improving parking efficiency, reducing user inconvenience, and optimizing the utilization of available space (Lam).

Cirebon City is the center of trade in Region III (Cirebon, Indramayu, Majalengka and Kuningan) with a high level of traffic density. This condition is often compounded by the presence of on-street parking activities that cause reduced road capacity that can be used, plus the existence of trade and service centers that attract visitor vehicle movements will have an impact on increasing parking needs. One of the commercial areas is located in Pekalipan sub-district such as on Street Pekiringan, Street Pasuketan, Street Karanggetas, Street Pandesan, Street Pekalipan, Street Petratean, Street Kanoman, and Street Winaon. This road misuse eventually disrupts the smooth flow of traffic in the vicinity because vehicles parked on the road will reduce the width of the road for passing vehicles. Given the number of vehicles parked on the road (On Street Parking) in the Commercial Area in Cirebon, it is necessary to arrange an integrated parking lot.

The purpose of this study is to identify the existing conditions of the parking layout in order to determine the results of Level of Security (LOS) with the existence and absence of on-street parking, to determine the effect of on-street parking on traffic, and to provide recommendations for parking arrangements with integrated parking development. This research is very important to do in an effort to create a commercial area that avoids congestion, meets parking needs efficiently, and can increase comfort for visitors and drivers while on the move in the commercial area.

RESEARCH METHOD

Research location

The study was geographically located in the commercial area of Cirebon City, specifically in Lemahwungkuk District and Pekalipan District of Cirebon City. The area is an area of shops and markets that have high activity.

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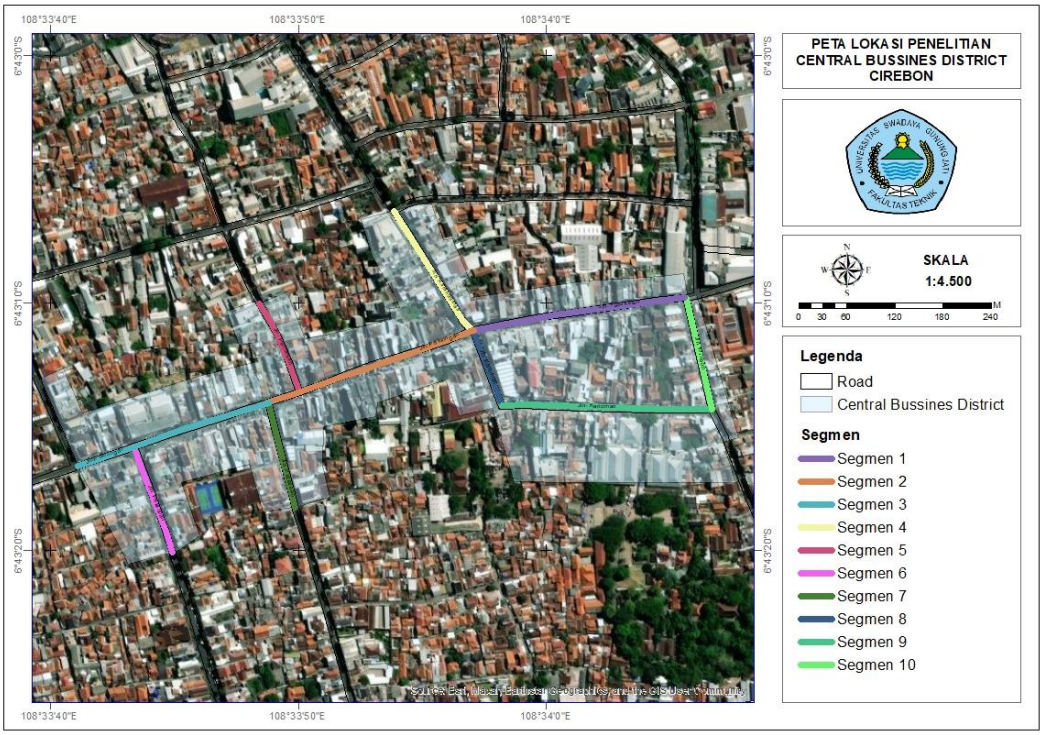

Picture 1. Research Location Plan
Source: Data processed

Research Approach Technique

This research uses a descriptive quantitative method, where the analysis referred to the Technical Guidelines for the Implementation of Parking Facilities and the 1997 Indonesian Road Capacity Manual. The research flow begins with identifying problems that occur in the commercial area of Cirebon City by conducting field observations and reviewing various literature so that the data needs required for this research are formulated.

1. Data collection in the form of primary data and secondary data. In this study, the primary data required are road geometric conditions, traffic volume, and parking volume. Meanwhile, secondary data is needed in the form of population data for Cirebon City and data on the number of vehicles in Cirebon City.
2. Data collection is based on direct surveys in the field and interviews with actors around the area as supporting data. Then, both primary and secondary data processing is carried out to analyze the problem.
3. In the form of conclusions obtained from the results of data analysis on existing problems in the commercial area of Cirebon City. Then given an alternative on how to arrange parking in the commercial area of Cirebon City.

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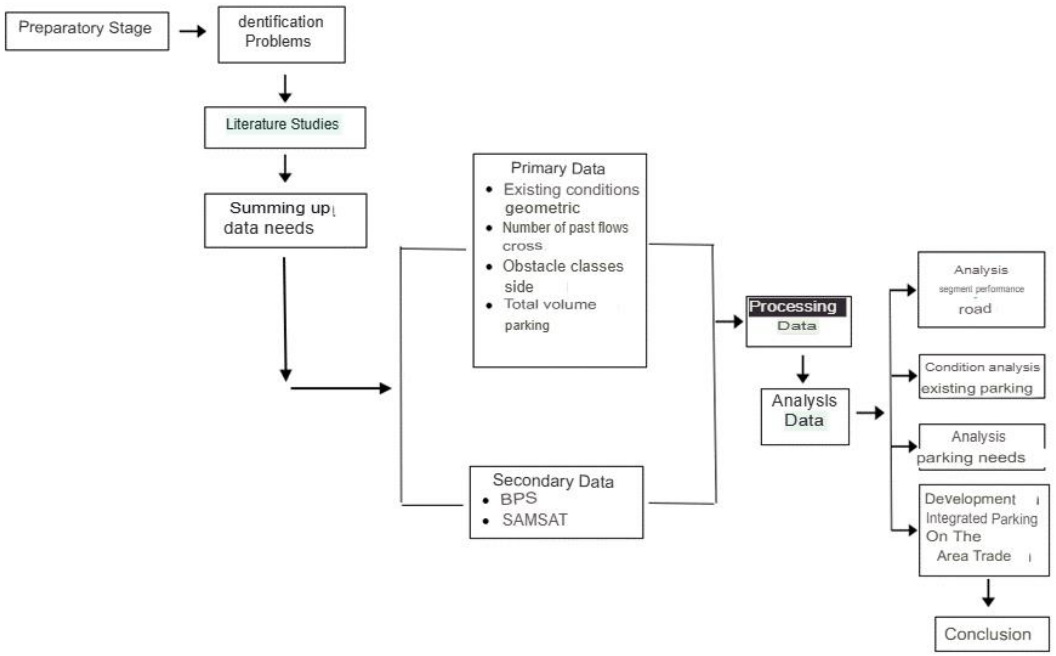

Picture 2. Research Flowchart

Data Collection Technique

Geometric Data

The method used in collecting road geometric data by measuring, which is by measuring the distance using a walking measure. The data required is in the form of road length, road width, shoulder width, pedestrian width, parking area length and parking area width.

Parking Volume Data

Parking volume data collection is done by observing and recording vehicles entering and leaving the parking area based on the type of vehicle during a certain time. The observation time starts from 07.00 - 17.00 WIB and is carried out on weekdays because it is a busy time in the research area.

Traffic Volume Data

Traffic volume data was obtained by conducting a traffic counting survey to count vehicles passing through each road section in the commercial area of Cirebon City which was carried out during peak hours. Vehicle counts are classified by vehicle type.

Data Analysis technique

In analyzing the performance of road sections refers to the 1997 Indonesian Road Capacity Manual (IRCM) guidelines where the analyzed traffic volume, road capacity, and degree of saturation. In analyzing parking conditions refers to the Guidelines for the Implementation of Parking Facilities 1997 where are being analyzed such as the volume of parking, parking accumulation, parking index and parking demand. While in analyzing the determination of alternative parking locations, the SWOT method is used.

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RESULT AND DISCUSSION

Parking conditions

Based on the results of research on parking conditions in the commercial area of Cirebon City, car users park with a parking pattern of 60°, while Motorcycle users with a parking pattern of 90°. However, there are different parking patterns at some segment points because they adjust to the limitations of the road segment.

Picture 2. Parking Condition

Parking Capacity

Observations and calculations show that the capacity of Motorcycle parking spaces is highest on Street Pekiringan I and Street Kanoman II at 133.33 vehicle units, while the capacity of car parking spaces is highest on Street Pekiringan II at 105.60 vehicle units

Table 1. Parking Space Capacity

Parking Location	Motorcycle			Car		
Road section	size of the Motorcycle parking area (m2)	Motorcycle SRP (0,75 x 2)	Capacity (unit) (b) / (c)	Size of the car parking area (m2)	Car SRP (2,5 x 5)	Capacity (unit) (d) / (e)
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Street pasuketan	135	1,5	90	810	12,5	64,8
Street Pekiringan I	200	1,5	133,33	900	12,5	72
Street Pekiringan II	180	1,5	120	1320	12,5	105,6
Street Karanggetas	120	1,5	80	480	12,5	38,4
Street Pandesan	60	1,5	40	240	12,5	19,2

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Street Pekalipan	150	1,5	100	800	12,5	64
Street Petratean	60	1,5	40	380	12,5	30,4
Street Kanoman I	67,5	1,5	45	270	12,5	21,6
Street Kanoman II	200	1,5	133,33	1000	12,5	80
Street Winaon	67,5	1,5	45	517,5	12,5	41,4

Parking Volume

Based on observations and calculations, the largest Motorcycle parking volume is in segment 9 of Street Kanoman II with 1238 Motorcycles and the largest car parking volume is also in segment 9 of Street Kanoman with 433 cars. This happens because the segment is located right in front of Kanoman Market so there is high activity.

Table 2. Parking Volume

Segment	Street Name	Vehicle Type	Parking Volume
1	St. pasuketan	Motorcycle	714
		car	407
2	St. pekiringan I	Motorcycle	730
		car	423
3	St. pekiringan II	Motorcycle	481
		car	371
4	St. karanggetas	Motorcycle	281
		car	195
5	St. pandesan	Motorcycle	144
		car	120
6	St. pekalipan	Motorcycle	438
		car	332
7	St. petratean	Motorcycle	139
		car	104
8	St. kanoman I	Motorcycle	270
		car	66
9	St. kanoman II	Motorcycle	1238
		car	433
10	St. winaon	Motorcycle	357
		car	182
total parking vehicle volume			**7425**

Source: Research Results

Parking Accumulation

Based on table 4, the highest accumulation that happened in the commercial area of Cirebon City for Motorcycles was found in segment 9 of Kanoman Street with 158 Motorcycles and the highest accumulation for cars was found in segment 2 of Pekiringan I Street with 73 cars.

Table 3. Highest Parking Accumulation

Segment	Highest Accumulation	
	Motorcycle	Car
1	106	66
2	111	73
3	106	54
4	79	37

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5	23	18
6	40	69
7	30	30
8	32	14
9	158	69
10	38	36

Source: Research Result

Parking Index

Based on Table 4, it is known that parking index values that pass 100% for motorcycle vehicles are found in segment 1 of Pasuketan Street and segment 9 of Kanoman II Street. Meanwhile, for car vehicles that pass 100% value are found in segment 1 of Pasuketan Street, segment 2 of Pekiringan I Street, and segment 6 of Pekalipan Street.

Table 4. Parking Index

Segment	Street name	Vehicle type	Highest accumulation	Parking capacity	Parking index %
1	St. pasuketan	Motorcycle	106	90	117,78
		car	66	65	101,85
2	St. pekiringan I	Motorcycle	111	133,33	83,25
		car	73	72	101,39
3	St. pekiringan II	Motorcycle	106	120	88,33
		car	54	106	51,14
4	St. karanggetas	Motorcycle	79	80	98,75
		car	37	38	96,35
5	St. pandesan	Motorcycle	23	40	57,50
		car	18	19	93,75
6	St. pekalipan	Motorcycle	40	100	40,00
		car	69	64	107,81
7	St. petratean	Motorcycle	30	40	75,00
		car	30	30	98,68
8	St. kanoman I	Motorcycle	32	45	71,11
		car	14	22	64,81
9	St. kanoman II	Motorcycle	158	133,33	118,50
		car	69	80	86,25
10	St. winaon	Motorcycle	38	45	84,44
		car	36	41	86,96

Source: Research Result

Traffic Volume

Analysis of vehicle volume in the commercial area of Cirebon City using the volume in the form of smp/hour. Observations are classified by type of vehicle, that is, Motorcycles (MC), light vehicles (LV), and heavy vehicles (HV). The observation of vehicles/hour is taken at the peak hour which is then multiplied by the equivalent of passenger cars (emp) so as to obtain the value of vehicle volume smp/hour.

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Table 5. Vehicle volume (Smp/hour)

Segment	Vehicle Volume (Smp/hour)			Total traffic volume (smp/hour)
	MC	LV	HV	
1	208,5	374	0	582,5
2	323,75	787	0	1110,75
3	236,4	386	0	622,4
4	228	483	0	711
5	235,2	266	0	501,2
6	477,75	1144	7,8	1629,55
7	222	149	0	371
8	247,2	127	0	374,2
9	283,2	148	0	431,2
10	178,8	85	0	263,8

Source: Research Result

The results of observations and calculations of vehicle volumes in the commercial area of Cirebon City with the highest total traffic volume on Street Pekalipan as much as 1629.55 smp/hour and the lowest traffic volume on Street Winaon as much as 263.8 smp/hour.

Road Section capacity Analysis

Capacity analysis of road sections is divided into two, which are the capacity of on street parking and capacity without on street parking. This is done to find out the difference in capacity value on each segment when there is on street parking and when without on street parking.

Table 6. *On Street Parking* Capacity

Segment	Factor Value Existing *On Street Parking*										capacity (C)
	Basic capacity (Co)	Lane width (FCw)		Direction Separation (FCsp)		Side Obstacles (FCsf)		City Size (FCcs)			
1	3300	3,50	1,00	0,00	1,00	H	0,95	0,1-0,5	0,90		2821,50
2	3300	3,50	1,00	0,00	1,00	H	0,95	0,1-0,5	0,90		2821,50
3	3300	3,50	1,00	0,00	1,00	H	0,95	0,1-0,5	0,90		2821,50
4	3300	3,50	1,00	0,00	1,00	M	0,98	0,1-0,5	0,90		2910,60
5	3300	3,25	0,96	0,00	1,00	M	0,95	0,1-0,5	0,90		2708,64
6	3300	3,50	1,00	0,00	1,00	H	0,95	0,1-0,5	0,90		2821,50
7	3300	3,00	0,92	0,00	1,00	M	0,95	0,1-0,5	0,90		2595,78
8	3300	3,50	1,00	0,00	1,00	M	0,98	0,1-0,5	0,90		2910,60
9	1650	3,00	0,92	0,00	1,00	VH	0,91	0,1-0,5	0,90		1243,24
10	3300	3,50	1,00	0,00	1,00	M	0,98	0,1-0,5	0,90		2910,60

Source: Research Result

Table 7. Capacity Without *On Street Parking*

Segment	Factor Value Without *On Street Parking*										capacity (C)
	Basic capacity (Co)	Lane width (FCw)		Direction separation (FCsp)		Side Obstacle (FCsf)		City Size (FCcs)			
1	4950	3,75	1,04	0,00	1,00	H	0,95	0,1-0,5	0,90		4401,54
2	4950	3,75	1,04	0,00	1,00	H	0,95	0,1-0,5	0,90		4401,54
3	4950	3,75	1,04	0,00	1,00	H	0,95	0,1-0,5	0,90		4401,54
4	4950	3,75	1,04	0,00	1,00	M	0,98	0,1-0,5	0,90		4540,54

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5	4950	3,50	1,00	0,00	1,00	M	0,95	0,1-0,5	0,90	4232,25
6	4950	3,75	1,04	0,00	1,00	H	0,95	0,1-0,5	0,90	4401,54
7	4950	3,50	1,00	0,00	1,00	M	0,95	0,1-0,5	0,90	4232,25
8	4950	3,75	1,04	0,00	1,00	M	0,98	0,1-0,5	0,90	4540,54
9	3300	3,50	1,00	0,00	1,00	VH	0,91	0,1-0,5	0,90	2702,70
10	4950	3,75	1,04	0,00	1,00	M	0,98	0,1-0,5	0,90	4540,54

Source: Research Result

Based on Table 6 and Table 7, there is a difference in the capacity value of road segments between the presence of on street parking and without on street parking in accommodating vehicles. For example, in segment 1 of Pasuketan Street where the capacity with on street parking is 2821.50, while without on street parking the capacity increases to 4401.54.

Saturation Degree

Based on Table 8 and Table 9, there is a difference between traffic performance with on street parking and without on street parking. For example, in segment 6 of Street Pekalipan where the LOS with on street parking has a value of C, while the LOS without on street parking has a value of B.

Table 8. Traffic Performance with *On Street Parking*

Segment	Vehicle volume (Smp/hour)	*On Street Parking* Capacity	Saturation degree	LOS *On Street Parking*
1	582,5	2286,90	0,25	B
2	1110,75	2821,50	0,39	B
3	622,4	2821,50	0,22	B
4	711	4365,90	0,16	A
5	501,2	2970,00	0,17	A
6	1629,55	2821,50	0,58	C
7	371	2821,50	0,13	A
8	374,2	2910,60	0,13	A
9	431,2	1199,14	0,36	B
10	263,8	2910,60	0,09	A

Source: Research Result

Table 9. Traffic Performance without *On Street Parking*

Segment	Vehicle volume (Smp/hour)	Without *On Street Parking* capacity	Saturation degree	LOS without *On Street Parking*
1	582,5	4401,54	0,13	A
2	1110,75	4401,54	0,25	B
3	622,4	4401,54	0,14	A
4	711	4540,54	0,16	A
5	501,2	4232,25	0,12	A
6	1629,55	4401,54	0,37	B
7	371	4232,25	0,09	A
8	374,2	4540,54	0,08	A
9	431,2	2702,7	0,16	A
10	263,8	4540,54	0,06	A

Source: Research Result

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Traffic projection for the next 5 and 10 years

Vehicle volume projections were carried out using the exponential method with a vehicle growth rate of Cirebon City of 2.080% per year so as to obtain vehicle volumes in 2029 and 2034 as shown in table 10 and table 11.

Table 10. Projected Traffic Performance of *On Street Parking*

segment	Vehicle volume(P0) 2024	Projection Result with *on street parking*					
		2029	DS	LOS	2034	DS	LOS
1	582,5	663,37	0,29	B	755,46	0,33	B
2	1110,75	1264,95	0,45	C	1440,57	0,51	C
3	622,4	708,81	0,25	B	807,21	0,29	B
4	711	809,71	0,19	A	922,12	0,21	B
5	501,2	570,78	0,19	A	650,02	0,22	B
6	1629,55	1855,78	0,66	C	2113,41	0,75	D
7	371	422,51	0,15	A	481,16	0,17	A
8	374,2	426,15	0,15	A	485,31	0,17	A
9	431,2	491,06	0,41	B	559,24	0,47	C
10	263,8	300,42	0,1	A	342,13	0,12	A

Source: Research Result

Tabel 11. Projected Traffic Performance without *On Street Parking*

segment	Vehicle volume(P0) 2024	Projection Results Without *on street parking*					
		2029	DS	LOS	2034	DS	LOS
1	582,5	663,37	0,15	A	755,46	0,17	A
2	1110,75	1264,95	0,29	B	1440,57	0,33	B
3	622,4	708,81	0,16	A	807,21	0,18	A
4	711	809,71	0,18	A	922,12	0,2	B
5	501,2	570,78	0,13	A	650,02	0,15	A
6	1629,55	1855,78	0,42	B	2113,41	0,48	C
7	371	422,51	0,1	A	481,16	0,11	A
8	374,2	426,15	0,09	A	485,31	0,11	A
9	431,2	491,06	0,18	A	559,24	0,21	B
10	263,8	300,42	0,07	A	342,13	0,08	A

Source: Research Result

Based on the results of the calculation analysis in table 10 and table 11, there is an increasingly high LOS value in the projections of the next 5 and 10 years, for example in segment 6 with the condition of on street parking where the DS value is obtained at 0.66 in 2029 (LOS C) and 0.75 in 2034 (LOS D). While in the condition without on street parking the DS value is obtained as 0.42 in 2029 (LOS B) and 0.48 in 2034 (LOS C).

Parking Requirement

The area of parking requirements can be determined by multiplying the highest parking accumulation in each segment by the Parking Space Unit (SRP). Based on table 11, it is known that parking space requirements for each road segment in the Cirebon City commercial area with a total area of 6,433.5m².

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Table 12. Parking Space Requirements

Segment	Road Section	Vehicle Type	Highest Accumulation	SRP Standard	Parking Space Requirement (m2) (d) x (e)	Total Parking Space Requirement (m2)
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	St. pasuketan	Motorcycle	106	0,75 x 2	159	918
		Car	66	2,3 x 5	759	
2	St. pekiringan I	Motorcycle	111	0,75 x 2	166,5	1006
		Car	73	2,3 x 5	839,5	
3	St. pekiringan II	Motorcycle	106	0,75 x 2	159	780
		Car	54	2,3 x 5	621	
4	St. karanggetas	Motorcycle	79	0,75 x 2	118,5	544
		Car	37	2,3 x 5	425,5	
5	St. pandesan	Motorcycle	23	0,75 x 2	34,5	241,5
		Car	18	2,3 x 5	207	
6	St. pekalipan	Motorcycle	40	0,75 x 2	60	853,5
		Car	69	2,3 x 5	793,5	
7	St. petratean	Motorcycle	30	0,75 x 2	45	390
		Car	30	2,3 x 5	345	
8	St. kanoman I	Motorcycle	32	0,75 x 2	48	209
		Car	14	2,3 x 5	161	
9	St. kanoman II	Motorcycle	158	0,75 x 2	237	1030,5
		Car	69	2,3 x 5	793,5	
10	St. winaon	Motorcycle	38	0,75 x 2	57	471
		Car	36	2,3 x 5	414	
			Total Kebutuhan Ruang Parkir pada Kawasan			6.443,50

Source: Research Results

SWOT Analysis of Parking Location

The location that has the potential to become an alternative off street parking location is in segment 3 at Pasar Balong with an area of 2,900 m² and segment 4 on Street Karanggetas with an area of 761 m². The approach taken to the selection of parking locations used the swot analysis method as shown in table 13.

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Gambar 2. Alternatif Lokasi Parkir

Table 13. SWOT Analysis of Alternative Off Street Parking Locations

	Location 1: Pasar Balong	Location 2: Karanggetas
Strengths (S)	- Prices are more affordable because the building is owned by the government. - The parking lot has a larger capacity with an area of 2900 m²	- Its strategic location, in the middle or center of the commercial area.
Weaknesses (W)	- Location is not in the middle or center of the commercial area	- Limited parking space with an area of 761 m². - Relatively high land price due to privately owned land
Opportunities (O)	- Can create cooperation opportunities with third parties. For example, when providing bicycle rental.	- The income or benefits from the development are more beneficial because the location of the land is next to the trade which has an active time until the evening.
Threats (T)	- Potential land acquisition conflicts with local residents due to its location adjacent to residential areas. - Potential conflict with traders because the location of the land to be acquired is still used for selling activities.	- Potential land acquisition conflicts with local residents due to its location adjacent to residential areas. - Unwillingness of landowners to sell their land.

Table 14. SWOT Analysis Weight

Alternative Location	Total Weight
Pasar Balong	1,8
Karanggetas	-1,3

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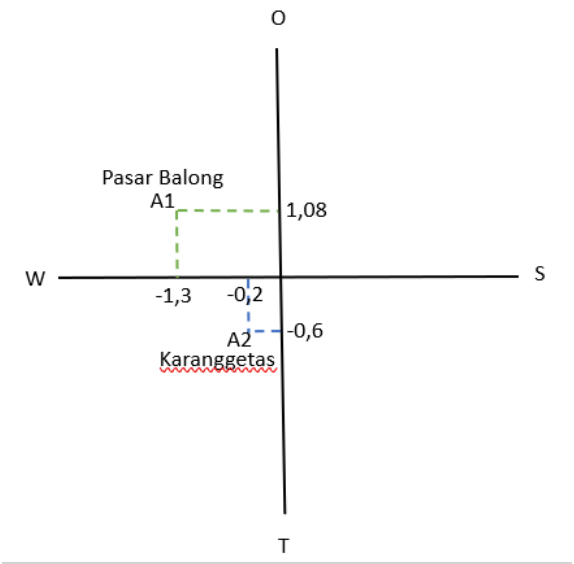
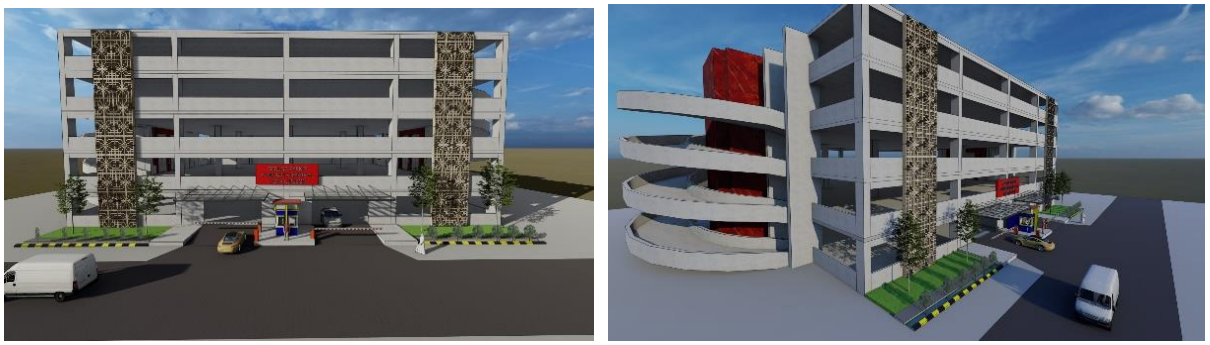


Picture 3. SWOT Analysis Graph

Based on the results of the calculation of the value weight of the SWOT Analysis, it is obtained that alternative 1 in Balong Market is in quadrant III that is, using a diffensive strategy (Negative-Positive) where it has great opportunities, but on the other hand has weaknesses so that a new strategy is needed that can change the previous strategy. Meanwhile, alternative 2 in Karanggetas is in quadrant IV, which is using a turn around strategy (Negative-Negative) where the situation is very disadvantaged with many weaknesses and threats. So that the best result that can be used as a location for integrated parking is at alternative location 1, which is at Pasar Balong.

Recommendation

The lack of land area in alternative parking locations in the commercial area of Cirebon City to accommodate parking needs of 6443.50 m² so that in order to reduce land requirements it is used parking locations in the form of high-rise buildings. Below is an illustration of a parking building in the commercial area of Cirebon City.



Picture 4. Illustration of Parking Building

Picture 3 above is only an illustration or prototype of a parking building for integrated parking development in the commercial area of Cirebon City. The illustration or prototype design is not based on the results of structural analysis.

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CONCLUSION

The performance condition of road sections in commercial areas with on-street parking causes the Level Of Service (LOS) value to be higher in the next 5 and 10 years projections that is at level C, while without on-street parking it makes road performance more stable with a Level Of Service (LOS) value at Level B. Therefore, a solution is needed for structuring on-street parking with integrated parking planning. Based on the results of research and calculations, a land area of 6,433.5 m² is needed to accommodate the parking needs of 4,792 m² Motorcycles, and 2633 m² cars. The results of the SWOT analysis that has been carried out, the location of the parking lot which is the first option is in Location 1, which is at the Pasar Balong with several advantages such as the land area that is able to accommodate parking capacity and from a relatively more affordable price because the building is owned by the government.

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