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ANALYSIS OF PARKING CHARACTERISTICS IN THE CENTER OF LABUAN BAJO CITY

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ABSTRACT

Labuan Bajo, a well-known tourist spot, has seen a quick increase in the number of vehicles, growing by an average of 6.02% each year, according to data from the West Manggarai Regency Central Statistics Agency. However, this increase has not been matched by sufficient parking spaces. Because of this, people are using roadside parking along Jalan Soekarno Hatta Bawah, which causes traffic jams. This study looks closely at how light vehicles and motorcycles park in the main area of Labuan Bajo City. The research method involves a 10-hour parking survey during peak times, from 7:00 AM to 6:00 PM, on days that are considered busy due to work activity. Primary data was gathered to figure out different parking features like the number of vehicles, how many are parked at the same time, how long they stay, how often parking spaces are used, how many spaces are available, and the parking index. The results showed that for motorcycles, there were 702 parked vehicles, with a peak of 194 vehicles per hour, but the capacity was only 65 vehicles per hour. For light vehicles, the number was 409, with a peak of 34 vehicles per hour, and the capacity was just 25 vehicles per hour. The analysis found that the Parking Index was over 1 for both types of vehicles, which means there is not enough parking space, and there is a strong need for a better, centralized parking system.

Keywords: labuan bajo; parking characteristics; parking volume

INTRODUCTION

Labuan Bajo is one of the newly identified super-priority tourism areas by the government, along with ten other regions in Indonesia. It is also the capital of West Manggarai Regency, as mentioned in the Cabinet Secretariat Letter Number R-0046/Seskap/DKK/9/2019, dated July 15, 2019. The city is now dealing with a new challenge: a steady rise in the number of vehicles, but there are no public parking spaces available for motorcycles or small cars. As a result, the roads that should be used for traffic are being used as parking areas. Vehicles passing through areas with high activity will be hindered in their movement if many vehicles park on the road (Sholikhin et al., 2017). This is clearly visible on Jalan Soekarno Hatta Bawah, where there are no parking spaces, so tourists, both local and foreign, park their vehicles on the left side of the road. This clearly affects the quality of road services. The population of West Manggarai Regency is 282,943 as of 2024, covering an area of 9,450 km², with 2,947.5 km² being land area divided into 12 sub-districts. According to data from the West Manggarai Regency Central Statistics Agency, the number of motor vehicles increased from 28,644 in 2021 to 34,159 in 2024, with an average annual growth rate of 6.02%. Tourist visitation data, based on admission tickets from various attractions and provided by the West Manggarai Regency Tourism Office (2020–2024), shows the number of tourists as 46,521, 60,439, 170,354, 123,359, and 77,143, respectively. The issue of insufficient parking facilities is a common problem in both large and developing cities like Labuan Bajo today. With rising motor vehicle ownership, the need for proper parking facilities has become increasingly important, as parking is a key part of the transportation system (Soeharto, 1997). To address this issue, it is necessary to provide sufficient parking spaces and develop an appropriate model for the existing parking areas. This must balance the demand for parking with the available

infrastructure and the specific characteristics of the current parking situation (LPKM-ITB, 1997). This study looks closely at how motorcycles and light vehicles park on Jalan Soekarno Hatta Bawah, which is in the center of Labuan Bajo. It examines several important factors like the number of vehicles parked, how long they stay, how often parking spaces get used, the total space available, how much parking is provided, and a parking index. The findings from this study will give a clear picture of the current parking situation and help in planning better and more efficient parking solutions in the future (Lestari, 2021). Parking is a transportation facility that must be organized and managed properly in order to meet the need for adequate and suitable parking spaces (Martin, 2021).

METHOD

This study took place in the central part of Labuan Bajo, specifically on Jalan Soekarno Hatta Bawah. The location was selected because it is a key area for tourism and trade, where on-street parking is common. The research used a descriptive quantitative approach. Primary data was gathered through a 10-hour parking survey on a busy day. The survey was done in a planned way, with vehicle license plate numbers and entry and exit times recorded at regular intervals, such as every 15 minutes (Arishandi et al., 2017). The vehicles studied were motorcycles and light vehicles, as there were no heavy vehicles at the site since they had moved to the new multipurpose port of Wae Kelambu in 2021. Before starting the main study, a preliminary investigation was carried out to check if the location was suitable for parking research and to collect the needed data, which was primary data in this case (Suweda & Putra, 2019). Primary data came from the parking patrols, while secondary data included information on vehicle growth, population, and tourist visits. The data from the parking patrols was then analyzed to find out the number of parked vehicles, how parking built up, the average time vehicles stayed, and the parking capacity. To predict future parking needs, growth factors were calculated based on an average vehicle growth rate of 6.02%.

1. Preliminary Study

The purpose of this preliminary study is to determine the data parameters to be surveyed and the methods to be used. The steps to be taken in this preliminary study stage are (Yany et al., n.d.):

1. Identification of problems
2. Formulation of data collection objectives
3. Conducting a literature study
4. Defining the parameters to be examined
5. Formulating and determining the scope of the survey

The final result of this stage is the specification of each data to be surveyed, including: parameters, scope of the survey area, and survey methods.

2. Literature Study

This stage begins with identifying problems at the research site and conducting a literature review (Hadi & Bintang, 2024).The literature used in the literature study includes books on transportation, scientific papers, related journals, and reports on similar activities in other places.

3. Research Location

The research is conducted in the heart of Labuan Bajo City, specifically at Jalan Soekarno Hatta bawah, within the Komodo District, West Manggarai Regency, East Nusa Tenggara Province.

This area is known for having the most tourist and business activity in Labuan Bajo, where parking on the streets is commonly seen.

4. Data Collection and Acquisition

The data used in this study includes primary and secondary data. Primary data is collected directly from the field (Wahdan & Farida, 2013). To gather this data, a parking patrol survey was conducted. This survey took place in an open area without defined boundaries, much like a cordon survey. The surveyors recorded the license plate numbers of vehicles entering and exiting the parking lot at the research location, with each surveyor stationed every 75 meters. This distance was chosen because it was considered practical for thorough data collection. The survey took place over a period of 10 hours, from 07:00 to 18:00, on a day that reflected typical peak working hours. After the survey, data collection continued through systematic patrols by the surveyors along set routes at regular intervals, such as every 15 minutes. During each patrol, they recorded the license plate numbers and the time of each recording to ensure accurate timing for reliable data analysis. On the other hand, secondary data is obtained from sources that have already been compiled or organized by other entities, such as institutions or agencies. Secondary data plays a supporting role in the study (Karakteristik et al., 2022). The specific secondary data needed for this study includes the vehicle growth rate over the past four years, from 2020 to 2024, population data, and tourist visit data, all of which were sourced from the Central Statistics Agency of West Manggarai Regency in 2025.

5. Data Processing and Analysis

Data processing and analysis are key parts of a research project (Homburger & Kell, 1977). This section involves scientific analysis and review to reach conclusions that answer the questions asked. The process of handling parking patrol survey data starts with matching vehicle license plates from different patrol rounds to find out when vehicles enter and leave, which helps in calculating the number of vehicles and how long they stay. Once the data is processed, analysis is done to create important parking performance indicators. These include calculating the volume of vehicles, determining peak demand times through parking accumulation, comparing parking usage with available parking space capacity to find utilization rates, and measuring how often parking spaces are used, known as turnover rates. All these results are used to assess the parking needs at the study site. The total number of vehicles entering and leaving the area gives an overview of how many vehicles are present in the study area. By subtracting the number of vehicles that leave, the parking spaces needed are found. This figure acts as a control for the whole parking plan. Using these two data sets together, we can analyze parking characteristics like volume, accumulation, duration, turnover rate, capacity, provision, and parking index. Parking forecasts are based on vehicle accumulation data from downtown Labuan Bajo. Using the highest parking accumulation, we calculate the number of available parking spaces, which leads to a prediction of parking space requirements for the upcoming year.

RESULT AND DISCUSSION

Parking Characteristics Analysis

Parking characteristics include parking volume, parking accumulation, average parking duration, parking turnover rate, parking capacity, parking space provision, and parking index (Dirjen perhubungan darat, 1996). In this study, there are two types of parking based on their location relative to the road, namely on-street parking and off-street parking. From the analysis of parking characteristics, it will be possible to identify parking problems in the study area.

1. Parking Volume

Parking volume is the number of vehicles parked in the study area during the observation or survey period (Suthanaya, 2010). In this case, calculations are grouped into 1-hour intervals, followed by analysis of the survey data to obtain the parking volume at the study location for 10 hours. From the results of the survey, fluctuations in the volume of vehicles entering and leaving the study area can be seen.

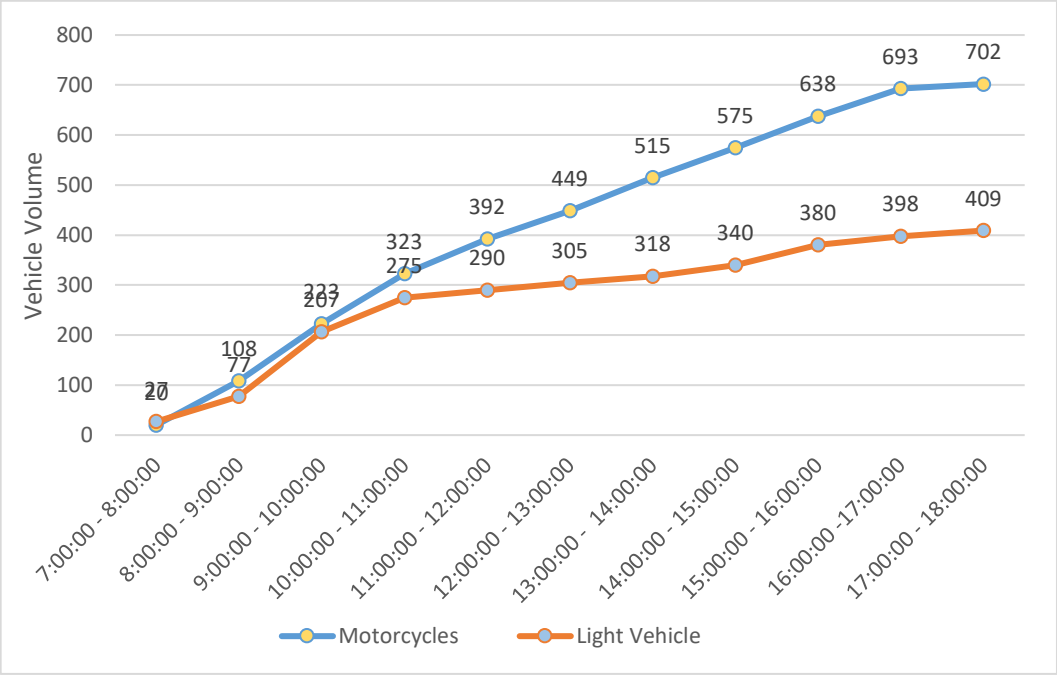

Figure 1. Volume of Light Vehicles and Motorcycles

Looking at the graph above, it is clear that the study location is visited more often by motorcycle users compared to those using light vehicles. This suggests that the study location is a busy hub that draws in a lot of people. The data from this volume serves as the main reference for determining future parking parameters.

2. Parking Accumulation

Parking accumulation refers to the total number of vehicles parked during a specific time period (Hobbs, 1974). It is used to track how parking levels change each hour, as illustrated in the image below.

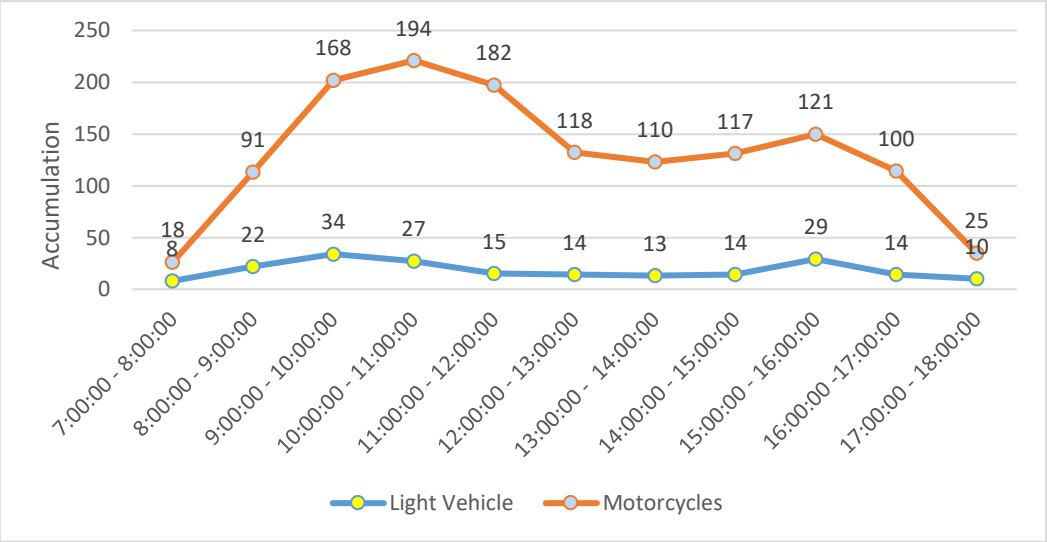

Figure 2. Accumulation graph of motorcycle and light vehicle parking

The image above shows that parking accumulation is a critical indicator for determining actual parking space requirements at certain times and is the main reference in parking capacity planning (e.g., the number of parking spaces required). The peak hours occurring around midday indicate that most motorcycle users begin arriving in the morning and reach their peak after rush hour.

3. Average Parking Duration

The average parking duration is the length of time a vehicle stays in a parking space (Abubakar, 1995). From the analysis results, the average parking duration is obtained as shown in the following table. This indicates that light vehicles tend to be used for longer periods or for activities that take more time, such as shopping, working, or spending leisure time at that location.

Table 1. Average vehicle parking duration

No.	Vehicle Types	Average Parking Duration (hour/vehicle)
1	Motorcycles	1.15
2	Light Vehicles	1.38

4. Parking Turnover Rate

The parking turnover rate is the rate of parking space utilization obtained by dividing the total number of vehicles parked during the survey by the number of available parking spaces (S. P. Warpani, 2002). The parking turnover rate for light vehicles is higher than that for motorcycles. This shows that the use of parking spaces for cars in downtown Labuan Bajo is more dynamic and efficient in terms of vehicle turnover compared to motorcycle parking spaces.

Table 2. Parking turnover rate

No.	Vehicle Types	Number of Vehicles	Number of Parking Spaces	Survey Duration	Parking Turnover Rate
		(Nt)	(S)	(TS)	TR= Nt/ (S . Ts)
1	Motorcycles	702	75	10	0.94
2	Light Vehicles	409	35	10	1.17

5. Parking Capacity

Parking capacity refers to the maximum number of vehicles that a parking space can hold (Tamin, 2000). The data clearly indicates that the parking facilities at the surveyed location are lacking in capacity, affecting both motorcycles and light vehicles.

Table 3. Parking capacity

No.	Vehicle Types	Number of Vehicles	Average Parking Duration	Parking Capacity
		S	D (hour/vehicle)	KP = S/D
1	Motorcycles	75	1.15	65
2	Light Vehicles	35	1.38	25

6. Parking Space Provision

Parking space provision can limit the number of vehicles that can be parked at the survey location for 10 hours (Oppenlander, 1976). This data clearly shows that the available parking capacity is insufficient to accommodate the total parking demand that occurs during this period, and also supports the need for physical expansion of parking capacity or the implementation of strict parking management policies to reduce demand or improve supply efficiency.

Table 4. Parking Space Provision

Vehicle Types	Survey Duration	Average Parking Duration	Number of Vehicles	Insufficiency Factor	Parking Space
	Ts (hour)	D (hour/vehicle)	S	F	PS= (S. Ts/D)*F
Motorcycles	10	1.15	75	0.9	587
Light Vehicles	10	1.38	35	0.9	228

7. Parking Index

The parking index is the ratio between accumulated parking and parking capacity (Morlok, 1995). The parking index can be used as a measure of parking space requirements to determine whether the existing parking capacity can still accommodate parking demand. This shows that accumulated parking exceeds existing parking capacity and is unable to accommodate parking demand. Parking demand based on maximum accumulation for motorcycles is 2.98 X 75 = 236 parking spaces, while for light vehicles it is 1.36 X 35 = 48 parking spaces.

Table 5. Parking Index

Vehicle Types	Time	Accumulation	Parking Capacity	Parking Index
Motorcycles	10:00 - 11:00	194	65	2.98
Light Vehicles	09:00 - 10:00	34	25	1.36

CONCLUSION

For motorcycles, the parking volume is 702 vehicles, with a maximum accumulation rate of 194 vehicles per hour and an average parking duration of 1.15 hours per vehicle. There are 75 available parking spaces, with a capacity of 65 vehicles per hour. This means the current

capacity is not enough to handle the 194 vehicles per hour demand. For light vehicles, the parking volume is 409 vehicles, with a maximum accumulation of 34 vehicles per hour and an average parking duration of 1.38 hours per vehicle. There are 35 available parking spaces, with a capacity of 25 vehicles per hour. Again, the current capacity cannot meet the 34 vehicles per hour demand. Based on the maximum accumulation rate, the required parking spaces for motorcycles are 2.98 multiplied by 75, which equals 224 spaces. For light vehicles, the required parking spaces are 1.36 multiplied by 35, which equals 48 spaces.

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