



Analysis Of Parking Space Capacity At Karya Nugraha Market

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ABSTRACT

Parking capacity plays an essential role in ensuring the effectiveness of urban transportation systems, particularly in areas characterized by dense economic activity such as Karya Nugraha Market in Baubau City. This study aims to analyze the adequacy and performance of parking facilities by examining static parking capacity, parking accumulation, and utilization levels through the Parking Index (PI) method. Field observations and direct measurements were conducted to obtain data on vehicle volumes, usage duration, and turnover rates in the designated parking areas. The results reveal that the available parking capacity consists of 10 SRP for cars and 168 SRP for motorcycles. During peak activity periods, the maximum parking accumulation reaches the same value as the static capacity for both types of vehicles, resulting in a Parking Index of 100%. This indicates that the parking facilities operate at full saturation and are unable to accommodate additional vehicles entering the market area. The fully saturated parking condition has significant implications for transportation performance, including increased congestion, reduced accessibility, and delays in vehicle movement surrounding the market environment. These conditions negatively impact visitor comfort and disrupt commercial activities. The findings underline the urgent need for improved parking management strategies, such as restructuring vehicle circulation patterns, expanding parking capacity where land availability permits, implementing time-limited parking regulations, and enhancing operational efficiency through clear parking markings and trained personnel. Integrating parking management with broader urban mobility policies is also crucial to ensure long-term sustainability and improved accessibility in the Karya Nugraha Market area.

Keywords: *Parking Capacity, Parking Index, Parking Management, Karya Nugraha Market*

1. Introduction

Parking refers to vehicles that are not moving, vehicles that are stationary and not temporary. A parking space can also be defined as a vehicle that stops temporarily (idle) or remains stationary for a long period of time. Parking refers to vehicles that are not moving, vehicles that are stationary and not temporary. A parking space can also be defined as a vehicle that stops temporarily (idle) or remains stationary for an extended duration (Jenamu et al., 2023). Parking problems are issues related to space requirements, where the provision of space in urban areas is limited by the size of the area and the city's land-use planning. The construction of parking lots will, to some extent, take up a portion of the city's land area because it requires dedicated space (Suthanaya, 2010).

In both major cities and developing cities, parking issues are always present, especially for four-wheeled vehicles. Recently, parking problems have greatly affected vehicle movements; vehicles passing through areas with high activity levels are obstructed by cars parked on the roadway, causing congestion. Parking is not a new phenomenon; it is a common issue frequently encountered within the transportation system (Simanjuntak et al., 2024)

Parking is not a new phenomenon. It is a common problem frequently encountered within the transportation system. Issues related to the need for parking facilities are common as vehicle ownership continues to grow. If the parking system is not properly managed, problems such as traffic congestion, decreased accessibility of an area, and other related issues will arise (Pamungkas et al., 2022)

A good parking area should provide security, proper lighting, clear access signs from the road, enough space for maneuvering, and the capacity to accommodate vehicles according to the needs of the area. Since buses that stop or remain stationary require space, they can cause serious problems when stopping or parking. The perception of Kadilangu as a friendly and well-organized tourist destination can also be disrupted by poor parking facilities. In addition, the increasing number of private vehicles used by visitors has made the need for parking space even more urgent (Zaim et al., 2025)

Parking problems in various markets include the absence of marked parking bays, causing vehicles to park irregularly. Poor parking management often leads to issues due to the high number of vehicles entering and exiting the area. The available parking space in the market area is very limited, making it unable to accommodate the number of vehicles entering the parking zone. People tend to seek practical solutions by parking their vehicles close to the stalls where they intend to shop. The market's location in an area with heavy traffic, such as near intersections, also contributes to the issue. The conditions at Laelangi Market are extremely crowded, resulting in highly congested traffic flow.

Recently, parking issues have significantly disrupted the flow of vehicles, as those traveling through high-traffic zones are obstructed by cars parked along the roadway, resulting in traffic congestion. As the urban population continues to grow, the demand for parking facilities has increased, especially at Karya Nugraha Market, a major commercial hub in Baubau City. Transportation problems in Baubau, particularly in busy activity centers such as Karya Nugraha Market, often lead to an insufficient number of parking spaces, forcing vehicles to park on the roadside. The increasing commercial activities in Karya Nugraha Market have further reduced the available parking capacity. Initial observations indicate that the market area has poorly organized parking zones. The existing parking spaces tend to expand onto the roadway, using the street as an additional parking area. As a result, during peak hours, vehicles accumulate at every parking point around Karya Nugraha Market.

2. Methods

The research location is Karya Nugraha Market, located on H. Agus Salim Street, Baubau City, 93713, Indonesia (Case study: On-street parking on H. Agus Salim). The reason for choosing this location is because H. Agus Salim Street is a public roadside area with heavy traffic flow and is also one of the busiest centers in Baubau City, with very high parking activity, as indicated by the large number of parking attendants along the left side of the road.

The methods of data collection and data processing in this study were designed systematically to obtain a comprehensive understanding of the parking conditions at Karya Nugraha Market, located on H. Agus Salim Street in Baubau City. This market was selected because it is one of the busiest centers of economic activity, characterized by heavy traffic flow and intense parking activity. Such conditions require an in-depth assessment of parking space needs, land-use efficiency, and the impact of parking activities on the surrounding traffic flow. To

achieve these objectives, this research employs several stages of data collection and processing as described below.

1. Parking Volume Survey at Karya Nugraha Market

The first step conducted in this study is the **parking volume survey**, which involves collecting data on the number of vehicles parked, entering, and exiting the market area within a given period. The survey is conducted during times considered representative of peak and non-peak hours, such as morning hours when market activity begins, midday during turnover of visitors, and late afternoon when shopping activity increases. The method of recording is done manually by dividing the observation into intervals of 15 or 30 minutes, depending on the research needs.

The parking volume survey is essential since it provides a real-world picture of parking behavior in the area. From the survey, the research can identify the number of vehicles using the parking space simultaneously, peak arrival times, and driver behavior patterns. The survey also provides information about the types of vehicles most commonly parked—whether motorcycles or cars allowing researchers to calculate proportional parking needs. Furthermore, the parking volume survey forms the basis for determining parking accumulation, parking duration, vehicle turnover rate, and the effective parking capacity used during the observation period.

2. Calculating Parking Space Requirements and Parking Index

Once field data is collected, the next step is to calculate the **parking space requirements** at Karya Nugraha Market. This calculation aims to determine whether the existing parking facilities are adequate or insufficient for the number of vehicles using the area. The calculation is conducted by referring to technical parking standards, such as national road planning guidelines and references from the Ministry of Transportation. Several key variables are considered in the calculation, including:

- **Parking accumulation**, the maximum number of vehicles parked simultaneously;
- **Vehicle volume**, including vehicles entering and exiting the area;
- **Parking duration**, indicating how long each vehicle occupies a parking space;
- **Vehicle turnover**, which describes how frequently a parking space is used throughout the day.

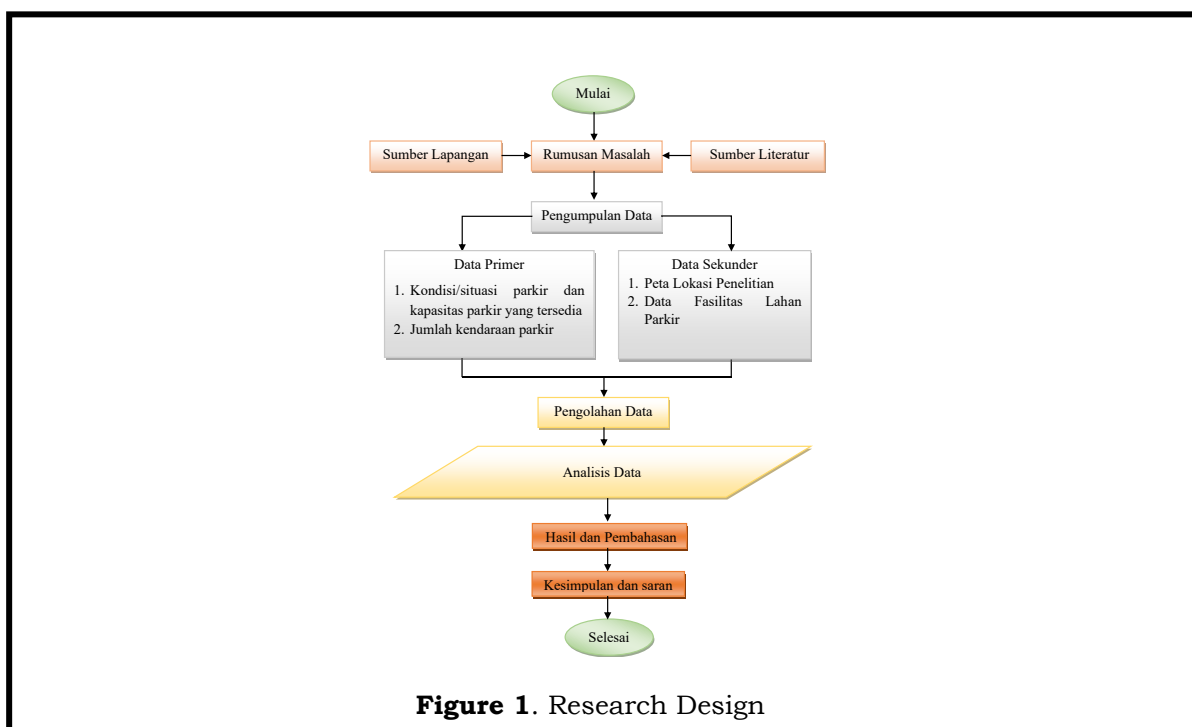
Using these variables, the actual parking space required can be determined to prevent congestion caused by vehicle buildup. Additionally, the study also calculates the **parking index**, an important indicator used to assess whether the parking facility is operating under ideal, near-full, or overcrowded conditions. A parking index exceeding 100% indicates insufficient parking capacity, often resulting in illegal parking or parking on the roadside, which disrupts traffic flow and decreases road capacity.

The calculation of parking space requirements and the parking index is crucial because it forms the foundation for recommending improvements in parking management. Mismatches between parking needs and the available land capacity can directly affect congestion levels, accessibility, and user comfort.

3. Discussion

The discussion stage is a significant part of the study, where all collected data are analyzed and interpreted comprehensively. This stage not only presents numerical results but also provides explanations regarding the causes, impacts, and relationships among various factors influencing the parking conditions at Karya Nugraha Market.

The discussion includes analyzing driver behavior when choosing parking locations, the tendency of visitors to park as close as possible to market stalls, and the role of parking attendants in regulating vehicle circulation. It also highlights how the limited land area around the market contributes to roadside parking, reducing the effective road width and causing traffic delays. Other factors such as the lack of marked parking spaces, insufficient supervision by authorities, and the absence of supporting facilities like clear signage and designated parking zones are also analyzed in detail.



Using the data obtained from the parking survey, the study examines key aspects such as peak accumulation of vehicles, congestion points, circulation patterns, and the impact on the surrounding community. The dynamic nature of traditional market environments, where frequent movement of vehicles occurs within short intervals, adds to the complexity of parking management. These interconnected factors are thoroughly explored to emphasize the need for an integrated approach to parking management in the area.

4. Conclusion and Recommendations

The final stage of the study presents conclusions derived from the analysis. The conclusions summarize the actual parking conditions at Karya Nugraha Market, including whether the existing facilities meet the required capacity or have exceeded it. Furthermore, the conclusions explain how the current parking patterns affect traffic flow, accessibility, and the comfort of market visitors.

Following this, the study provides recommendations to improve the parking system. These recommendations may include reorganizing parking zones, adding marked parking bays, installing supporting traffic signs, implementing time-based parking management, and developing additional off-street parking spaces. Recommendations regarding the training and supervision of parking attendants are also included to ensure consistent and orderly parking operations.

These improvements aim to enhance user comfort, minimize congestion, and create a more organized and visitor-friendly market environment. By optimizing the parking system, Karya Nugraha Market is expected to offer a better shopping experience while supporting local economic growth.

3. Findings and Discussions

3.1 Findings

Parking volume refers to the number of vehicles entering, leaving, and occupying a parking area within a specific period of time. This parameter is used to determine the level of activity at a location and to illustrate the intensity of parking facility usage. Through parking volume observations, it is possible to identify peak hours when vehicle numbers surge, how many vehicles utilize the parking facilities, and how users behave when choosing parking spaces. Parking volume data also forms the basis for calculating parking accumulation, parking duration, and the parking index, which helps assess whether the available parking capacity is sufficient or experiencing shortages. Therefore, parking volume plays an important role in transportation planning and parking management, particularly in efforts to reduce congestion, improve area accessibility, and ensure that parking facilities function optimally.

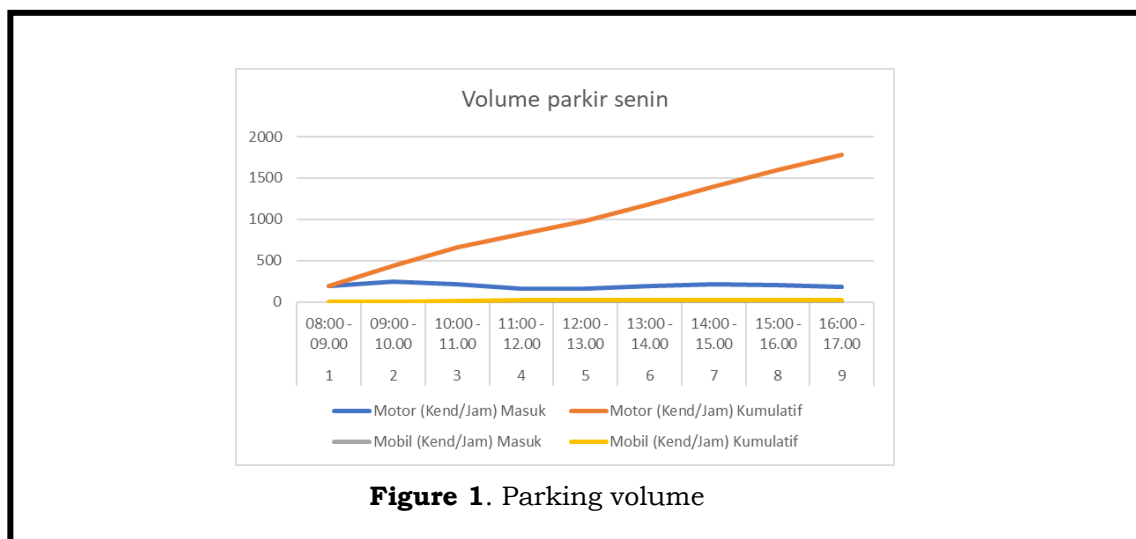


Figure 1. Parking volume

The parking index is the percentage of the accumulated number of vehicles within a specific time interval divided by the number of available parking spaces, multiplied by 100%. The formula used is as follows:

a. Cars

$$IP = 10/10 \times 100 = 100\%$$

b. motorcycle

$$IP = 168/168 \times 100 = 100\%$$

From the calculations above, it can be seen that the static capacity for motorcycles is 168 SRP, which is equal to the maximum motorcycle accumulation of 168 SRP. For cars, the static capacity is 10 SRP, which also matches the maximum car accumulation of 10 SRP. Based on the calculations, the parking index obtained is 100% for motorcycles and 100% for cars. This indicates that the number of vehicles in the parking area is equal to the available capacity. Therefore, it can be concluded that the parking capacity for both motorcycles and cars is sufficient, as it does not exceed 100%

3.2 Discussions

Parking issues are one of the critical concerns in urban transportation systems, especially in areas with high socio-economic activity such as traditional markets. One of the locations experiencing significant pressure in terms of parking is Karya Nugraha Market, which serves as an economic activity center for the community in Baubau City. The high number of visitors, the intense movement of vehicles, and community activities that take place throughout the day cause the parking spaces in this area to operate at maximum capacity.

To understand the level of parking pressure at a given location, one of the primary indicators used is the Parking Index (IP). The Parking Index describes the relationship between the number of vehicles parked at peak accumulation and the available parking capacity. The IP value is essential for determining whether parking spaces are adequate, insufficient, or even over-capacity.

In this discussion, the following calculation data are used:

Parking Index for Cars = 100%

Parking Index for Motorcycles = 100%

Car parking capacity = 10 SRP

Maximum car parking accumulation = 10 SRP

Motorcycle parking capacity = 168 SRP

Maximum motorcycle parking accumulation = 168 SRP

This, the parking index values for both types of vehicles are at the maximum allowable level, which is 100%. This figure indicates that all available parking spaces are fully occupied at certain times. The following discussion will explain the technical meaning of the parking index values, their implications for transportation performance, an analysis of the causes and impacts, and comprehensive recommendations for parking system improvements.

4. Conclusion

The parking issues at Karya Nugraha Market indicate that the parking capacity for both cars and motorcycles is fully utilized, as shown by a Parking Index value of 100%. This condition confirms that the area has reached its saturation

point, potentially causing congestion, reduced visitor comfort, and disruptions to commercial activities. To address these challenges, a more structured parking management system is required, including regulating vehicle entry exit flow, expanding parking areas when feasible, or implementing timed parking policies to maintain smooth vehicle circulation. Additionally, providing clear parking markings, deploying well-trained parking attendants, and utilizing alternative areas as auxiliary parking zones can serve as effective short-term solutions. These measures will not only improve the efficiency of parking space utilization but also support smoother traffic flow and create a more orderly and comfortable market environment for the community.

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