

Analysis of Traffic Characteristics on Pasar Kapasan Street, Surabaya, in Front of Kapasan Market, Surabaya**Wahyu Ali¹, Hanie TekiTjendani², Nurani Hartatik³**
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Abstract: Surabaya is a metropolitan city with many major roads. Roads are essential infrastructures that are greatly needed. A roadway is one of the most important transportation facilities, as it connects one place to another. Therefore, the condition of a road segment greatly affects road performance. Pavement on roadways helps maintain the road in good and stable condition so that road users feel safe and comfortable when driving. However, various problems often occur, such as traffic congestion or vehicle buildup on certain road segments. One of the contributing factors is on-street parking. On-street parking along Kapasan Street, Surabaya, frequently causes congestion, preventing the road segment from functioning as intended. Kapasan Street in Surabaya is the object of this study. The purpose of this research is to analyze the traffic characteristics and the degree of saturation caused by on-street parking on Kapasan Street, Surabaya. The methods used include field surveys and direct observation. The study was carried out for one week with predetermined time intervals. Four surveyors were involved in data collection, and a traffic counter application was used to gather the data. The analysis results show that the highest traffic volume occurred on Monday, with a value of 13,387.95 pcu/hour. Traffic speed peaked on Sunday at 683.49 km/hour, the highest density occurred on Thursday with a value of 997 vehicles/hour, and the highest degree of saturation occurred on Friday with a value of 0.76. The conclusion from this analysis is that on-street parking significantly affects traffic characteristics.

Keywords: on-street parking, traffic characteristics, degree of saturation

INTRODUCTION

Parking areas must be given proper attention in the management of parking facilities in public spaces. Parking managers must carefully consider the parking demand and its availability so that drivers can park in designated parking areas (off-street parking) rather than parking on the roadway, which may disrupt other road users. *Suara Surabaya* has reported congestion occurring on Kapasan Street, Surabaya. Likewise, *Jawa Pos* has also reported heavy congestion on the same road.

The phenomenon observed on Kapasan Street, especially in front of Pasar Surya Kapasan, shows a large number of vehicles parking on the roadway, which disrupts the performance of the road. The parking demand in front of Pasar Surya Kapasan is exceptionally high due to the large number of visitors who choose to park on the street. The high volume of vehicles entering and leaving the on-street parking area creates traffic obstructions, resulting in congestion or vehicle buildup at certain points. This condition significantly interferes with the expected performance of the road segment. Traffic flow on Kapasan Street becomes unstable due to the presence of on-street parking.

Diah (2019) used Kapasan Street as the object of her research to analyze traffic congestion, and Gusti (2022) also selected Kapasan Street as his research location to analyze road performance caused by congestion.

Preliminary surveys conducted by the author show that Kapasan Street is a two-way road with four lanes and a length of 1 km. Along Kapasan Street, not only is there a supermarket, but many active shop-houses (ruko) also operate, such as fabric stores, textile shops, screen-printing shops, accessory shops, and others. The operational hours of Kapasan Market are from 6:00 AM to 5:00 PM. Parking conditions at Kapasan Market show that on-street parking is full, with many vehicles unable to park inside the

designated parking area due to limited space. As a result, customers park on the roadway. Moreover, many shop-houses along Kapasan Street lack proper parking arrangements, causing more customers to park on the street.

Based on the information gathered and the initial survey results, the traffic problems occurring on Kapasan Street, Surabaya, are highly important to study in greater depth. The parking space provided must be adequate to meet parking demand so that vehicles do not occupy the roadway and disrupt traffic flow.

In this study, the author uses the Indonesian Highway Capacity Manual (MKJI, 1997) as the calculation guideline. MKJI (1997) is used because it provides comprehensive calculation procedures for both rural and urban roads and therefore serves as an appropriate reference. MKJI (1997) clearly outlines the rules and values needed for road performance evaluation. The issue of on-street parking on Kapasan Street can be analyzed to help identify solutions for reducing congestion. By analyzing traffic characteristics, it is possible to determine the level of congestion caused by on-street parking.

The objective of this research is to analyze the traffic characteristics occurring on Kapasan Street, Surabaya, as well as the degree of saturation resulting from the presence of on-street parking.

RESEARCHMETHOD

Thirafi (2024) analyzed the activities of the Tanjung Anyar Market and their impact on traffic performance on Residen Pamuji Street in Mojokerto City using the PKJI guidelines. The variables examined included traffic volume, side friction, road capacity, degree of saturation, and level of service. The analysis showed that the highest traffic volume occurred on Monday, reaching 4,868.5 pcu/hour.

The variables related to traffic characteristics always have systematic and mathematical relationships. The following is an explanation of these characteristic variables (Tamin, 2000).

- a. Traffic volume is the number of vehicles passing through a point within a certain period of time. It can be calculated using the formula:

$$Q = \frac{N}{T} \quad (1)$$

- b. Traffic speed is the rate of movement. In its calculation, the following formula is used:

$$V = \frac{S}{T} \quad (2)$$

- c. Traffic density is the number of vehicles occupying a particular road segment. It is calculated using the following formula:

$$K = \frac{Q}{V} \quad (3)$$

Degree of saturation in traffic is the ratio of traffic flow to the capacity of a road. This value indicates whether a road segment has good capacity or not. To determine the degree of saturation, the traffic volume and road capacity are required, as shown in the following formula:

$$DS = \frac{Q}{C} \quad (4)$$

The data for this study were collected over seven days, from Monday to Sunday, on Kapasan Street, Surabaya. The survey technique used in this research was direct field observation. A traffic counter application was used to record the number of vehicles passing through, and the data were then entered into a data collection table.

Two surveyors were involved in collecting the field data. There were four survey points, divided into two groups. The first group was positioned before and after Kapasan Market, while the second group was positioned at the median of the road in front of Kapasan Market. Additionally, the author used a measuring tape to obtain geometric data for Kapasan Street, Surabaya.

RESULTS AND DISCUSSION

The geometric data obtained from measuring the road using a measuring tape are as follows:

Table 1. Geometric Data of Kapasan Street

Road Condition	Description
Road type	4-lane divided
Road width	15.8 m
Road length	1 km
Curb	45 cm
Sidewalk	1.43 m
Shoulder width	1.72 m

Based on the geometric data, the width and length of Kapasan Street, Surabaya, can be identified. Kapasan Street has a curb measuring 45 cm, a sidewalk of 1.43 m, and a shoulder width of 1.72 m.

The data used in this study were obtained from the author's direct observation over seven days (one week) during the predetermined time period of 05:00–19:00 WIB on Kapasan Street, Surabaya. The following are the results of the author's analysis to obtain the traffic characteristic values on Kapasan Street, Surabaya.

Table 2. Total Traffic Volume from Monday to Sunday on Kapasan Street

Day	Value
Monday	13,387.95 pcu/hour
Tuesday	13,048.35 pcu/hour
Wednesday	12,864.95 pcu/hour
Thursday	12,095.55 pcu/hour
Friday	13,311.25 pcu/hour
Saturday	11,684.75 pcu/hour
Sunday	10,652.75 pcu/hour

Based on the table, the values represent the total traffic volume recorded over seven days. The peak traffic volume occurred on Monday, reaching 13,387.95 pcu/hour. A high number of vehicles passed on Friday under busy-but-flowing conditions, which resulted in another high traffic volume value. Meanwhile, the lowest total traffic volume occurred on Sunday, with 10,652.5 pcu/hour. The lower traffic volume on Sunday was influenced by vehicles stopping briefly to load or unload goods at Kapasan Market or the surrounding shop-houses, causing temporary vehicle buildup that reduced overall traffic flow.

The following section presents the results of the traffic speed calculations for Tuesday on Kapasan Street, Surabaya:

Table 3. List of Traffic Speeds from Monday to Sunday on Kapasan Street

Day	Traffic Speed Value
Monday	478.74 km/hour
Tuesday	531.73 km/hour
Wednesday	529.22 km/hour
Thursday	486.67 km/hour
Friday	546.16 km/hour
Saturday	514.98 km/hour
Sunday	683.49 km/hour

The table shows the traffic speeds recorded during the one-week observation period. Among the seven days, the smoothest traffic flow occurred on Sunday, with a value of 683.49 km/hour. This is because there were no activities or on-street parking on that day. On Sundays, Kapasan Market and the shop-houses along Kapasan Street are not operating, resulting in uninterrupted traffic flow.

The following section presents the traffic density calculations for the week in the form of a table:

Table 4. Traffic Density from Monday to Sunday on Kapasan Street

Day	Traffic Density Value
Monday	977 pcu/hour
Tuesday	896 pcu/hour
Wednesday	906 pcu/hour
Thursday	927 pcu/hour
Friday	871 pcu/hour
Saturday	852 pcu/hour
Sunday	564 pcu/hour

Based on the survey results, the traffic density on Kapasan Street, Surabaya, increased on Monday, reaching 977 pcu/hour. Traffic density then decreased on Tuesday, followed by fluctuations and an increase over the next few days, reaching its highest peak on Thursday.

The following are the results of the author's analysis regarding the degree of saturation that occurred on Kapasan Street, Surabaya:

Table 5. Peak Degree of Saturation from Monday to Sunday on Kapasan Street

Day	Degree of Saturation Value
Monday	0.74
Tuesday	0.74
Wednesday	0.74
Thursday	0.73
Friday	0.76
Saturday	0.69
Sunday	0.64

Based on the analysis, the highest degree of saturation occurred on Friday, with a value of 0.76. The lowest degree of saturation occurred on Sunday, with a value of 0.64.

CONCLUSION

The highest traffic volume occurred on Monday, reaching 13,388.95 pcu/hour. The highest traffic speed was recorded on Sunday, with a value of 683.49 km/hour. The highest traffic density occurred on Monday at 977 vehicles/hour. Based on the author's analysis, three traffic characteristics were significantly affected by on-street parking on Kapasan Street, Surabaya.

The peak traffic volume on Monday was caused by the large number of vehicles parking on the roadway, reducing the available road space for moving vehicles. The highest traffic speed occurred on Sunday because there were no activities taking place on Kapasan Street; the market and shop-houses were not operating, resulting in smooth traffic flow. The highest traffic density on Monday was due to congestion and vehicle buildup caused by on-street parking.

Furthermore, the highest degree of saturation was recorded on Friday, with a value of 0.76. From the analysis, it can be concluded that the higher the traffic speed, the lower the traffic density, and conversely, the lower the traffic speed, the higher the traffic density.

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