

Analysis of Road Performance at the Center of Community Activities Due to Side Obstacles (Case Study of Alun-Alun Sukaraja)

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ARTICLE INFO	ABSTRACT
<p>Keywords:</p> <p>Road performance, community center, road intersection, Sukaraja</p>	<p><i>In Sukaraja Square, congestion often occurs, as well as increasing the risk of accidents due to the absence of adequate traffic arrangements. The purpose of this paper is to analyze the road performance that occurs in the center of community activities due to side obstacles. This research uses the Indonesian Road Capacity Guidelines (PKJI) 2023 method. The survey was conducted at the Sukaraja Square intersection. The data collected included road geometry, vehicle volume and vehicle speed. For data collection in the road intersection area and the center of community activities using the method of systematic observation of vehicles in the road area. The results of this study indicate that there is no major potential hazard but the surrounding community must remain careful because the area is still with inadequate facilities.</i></p>

1. Introduction

Road performance is something that has a major influence on traffic. However, traffic is not free from the possibility of obstacles such as traffic control, technology, and lack of extensibility of old systems to new technologies (Razavi, Hamidkhani, & Sadeghi, 2019). Therefore, supervision in traffic must be tightened so that existing traffic obstacles are not so affected. In this case we have a lot to fix in the existing traffic problems, so that traffic is not hampered anymore. The development of technology for the smooth performance of the road itself will greatly help road users (Suartawan, Suthanaya, & Wedagama, 2022).

In Indonesia, one of the things that affect traffic congestion is the huge population density due to the dense transportation in developing cities. So in Indonesia itself, traffic signs are very important for regulating road intersections (Tatsubori, Walcott-Bryant, Bryant, & Wamburu, 2018). Although traffic signs aim to regulate and smoothen the flow of vehicles, under heavy traffic conditions, some signs can become a hindrance to road performance. This is especially the case if the signs do not match the actual conditions on the ground or if road users do not comply with the rules.

In big cities such as JABODETABEK, Bandung, Cirebon, Sukabumi, and others, traffic jams are common, especially during peak hours. However, if traffic signs at road intersections are not available, the risk of accidents can increase significantly. Therefore, the presence of traffic signs is very important in maintaining smooth and safe traffic. They play a major role in supporting optimal road performance and safety for users (Babić, Fiolic, & Ferko, 2022).

A clear example of this can be seen in Sukabumi, where street vendors have become a reference point for unorganized traffic (T, 2021). Street vendors work for the economy, but because they are not organized, they cause traffic congestion. Street vendors should be organized in a way that does not

hinder traffic on the streets, or perhaps the government can provide a special neighborhood for vendors so that street vendors are not on the streets. If the government can provide a place, then the obstacles caused by street vendors will be reduced little by little.

As noted above, one of the major bottlenecks in Sukaraja Square is the failure of traffic lights at intersections. This problem contributes greatly to the congestion that often occurs at the location, as well as increasing the risk of accidents due to the absence of adequate traffic control (Purnama, Rifai, & Nasrun, 2022). In addition, the presence of street vendors blocking the road is also a nuisance factor that affects the smooth flow of traffic. Although the local government has provided a special area for trading in Alun-Alun, there are still traders who choose to sell on the side of the road. Therefore, the author is interested in writing with the title "Analysis of Road Performance in the Community Activity Center Area Due to Side Obstacles (Case Study Alun-Alun Sukaraja)."

2. Literature Review

2.1 Road Performance

Road performance plays an important role in influencing the smooth flow of traffic. Every day, road traffic plays a crucial role in organizing various activities, especially in big cities. Therefore, traffic data analysis becomes indispensable to support smooth and efficient road performance (Mondal & Rehena, 2020). Therefore, road performance and road traffic are interconnected with each other in the smooth running of a road. If one of them does not work well, traffic resistance or road performance resistance will be poor. As much as possible, road performance and traffic must remain stable so that there are no bottlenecks.

Road performance can be described based on the condition of road stability, travel time, saturation level and free speed of each vehicle traveling on the road (Faradila & Puspito, 2022). The better the road stability condition, the better the road. In this case, the increase in the number of vehicles will cause traffic congestion if transportation facilities and infrastructure are not running properly (Isradi, Nareswari, Rifai, & Prasetijo, 2021). The more vehicles on a road, the higher the potential for congestion. This is due to the imbalance between the volume of vehicles and the available road capacity. That is why, in big cities, traffic congestion is often a major problem that disrupts smooth travel and transportation efficiency.

The high number of traffic accidents and damage to road infrastructure have a major influence on the quality of road services (Maharani, Rifai, & Prasetijo, 2022). The combination of these factors creates a nuisance that not only exacerbates congestion, but also reduces efficiency and comfort for road users, especially in congested urban areas. In addition, the inability of roads to accommodate high vehicle volumes often worsens the situation, causing more congestion and extending travel times. These impacts also affect the economic sector, as time wasted on the road translates into lower productivity and higher transportation costs (Bezerra, Kaiser, & Battistelle, 2020).

Improved road infrastructure and better traffic management are critical to addressing the existing problems (Isradi, Molina, Rifai, Mufhidin, & Prasetijo, 2021). Evaluations of road conditions and traffic systems should be conducted regularly to ensure smooth operation and safety. Without proper improvements, the problems of congestion and accidents will continue, reducing transportation efficiency. Therefore, concrete measures to improve road infrastructure and traffic management are urgently needed.

2.2 Classed of Road

Road class refers to the category or class of roads that are divided based on their capacity and function in supporting the transportation system (Isradi M. N., 2021). The road class is very important to determine the design and maintenance specifications that suit the traffic needs. In many countries, roads are divided into several classes, such as arterial, collector and local roads. Determining the right road class will affect the smooth flow of traffic and the safety of road users.

Each road class has certain criteria based on road capacity, vehicle volume, and the type of traffic served. High-class roads, such as arterial roads, are designed to accommodate large vehicle volumes and high speeds (Rifai A. I., 2020). Meanwhile, lower-class roads, such as local roads, focus more on access to residential areas or business districts. The road class also determines the prioritization of maintenance and necessary infrastructure improvements.

Road classification is also strongly linked to safety factors, as higher-class roads are generally equipped with better supporting facilities, such as lighting and traffic signs (Soylu, 2024). Low-grade roads are usually narrower and have higher crash potential. Therefore, proper road class management can reduce the risk of accidents and improve overall traffic safety. All these factors need to be considered in effective road network planning.

2.3 Intersections

A road intersection is an area where two or more roads meet or intersect. This area includes the roadway lanes and curbs used by vehicles to pass. According to (Isradi, Tarastanty, Dermawan, Mufhidin, & Prasetijo, 2021), Roads play an important role in the smooth flow of traffic. The presence of intersections also affects travel safety and efficiency.

Regarding road intersections, many focus on signalized road intersections but few discuss unsignalized road intersections (Olayode, Tartibu, Okwu, & Uchechi, 2020). In fact, this is a gap and a crisis for the world's roads. This is because unsignalized intersections can only be found in remote areas. In urban areas, they can be found at roundabouts. Where a detour is provided instead of, in place of traffic lights.

An unsignalized intersection is an intersection that is not signalized in its arrangement (Rifai A. I., 2021). Not using signals means there are no traffic lights at the intersection. The result of not using the signals at the intersection will be congestion at the intersection. As a result, traffic congestion increases and accidents are more likely to occur. At intersections without traffic lights, conflicts will occur as vehicles converge from different directions to enter one of the available road segments (Immanuel, Rifai, & Prasetijo, 2022).

3. Method

Data is the main thing in which scientific research and modeling are structured. This research uses the Indonesian Highway Capacity Manual (IHCM) 2023 (Rifai, Hadiwardoyo, Correia, Pereira, & Cortez, 2015). Indonesian Highway Capacity Manual (IHCM) is a guideline used to analyze and measure the capacity and performance of roads in Indonesia. The IHCM can be updated every few years, such as the 1997 IHCM which has now been updated to the 2023 IHCM, which is currently used as a guideline in traffic engineering and various other purposes (Irawati, Munawar, & Setiadji, 2023).

The survey was conducted at the Sukaraja Square intersection. Data collected included road geometry, vehicle volume and vehicle speed. From the guidelines raised, it will be a reference in carrying out field data collection and research (Rifai, Hadiwardoyo, Correia, & Pereira, 2016). Where procurement of problems is a systematic process of scientific research, it must begin with correctly identifying the problem. For data collection in the area of road intersections and community activity centers using the method of systematic observation of vehicles in the road area.

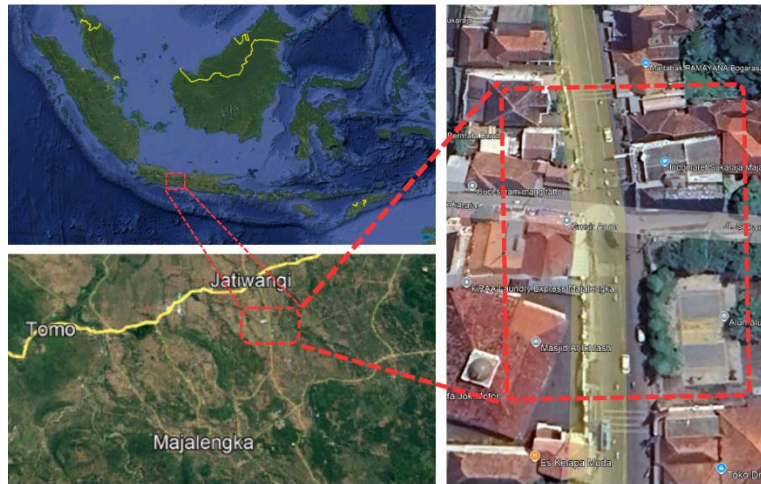


Figure 1: Road location in the study

4. Results and Discussion

4.1. Survey Data

Based on a survey conducted on Jl. Jatiwangi - Majalengka near Alun-alun Sukaraja, the research focused on peak hours when the volume of vehicles on the road section increased significantly. This increase in the number of vehicles has a direct impact on the level of traffic flow density. The data used in this study includes various aspects, such as road geometric conditions, driver behavior, and facilities available in the community center area. All aspects contribute to analyzing traffic problems at the location. The survey was conducted on Thursday, November 20, 2024 at 06.20-07.20 WIB..

4.2. Road Geometry Data

Table 1. Road geometric data

Description	Jl. Jatiwangi - Majalengka
Road Type	2/2 UD (2 Lane 2 Ways Undivided Direction)
Road Width	7 m
Road Shoulder Width	1 m
Median	None

The Table above is the result of a direct survey/measurement with reference to PKJI 2023. Jl. Jatiwangi - Majalengka has 2 lanes with 2 undivided directions. With a road lane width of 7 meters with each lane having a width of 3.5 meters, the width of the road shoulder is 1 meter on either side. for medians, on the road section analyzed there is no median.

4.3. Traffic Volume Analysis

Table 2. Traffic vehicle volume

TIME	Total Vehicle Vhc/Jam					Total
	PC	LV	LB	LT	MC	

Direction 1						
06.20-06.40	29	9	-	3	246	287
06.40-07.00	32	5	2	4	329	372
07.00-07.20	21	13	-	9	220	263
Total	82	27	2	16	795	922
Direction 2						
06.20-06.40	22	7	-	2	267	298
06.40-07.00	38	6	-	5	292	341
07.00-07.20	39	4	1	11	191	246
Total	99	17	1	18	750	885

Traffic volume is calculated based on the number of vehicles crossing a road section in units of vehicles per unit time. These vehicles are classified into several categories, namely passenger cars (PC) with a capacity of 4-7 passengers, small freight cars, medium freight cars, medium vehicles (MV) such as medium buses and two-axle freight cars, large buses (LB) consisting of buses with 2 or 3 axle configurations, and large trucks (LT) which include three-axle freight cars, articulated trucks, and outboard trucks.

Table 3. Passenger car equivalent calculation

EMP	Direction 1						Direction 2					
	PC 1	LV 1,5	LB 1,6	LT 2,5	MC 0,7	qara h1	PC 1	LV 1,5	LB 1,6	LT 2,5	SM 0,7	qway1
vch/hour	82	27	2	16	795	922	99	17	1	18	750	885
SMP/hour	82	40,5	3	40	556	722	99	25,5	1,6	45	525	696
Q total	1807	vch/hour		%way1	50	PA%	Fsm					
	1418	SMP/hour		%way2	50	+=	50	p	1,3			

From the calculation of Table 3 above, the results obtained are the total Q in two directions, namely 1,418 SMP / hour with EMP reference from PKJI 2023.

4.4. Road Capacity

Capacity refers to the maximum number of hours per person or vehicle capable of passing a point or uniform road segment within a certain period, time, following applicable road conditions, traffic, and control systems. The calculation of road capacity can be done using the road capacity formula based on IHCM 2023 guidelines.

Table 4. Road capacity calculation

C_0	4000
FC_L	1,00
FC_{PA}	1,00
FC_{HS}	0,90
C	3640

$$C = C_0 \times FC_L \times FC_{PA} \times FC_{HS}$$

With the above formula, it can be seen through Table 4 that the result for road capacity on Jl. Jatiwangi - Majalengka is 3,640. The numbers listed are all taken from PKJI 2023 with provisions that have been adjusted to the conditions in the field.

4.5. Degree of Saturation

The determination of the degree of saturation value based on the Indonesian Road Capacity Guidelines (IHCM 2023) is done by calculating the ratio between vehicle volume (SMP/hour) (q) and road segment

capacity (SMP/hour) (C). The degree of saturation, symbolized as D_j , has a maximum value of ≤ 1.00 . This value is used to identify whether there are capacity issues on the road facility being analyzed.

$$D_j = q/C$$

$$D_j = 1418/3640$$

$$D_j = 0,4$$

4.6. Actual Speeds

The actual speed or average travel time of vehicles calculated based on hours can be calculated by the length of the segment known based on the analysis of meter units with vehicle speed or space average in units of km/hour. The actual speed can be seen in PKJI 2023 here can be found with D_j 0.4 and a distance of 50 km / h is 42.8km / h actual speed on Jl. Jatiwangi - Majalengka.

4.7. Level of Services

The level of road service is evaluated based on the calculation of the degree of saturation (D_j). Based on Regulation of Government of The Republic of Indonesia No.14, the classification of the level of service on Jl. Jatiwangi - Majalengka is included in category B because the level of saturation on this road section ranges from 0.4 which is still relatively low from the maximum saturation limit of ≤ 1.00 .

5. Conclusion

The research was conducted on the Jatiwangi-Majalengka Road section on November 20, 2024, between 06.20-07.20 WIB. Based on the survey results, the data obtained showed that the total vehicle volume reached 1,418 SMP/hour, the road capacity was 3,640 SMP/hour, the actual speed was 42.8 km/hour, the degree of saturation was 0.4, and the level of service was in category B. This result shows that the road still has adequate capacity to accommodate the current traffic flow without causing congestion. These results indicate that the road still has sufficient capacity to accommodate the current traffic flow without causing congestion. The actual speeds recorded also reflect the smooth movement of vehicles on the road. Therefore, it can be concluded that the Jatiwangi-Majalengka Road is still comfortable, feasible, and efficient to use by road users. However, to ensure this condition is maintained, periodic monitoring of traffic volume and road conditions is highly recommended.

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