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Road Performance Evaluation Due to Office Construction: A Case Study Biola Road in Samarinda

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***Abstract*—** *Biola Road is a residential road because it is in a residential area and to serves traffic in a residential environment. Previously, on the Biola Road section there were no delays or vehicles that filled the shoulder of the road, but then after the operation of the Education and Culture Office there were traffic problems on that road, such as an increase in the value of delays at certain times and the use of the shoulder of the road by parking vehicles. This traffic problem usually occurs in the morning due to the activities of the community who go to work or school and the activities of employees going to the office. The performance of the Biola Road without office activity on Saturday by DS 0.1 and Level of Service A, while the performance of the road section with office activity on Monday decreased to DS 0.45 and level of Service C. the degradation of the performance was caused by the large amount of activity at the Office which also creates high side barriers due to the use of the road shoulders as vehicle parking by the office employee.*

***Keywords*—** *Traffic, evaluation, performance.*

I. INTRODUCTION

The construction of public facilities such as office buildings is carried out as a supporting facility for community activities, this development will result in increased activity after the operation of the facility. one of them is by the operation of the Samarinda City Cultural Education Office there is a new activity that is burdening the violin roads at certain times.

These activities will affect the traffic with vehicles going in and out of the office, and using the shoulder of the road as a parking lot. This will cause a decrease in the performance of roads, and increase delays. Side barriers on the shoulder of the road are also getting higher due to the presence of quite a number of street vendors.

Fig. 1. the use of road shoulder as a parking lot

Fig. 2. The use of the shoulder of the road by street vendors

Traffic problems on Biola Road occur during peak hours due to community activities and the Education and Culture Office of Samarinda City at the same time, to improve the performance of the Biola Road, research is needed to determine the decline in road performance that occurred at the study location with the existence of Activities office compared to the absence of office activity to find out the source of the problem that occurred.

The same research has been carried out by Cokorda Pemayun on Analysis of the Performance of Diponegoro Road due to the trip generation of SDN 5 Pedungan. In this study it was found that trip generation ranges from 1.25 smp / hour to 96 smp / hour. The performance of the Diponegoro road section has decreased with the operation of SDN 5 Pedungan, especially at peak hours, around 06.30-07.30. This decrease in performance can be seen from the value of the degree of saturation, where without the activity of SDN Pedungan 5 DS is 0.92 with the level of service E, while the activity of the school is obtained DS value of 1.03 with the level of service F. From the prediction results of generation the next 10 years at the peak hour is 111.21 smp / hour with a future DS value of 2.38.

Other research conducted by Rachmad Mudiyono and Nina Anindyawati on Performance Analysis of Semarang City Majapahit Road (Case Study: Road Segment in Front of Pegadaian Office to Gayamsari Toll Bridge). This research is also based on congestion problems that occur due to high side obstacles such as vehicles going in and out, stopping vehicles, and roadside parking. From the analysis results it was found that the DS value of the road segment was 0.88 with LOS E,

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so with these conditions a solution / alternative was needed to improve the performance of the Majapahit road section.

Subsequent research was conducted by Titi Kurniati, this study aims to determine the effect of parking on the road on the performance of the road section (Case Study: Jalan Pemuda, Padang). This study analyzes changes in number of effective lanes due to vehicles parked on the road to the degree of saturation and average speed. The analysis shows that reducing the number of effective lanes has a significant effect on road performance. The biggest reduction in degree of saturation is 132% due to the reduction in effective lane 4 to 2. For all peak hours, the average speed of light vehicles as a result of MKJI analysis is greater than the average speed of the survey results. Decrease in average speed of the highest survey results by 38.76% due to reduction in effective lane from 3 to 2.

And research conducted by I Made Agus Rai Purbawa regarding the analysis of the road performance due to side barriers along with alternative solutions (case study: Jalan Serma Kawi-Denpasar). The road section in this research is a link between the area of trade and education activities with various public facilities on the side of the road. Thus, the level of side barriers that exist on this road section is very high, both from the presence of pedestrians, slow vehicles, vehicles coming in and out to the side of the road and parking vehicles. Based on the survey results in this study, it was found that peak hours occurred at 13.45-14.45 with a total weight of side barriers of 913.8 per hour / 200 m. For the degree of saturation in this road section of DS 0.59 with service level F, and with alternative solutions given the value of the degree of saturation of the road section can drop to DS 0.42 with service level C

II. METHODOLOGY

This research was conducted by reviewing the volume of vehicles on the Biola road and surveying the side obstacles on the road including in and out vehicles, parking vehicles, pedestrians, and slow-moving vehicles. The survey in this study was conducted on 1 effective day (Monday) and 1 holiday (Saturday), at 6:00 to 18:00.

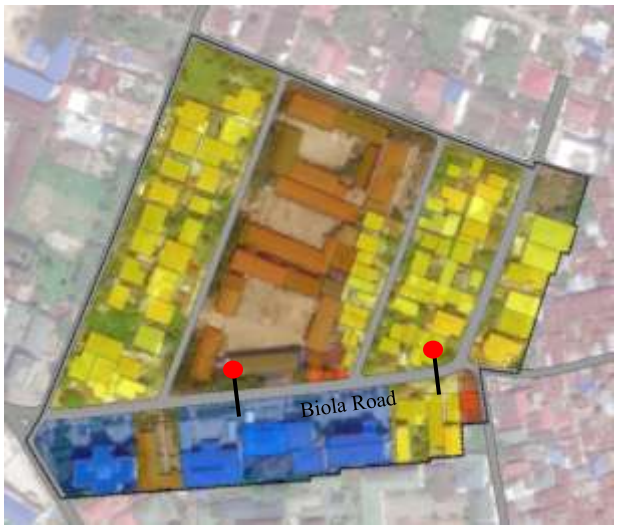

Fig. 3. Location of violin roads and survey points

The survey data is used for calculating the performance analysis of road sections with MKJI by first determining influential factors such as basic capacity, road width adjustment factors, direction separator adjustment factors, side obstacle adjustment factors, and city size adjustment factors. to calculate the side obstacles on the road using the weight factor, so the side obstacle level is obtained according to the criteria in Table 1. As for the weight factor used as follows:

- Pedestrian (PED) = 0.5
- Vehicle Parking (PSV) = 0.1
- Vehicle Coming in and out of the side of the road (EEV) = 0.7
- Slow Vehicle (SMV) = 0.4

TABLE 1. Side Barriers on Urban Roads

Code	Side Barriers Class	Magnitude per 200m / hour (two sides)	Special Conditions
VL	Very Low	<100	A residential area with side roads
L	Low	100-299	Residential area; several public vehicles etc.
M	Medium	300-499	Industrial area; several shops on the side of the road
H	High	500-899	Komeril area, high road side activity
VH	Very High	>900	Commercial area with roadside market activity

while the formula in the capacity calculation road segments are the following:

$$C = Co \times FC_W \times FC_{SP} \times FC_{SF} \times FC_{CS}$$

C = Actual capacity (smp / hour)
C_0 = basic capacity (smp/ hour)
F_{CW} = road width adjustment factor
F_{CSP} = direction separator adjustment factor
F_{CSF} = adjustment factor of side and shoulder barriers/curb
F_{CCS} = city size matching factor

The assessment of the road performance in this study refers to the value of the degree of saturation and the level of road services obtained by the following formulas and criteria:

$$DS = \frac{Q}{c}$$

information :
DS = Degree of saturation
Q_{TOT} = Total Current (smp / hour)
C = Capacity

TABLE 2. Road Service Level

Scope Limits V/C	Level of Service	Traffic Flow Characteristics
≤ 0,04	A	Free traffic, free speed
0,04 s/d 0,24	B	the traffic is rather crowded, and the speed decreases
0,25 s/d 0,54	C	Traffic is busy, speed is limited
0,55 s/d 0,80	D	Traffic is saturated, speed starts low
0,81 s/d 1,0	E	Traffic start to jam, low speed
>1,0	F	Traffic jams, very low speed

Source : HCM 2000

III. ANALYSIS RESULT

Based on the survey, the side obstacle data for Monday was 500.7 with High side obstacle classes, and for Monday

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46.8 with low side obstacle classes. This is because on Monday there is activity from the education and culture's Office on the Biola Road section which provides side barriers in the form of vehicles going in and out, parking vehicles, slow moving vehicles, and active street vendor activities on Monday and Saturday. An example of calculating side barriers can be seen in Table 3 and Table 4.

For example, Calculation of side barriers on Monday Saturday, during peak hour as follows:

SF_{Monday} = Quality Factor x Frequency of Occasion
= (0.5 x 85) + (1 x 338) x (0.7 x 162) x (0.4 x 042)
= 500.7

$SF_{Saturday}$ = Quality Factor x Frequency of Occasion
= (0.5 x 85) + (1 x 338) x (0.7 x 162) x (0.4 x 042)
= 500.7

TABLE 3. Calculation of Side Resistance According to Quality Factor On Monday

Type of Side Obstacle	Symbol	Quality Factor	Freq.Of Occasion	Freq.Of Quality
Pedestrian	PED	0.5	85	42.5
Vehicle parked or stopped	PSV	1	328	328
Vehicle going in/out to the side of the road	EEV	0.7	162	113.4
Vehicle moving slowly	SMV	0.4	42	16.8
TOTAL				500.7

TABLE 4. Calculation of Side Resistance According to Quality Factor On Saturday

Type of Side Obstacle	Symbol	Quality Factor	Freq.Of Occasion	Freq.Of Quality
Pedestrian	PED	0.5	30	15
Vehicle parked or stopped	PSV	1	27	27
Vehicle going in/out to the side of the road	EEV	0.7	4	2.8
Vehicle moving slowly	SMV	0.4	5	2
TOTAL				46.8

Meanwhile, vehicle volume data on Monday and Saturday are in table 5 as follows:

TABLE 5. Volume Recap of Biola Road

	Saturday			Monday		
Q	Morning	Noon	Evening	Morning	Noon	Evening
	139.5	173	156.5	596	427.5	258

With the calculation of capacity for each day is as follows:

C_{SENIN} = C_0 x FC_{SP} x FC_W x FC_{SF} x FC_{CS}
= 2900 x 1.00 x 0.56 x 0.86 x 0.94
= 1312.84 smp/jam

C_{SABTU} = C_0 x FC_{SP} x FC_W x FC_{SF} x FC_{CS}
= 2900 x 1.00 x 0.56 x 0.94 x 0.94
= 1434.97 smp/jam

So, the results of the calculation of the Degree of Saturation and Service Level of the road for each day and peak hour are in Table 6. For example, Calculation of degree of saturation on Monday morning with Q = 596 smp / hour, and Capacity (C) = 1312.84 smp / hour, the DS values are as follows:

DS = 596 / 1312.84
= 0.45

TABLE 6. Degree of Saturation and Service Level of Biola Road

	Saturday			Monday		
	Morning	Noon	Evening	Morning	Noon	Evening
DS	0.10	0.12	0.11	0.45	0.33	0.20
LOS	A	A	A	C	C	B

The DS and LOS values of the Biola Road section on Saturday show the level of road service which is still very good, the condition of free flow at high speed, the driver can choose the desired speed without a hitch. Meanwhile, DS and LOS values on Monday showed a decrease in the level of service of roads where the peak is in the morning with the criteria for stable flow, but the speed and motion of the vehicle is controlled. Drivers are limited in choosing speed.

IV. CONCLUSION

This study evaluates the performance of the Biola Road due to additional activities from the education and culture's Office on the road section. So, it was concluded that there was a decrease in the performance of the Road section with the activity in the office. It was found that on Saturday the DS of Biola Road segment was still at 0.10-0.12 with service level A, while on Monday DS was decreasing by the range of 0.20-0.45 with service levels B and C. The Differences of road performance on Saturdays and Mondays are due on Saturdays are off day where there is no activity from the office.

The difference in the performance of this road section is also influenced by the value of the side barriers which are very different on Monday and Friday, These side barriers include the use of the shoulder of the road as a parking lot by office employees or the use by street vendors.

This could be one of the references in improving the performance of the Biola Road section to overcome the problems that occur. So that in the future it is necessary to do a review of the needs of parking space for the building, the goal is to make available parking areas that can only accommodate vehicles from office employees so that no longer vehicles that burden the shoulder. in addition, it is necessary to curb the use of the shoulder of the road by street vendors to be directed to other locations that do not interfere with the performance of the Biola road.

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