ISSN (e): 2250 – 3005 || Volume, 07 || Issue, 04|| April – 2017 ||
International Journal of Computational Engineering Research (IJCER)

Effect of the Nipah Mall Development on the Performance Roads of Urip Sumohardjo in Makassar City

Hasyim Bacari[1], Shirly Wunas[2], Jamaluddin Rahim[3]
[1] *Master Degree Of Transportation Planning, Faculty Of Postgraduate, Hasanuddin University,*
[2]*Professor, Urban and Regional Planning, Hasanuddin University, Makassar-Indonesia*
[3]*Lecturer, Transportation Engineering, Hasanuddin University, Makassar-Indonesia*
Email:hasyim.bacari@gmail.com

ABSTRACT
Development of shopping centers have an impact on the increase in traffic volume resulting from the pull and vehicle movement generation. This research aimed to analyze the condition of the road network services of Urip Sumohardjo in Makassar and projection of the traffic volume to the presence of Nipah Mall. Data obtained by recording and counting directly at the research locus and the document data obtained from relevant agencies. Analysis of road service processed using Microsoft Excel based Indonesian Highway Capacity Manual (IHCM) 1997. The results showed the existing level of service at the level of the current "C" is stable, the speed can be controlled by traffic with the degree of saturation of 0.74 is the threshold performance good road. Estimated level of service after the Nipah Mall operates at the level of "E" is an unstable flow, low speed and vary the volume at near capacity, traffic volume with the degree of saturation of 0.98 has exceeded the threshold a good road performance. It is caused by the amount of traffic generation and pull caused by Nipah Mall that will be the side obstacles that impact on the vehicle speed and impairment of road capacity.
Keywords: *Road Performance, Service Level Roads, Traffic Impact.*

I. INTRODUCTION
Makassar City was included in the province of South Sulawesi, Indonesia with a total area of 175.77 km^2 and has a population of 1,449,401 inhabitants [1]. One of the problems faced by Makassar city is the traffic congestion caused by the rapid development of shopping centers that have an impact on the increase in traffic volume resulting from pull and vehicle movement generation. Moreover, these problems are also caused by the condition of transportation infrastructure is very limited and many other activities that are central location around shopping centers.
Urip Sumohardjo road has type 6/2D with a lane width of 22.1 meters which serves as a primary arterial road by Decree of the Ministry of Public Works and Public Housing No.248/KPTS/2015, which is the connecting road between the provincial capital and district capitals, as well as the inter-site network activity centers with residential areas, it is feared could lead to generation and traffic pulls beyond the capacity of the road if Nipah Mall operates. [2,3, 4,5]. Based on the description of the problems it is necessary to analysis level of service before and after the Nipah Mall operates.

II. METHODOLOGY
This research was done on Sumohardjo Urip road in Makassar City specially in front of the construction site of Nipah Mall Makassar. It was carried out for 3 days in December 2016, namely Monday, Friday and Saturday. Measurement data such as road geometric data including street names, i.e. type of road, lane width, road median width, shoulder width, as well as drainage channels. Data traffic count in the form Survey Daily Traffic (SDT) to the point of taking the survey before the construction site of Nipah Mall used to determine the level of service by reviewing Capacity (C), free flow speed (FV), travel speed (V) and the degree of saturation (DS) [5,6,7]. Secondary data were obtained from the data building area of Nipah Mall, building as well as data pulls and vehicle movement generations of Trans Mall Makassar is used as a reference in determining the amount of pull and the generation of vehicles produced by Nipah Mall using area ratio of building to the pull and the generation of vehicles is produced by Trans Makassar Mall.

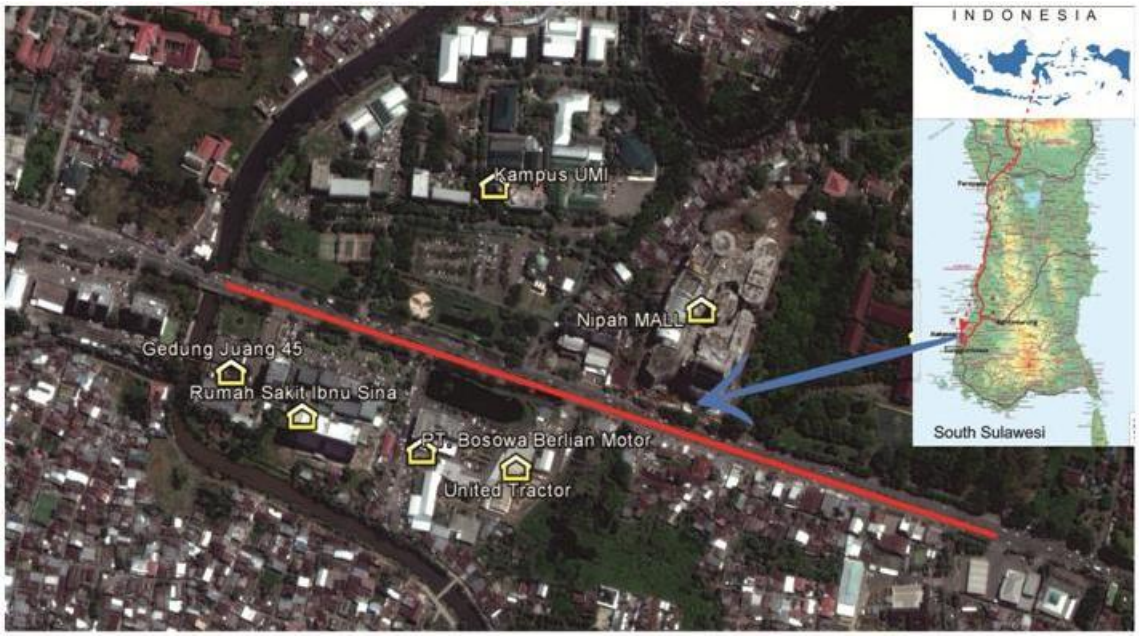


Figure 1. Locus of Research

III. RESULT AND DISCUSSION

Road Network Performance

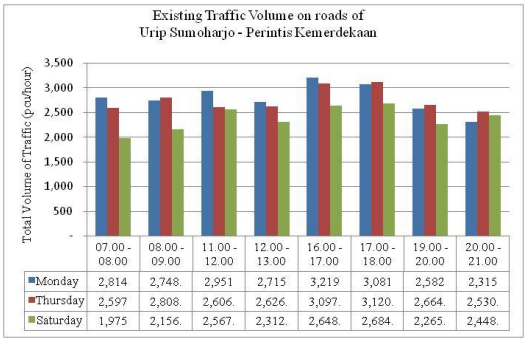
Urip Sumohardjo road in Makassar City has a type of six lanes and two ways with a median (6/2 devided) with a total of 22.1 meters wide lane serves as a primary arterial road that is impassable class I vehicles including a payload the size of a width not exceeding 2,5 meters, the length does not exceed 18 meters, and the heaviest axle load permitted > 10 ton.

Figure 2. Sectional Crossing on Urip Sumohardjo road

Source: Field Survey Results in 2016

Existing Traffic Volume

The volume of vehicles in units pcu/hour can be seen in Figure 3



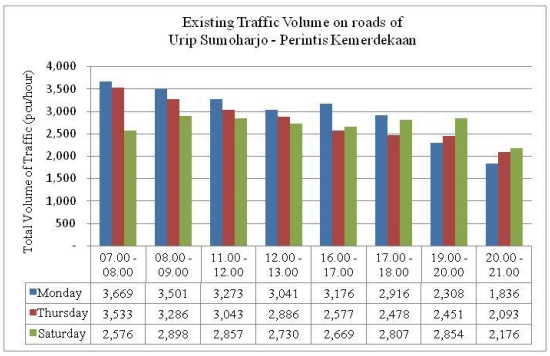


Figure 3. Fluctuations in traffic flow

The volume of peak hour traffic takes place on Monday, 16:00 to 17:00, the lowest on Saturday hours 7:00 to 8:00. The peak time of 16:00 to 17:00 o'clock on Monday occurred as a result of the movement of the center of activity to settlements.
The highest traffic volumes padasegmen II occurred on Monday 07.000-08.00 hours, the lowest on Monday 20:00 to 21:00 hours, as in Figure 3. The peak time at 07.000-08.00 on Monday occurred as a result of the movement of the center of the settlement to the activity centre.

Side Obstacle
Side obstacles along 200 meters of the observation point showed the highest obstacle on Thursday at 16:00 to 17:00 in the period of peak hours, namely the influence of the vehicle and out the activity centers around the construction site of Nipah Mall.
In the table below, based on the class side friction for urban roads (IHCM, 1997), side obstacles for urban road on Urip Sumohardjo road in front of the construction site of Nipah Mall is very high (VH) were assessed with frequency weighting incidence of side friction as shown in Table 1.

Table 1. Frequency Weighted Side Obstacles

Type of the side obstacle occurrence	Symbols	Weight Factor	Occurrence Frequency	Weight Frequency
Pedestrian	PED	0.50	105/hour, 200 vehicles	52.5
Stop Vehicle Parking	PSV	1.00	49/hour, 200 vehicles	49.0
Vehicles Sign In + Out	EEV	0.70	1800/hour, 200 vehicles	1260.0
Slower vehicles	SMV	0.40	2/hour, 200 vehicles	0.8
Total :				1362.3

Speed
Free flow speed of light vehicles on Urip Sumohardjo road – Perintis Kemerdekaan road as shown in Table 2.

Table 2. Calculation Results Flow Free

Roads	FVo	FVw	FFVs	FFVcs	FV
	(1)	(2)	(3)	(4)	(6)=[(1)+(2)]x(3)x(4)
Urip Sumohardjo – Perintis Kemerdekaan road	61	2	0.848	1	53.424

The speeds of vehicular traffic on the roads were observed for 3 days in a period of time of 07.00 to 21:00, are as in Figure 4.

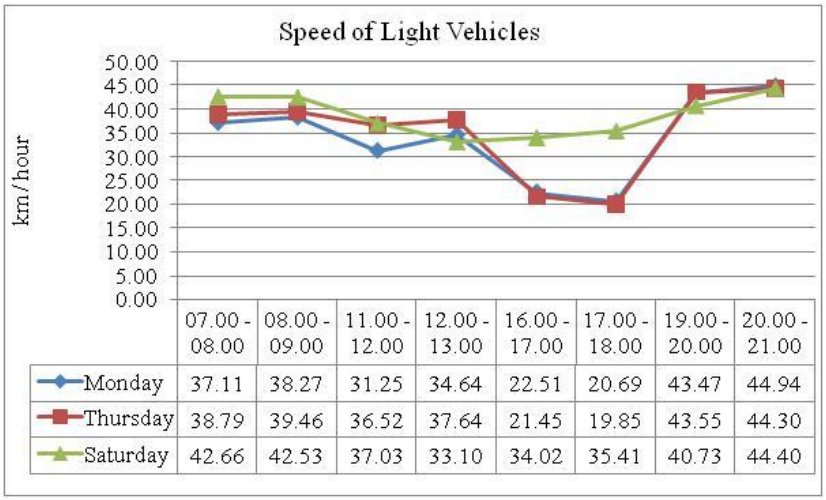


Figure 4. Speed of Fluctuations on the roads of Urip Sumohardjo (km/hour)

The highest speed occurred on Monday at 20:00 to 21:00 is 44.94 km/hour. This is due to the low traffic volume of about 2315 pcu/hour. Lowest rate occurred on Thursday at 17:00 to 18:00 is 19.85 km/hour, due to high traffic volume is 3120 pcu/hour.
The decrease in speed on roads due to the influence of the side obstacles in the form of vehicle exit/entrance on the side of the road segment is very high, where the free flow speed is 61 km/hour while the free flow speed connected amounted to 53.42 km/h refer to Table 2.

Capacities
Urip Sumohardjo road capacity is 4365.5 pcu/hour as shown in Table 3.

Table 3. Road Capacities (pcu/hour)

Roads	Co	FCw	FCsp	FCsf	FCcs	C
	(1)	(2)	(3)	(4)	(5)	(6)=(1)x(2)x(3)x(4)x(5)
Urip Sumohardjo road – Perintis Kemerdekaan road	4950	1.04	1	0.848	1	4365.5

The degree of saturation and Road Service Levels

Table 4. Degree of Saturation and Levels Road Service

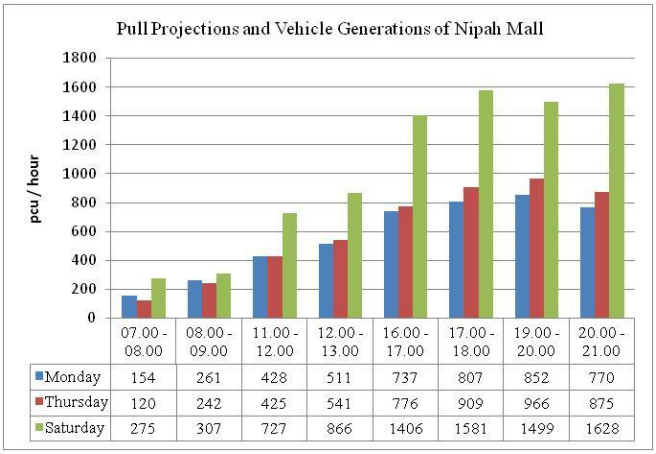
Roads	Volume (Q) (pcu/ hour)	Capacity (C) (pcu/ hour)	DS	LOS
Urip Sumohardjo road – Perintis Kemerdekaan road	3,219.05	4365.504	0.74	C

The degree of saturation on the road section of Urip Sumohardjo was 0.74 at the level of service (LOS) C. This is the threshold of good road performance. Degree of the saturation that exceeds 0.75 will have an impact on congestion, road densities will be higher and lower speed. This happens because of the high obstacles to the side so the impact on the capacity of impairment that needs to take steps to anticipate (IHCM, 1997)

Capability Projection of the Road Lane for the Traffic Volume of Nipah Mall
Pull Projections and Vehicle Generations of Nipah Mall
To get an idea of the traffic volume on the road of Urip Sumohardjo in Makassar City after Nipah Mall in operation, it first has to look for the amount of pulls and arousal generated by Nipah Mall by comparing the building area and the number of pull and generation as shown in the following equation [8]:

$$Total\ Pulls\ and\ Generation\ of\ Nipa\square\ Mall = \frac{Total\ Pulls\ and\ Generation\ of\ Trans\ Mall\ x\ Building\ Area\ of\ Nipa\square\ Mall}{Buildings\ Area\ of\ Trans\ Mall}$$

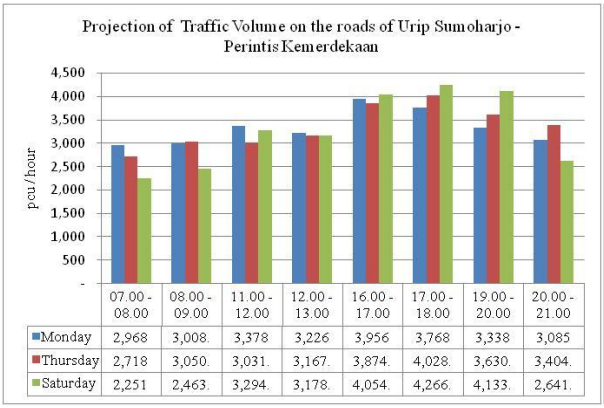
After processing the data, it will get the additional volume of traffic as seen in Figure 4. From this figure shows that the traffic volume has increased significantly in the afternoon starting at 16:00. this proves that the tendency of people to visit the shopping center in the afternoon until evening. Extra traffic volume due to the pull and the largest vehicle movement generation occurred on Saturday at 17:00 to 18:00 namely 1581 pcu/hour and will increase traffic volume by 36.2% of the capacity of roads.



	07.00 - 08.00	08.00 - 09.00	11.00 - 12.00	12.00 - 13.00	16.00 - 17.00	17.00 - 18.00	19.00 - 20.00	20.00 - 21.00
Monday	154	261	428	511	737	807	852	770
Thursday	120	242	425	541	776	909	966	875
Saturday	275	307	727	866	1406	1581	1499	1628

Figure 5. Pull projections and vehicle generations of Nipah Mall

Projection of Traffic Volume
Estimated volume of traffic on Urip Sumohardjo road after Nipah Mall operates an existing traffic volume with the pull and the generation of vehicles of Nipah Mall. From Figure 5, it appears that the change in the volume of traffic is significant happened on Saturday 17:00 to 18:00. This is caused by a number of good vehicles will enter and exit the Nipah Mall.



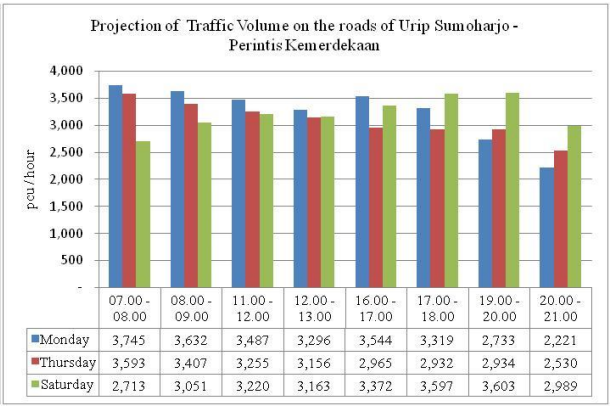


Figure 6. Projection of Traffic Volume

Projection of the Saturation Degree and Levels of the Road Service

Table 5. Projection of the Saturation Degree and Levels of the Road Service

Roads	Volume (Q) (pcu/ hour)	Capacity (C) (pcu/hour)	DS	LOS
Urip Sumohardjo road – Perintis Kemerdekaan road	4266	4365.5	0.98	E

Based on Table 5, the projection level of road service on Urip Sumohardjo road – Perintis Kemerdekaan road after the Nipah Mall operates at the level of "E" is an unstable flow, low speed and vary the volume at near capacity with the degree of saturation of 0.98 has exceeded the thresholds of good road performance. This happens because of the generation and the pull of the traffic caused by Nipah Mall will become a bottleneck side so that impact on the vehicle speed and a decrease in the value of the capacity of the road so that required treatment in the form of widening the physical road, traffic engineering or traffic management to improve performance the road.

IV. CONCLUSION

Service conditions of the road networks of Urip Sumohardjo in Makassar at the level of the current "C" is stable, the speed can be controlled by traffic with the average speed of vehicles 22.51 km/hour with the degree of saturation of 0.74 is a threshold of good road performance.

Projection of the traffic volumes to the presence of Nipah Mall was 4266 pcu/hour. The increase is caused by the pull and movement generation that produced by Nipa Mall at 1581 pcu/hour consisted of 884 pcu/hour of light vehicles and 697 pcu/hour motorcycle so the level of service after the Nipah Mall operates at the level of "E" is the current unstable, low speed and vary the volume of traffic at near capacity with a degree of saturation of 0.98 has exceeded the threshold of a good road performance.

ACKNOWLEDGEMENTS

The author would like to thank the highest possible to Pusbiktek-BPSDM Ministry of Public Works and Public Housing, who has given scholarships and the opportunity to attend the Master program of Transportation Engineering at Hasanuddin University Makassar in 2015 to 2017 and the Government of South Sulawesi Province as an Allower task of learning which has given an opportunity to continue my education. And also I sincerely express my gratitude and highest appreciation to the Supervisor Team consisting of Prof.Dr.Ir.Shirly Wunas, DEA, and Dr. Ir. Jamaluddin Rahim, MSTr who always took the time to provide guidance, direction, and correction for improving this article.

REFERENCES

[1]. Central Bureau Statistics of Makassar city, 2016. Makassar in Figures 2016, Makassar city.
[2]. Ministry of Public Works and Housing, 2015. The Minister of Public Works and Housing No. 248/KPTS/20015 on Segment Determination in Primary Road Network According to function as an Arterial Road (AR) and Collector Roads (CR), Jakarta
[3]. Law of Indonesian Republic No. 22 of 2009. Traffic and Road Transport, Jakarta.
[4]. Law of Indonesian Republic No. 38 of 2004. Road, Jakarta.
[5]. Directorate General of Highways, Ministry of Public Works, 1997. Indonesian Highway Capacity Manual (IHCM) 1997, Jakarta, Sweroad and PT. Bina Karya.
[6]. Morlok, Edward K., 1991, Introduction to Engineering and Transportation Planning, Jakarta, Erlangga Publishers.
[7]. Tamin, Ofyar Z., 2000. Planning and Transport Modeling, 2nd edition, Bandung, ITB Publishers.
[8]. Putu Alit S. 2010. Modeling Pull Journey Into Shopping Center in Badung, Bali Province, Scientific Journal of Civil Engineering Vol. 14 No. 2