

Performance on The Arterial Road In North Luwu Regency

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Abstract: Arterial roads in North Luwu Regency are Sultan Hasanuddin road, serving local traffic within cities, intercity within the province and inter province. This research aims to analyze the performance of road segments and formulate the handling of roads, using traffic survey methods and performance indicators analysis. It can be explained that the geometric road varies on road segment, low speed, the ratio between traffic volume with road capacity (VCR) 0.56-0.64. The level of service road, categorized C, relatively stable. Predicted traffic growth rate 10 years ahead with the assumption of traffic growth rate of 9%, the VCR is on the service level D, close to VCR saturation between 0.80-0.91. A strategy to improve road performance by reducing side constraints, completing road markings and road signs and parking controls and improving road geometric conditions by maximizing the benefits of road space, road widening and pedestrian building for pedestrians.

Keywords: Traffic volume, Capacity, Speed, Road network

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I. Introduction

Transportation infrastructure systems should always be used anywhere and anytime. Otherwise, it will lose the benefits so it is less efficient and effective. Therefore, it is important to know the magnitude of the need for future transportation so that it can be optimized users and save resources by arranging or managing the transportation infrastructure system as needed [1]. The transport organizer must be able to realize effective and efficient performance. Effective in the sense of survival, high accessibility, integrated, sufficient capacity, regular, smooth and fast, easy to achieve, timely, convenient, affordable, orderly, safe, and low pollution. Efficient in terms of low public load and high utility [2,3,11].

Bad condition of the transportation system in a region, among others, because the institutional system of the components of transportation systems that have not been optimized. It is said not yet optimal because the parties involved in the organization of transportation is not well organized, each party involved has not been fully aware of its functions and roles, so that the overall implementation of transportation operations had not had a clear vision [3]. This happens is suspected that the coordination has not been done properly, so that the services provided are not as expected by the community.

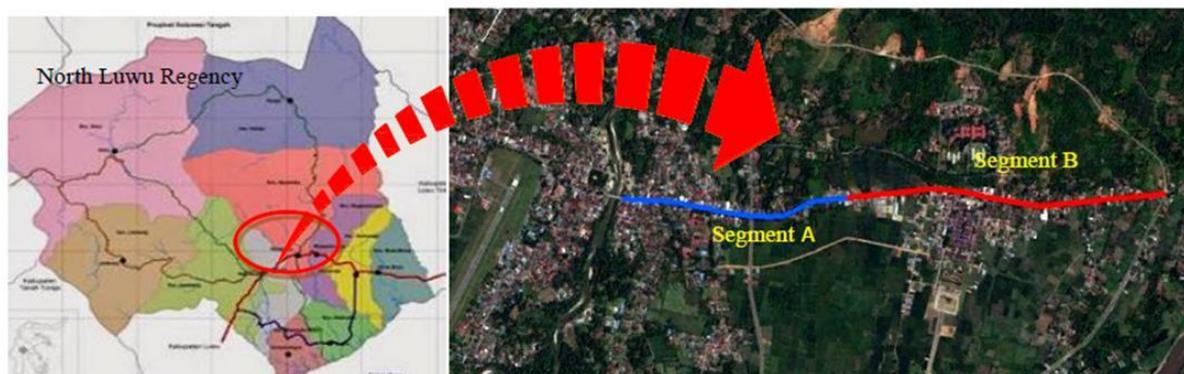


Figure 1. Research sites on the arterial road of Sultan Hasanuddin

The arterial road of Sultan Hasanuddin in North Luwu Regency is the main road serving the local traffic, intercity within the district, intercity within the province and between provinces. Road traffic conditions at peak hour have started to jam due to increased traffic volume and side barriers as well as less intensive maintenance affecting the movement of traffic so that the ratio of traffic volume and enlarged capacity close to saturation point [4,5,6].

Arterial roads are a common road, serving the main transport with distant travel features, high speed, and efficient constraints [7,8]. The Sultan Hasanuddin road is a Trans Sulawesi road that serves as a primary arterial road connecting between national activity centers and regional activity centers. Transportation infrastructure requires the integration of development in order to generate public economy and make the transportation sector plays an important role in the development and growth of other sectors [9,10].

This research aims to analyze the performance of road transport and handling strategies based on the degree of saturation that is the ratio of traffic volume to capacity, the projected traffic growth for the next 10 years, using survey and traffic analysis methods, describe with qualitative and quantitative approach with road performance, growth and intensity and formulate strategies for handling it.

II. Results And Discussion

Road Performance

The geometric condition of Sultan Hasanuddin's arterial road has a body width of 10-14 meters, with an asphalt pavement width of 6-10 meters, the standard road is a primary artery function width of the road body of at least 11 meters and the width of the traffic line of at least 7 meters [6,7, 12]. Land use along the road is a designation of housing, settlement, trade, office and green open space [9,13].

Table 1. Performance of Roads

No.	Performance Indicators	Performance Measurement	Arterial Road of Sultan Hasanuddin	
			Segment A	Segment B
1	Geometric [6,7]			
	- The width of the Road	11 Meters	14 Meters	10 Meters
	- Traffic Width	7 Meters	10 Meters	6 meters
	- Shoulder Width	Effective width (≥ 2 meters)	2 Meters	2 meters
2	Capacity [6]	VCR < 0,75	The traffic volume Peak hour is 1.967 pcu/hour, capacity is 3.083 pcu/hour, VCR 0.64	The traffic volume Peak hour is 1,233 pcu/hour, capacity is 2,189 pcu/hour, VCR 0,64
3	Speed[4,7]	Speed of Plan 60-80 km / hour		
	- Speed field		24 km/hour	30 km/hour
	- Current velocity Free		43 km/hour	37 km/hour
4	Side Barriers [6]	Low	High	Low
5	Degree of Saturation [6]	< 0,75	0,64	0,56
6	Level of Service [4,9,10]	B	C	C

Source: Analysis Result, 2018

Maximum traffic volume occurs on Monday at 07.00-08.00 for 1,967 pcu/hour segment A and 1,233 pcu/hour segment B. The daily volume fluctuation of the largest volume occurs on Monday. This is influenced by local vehicles used by office workers, school children and daily activities of market visitors. The performance of arterial roads as in Table 1, the geometric conditions of the road, capacity, velocity, degree of saturation are still within the SNPM/K standard [6,13,15]. The side obstacles are relatively high on the road segment A and the low service level is categorized C. The capacity of the road space in accommodating the traffic volume is still greater than the volume of traffic passing through it.

The free flow rate in segment A is larger than segment B, segment A is wider (10 m) than segment B (6 m). Similarly, the factors of correction of the level of side barriers are different based on the survey of side barrier events in the field.

Traffic speed of vehicles on the roads observed for 3 days during the time period of 07.00 to 18.00, indicating that the speed of segment A on Monday at 07.00-08.00 is the lowest (23.73 km/hour) and the highest on Saturday at 13:00 to 14:00 i.e. 40.89 km/hour, while for Segment B the lowest speed on Monday at 07.00-08.00 with a value of 30.26 km/hour and the highest on Thursday at 17:00 to 18:00 with a value of 41.91 km/hour. It illustrates that the actual average speed of light vehicles in segment A is lower than the current free-flow rate, while in segment B the actual speed is higher than the free-flow rate. From the above description it can be concluded that the difference in the speed of the field is influenced by side barriers on each segment of the road, such as pedestrians, parking vehicles and stops, vehicles exit/entrance and vehicles slow on the side of the road.

Side constraints on each segment shows the highest frequency of occurrence occurring in segment A with weighted resistance value of 631.9 events/hour the lowest frequency occurrence occurs in segment B with an incident weighting frequency of 103.4 events/hour. Differences in side barriers are affected by the function of the land on each different road segments such as shopping malls, shop houses, offices, etc., thus affecting the smoothness of vehicles in and out, parking/ stopping, slow vehicles and pedestrians on the road segment side [14,16]. The degree of saturation is one of the main indicators showing the performance of traffic services from a road segment [11,15,16]. The value of degree of saturation is the ratio between traffic volumes with the capacity of the road segment through the road. Based on Table 1, the degree of saturation with the maximum volume of 1967 (pcu/hour), is 0.64 in segment A, the level of service, including category C is still within the stable limit, operating speed is limited and the barriers start from other vehicles.

Traffic growth

The traffic growth projection is simulated with varying between 3% -9%, population growth 1.01%, vehicle growth rate 11.19% (the data of Samsat Luwu north). Predicted degree of saturation of road segment for next 10 years traffic volume equal to 2,792 pcu/hour with DS value = 0,91 for segment A and traffic volume 1,750 pcu/hour with DS = 0,80 for segment B. In year 2028, service on both roads respectively at level D.

Roadsides handling strategy

Handling of road performance refers to the predicted traffic growth (IHCM), 1997, where is in segment A already exceeded the value of a patient's urban saturation degree is $VCR > 0,75$ so it is necessary to anticipate early development plan which started with predecessor survey, ability study phase, and detail plan development and service.

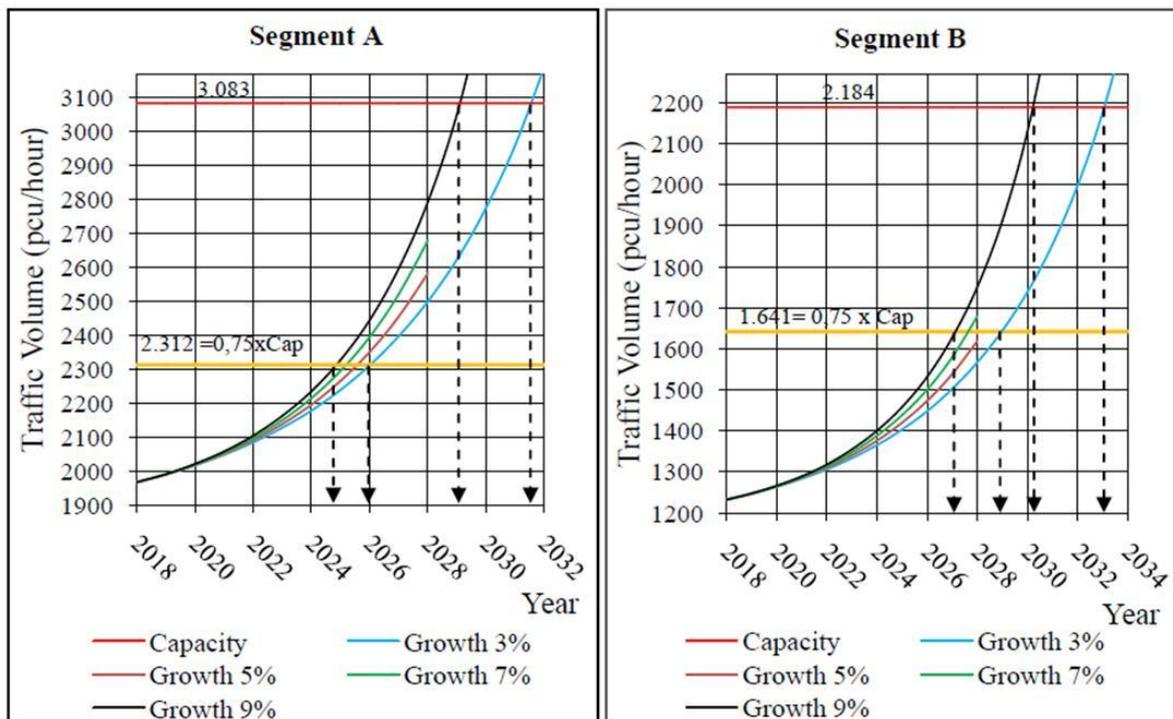


Figure 1. Traffic growth projection

In year 2025 and 2028 segments A and B critical conditions ($VCR > 0.75$) mean that in that year is a critical year for handling, traffic conditions close to unstable, operating speeds decline relatively quickly due to obstacles arising, and relative freedom of movement small [3,10,11,15]. To anticipate this problem some of the handling strategies that are caused due to traffic growth in the future will be among others

a. Reduce side barrier weight to improve road performance. If the next 10 years traffic volume and side barrier weight become low on segment A and B, it is predicted that road capacity in segment A will increase by 6.3% and in segment B increase by 1.0%. The decrease in the degree of saturation (VCR) in segments A and B was 12.2% and 1.5%, respectively.

b. The widening of the road body is the last solution to improve road performance, although this is possible because it is already contained in the 2018 Medium Term Development Plan (MTDP). The road widening scenario becomes 14 meters in segment A and B with a width of 2 meters, changing from two- the two-way lanes (2/2UD) into four-lane two-way (4/2UD), and an increase in road capacity for Segments A and B of 57% and 138%, with VCRs predicted to decline for segment A by 22% and segment B about 55%.

III. Conclusion And Recommendation

Road performance in both segments of service level categorized C, which is still in stable condition; the speed of operation began to be limited due to side obstacle interference and the development of traffic volume. However, it is predicted that in the next 10 years, the value of its saturation degree is critical, exceeding the threshold value of 0.75, so it needs a handling strategy to anticipate the increase of traffic volume by reducing the incidence of side barriers and widening the road.

References

- [1]. Tamin, Z.O, 2000, Transport Planning and Modeling, Institute Technology Bandung (ITB), Bandung
- [2]. Ministry of Transportation Regulation No. 49 of 2015 on National Transportation System, 2015. Jakarta
- [3]. Jinca, M.Y. 2015, Transportation Planning, Course Module, Master of Transportation Engineering and Faculty of Engineering, Makassar
- [4]. Government Regulation No. 34 Year 2006 on Road, 2006. Jakarta
- [5]. Department of Public Works Directorate General of Highways, 1997, Indonesia Road Capacity Manual (IRCM), Jakarta

- [6]. Regulation of the Minister of Public Works No: 19/PRT/M/2011 on Road Technical Requirements and Road Planning Technical Criteria 2011. Jakarta
- [7]. Samri M, Jinca M.Y, Rahim J, 2018. Performance of Primary Rural Road Transport (A case Study in North Luwu, South Sulawesi Indonesia). *International Journal of Engineering & Technology IJET-IJENS* Vol:18 No:02, PP 1-4.
- [8]. Widiyany, Jinca M.Y, Sitepu G, 2018, An Analysis of Road Network in Supporting Transport of Containers for Agropolitan Commodities in Enrekang Regency, South Sulawesi, Indonesia *Journal of Mechanical and Civil Engineering. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)* e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 14, Issue 1 Ver. I (Jan. - Feb. 2017), PP 18-22.
- [9]. Local Government of North Luwu Regency, 2011, Spatial Plan And Region of North Luwu Regency 2011-2031.
- [10]. Ministry of Public Works Directorate General of Highways, Law of the Republic of Indonesia Number 38 Year 2004 on Road, Jakarta
- [11]. Ministry of Transportation Regulation No. 14 of 2006 on Road Traffic Management and Engineering on the Road, 2015. Jakarta
- [12]. Arifuddin, Jinca, M. Y, Rahim J, 2017, An Analysis of the Functional Roadworthy on Perintis Kemerdekaan in Makassar South Sulawesi Province, *American Journal of Engineering and Research. American Journal of Engineering Research (AJER)* e-ISSN: 2320-0847 p-ISSN : 2320-0936, Volume-6, Issue-3, pp-140-145
- [13]. Jaurianty S, Jinca M.Y, Manapa E.S, 2018. Stakeholder Knowledge of Sustainable Road Implementation In Buru Regency *Journal of Mechanical and Civil Engineering. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)* e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 15, Issue 2 Ver. I (Mar. - Apr. 2018), PP 38-42.
- [14]. Hamzah M.I, Jinca M.Y, Hamzah B, 2016. Traffic Jams on Majene Axis Road of Campalagian Market In Polewali Mandar Regency, West Sulawesi, Indonesia *International Refereed Journal of Engineering and Science. International Refereed Journal of Engineering and Science (IRJES)* ISSN (Online) 2319-183X, (Print) 2319-1821, Volume 5, Issue 7 (July 2016), PP.27-34
- [15]. Sihaloho, A., and Jinca, M. Y. (2012). Performance of The National Road Transport Network Service Trans Island Maluku Ambon. *International Journal of Civil & Environmental Engineering IJCEE-IJENS* Vol:12 No:04, PP.78-82.
- [16]. Rachman N. M, Jinca M.Y, Mulyadi R, 2017. The Development of Rural Road Transport Network in Baraka Enrekang Regency, South Sulawesi-Indonesia *Journal of Mechanical and Civil Engineering. International Refereed Journal of Engineering and Science (IRJES)* ISSN (Online) 2319-183X, (Print) 2319-1821, Volume 5, Issue 6 (June 2016), PP.05-10.