

An Analysis Of The Road Network Performance In Area Faculty Of Engineering Hasanuddin University Gowa

Sari Utami Ramdani¹, Baharuddin Hamzah², Jamaluddin Rahim³

¹Master Student in Transportation Engineering, Graduate School, Hasanuddin University, Makassar-Indonesia

²Professor, Department of Architecture, Hasanuddin University, Makassar-Indonesia

³Lecturer, Transportation Engineering, Hasanuddin University, Makassar-Indonesia

Corresponding Author: Sari Utami Ramdani

Abstract: A campus is a center of educational activity that has a high activity on the movement of vehicles. The existence of the Campus Faculty of Engineering Hasanuddin University Gowa affects to the flow of human movement and cause the attraction of the trip, which implies the increase in traffic volume and level of service road. A study of the performance of Malino axis road due to the existence of the Campus Faculty of Engineering Hasanuddin University Gowa. This research aims to explain the performance of the road network in area Faculty of Engineering Hasanuddin University Gowa and traffic handling strategy. The analysis shows that the flow of vehicles entering the campus will burden the road to Malino by 12% -15%, while the exit vehicles will increase the traffic load on the toll road to Sungguminasa by 12% -13.5% of the total number of vehicles, currently the degree of saturation the road of Malino axis road 0.56 with the level of service classified C. In year 2023 to 2025 predicted the level of Malino axis road service decreased (category D) with the degree of saturation 0.77 - 0.88 make the traffic flow is unstable due to high traffic volume. Malino axis traffic volume approaches planned road capacity in 2026 with a saturation degree for 0.94 (service level E). Moving heavy vehicle operating hours across the peak hour due to C excavation activities, increasing road width, and maximizing the Bus Rapid Transite (BRT) as a public transport mode is a handling strategy to maintain road network performance.

Keywords: Education center, Road Network, Level of Service

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I Introduction

Growth and development of the city or region has implications for the increasing needs of the population. With the increase in population demand will also increase the demand for travel in the form of increased movement of people and goods in a city or region. The activity of this movement will increase the volume of road traffic and can change the traffic pattern so that absolutely necessary transportation network is adequate and effective and efficient [1,2,3,4].

Transportation can be interpreted as an attempt to move, transport, or divert an object from one place to another, where the object can be more useful for certain purposes [5]. Roads as one of the transportation infrastructure is very important in people's lives, especially in supporting the movement to perform various activities. The development of the road network is done to optimize the traffic function in supporting growth and equity in cross-linking the city center of the district of metro city, to meet the needs of rapid movement can be developed alternative road.

The road network should be developed in line with the direction of urban system development and regional and national transportation plans to be structured and able to serve traffic efficiently according to hierarchy. The construction of spatial-based roads in its operations are a road sector development that refers to the indication of a spatial strategic program. Provision of regional transportation facilities and infrastructure should be able to provide increased accessibility and mobility of the community and regional development in support of economic improvement of local communities.

Gowa regency is one of the Metropolitan Urban Area of Mamminasata as the National Center of Activities stipulated in Government Regulation No. 26/2008 on the territory of the National Spatial Plan. In this case the area is an urban center with a national interest. In addition, one of the strategic areas for the development of the education area is a former Gowa Paper Factory (GPF).

Changes in land function from formerly factory land to Higher Education certainly cause the rise/pull of traffic on the Malino axis road. Traffic volume on the road work study area increase due to the movement of vehicles out and in from the Faculty of Engineering Hasanuddin University Gowa so that road performance will decrease.

II Research Methods

This research is descriptive, using qualitative and quantitative approach by analyzing the road service level due to traffic movement and policy for problem solving. The location of the research was conducted on the Malino axis road in front of the campus of the Faculty of Engineering Hasanuddin University Gowa, as in Figure 1.

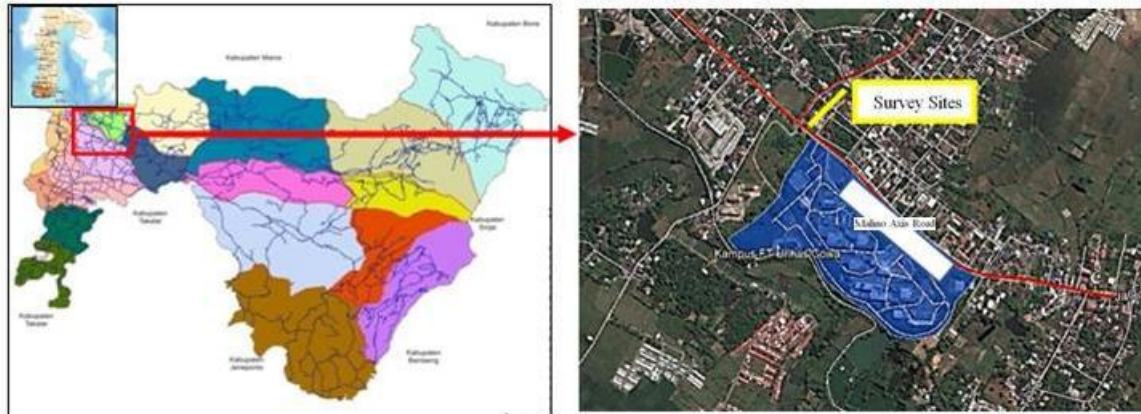


Figure 1. Research Sites

A data analysis technique used in this research is with qualitative and quantitative analysis. Qualitative analysis is a descriptive description of each parameter based on related theory and obtained, while quantitative analysis is the result of a survey that can be calculated mathematically.

The research populations include: (i) All the number of vehicle movements on the Malino axis road in front of the Campus Faculty of Engineering Hasanuddin University Gowa and the movement of vehicles coming out of campus; (ii) traffic flow of roads studied on Monday, February 5, 2018; Wednesday, February 7, 2018 and Friday, February 9, 2018 at 07:00 am to 18:00 pm.

The data used in this research are primary and secondary data. Primary data were obtained by conducting a traffic flow survey by counting the number of vehicles of various types passing through a road segment, in accordance with the traffic enumerated technical guidelines (Department of Settlement and Regional Infrastructure, 2004). Secondary data in the form of documents and references that are considered appropriate to the problem under study.

Analysis of the road geometric conditions to traffic using geometric road planning procedures out of town [6]. The calculation of road capacity was carried out by direct measurement of roads at the study sites and using basic equations in HCM 1997 for out-of-town road capacity capacity [7,8].

The level of service is a qualitative measure that describes operational conditions within a traffic flow and the perception of the driver and/or passenger of the conditions [9]. The level of service is a qualitative measure between the speed or travel time (average space velocity) with the ratio between the maximum traffic volume that can be accommodated by the road to capacity [10].

The traffic volume is calculated from the multiplication of the amount of traffic on each vehicle type with the vehicle conversion factor influenced by the slope of the road and the road direction division. Each type of vehicle has different movement characteristics because of the dimensions, speed and maneuverability of the road geometric, therefore the conversion of passenger car units [11] is used.

III Results And Discussion

Road Geometric Condition

The Malino axis road is the primary collector road in good condition with an average roughness rate estimated at less than 3 (three) meters in each kilometer of road length and has been hardened with the same pavement type i.e *laston asphalt* (ATB + HRS). The condition of the front surface of the Malino axis road of the Faculty of Engineering Hasanuddin University Gowa has a width of 8.0 meters of road with a shoulder of the road 1.0 meters with pavement width 1.5 meters on the right side of the road.



Figure 2. Existing condition of the Malino axis road in front of the Faculty of Engineering Hasanuddin University Gowa

Traffic Volume

Traffic observations were conducted for 3 days, i.e Monday (February 5, 2018), Wednesday (February 7, 2018) and Friday (February 9, 2018). The reason for the election of the working day is to see the influence of the activities of the Campus Faculty of Engineering Hasanuddin University Gowa on the traffic volume on Malino axis road. The survey time has been conducted for 12 hours starting from 06.00 am to 18.00 pm to find the peak volume between the times.

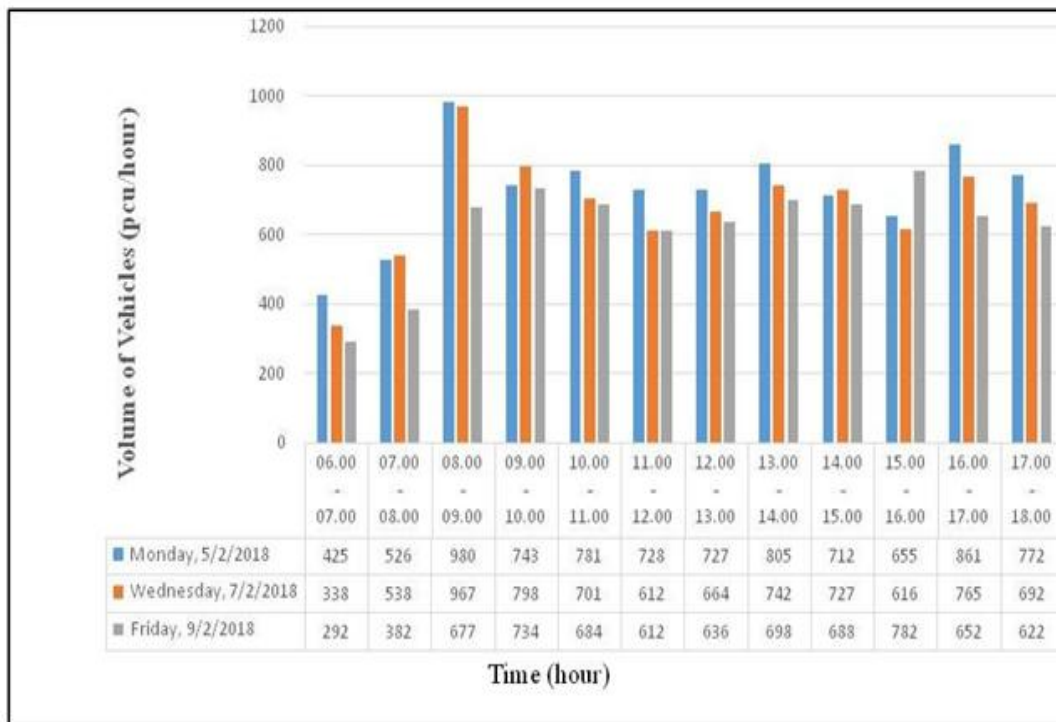


Figure 3. Traffic volume direction Malino - Sungguminasa

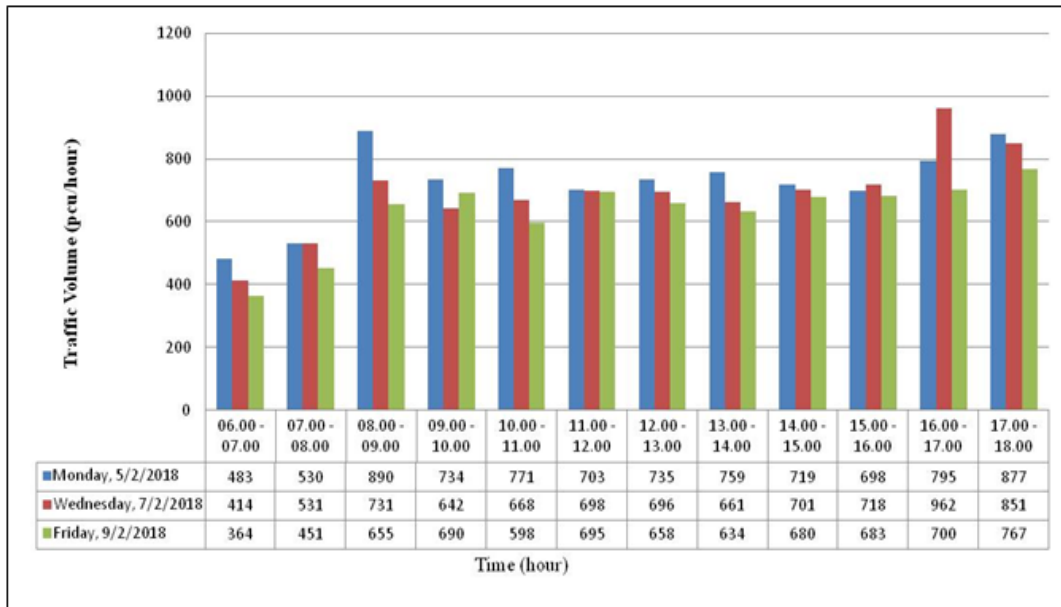


Figure 3. Traffic volume direction Malino - Sungguminasa

The maximum traffic volume of Sungguminasa-Malino direction occurs on Monday at 08.00 to 09.00 Wita of 980 pcu/hour while the minimum traffic volume occurs on Friday at 06.00 to 07.00 Wita of 292 pcu/hour. Maximum traffic volume of Malino-Sungguminasa direction occurs on Wednesday at 16.00 to 17.00 Wita of 962 pcu/hour while the minimum traffic volume occurs on Friday at 06.00 to 07.00 Wita of 364 pcu/hour.

The existence of a dictionary of Faculty of Engineering Hasanuddin University Gowa affects the volume of traffic that through the Malino axis road section on vehicles in and out of the campus that weighs the road from each direction, i.e, the direction of Malino and Sungguminasa direction. Vehicles entering the campus will burden roads to Malino by 12% -15%, while the exit vehicle will increase the traffic load on the road to Sungguminasa by 12-13.5% of the total number of vehicles.

Road Capacity

The road capacity analysis is based on the additional number of vehicles on the Malino axis road due to the existence of the Campus Faculty of Engineering Hasanuddin University Gowa. The road capacity analysis shows that the Malino axis road segment is able to accommodate a maximum traffic flow of 3,348 pcu/hour in both directions with the current physical path of the road.

Level of Road Service

The Malino axis road segment has a saturation rating of 0.56 with the level of category C road service. This condition indicates that the speed of the vehicle is controlled by the busy traffic volume even though the traffic flow is quite stable. This situation occurs because the movement of vehicles from the direction of the campus and the centers of activity around the residential areas that increase the volume of traffic.

Traffic Growth Prediction

The traffic growth prediction is based on the maximum volume of traffic on Malino axis road in 2008 of 976 pcu/hour and in 2018 at 1870 pcu/hour. This illustrates an increase in traffic volume over a decade or 6.71% per year. Predictions for the next ten years are presented in Table 1.

Table 1. Projected traffic volume over the next 10 years

Year	Traffic (pcu/hour)	Volume	Capacity (pcu/hour)	(C)	Degree of Saturation (DS)	Level of Road Service (LOS)
2019	1995,7		3348		0,60	C
2020	2129,8		3348		0,64	C
2021	2272,9		3348		0,68	C
2022	2425,6		3348		0,72	C
2023	2588,6		3348		0,77	D
2024	2762,6		3348		0,82	D
2025	2948,2		3348		0,88	D

2026	3146,4	3348	0,94	E
2027	3357,8	3348	1,00	F
2028	3583,4	3348	1,07	F

Source: Result of analysis, 2018

The prediction of traffic volume over the next ten years shows the capacity of Malino axis road segment of 3348 pcu/hour can still serve stable traffic volumes with C road service category until 2022, with a saturation degree of 0.72.

Year 2023 - 2025 level of Malino axis road service decreasing (category D). The degree of saturation of 0.77 to 0.88 makes traffic flow, unstable due to high traffic volume. This leads to temporary barriers and massive speed reductions so the driver has very limited freedom in running the vehicle.

Malino axis traffic volume approaches planned road capacity in 2026 with a saturation degree for 0.94 (service level E). The high traffic density occurs due to the high internal traffic constraints and the drivers begin to feel short duration jams.

In year 2027, the Malino axis road segment is already capable of servicing large volumes of traffic. Level of service F by the degree of saturation 1.00 conditions of the current is restrained and there is a very long queue of vehicles that cause congestion for a long duration. In the queue state, the speed and current decrease in 0.

Strategy of Handling

Alternative treatment in anticipating problems arising from the existence of the Campus Faculty of Engineering Hasanuddin University Gowa. Road performance is evaluated using a parameter for the Degree of Saturation (DS). The maximum permissible saturation degree is 0.75 [5].

1. Moving the heavy vehicle operating hours that pass at peak hour.

Mining sites in Gowa Regency are located along the Bili-Bili river. Heavy vehicle traffic has an impact on road performance. The solution to this problem is moving heavy vehicle operating hours, especially at peak hours so as to increase road performance.

2. Adding Wide Road

Alternative road widening is done by using the road shoulder for road segment direction of Malino 1 meter and pedestrian for road segment direction Sungguminasa equal to 1 meter. So that the capacity and performance of the road increases.

3. Maximize the use of the BRT bus as a mode of public transport.

Since 2016, BRT bus facilities from the direction of Makassar to Campus Faculty of Engineering Hasanuddin University Gowa already available. However, this facility has not been fully utilized by the community. If the use of the BRT bus is well utilized, especially for private vehicle users, the value of degree of saturation with the reduction scenario for each motorcycle and light vehicle users is 50%.

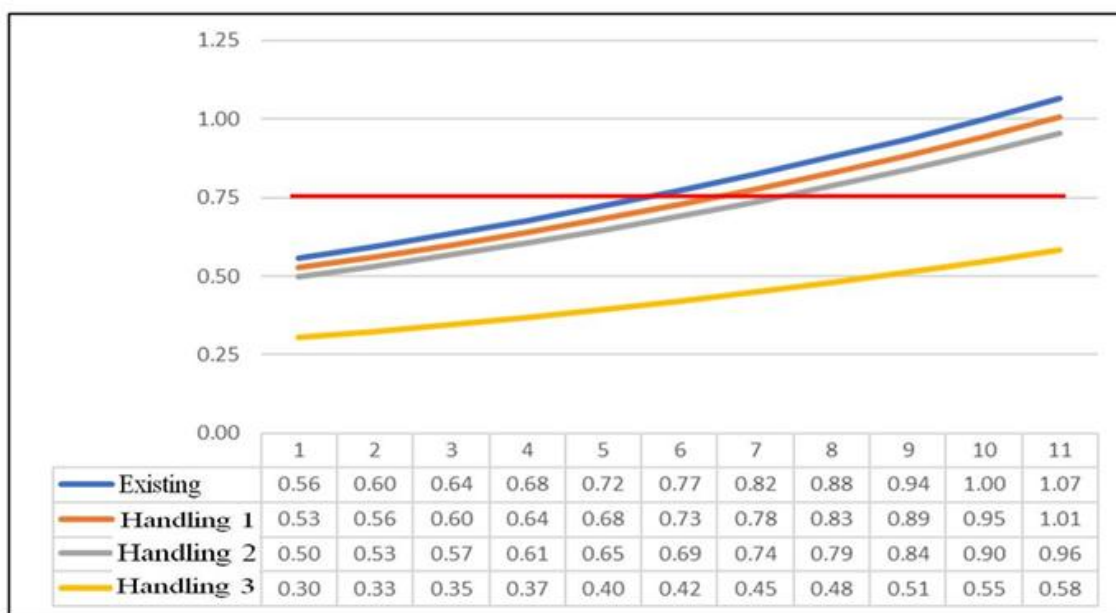


Figure 5. The degree of saturation before and after treatment

IV. Conclusion

The current Malino axis road segment at peak hour has a degree in 0.56 with service level C where the flow is stable and the speed is controlled by traffic. Based on the predicted traffic growth with 6.71% growth assumption indicates that in 2023 to 2025 it is predicted Malino axis road service level is decreasing (category D) with the degree of saturation 0.77 - 0.88 making traffic flow unsuitable due to high traffic volume. Malino axis traffic volume approaches planned road capacity in 2026 with a saturation degree for 0.94 (service level E), this condition needs to be done capacity handling and traffic management. The strategy of development policy and development of road transportation based on the analysis can be done to maintain road network performance by moving heavy vehicle operational hours, which pass at peak hour due to C excavation activity, increasing road width, and maximizing BRT as a transportation mode.

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