

# Analysis of the Priority of the Improvement of the Provincial Road Status in Mamminasata Region at South Sulawesi Based on Analytic Hierarchy Process

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**Abstract:** This research aimed to determine the priority in the improvement of the road status based on the technical criteria as the determination basis of the improvement of the road status in Makassar City. This research used the Expert Choice 9 software with three criteria, namely the speed, the volume capacity ratio and the rising pull which had passed the cut off process. The selection of the respondents in AHP was carried out with the interviews through questionnaires with 21 people in the government institution called the Highway Construction and Maintenance Service of South Sulawesi Province. The research result indicated that in Makassar city, the roads given priority were Hertasning Road (32%), Aroepala Road (31%), Paccerekkang Road (17%), Kapasa Raya Road (12%), and Panampu Road (8%). The priority for the status improvement of road sections in Makassar city tended to be on the seizures and pull criteria rather than volume capacity ratio and speeds.

**Keywords:** Expert Choice 9 software, Road status.

## I. INTRODUCTION

Making and improving the road network is one of the best choices to reduce transportation costs and improve management efficiency throughout the region [1].

The development of road infrastructure prepared by the government is based on the level of road service [2]. Road improvements are based on low service levels with high traffic needs. This is based on the principle of service supply carried out at the request or known as "ship follows the trade" [3]. The consequence of this approach is that accessibility from the central region is good and other areas that have low accessibility are bad. For this reason, an approach is needed where service is not only based on demand or what is known as "trade follows the ship" [3].

South Sulawesi Province, as well as with other regions in Indonesia have almost the same problem, namely uneven development in each region [4].

Regional disparity between regions in South Sulawesi is very pronounced, some of the main obstacles faced in handling road improvements in South Sulawesi Province include the extent of areas that must be handled, and community centers scattered, population distribution and economic resources uneven and low income of the community [5].

It is expected that this approach to regional development Maros Regency, Makassar City, Gowa Regency, and Takalar Regency (Mamminasata area) are getting better and the acceleration of economic growth is taking place in all regions [6]. Furthermore, in the context of development integration in the region of South Sulawesi Province, the development of transportation in the Mamminasata Region must be integrated with the development plan in the region of South Sulawesi Province [7]. For the development of the Mamminasata Area, it is a regional development strategy carried out through the development of roads as a driver that must be developed in the concept of territorial development [7].

Based on the Regional Spatial Plan (RTRW) of South Sulawesi Province, that the Mamminasata Area is included in the development work area with its main activities being trade, hospitality, education, forestry, tourism, fisheries, industry, plantations, mining, agriculture and livestock. With regard to the condition of these activity centers, the spread must be given access so that the existing products can be distributed to other regions smoothly [8].

Based on this, the Mamminasata Area needs it improvement of the road network in developing its territory because the road is a vital means that needs to be maintained and enhanced its function to facilitate the flow of land transportation [8,9].

Increasing the length of the network by itself opens up relations between regions and regions. In addition, it becomes easier to open up the isolation of regions against other regions. This shows the progress of the region with the characteristics of urban-rural life or vice versa, economic growth and the existence of equitable development in all areas of Maros Regency, Makassar City, Gowa Regency, and Takalar Regency, but these indications still need to be supported by improved road quality so that accessibility and mobility of human movements, goods and services will increase [10].

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For this reason, it is necessary to conduct a priority analysis study improving the Status of Provincial Roads in the Mamminasata Region of South Sulawesi Province. Najid, Tamin, Sjafruddin, and Santoso (2005) said that in the development of the road network the right decision is needed based on a criterion of increasing road links not only in terms of level of service but also from other criteria such as degree of saturation (DS) or volume capacity ratio (VCR), generation of attraction, land use, and accessibility that can be reviewed in terms of speed and population density. The purpose of this study is to analyze the interconnection level of district and provincial roads in the Mamminasata area.

## II. METHODOLOGY

### Research Location and Time

This research was conducted at the Provincial Highways Office South Sulawesi. This research was conducted in March to June 2016

### Population and Samples

The population of this study is all connecting roads between regencies in the district where the study was conducted in the Mamminasata area (Makassar City, Maros Regency, Gowa Regency, Regency Takalar). Based on the existing population and taking into account limited funding and research time as well as input from participants / stakeholders during the preliminary survey, the samples taken in this study were 5 (five) roads in the district / city in the Mamminasata area which included the middle ring road or the middle ring road Mamminasata area that is interconnected. The roads that were analyzed were

Tamangapa Raya, Paccerekang, Pamanjangan, Samata and Patalassang.

### Data Collection

The data collected consists of primary data and data secondary. Primary data is data collected or obtained directly in the field. The purpose of primary data collection is to find data that has a high level of accuracy. The primary data in this study is to distribute questionnaires to government agencies, namely the provincial highways department in South Sulawesi. Secondary data in the form of supporting data collected through literature study taken from related institutions such as Bappeda, BPS, previous research results, and data from the internet. The purpose of this secondary data collection is to obtain institutional data which will then be processed and analyzed.

### Analysis Method

The analysis approach / model used in this study is Multi Criteria Analysis (AMK) approach. This Multi Criteria Analysis Approach combines a number of multi-variable criteria and multi-faceted perceptions of related parties. In this study, multi-criteria analysis techniques are used to analyze and prioritize a number of proposals for the development of the transportation system (in this case the proposed changes in road status) that are excavated from the area.

## III. RESULT AND DISCUSSION

Volume Analysis Traffic is taken from the highest volume in a day with a 5-hour survey period. In the data analysis and analysis of traffic volume surveys used MKJI 1997. The results of processing survey data can be seen in the Table 1.

**Table. 1 Traffic Volume for Roads in Each Region**

Day	Volume (pcu/hour)				
	JIPaccerekang	JITamangaparaya	JISamata	Jl. Pamanjangan	Jl.Pattalasang
Monday	876.2	1190.4	2914.7	619.5	230.5
Tuesday	725.4	1060.8	5067.9	502.5	150.4
Wednesday	705.5	1068	4199.6	580.5	120.8
Thursday	820.9	982.8	3410.7	646.5	180.6
Friday	580.4	962.4	3747.5	417	100.7
Saturday	630.6	994.8	3857.6	421.5	45.2
Sunday	780.5	967.2	3679.9	601.5	40.8
Average	731.5	1032.3	3839.7	541.2	124.1
Maximum	876.5	1190.4	5067.9	646.5	230.5

Capacity analysis of each road section of the study location is based on the type of road that exists, namely the type of urban road and the type of out-of-town road, the number of lanes and directions of the vehicle, namely 2 lane 2 lane toward urban road type, and standard coefficients of geometric characteristics set out in MKJI1997 as shown in Table 2.



**Table. 2 Road Capacity of Study Locations**

No	Road	Co (pcu/hour)	Correlation Factor				Capacity, C (pcu/hour)
			FCw	FCS P	FCSF	FCcs	
1	Jl. Paccerekang	2300	0.87	1.00	0.98	0.93	2299.46
2	Jl. Tamangapa Raya	2900	0.87	1.00	0.99	0.95	2372.88
3	Jl.Samata	6600	1.00	1.00	0.92	1.03	6254.16
4	Jl.Pamanjengan	1800	0.87	1.00	0.98	0.95	1475.94
5	Jl.Pattalasang	1500	0.87	1.00	0.92	0.93	1116.55

Road section speed calculation results for each type of vehicle road sections can be seen in Table 3 below. The Table 4 shows that JalanSamata has the largest capacity value with a total of 6254.16 pcu / hour and an average speed of 37.33 km / h while the traffic volume is 3839.70 pcu. This shows that JalanSamata has the highest level of

vehicle density which is a major cause of congestion. While at JalanPattalasang the lowest capacity is 1116.55 pcu / hour, the average speed is 52.33 km / h and the traffic volume is 124.28 pcu. This shows that JalanPattalasang still has smooth traffic.

**Table. 3 Road Speed of Study Locations**

No	Road	Speed (km/h)			Average
		Heavy Vehicle	Light Vehicle	Motorcycle	
1	Jl. Paccerekang	38	35	45	39.33
2	Jl. Tamangapa Raya	40	37	48	41.67
3	Jl.Samata	40	30	42	37.33
4	Jl.Pamanjengan	50	50	60	53.33
5	Jl.Pattalasang	45	50	62	52.33

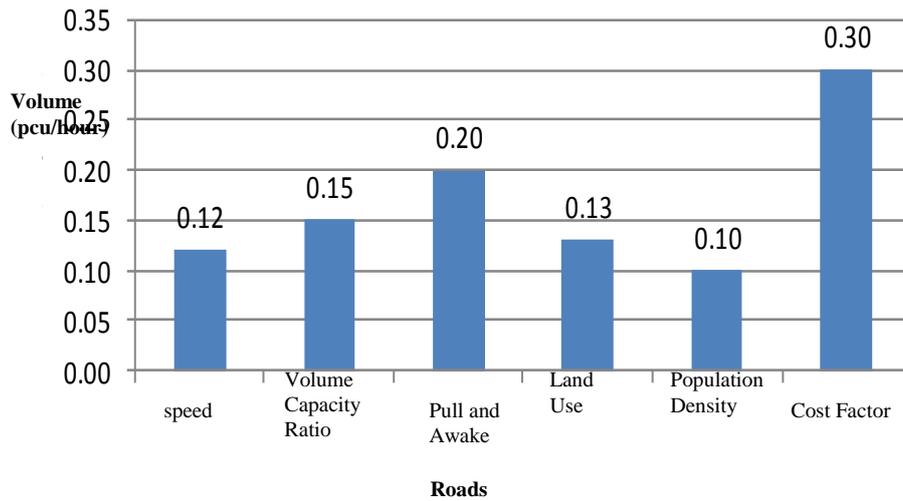
**Table. 4 Combination of capacity, speed and volume of traffic**

No	Road	Capacity (pcu/hour)	Speed (km/h)	Traffic Volume (pcu)
1	Jl. Paccerekang	2299.46	39.33	731.35
2	Jl. Tamangapa Raya	2372.88	41.67	1032.3
3	Jl.Samata	6254.16	37.33	3839.7
4	Jl.Pamanjengan	1457.94	53.33	541.90
5	Jl.Pattalasang	1116.55	52.33	124.28

Framework for priority analysis with Analytical methods Hierarchi Process (AHP) was done. Figure1 shows graph results from a combination of 21 respondents. From figure 4.8, it can be seen that the criteria of cost factor become the main factor with a value of 30%, followed by the criteria of generation and attraction with a value of 20%, followed by the criteria of volume capacity ratio (VCR) with 15%, land use 13%, criteria for speed 12 %, and population density of 10%. After analyzing the criteria, the criteria are analyzed for the road segment so that it can be known which roads are the priorities to be improved. Table 5 shows that the biggest criteria are on Samata Street where the percentage of speed is 32%, VCR is 35%, generation and attraction is 30%, land use is 31%, population density is 29% and factor costs are 30%.Based on Figure 2, It shows that the percentage of influence from the five criteria on Samata road is 30%, on Tamangapa Raya road is 28%, on Paccerekang road is 22%,

on Pamanjengan road is 11%, and on Pattalasang road is 9%.

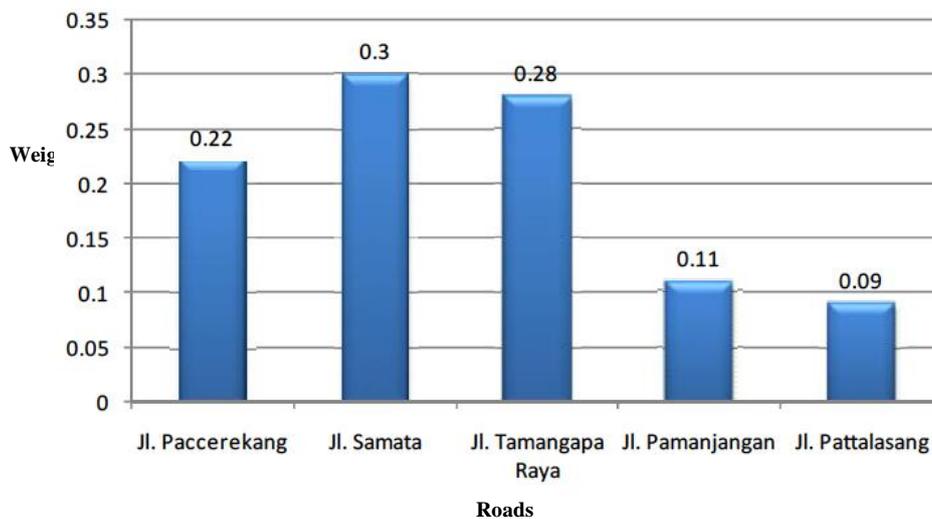
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**Fig. 1 Value of Criteria Weight of Combination of 21 Respondents**

**Table. 5 Combination of capacity, speed and volume of traffic**

No.	Road	Criteria					Cost
		Speed	VCR	Volume	Land	Population Density	
1.	Jl. Pamanjangan	0.13	0.10	0.15	0.07	0.12	0.11
2.	Jl. Paccerakkang	0.18	0.20	0.15	0.29	0.26	0.22
3.	Jl. Tamangapa Raya	0.27	0.30	0.25	0.28	0.27	0.28
4.	Jl. Samata	0.32	0.35	0.30	0.31	0.29	0.30
5.	Jl. Pattalasang	0.10	0.05	0.15	0.05	0.06	0.09



**Fig. 2 The Value of the Fifth Criteria for the Road Section**

**IV. CONCLUSION**

The conclusions that can be drawn from this study are the level of interconnection in the Maminasata region is still low compared to travel needs in this region so that it needs an increase in road status in some sections existing roads to meet travel needs in the region Mamminasata. Characteristics of travel in the Mamminasata area, namely on JalanSamata has the largest capacity of 6254 smp / hour, with an average speed of 37 km / hour, while the traffic volume is 3839 pcu.

The results of the priority analysis increase the status of the Road in the Area segment Mamminasata Priority Is Samata Street.

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