



Analysis of the Preservation Priority Scale on Strategic Roads in Malang District

Edwin Arief Fachruddin^{1*}, Lalu Mulyadi², Maranatha Wijayaningtyas³
^{1,2,3} Master of Civil Engineering Study Program, Specialization in Construction Management
Malang National Institute of Technology
Corresponding Author: Edwin Arief Fachruddin

ABSTRACT : The aim in compiling this research was to find out the variable aspects, criteria and weighting alternatives in determining priorities and to analyze the priority order of aspects, criteria and alternatives for handling road preservation on strategic roads in the Malang Regency area; and to determine a road preservation strategy based on the results of determining priorities on strategic roads in Malang Regency. This research is a quantitative descriptive research with the aim of determining the weighting criteria variable in determining road preservation priorities using the AHP method. In this study using a sampling technique with purposive sampling method. The population of this research is policy/decision makers who also know and are involved in project activities in Malang Regency as many as 25 people. In this study, samples were taken randomly using disproportionate stratified random sampling. The total number of samples to be taken is 24 respondents. The results of the analysis using AHP can be concluded that (1) Aspect variables in determining the priority for handling preservation on strategic road sections in the Malang Regency area are Spatial Structure Aspects (A) (11.3%), Community Proposed Aspects (B) (25.7%) , Technical Aspect (C) (55.4%) and Basic Service Aspect (D) (7.5%). (2) The order of priority for road preservation shows that the Mangliawan-Tumpang road section is the first priority, then followed by the Kreet-Gondangkegi road section on the second priority, then the next priority is the Talok-Wonomulyo road section, the Kreet-Wajak road section and the Tumpang-Wonomulyo road section on the order of last priority. (3) The road preservation handling strategy is carried out based on the budget capacity of the Malang Regency Government. Handling of alternative road segments is carried out in stages over a period of 5 years with handling in the form of Long Segments and routine road maintenance.

Keywords: Aspects of Spatial Structure, Aspects of Community Proposals, Technical Aspects, Aspects of Basic Services

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I. INTRODUCTION

Malang Regency is located between 112°17',10,90" to 122°57',00,00" East Longitude and 7°44',55,11" to 8°26',35,45" South Latitude with administrative area boundaries consisting of: (1) North: Pasuruan Regency, Mojokerto Regency and Jombang Regency; (2) East: Probolinggo Regency and Lumajang Regency; (3) South: Indonesian Ocean; and (4) West side: Blitar Regency and Kediri Regency. Meanwhile, in the central part of Malang Regency, it is bordered by Malang City and Batu City. The area is 351,872.62 ha. Administratively, the Malang Regency area consists of 33 sub-districts, 12 sub-districts, 378 villages, 3,185 Community Units (RW) and 14,667 Neighborhood Units (RT). Malang Regency is the second largest area after Banyuwangi Regency out of 38 regencies/cities in the Province of East Java with an area of around 347,051.09 Ha [1] . Malang Regency has a length of 1668.762 km, consisting of 189 Regency roads and 232 Regency City roads [2] .

According to Law Number 2 of 2022 concerning the Second Amendment to Law Number 38 of 2004 concerning Roads, a road is a land transportation infrastructure which includes all parts of the road, including connecting buildings, auxiliary buildings and their equipment designated for traffic, which are on ground level, above ground level, below ground level, and/or water, as well as above water level, except for rail roads, lorry roads and cable roads. Meanwhile, according to their function, roads are grouped into arterial roads, collector roads, local roads and neighborhood roads. District roads include collector roads, local roads, public roads and

*Corresponding Author: Edwin Arief Fachruddin

district strategic roads. Collector Road is a public road that functions to serve collector or divider transportation with the characteristics of medium distance travel, moderate average speed and limited number of access roads. The collector road in the district primary road network system is Primary Collector Road 4 [3] .

The district has 5 strategic sections, namely Jalan Mangliawan (Bts. Kota Malang) – Tumpang, Tumpang – Wonomulto, Talok -Wonomulyo, Kreet – Wajak and Kreet – Gondanglegi because they are district roads that have Primary Collector 4 and Local Primary functions with a width of more than 6 m, but currently the reality is that these road sections are passed by large vehicles and function as collectors, besides that they also connect the National Activity Center (PKN) with the Bromo Tengger Semeru National Tourism Strategic Area (KSPN), Abdulrahman Saleh Airport, Pandaan Toll Gate Malang, Plans for the Malang – Kepanjen Toll Gate and the Southern Route (JLS). Malang Regency Strategic Section should ideally be in a steady state and optimal handling of road infrastructure certainly requires good management, starting from the planning stage to the construction implementation stage. The problem in determining road preservation priorities in Malang Regency is the limited budget with a high number of needs. Determination of road preservation priorities is currently only based on proposals from 7 Road Technical Management Units (UPT), Musrenbang from Villages/Kelurahans without any priority and has not taken into account other supporting factors such as basic services, spatial structure and so on so that road preservation activities are programmed mainly on strategic segments in Malang Regency by the Office of PU Bina Marga have become less than optimal. Based on the background above, it is hoped that the results of this study will be able to overcome problems in determining priority handling of Primary Local Roads (JLP) and Primary Collector 4 Roads (JKP4) in the Malang Regency area.

The aim in compiling this research was to find out the variable aspects, criteria and weighting alternatives in determining priorities and to analyze the priority order of aspects, criteria and alternatives for handling road preservation on strategic roads in the Malang Regency area; and to determine a road preservation strategy based on the results of determining priorities on strategic roads in Malang Regency.

II. LITERATURE REVIEW

Road infrastructure

Highways are major roads that connect one area to another that are used for both motorized and non-motorized vehicles [4] .

Road Classification

The road network is a system that binds and connects growth centers with different regions in the influence of their services in a hierarchy [5]

Road Preservation

Road preservation is a road handling activity, in the form of prevention, maintenance and repair needed to maintain road conditions so that they continue to function optimally to serve traffic so that the specified design life can be achieved [6]

Road Maintenance (Road Maintenance)

The principle of road maintenance is carried out on the principle of effective and efficient economic benefits, through a minimum budget optimum road conditions can be produced so that people feel happy because transportation costs are low. [7]

Road Improvement (Reconstruction)

Road improvement is road management to improve road services in the form of structural and/or geometric improvements in order to achieve the planned level of service or in other words, road improvement is carried out to improve road conditions with unstable or critical capabilities to become roads with steady conditions [7]

Priority Measurement Aspect

Aspects are the elaboration of more operational constructs before they are further translated into more operational behavioral indicators [8] The aspects used in determining priorities are as follows: Aspects of Spatial Structure , Aspects of Community Proposals, Technical Aspects, and Basic Service Aspects

Process Analytic Hierarchy Method (AHP)

The AHP method is a decision-making method that structures complex problems in a hierarchy consisting of several levels containing objectives, several aspects and or consideration criteria as well as a number of alternative solutions. [9]

III. RESEARCH METHODS

In this study using a sampling technique with purposive sampling method. The population of this research is policy/decision makers who also know and are involved in project activities in Malang Regency as many as 25 people. In this study, samples were taken randomly using disproportionate stratified random sampling. The total number of samples to be taken is 24 respondents.

IV. RESEARCH RESULTS AND DISCUSSION

Summary of all Priority Aspects, Criteria and Alternatives

Based on the results of AHP testing, Priority Aspects, Criteria and Alternatives were obtained. Each Aspect has prioritized Criteria, as well as each Criterion has a preferred Alternative. The following is a summary of all priority aspects, criteria and alternatives, namely:

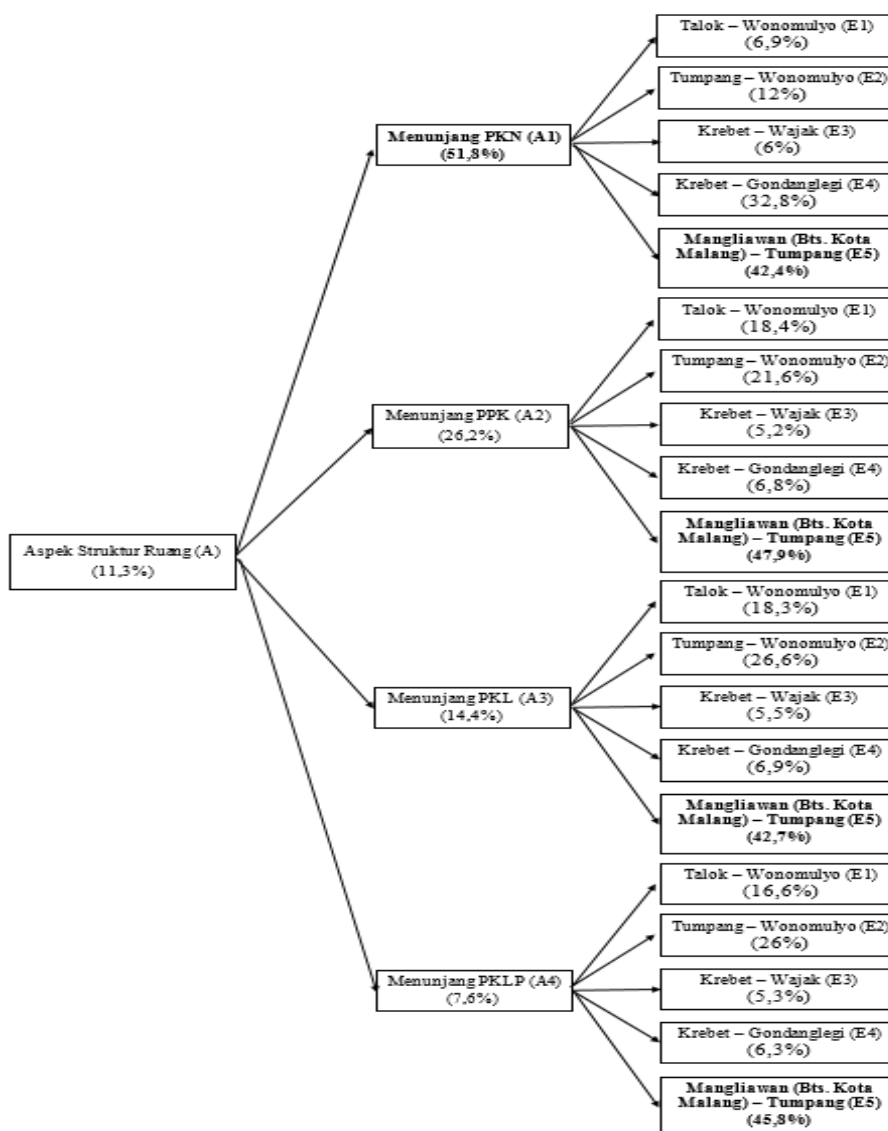


Figure 1 Priority Recap of Spatial Structure Aspects

Source: Research Processed Results

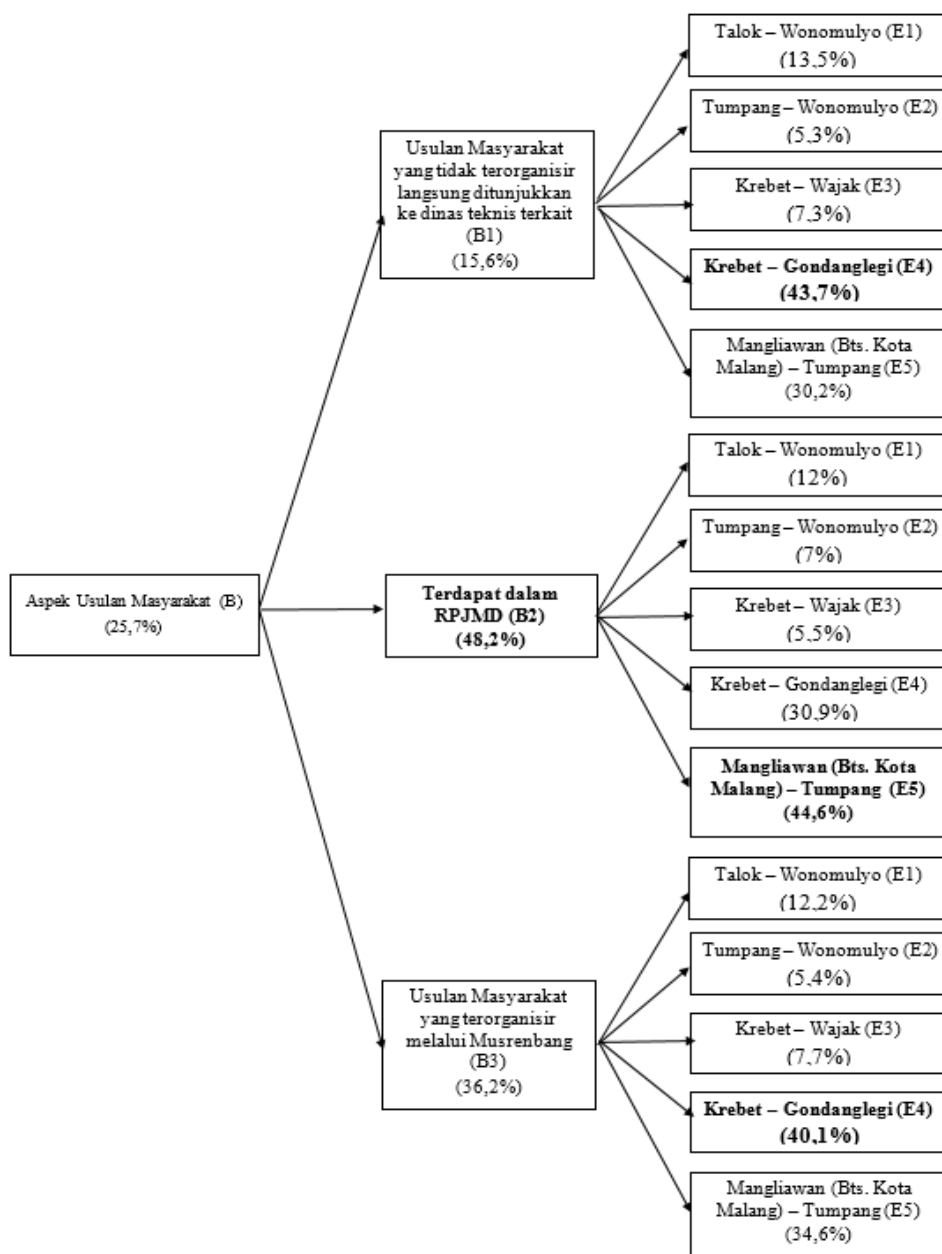


Figure 2 Summary of Priority Aspects of Community Proposals

Source: Research Processed Results

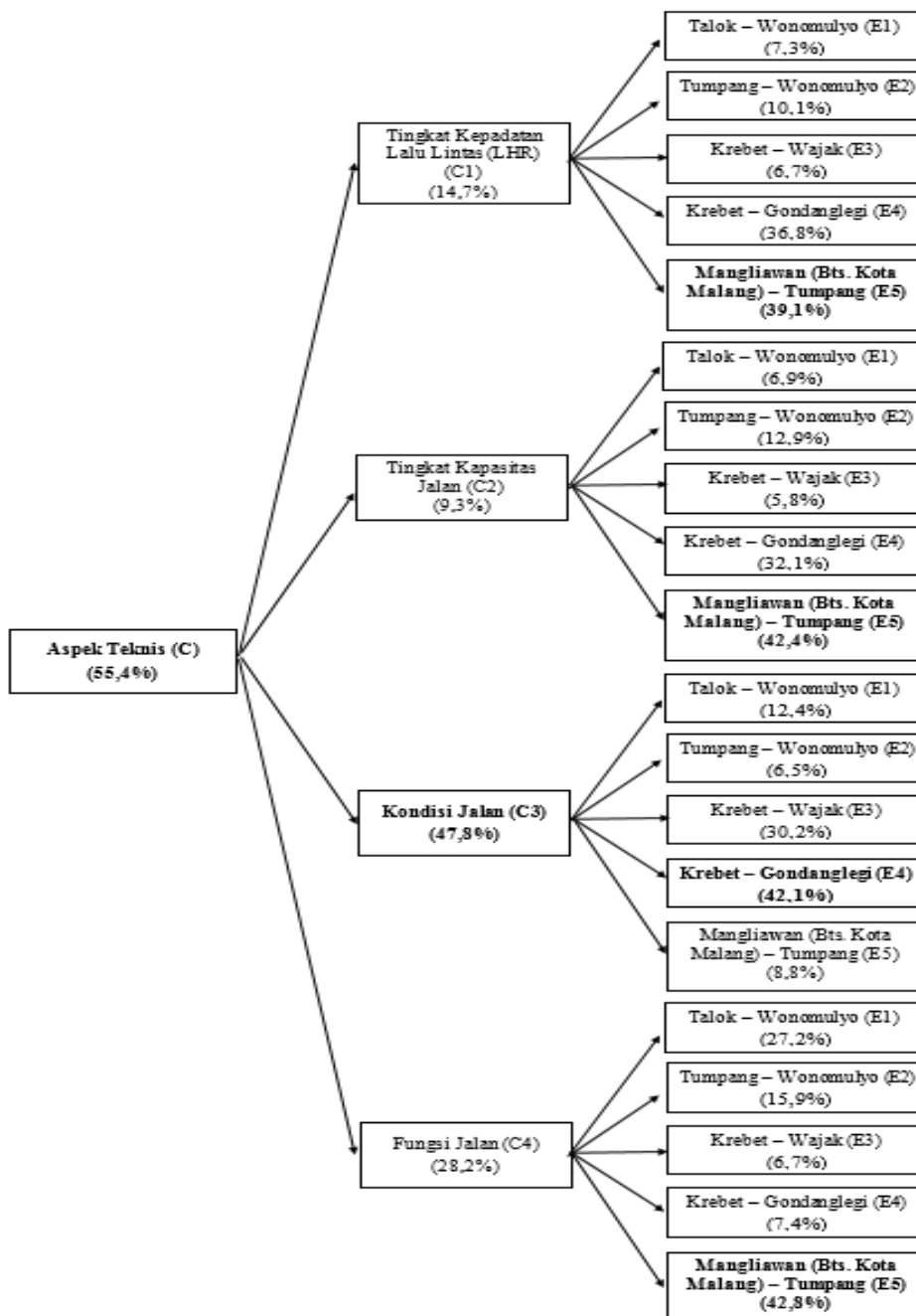


Figure 3 Summary of Priority Technical Aspects

Source: Research Processed Results

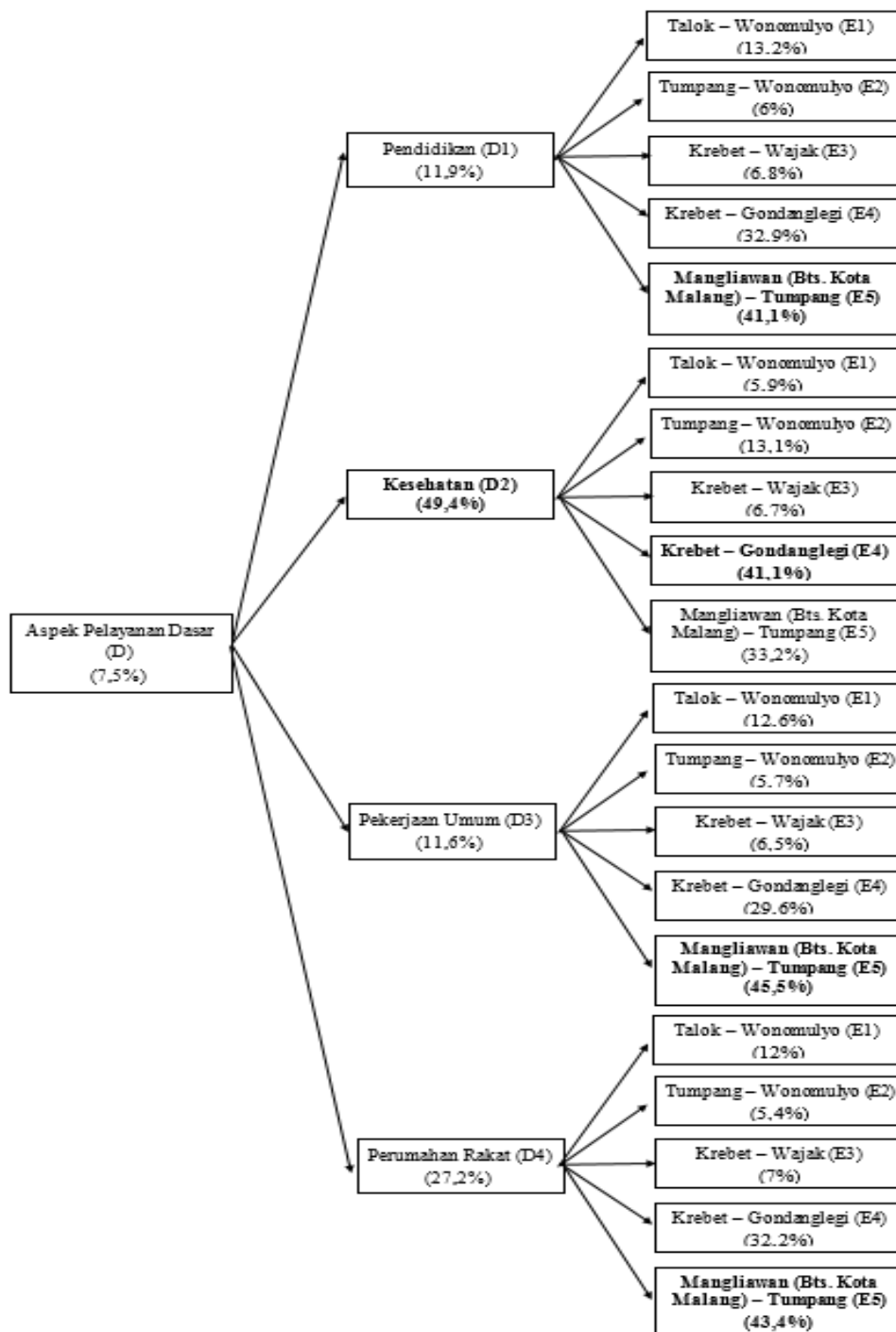


Figure 4 Summary of Priority Aspects of Basic Services

Source: Research Processed Results

Dynamic Sensitivity Combination Measurement

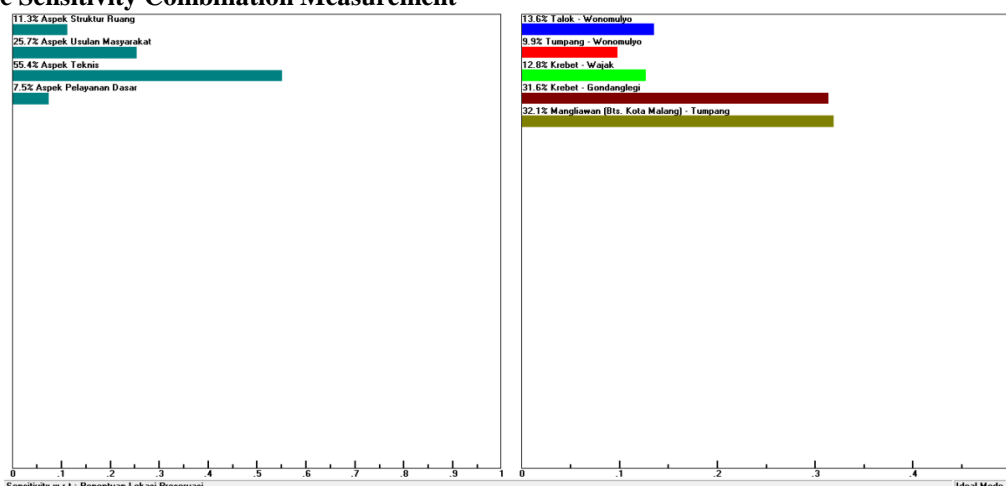


Figure 5 Results of Dynamic Sensitivity Combination Measurements

Source: Research Processed Results

Based on Figure 5 it can be seen that from the Technical Aspect it has a value of 55.4% which is the largest compared to the value of other aspects. The Aspect of Community Proposals is a priority for the Second Priority Aspect with a value of 25.7%. The Spatial Structure Aspect is a priority for the Third Priority Aspect with a value of 11.3%. While the Basic Service Aspect is the Last Priority Aspect with a value of 7.5%. So it can be concluded that the Technical Aspect is a Priority Aspect in the Road Preservation project

In addition, it can also be seen that the Alternative Road Section which is the Preservation Priority is the Alternative Road Section of Mangliawan (Bts. Malang City) – Tumpang with a value of 32.1%. The Krebet – Gondanglegi Road Section Alternative became the second Priority Alternative with a value of 31.6%. The alternative for Jalan Talok - Wonomulyo is the third priority alternative with a value of 13.6%. The Krebet – Wajak Road Alternative is the fourth Priority Alternative with a value of 12.8%. Meanwhile, the Alternative Road Section Tumpang - Wonomulyo is the Last Priority Alternative with a value of 9.9%. So it can be concluded that the Mangliawan (Bts. Malang City) – Tumpang Road Section Alternative is a Preservation priority.

Performance Measurement

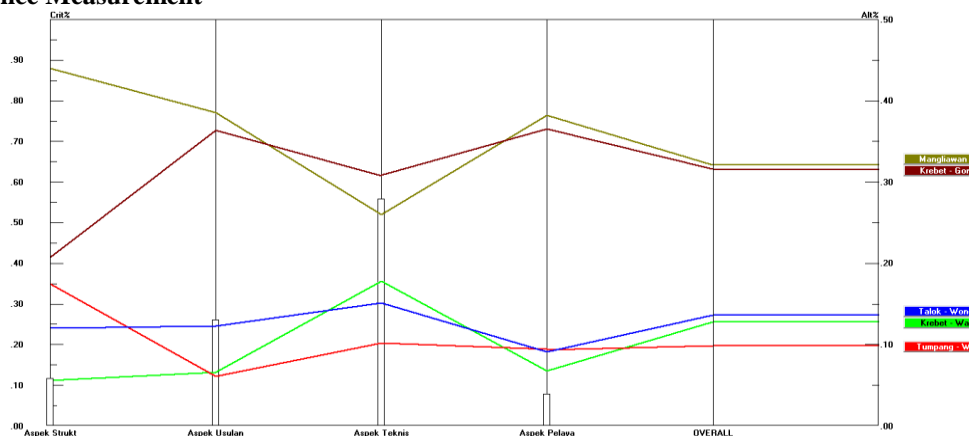


Figure 6 Performance Measurement Results

Source: Research Processed Results

Based on Figure 6 , it can be seen that the Alternative Road Segment Rating is based on Research Aspects. In the Spatial Structure Aspect, the Alternative for Jalan Mangliawan (Bts. Malang City) – Tumpang is ranked first. In the Aspect of Community Proposals, the Alternative for Jalan Mangliawan (Bts. Malang City) – Tumpang is ranked first. In the Technical Aspect, the Alternative Jalan Krebet – Gondanglegi is ranked first. In the Basic Service Aspect, the Alternative for Jalan Mangliawan (Bts. Malang City) – Tumpang is ranked first. Based on these 4 criteria, overall the Alternative for Jalan Mangliawan (Bts. Malang City) – Tumpang is a priority in the Road Preservation Project.

Discussion

Aspects, Criteria and Alternatives for Determining Priorities for Handling Road Preservation

There are 4 aspects and 15 criteria used in determining the priority of preservation on strategic roads in Malang Regency . The determination of these aspects and criteria is based on the results of previous research studies and *Focus Group Discussions* (FGD) of related *stakeholders* , including the Binamarga PU Engineering Development Sector, the Bappeda Infrastructure Sector, Transportation Service Transportation Management and the DPKPCK Building Spatial Planning Sector . The following lists the aspects and criteria in this study:

Table 1 Determination of Road Preservation Aspects and Criteria

No.	Road Preservation Aspects	Road Preservation Criteria
1	Spatial Structure Aspect (A)	Criteria for Supporting PKN (A1)
		Criteria for Supporting PPK (A2)
		Criteria for Supporting street vendors (A3) and
		Criteria for Supporting PKLP (A4)
2	Community Proposal Aspect (B)	Criteria for Community Proposals that are Not Organized Are Directly Addressed to the Related Technical Service (B1)
		Criteria Available in RPJMD (B2)
		Criteria for Community Proposals Organized Through Musrenbang (B3)
3	Technical Aspect (C)	Criteria for Traffic Density Level (LHR) (C1)
		Road Capacity Level Criteria (C2)
		Criteria for Road Conditions (C3)
		Road Function Criteria (C4)
4	Basic Service Aspect (D)	Educational Criteria (D1)
		Health Criteria (D2),
		Public Works Criteria (D3)
		Public Housing (D4).

(Source: Researcher Data, 2022)

Then, based on the results of the *Focus Group Discussion* (FGD) with relevant *stakeholders* and the results of the road condition survey, 5 alternative roads will be preserved, including:

Table 2 Determination of Road Preservation Alternatives

No.	Road Preservation Alternatives
1	Alternative Road Section Talok – Wonomulyo (E1)
2	Alternative Tumpang Road Section – Wonomulyo (E2),
3	Alternative Jalan Kreet – Wajak (E3)
4	Alternative Jalan Kreet - Gondanglegi (E4)
5	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5)

(Source: Researcher Data, 2022)

Order of Priority Aspects, Criteria and Alternatives in Handling Road Preservation

Based on the results of the *Analytical Hierarchy Process* (AHP) analysis, it can be seen regarding the order of Prioritized Aspects, Criteria and Alternatives in Handling the Preservation of Strategic Road Sections in Malang Regency . Priority aspects, criteria and alternatives are marked with a bold mark (**Bold**). Following are the results of prioritizing each aspect, criteria and alternatives in this study:

Table 3 Priority Aspects, Criteria and Alternatives

No	Aspect Priority	Priority Criteria	Alternative Priority
1	Spatial Structure Aspect (A) (11.3%)	Support PKN (A1) (51.8%)	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (42.4%)
			Alternative Jalan Kreet - Gondanglegi (E4) (32.8%)
			Alternative Tumpang Road Section – Wonomulyo (E2) (12%)
			Alternative Road Section Talok – Wonomulyo (E1) (6.9%)

Analysis of Preservation Priority Scale on Strategic Road Sections in Malang Regency

No	Aspect Priority	Priority Criteria	Alternative Priority
		Support KDP (A2) (26.2%)	Alternative Jalan Kribet – Wajak (E3) (6%)
			Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (47.9%)
			Alternative Tumpang Road Section – Wonomulyo (E2) (21.6%)
			Alternative Road Section Talok – Wonomulyo (E1) (18.4%)
			Alternative Jalan Kribet - Gondanglegi (E4) (6.8%)
		Support street vendors (A3) (14.4%)	Alternative Jalan Kribet – Wajak (E3) (5.2%)
			Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (42.7%)
			Alternative Tumpang Road Section – Wonomulyo (E2) (26.6%),
			Alternative Road Section Talok – Wonomulyo (E1) (18.3%)
		Support PKLP (A4) (7.6%)	Alternative Jalan Kribet - Gondanglegi (E4) (6.9%)
			Alternative Jalan Kribet – Wajak (E3) (5.5%)
			Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (45.8%)
			Alternative Tumpang Road Section – Wonomulyo (E2) (26%)
			Alternative Road Section Talok – Wonomulyo (E1) (16.6%)
		2	Community Proposal Aspect (B) (25.7%)
Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (30.2%)			
Alternative Road Section Talok – Wonomulyo (E1) (13.5%)			
Alternative Jalan Kribet – Wajak (E3) (7.3%)			
Alternative Tumpang Road Section – Wonomulyo (E2) (5.3%)			
Available in RPJMD (B2) (48.2%)	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (44.6%)		
	Alternative Jalan Kribet - Gondanglegi (E4) (30.9%)		
	Alternative Road Section Talok – Wonomulyo (E1) (12%)		
	Alternative Tumpang Road Section – Wonomulyo (E2) (7%)		
Proposals Through Musrenbang (B3) (36.2%)	Alternative Jalan Kribet – Wajak (E3) (5.5%)		
	Alternative Jalan Kribet - Gondanglegi (E4) (40.1%)		
	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (34.6%)		
	Alternative Road Section Talok – Wonomulyo (E1) (12.2%)		
	Alternative Jalan Kribet – Wajak (E3) (7.7%)		
3	Technical Aspect (C) (55.4%)		
		Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (39.1%)	
		Alternative Jalan Kribet - Gondanglegi (E4) (36.8%)	
		Alternative Tumpang Road Section – Wonomulyo (E2) (10.1%)	
		Alternative Road Section Talok – Wonomulyo (E1) (7.3%)	
		Road Capacity Level (C2) (9.3%)	Alternative Jalan Kribet – Wajak (E3) (6.7%)
			Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (42.4%)

No	Aspect Priority	Priority Criteria	Alternative Priority		
4	Basic Service Aspect (D) (7.5%)	Road Conditions (C3) (47.8%)	Alternative Jalan Kribet - Gondanglegi (E4) (32.1%)		
			Alternative Tumpang Road Section – Wonomulyo (E2) (12.9%)		
			Alternative Road Section Talok – Wonomulyo (E1) (6.9%)		
			Alternative Jalan Kribet – Wajak (E3) (5.8%)		
			Alternative Jalan Kribet - Gondanglegi (E4) (42.1%)		
			Alternative Jalan Kribet – Wajak (E3) (30.2%)		
			Alternative Road Section Talok – Wonomulyo (E1) (12.4%)		
			Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (8.8%)		
		Path Function (C4) (28.2%)	Alternative Tumpang Road Section – Wonomulyo (E2) (6.5%)		
			Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (42.8%)		
			Alternative Road Section Talok – Wonomulyo (E1) (27.2%)		
			Alternative Tumpang Road Section – Wonomulyo (E2) (15.9%)		
		4	Basic Service Aspect (D) (7.5%)	Education (D1) (11.9%)	Alternative Jalan Kribet - Gondanglegi (E4) (7.4%)
					Alternative Jalan Kribet – Wajak (E3) (6.7%)
					Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (41.1%)
					Alternative Jalan Kribet - Gondanglegi (E4) (32.9%)
Alternative Road Section Talok – Wonomulyo (E1) (13.2%)					
Alternative Jalan Kribet – Wajak (E3) (6.8%)					
Alternative Tumpang Road Section – Wonomulyo (E2) (6%)					
Health (D2) (49.4%)	Alternative Jalan Kribet - Gondanglegi (E4) (41.1%)				
	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (33.2%)				
	Alternative Tumpang Road Section – Wonomulyo (E2) (13.1%)				
	Alternative Jalan Kribet – Wajak (E3) (6.7%)				
Public Works (D3) (11.6%)	Alternative Road Section Talok – Wonomulyo (E1) (5.9%)				
	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (45.5%)				
	Alternative Jalan Kribet - Gondanglegi (E4) (29.6%)				
	Alternative Road Section Talok – Wonomulyo (E1) (12.6%)				
Public Housing (D4) (27.2%)	Alternative Jalan Kribet – Wajak (E3) (6.5%)				
	Alternative Tumpang Road Section – Wonomulyo (E2) (5.7%)				
	Alternative Section of Jalan Mangliawan (Bts. Malang City) – Tumpang (E5) (43.4%)				
	Alternative Jalan Kribet - Gondanglegi (E4) (32.2%)				
			Alternative Road Section Talok – Wonomulyo (E1) (12%)		
			Alternative Jalan Kribet – Wajak (E3) (7%)		
			Alternative Tumpang Road Section – Wonomulyo (E2) (5.4%)		

Source: Research Processed Data, (2022)

Road Preservation Strategy based on the results of determining the priority for Road Preservation Management

Analytical Hierarchy Process (AHP) analysis above, it can be seen that the main priority aspect in the Preservation of Strategic Road Sections in Malang Regency is the Technical Aspect. The technique in implementing the Preservation of Strategic Roads in Malang Regency is the main concern that must be fulfilled properly so that the Strategic Roads Preservation project can run smoothly . While the Aspects of Community

Proposals, Spatial Structure Aspects and Basic Service Aspects are the second, third and fourth priorities in the Preservation of Strategic Road Sections in Malang Regency.

Besides that, it can also be known the order of Priority Criteria based on Technical Aspects on the Preservation of Strategic Road Sections in Malang Regency is the Road Condition criterion. So it can be concluded that in the Preservation of Strategic Road Sections in Malang Regency, attention must be paid to the Technical Aspects in the form of Road Conditions so that the Preservation project can run smoothly. Then there are also Priority Criteria other things that must be considered in the implementation of Strategic Road Section Preservation in Malang Regency such as the Criteria for Supporting the National Activity Center (PKN) on the Spatial Structure Aspect, the Criteria contained in the RPDJMD on the Community Proposal Aspect and the Health Criteria on the Basic Service Aspect.

Based on the results of determining alternative priorities, it is known that the Alternative for Jalan Mangliawan (Bts. Malang City) - Tumpang is a priority alternative in the Road Preservation project. So from the results of the analysis, overall the road sections that are the Priority for Road Preservation are Jalan Mangliawan (Bts. Malang City) – Tumpang . The Preservation Project on the road section must pay attention to the Technical Aspects in the work process, especially on the Road Condition Criteria.

Strategic determination was carried out from the results of interviews or the results of *Focus Group Discussions* (FGD) with structural officials of PU Binamarga, the result of which was that there were 5 priorities for handling strategic road preservation in Malang Regency through AHP analysis, the strategy implemented was to handle preservation in total/long segments in each each road segment in stages over 5 years with the priority order of handling according to the priority of the AHP result road. The road management strategy based on the results of the AHP obtained is to divide the road management priorities for 5 years. The following is a road management strategy for 5 years, namely:

Table 4 Road Preservation Strategy for 5 Years

Year	Road Handling
1	Handling the long segment of the Mangliawan-Tumpang Long segment of 15.6 km
	Handling the Kreet-Gondanglegi Section long segment of 9.8 km
	Handling of the Talok-Wonomulyo section long segment of 18.7 km
	Handling the Kreet-Wajak Section segment of 10.7 km long
2	Handling the Tumpang-Wonomulyo Section segment of 3.9 km
	Handling the Kreet-Gondanglegi Section segment of 9.8 km
	Handling the Mangliawan-Tumpang Section segment of 15.6 km
	The handling of the Talok-Wonomulyo Section segment of 18.7 km
3	Handling the Kreet-Wajak Section segment of 10.7 km
	Handling the Tumpang-Wonomulyo section segment of 3.9 km
	Handling the Talok-Wonomulyo section segment of 18.7 km
	Handling the Kreet-Gondanglegi Section segment of 9.8 km
4	Handling the Mangliawan-Tumpang section segment of 15.6 km
	Handling the Kreet-Wajak Section segment of 10.7 km
	Handling the Tumpang-Wonomulyo section segment of 3.9 km
	Handling the Talok-Wonomulyo section segmen is 18.7 km
5	Handling the Kreet-Gondanglegi Section segment is 9.8 km
	Handling the Tumpang-Wonomulyo section segment of 3.9 km
	Handling the Kreet-Wajak Section segment of 10.7 km
	Handling the Tumpang-Wonomulyo section segment of 3.9 km

(Source: Researcher Data, 2022)

The road sections that had not been handled by preservation in that year were temporarily handled by holding treatment with routine maintenance so that there was no deterioration in condition. The existing preservation handling strategy is an equal distribution approach by carrying out preservation in stages/partially on each road segment without any long segment handling because of the length of the road and the breadth of the area and the need for large preservation handling if it has to be implemented in total/ *long segment* while the available infrastructure budget still limited.

V. CONCLUSION

Based on the results of the analysis using AHP, several conclusions were obtained, namely: (1) Aspect variables in determining the priority for preservation handling on strategic road sections in the Malang Regency area are Spatial Structure Aspects (A) (11.3%), Community Proposed Aspects (B) (25.7%), Technical Aspect (C) (55.4%) and Basic Service Aspect (D) (7.5%). (2) The order of priority for road preservation shows that the Mangliawan-Tumpang road section is the first priority, then followed by the Krebet-Gondangkegi road section on the second priority, then the next priority is the Talok-Wonomulyo road section, the Krebet-Wajak road section and the Tumpang-Wonomulyo road section on the order of last priority. (3) The road preservation handling strategy is carried out based on the budget capacity of the Malang Regency Government. Handling of alternative road segments is carried out in stages over a period of 5 years with handling in the form of Long Segments and routine road maintenance.

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