Analytical Hierarchy Process (AHP) To Determine Location Priority Scale For Bridge Widening At Lawang-Malang Road, Indonesia

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Abstract: This research is conducted to obtain the aspect weight and criteria as well as to obtain the order of alternative rank of widening bridge in Lawang-Malang road and also to obtain priority to determine the widening of bridge which will be adjusted with the available budget ceiling. The research method used is Analytical Hierarchy Process (AHP) towards the answers from questionnaires distributed to 15 respondents from people who know and get involved in the allocation of bridge widening fund in Lawang-Malang road segment. Based on the results of research and data analysis, it is found that the aspect orders as the priority consideration of the bridge widening are the aspect of the area development (A), the aspect of Development Outcome (C), the aspect of Cost (D), the aspect of Technical Execution (E) with each weight of 0.462, 0.202, 0.178, and 0.158 .While the alternative order of Lawang-Malang bridge that needs to have widening project is Kalewak Bridge (E5) with weight of 0.415, Karanglo Bridge (E4) with weight of 0.315, Kalisurak Bridge (E2) with weight of 0.144, Simping Bridge 1 (E1) with weight of 0.085, and Mondoroko Bridge (E3) with weight of 0.041. In addition, the priority orders of the bridge determination that will get widening adjusted to the available budget ceiling are Kalimewek Bridge (E5), Karanglo Bridge (E4) and Kalisurak Bridge (E2).

Index Terms: allocation of funds, bridge maintenance, priority scale.

1 INTRODUCTION

ROADS and bridges are one of the critical infrastructure in supporting economic development and welfare of the local community [1]. In big cities, generally, there are many good roads and bridges available. However, since roads and bridges have a characteristic of quality degradation, both roads and bridges are used or not, so to maintain the quality of roads and bridges in order to stay good or at least reduce quality degradation, continuous or routine maintenance is required to do [2]. It causes not a few roads are also damaged due to limited government funds for maintenance. Road and bridge networks are also transportation infrastructures that play an important role in the economic, socio-cultural, environmental, political, and defense sectors [3]. Seeing the growing economic conditions, of course, more demands of society to the government to improve the means of better transportation. In addition, an adequate road network is one of the needs to support the smoothness of economic activities, information, and technology from a region. City of Lawang and Malang, annually the number of people's growth is always increasing, followed by the volume of vehicles which is also increasing. It can be seen from the road that connects the city of Lawang until Malang in certain hours that experience much traffic. In addition to the increasing number of vehicles, the traffic is also suspected as a result of road widening which is not accompanied by widening of bridges at certain points.

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Therefore, the bridge widening in the present day is highly needed because it can reduce the impacts of traffic. However, since the existing physical development budget is limited, thus the work of bridge handling is more directed on bridge maintenance [4]. Hence, the priority of bridge handling needs to be done, so that it will help the decision making to allocate the limited fund to the bridge that indeed need to be prioritized. To achieve the objectives of an effective and efficient bridge handling in its implementation, a limit must be determined to cover the required or allocated budget, schedule or time, location of the activity and the quality or performance that is willing to be achieved. However, in reality, budget or cost constraint becomes the main factor in realizing bridge handling activity, in which it is estimated that in budget year of 2018, the availability of fund in the management of the bridge widening infrastructure construction is only IDR 20.000.000.000. From there, it can be seen that the bridge that will be handled is not equal to the fund required for the activity. Therefore, there needs to be a selection or determination of the bridge that will get handling first. Selection of this alternative absolutely requires criteria and the right way in order that the policies taken can be accounted for. Alternative selection with several criteria can be done by various methods such as Dominance, Feasible Ranges, Lexicography, Effectiveness Index or Analytical Hierarchy Process [5]. Each method has its own advantages and disadvantages, and to choose which method to apply should be matched with the problems at hand. However, during this time, the determination of handling priority order with the bridge widening in Lawang-Malang road is done based on the proposal of the community through the mechanism of Musrenbang (Development Planning Meeting) or by requesting direct proposal from each region starting from the Village level with the criteria of budget and technical only. However, how these criteria affect the priority order has not been based on any method that can be scientifically accountable, so the issue of the priority order of this bridge handling is always a polemic. Polemics are generally focused on which alternatives should be chosen, since many interested parties will choose an alternative and not on what aspects and criteria that determine the election of an alternative, it should be realized that from various aspects and criteria, there must

have different weight of interest. Therefore, the determination of the weight of the aspects and criteria will be adjusted to the stakeholder's desires defined as stakeholders, i.e. all parties concerned with the issues and issues that are the focus of the study or attention. After determining the weight of the aspects and criteria, an important process that needs to be present in the alternative selection process is an inter general assessment process of all stakeholders' alternatives to the aspects and criteria being considered. A good alternative selection system is a system that, among others, accommodates aspects of openness, speed, and convenience for stakeholders in the process of choosing between alternatives. Therefore, it is necessary to do research to get the right way for decision making for the handling of the bridge that can be accounted for and adjusted with existing funds. For this purpose, all aspects and criteria should be treated fairly in accordance with their respective interests, and among the methods mentioned above the Analytical Hierarchy Process (AHP) method is most likely to be applied, because AHP helps solve the problem complex by structuring a hierarchy of Aspects and criteria, interested parties, outcomes and by drawing various considerations for developing weights or priorities [6]. Given that, there is currently no research on the implementation of the AHP method for determining alternative handlings with the widening of bridges in Lawang - Malang road segment, further research is needed.

2 RESEARCH METHOD

2.1 AHP Method (Analytic Hierarchy Process)

AHP is used to examine the problems that begin by defining the problem carefully and then compile it into a hierarchy consisting of several levels or stages, ie goal level, criteria, and alternatives. After composing the hierarchy, the next step is assigning numerical values to subjective considerations of the degree of preference between elements at each hierarchical level [7]. The end result of AHP is a priority for existing alternatives to meet the objectives of the problem faced [8]. The Working Principle of AHP is the simplification of a complex, unstructured, strategic, and dynamic matter into its parts and organizing in a hierarchy [9]. Then, the importance of each variable is given a subjective numerical value of the relative importance of that variable relative to other variables [10]. From the various considerations are then performed synthesis to establish a variable that has a high priority and role to influence the results on the system. Graphically, the management of AHP decisions can be constructed as a multilevel diagram, starting with a goal, then first level aspects, criteria, and ultimately alternatives.

2.2 Research Site

This study is conducted on the bridge widening handling on Lawang - Malang road segment which is the primary Arterial road functioning as a strategic route connecting between cities, sub-districts, agricultural centers, markets and tourist attractions that will be built in budget year of 2018, which are as follows:

1. Simping 1 Bridge km. S.Baya : 69 + 300
2. Kalisurak Bridge km. S.Baya : 71 + 390
3. Mondoroko Bridge km. S.Baya : 79 + 630
4. Karanglo Bridge km S.Baya : 80 + 730
5. Kalimewek Bridge km S.Baya : 82 + 140

2.3 Research Aspects and Criteria

The aspects and criteria of research in this study can be seen in Table 1.

TABLE 1: *RESEARCH ASPECTS AND CRITERIA*

Aspects	Criteria
Area Development (A)	Economic Activities (A1)
	Geographic Location (A2)
	Tourism Site (A3)
	Natural Resources (A4)
	Displacement of Capital Regency (A5)
	Expansion of community service access (A6)
Technical Implementation (B)	Traffic Density (LHR) (B1)
	Bridge Widening Implementation Time (B2)
	Vehicle Tonnage Load Level (C3)
	Bridge Function (C4)
Even Distribution of Development Results (C)	Population Amount and Spread (C1)
	Characteristics and Spread of Land Use (C2)
	Level of Community's Activity and Participation (C3)
	Accessibility level of an area (C4)
	Community Economic Level (C5)
Cost (D)	Material Cost (D1)
	Equipment Cost (D2)
	Transportation Cost (D3)
	Labor Cost (D4)

2.4 Data Collection

Data collection is done through questionnaires with statement items related to the assessment of each Aspect and Criteria and alternatively uses pairwise comparison scale 9-1-9 where the number 1 is the response code of respondents that states both elements are equally important, while the number 9 is the response code of respondents that states an absolute element is more important than other elements.

2.5 Data Processing and Analysis

Data obtained from survey results (questionnaires) will be processed to obtain information in the form of tables. The result of data processing is used to answer the question on research problems. Data processing should consider the type of data collected by concentrating on the objectives that will be achieved. The accuracy in analytical techniques greatly influences the accuracy of the research results. The data analysis technique used is AHP method with Expert Choise 21.

3 RESULTS AND DISCUSSION

3.1 Priority Determination with Expert Choise

The first phase of data processing is entering data from the questionnaire comparison of aspects obtained from 15 respondents with weight assessment. After computation calculation, then Consistency Ratio is calculated by comparing Consistency Index with Random Consistency Index with condition that it cannot exceed the specified passing grade. After all data is declared consistent, then the average geometric value of $\overline{X}_g$ will be obtained for each pair of subsequent aspects, then weighting calculation will be done. There are four aspects that are taken into consideration in handling the widening of the bridge, namely: Aspects of Regional Development, Aspect of Technical Implementation,

Even distribution of development results, and Aspect of Cost. From the research data, the next phase done is calculating the criteria weight of each Aspect and Criteria. By using *Expert Choise* software, the weight of each aspect can be seen in Table 2.

TABLE 2: *WEIGHT AND VALUE OF CONSISTENCY RATIO FOR MATRIX OF PAIRWISE COMPARISON AMONG ASPECTS*

Criteria	Weight
Area Development (A)	0.462
Aspect of Technical Implementation (B)	0.158
Even Distribution of Development Results (C)	0.202
Aspect of Cost (D)	0.178
CI (Consistency Index)	0.020
CR (Consistency Ratio)	0.022

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CI is 0.020 and CR is 0.022, meaning that matrix of the aspects are stated consistant because the value of CR < 8%. On the other hand, it is also known that "Area Development" has the greatest weight of 0.462 or 46.2%. The second position is occupied by "Even Distribution of Development Results" of 0.202 (20.2%), the third position is owned by "Aspect of Cost" of 0.178 (17.8%) and the last is "Aspect of Technical Implementation" of 0.158 (15.8%).

3.2 Weighing Criteria

a. Aspect of Area Development

There are six criteria found in the Aspects of Area Development. These six criteria are the factors influencing the selection of which bridges require the allocation of funds for the widening of the bridge. The six items are Economic Activities (A1), Geographical Location (A2), Tourism Site (A3), Natural Resources (A4), Displacement of Capital Regency (A5) and Expansion of Community Service Access (A6). Afterwards, weight of each criterion is calculated and the weight can be seen in Table 3.

TABLE 3: *WEIGHT AND VALUE CONSISTENCY RATIO FOR CRITERIA BASED ON ASPECT OF AREA DEVELOPMENT*

Criteria	Weight
Economic Activities (A.1)	0.207
Geographical Location (A.2)	0.362
Tourism Site (A.3)	0.080
Natural Resources (A.4)	0.047
Displacement of Capital Regency (A5)	0.232
Expansion of Community Service Access (A.6)	0.072
CI (Consistency Index)	0.007
CR (Consistency Ratio)	0.006

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CR of 0.006, meaning that matrix of the aspects are stated consistent because the value of CR < 10%. The research result also shows that the criteria of ”Geographical Condition” has the highest weight of 0.362 (36.2%) and the lowest weight is in the criteria of "Natural Resources" of 0.047 (4.7%).

b. Aspect of Technical Implementation

There are four criteria on the aspect of Technical Implementation. These four criteria are the factors that influence which bridge selection requires the allocation of funds. The four items are Traffic density (LHR) (B1), Bridge Widening Implementation Time (B2), Vehicle Tonnage Load Level (B3), and Bridge Function (B4). Next, weight of each criterion is calculated and the weight can be seen in Table 4.

TABLE 4: *WEIGHT AND VALUE CONSISTENCY RATIO FOR CRITERIA BASED ON ASPECT OF TECHNICAL IMPLEMENTATION*

Criteria	Weight
Traffic density (LHR) (B.1)	0.308
Bridge Widening Time (B.2)	0.119
Vehicle Tonnage Load Level (B.3)	0.480
Bridge Function (B.4)	0.093
CI (Consistency Index)	0.009
CR (Consistency Ratio)	0.010

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CR is 0.010, meaning that matrix of the aspects are stated consistent because the value of CR < 10%. The research result also shows that the criteria of ”Vehicle tonnage load level” has the highest weight compared to the other three criteria that is equal to 0.480 (48.0%).

c. Even Distribution of Development Results

There are five criteria found in Even Distribution of development results. These five criteria are the factors that influence which bridge selection requires the allocation of funds. The five items are Population Amount and Spread (C1), Characteristics and Spread of Land Use (C2), Community’s Activity and Participation Level (C3), Accessibility level of an area l (C4), Economic Community Level (C5). Next, weight of each criterion is calculated and the weight can be seen in Table 5.

TABLE 5: *WEIGHT AND VALUE CONSISTENCY RATIO FOR CRITERIA BASED ON ASPECT OF DISTRIBUTION OF DEVELOPMENT RESULTS*

Criteria	Weight
Population Amount and Spread (C.1)	0.238
Characteristics and Spread of Land Use (C.2)	0.400
Community’s Activity and Participation Level (C.3)	0.093
Accessibility level of an area (C.4)	0.051
Economic Community Level (C.5)	0.218
CI (Consistency Index)	0.007
CR (Consistency Ratio)	0.006

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CR is 0.006, meaning that matrix of the aspects are stated consistent because the value of CR < 10%. The research result also shows that the criteria of ”Characteristics and Spread of Land Use” has a weight of 0.400 (40.0%) which is larger than other criteria.

d. Aspect of Cost

There are four criteria on the Cost Aspect. These four criteria

are the factors that influence which bridge selection requires the allocation of funds. The four items are Material Cost (E1), Equipment Cost (E2), Transportation Cost (E3) and Labor Cost (E4). Afterwards, weight of each criterion is calculated and the weight can be seen in Table 6.

TABLE 6: *WEIGHT AND VALUE CONSISTENCY RATIO FOR CRITERIA BASED ON ASPECT OF COST*

Criteria	Weight
Material Cost (D.1)	0.306
Equipment Cost (D.2)	0.097
Transportation Cost (D.3)	0.503
Labor Cost (D.4)	0.095
CI (Consistency Index)	0.008
CR (Consistency Ratio)	0.008

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects for criteria of Cost Aspect, it obtains the value of CR is 0.008, meaning that matrix of the aspects are stated consistent because the value of CR < 8% and the biggest weight is in "Transportation Cost" of 0.503 (50.3%) which is larger than the other criteria.

3.3 Alternative Weighted Score Based on Criteria

a. Criteria of Technical Aspect of Regional Development

The next phase is entering the data from the questionnaire to the alternative comparison of the criteria in the aspects obtained from 15 respondents with the weight of the assessment. After the comparative calculation as in Appendix 3, then Consistency Ratio is calculated by comparing Consistency Index with Random Consistency Index with the condition that it cannot exceed the passing grade that has been determined. After all data is stated consistent, then the average geometric value $\overline{X}_g$ will be obtained or each pair of aspects carried out the calculation of weighting aspects. Comparison between alternatives based on criteria consists of 5 matrix of pairwise comparison. Alternative weight of each criterion is presented in Table 7.

TABLE 7: *ALTERNATIVE PRIORITY BY CONCERNING CRITERIA FROM ASPECT OF AREA DEVELOPMENT (A)*

Bridges	A.1	A.2	A.3	A.4	A.5	A.6
Simping Bridge (E1)	0.072	0.087	0.086	0.075	0.086	0.097
Kalisurak Bridge (E2)	0.172	0.157	0.114	0.163	0.151	0.130
Mondoroko Bridge (E3)	0.042	0.036	0.062	0.039	0.039	0.040
Karanglo Bridge (E4)	0.304	0.290	0.310	0.302	0.316	0.343
Kalimewek Bridge (E5)	0.410	0.430	0.428	0.421	0.408	0.389
CI (Consistency Index)	**0.009**	**0.030**	**0.020**	**0.008**	**0.030**	**0.040**
CR (Consistency Ratio)	**0.008**	**0.027**	**0.018**	**0.007**	**0.027**	**0.036**

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CR for six criteria respectively are 0.008, 0.027, 0.018, 0.007, 0.027 and 0.036, meaning that the matrix of the six criteria is stated to be consistent, because the value of CR < 10%. In addition, it is known that the priority of bridges that will be widened according to each criterion A1, A2, A3, A4, A5 and A6 is to prioritize "Kalimewek Bridge (E5)" which needs to be carried out first.

b. Criteria of Technical Implementation Aspect

Comparison between alternatives based on Criteria of Technical Implementation Aspect; there are 4 matrix of pairwise comparison where the matrix is presented completely in weight of each alternative criterion.

TABLE 8: *ALTERNATIVE PRIORITY BY CONCERNING CRITERIA FROM TECHNICAL IMPLEMENTATION ASPECT (B)*

Bridge	B.1	B.2	B.3	B.4
Simping Bridge (E1)	0.066	0.084	0.075	0.109
Kalisurak Bridge (E2)	0.168	0.141	0.164	0.075
Mondoroko Bridge (E3)	0.041	0.047	0.034	0.040
Karanglo Bridge (E4)	0.297	0.339	0.291	0.313
Kalimewek Bridge (E5)	0.429	0.389	0.436	0.463
CI (Consistency Index)	0.005	0.040	0.020	0.050
CR (Consistency Ratio)	0.005	0.036	0.018	0.045

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CR for four criteria respectively are 0.005, 0.036, 0.018 and 0.045, meaning that the matrix of the four criteria is stated to be consistent, because the value of CR < 10%. In addition, it is known that the priority of bridges that will be widened according to each criterion B1, B2, B3 and B4 is to prioritize "Kalimewek Bridge (E5)" which needs to be realized first.

c. Criteria of Development Results Even DIstribution

Comparison between alternatives based on Criteria of Development Results Even Distribution; there are 5 matrix of pairwise comparison where the matrix is presented completely in weight of each alternative criterion.

TABLE 9: *ALTERNATIVE PRIORITY BY CONCERNING CRITERIA FROM DEVELOPMENT RESULTS EVEN DISTRIBUTION (C)*

Bridges	C.1	C.2	C.3	C.4	C.5
Simping Bridge (E1)	0.082	0.102	0.079	0.093	0.100
Kalisurak Bridge (E2)	0.144	0.087	0.163	0.153	0.079
Mondoroko Bridge (E3)	0.042	0.040	0.036	0.041	0.042
Karanglo Bridge (E4)	0.345	0.328	0.309	0.316	0.328
Kalimewek Bridge (E5)	0.387	0.443	0.413	0.398	0.451
CI (Consistency Index)	0.030	0.040	0.010	0.030	0.040
CR (Consistency Ratio)	0.027	0.036	0.009	0.027	0.036

Based on AHP analysis result table, the weight and the value of consistency index (see in Appendix 3) for matrix of pairwise comparison among aspects obtain the value of CR for five criteria respectively are 0.027, 0.036, 0.009, 0.027 and 0.036 meaning that the matrix of the five criteria is stated to be consistent, because the value of CR < 10%. On the other hand, it is known that the priority of bridges that will be widened according to all criteria is to prioritize "Kalimewek Bridge (E5)" which needs to be realized first.

d. Criteria of Cost Aspect

Comparison between alternatives based on Criteria of Cost Aspect; there are 4 matrix of pairwise comparison where the matrix is presented completely in weight of each alternative criterion.

TABLE 10: *ALTERNATIVE PRIORITY BY CONCERNING CRITERIA FROM COST ASPECT (D)*

Bridges	D.1	D.2	D.3	D.4
Simping Bridge (E1)	0.092	0.078	0.087	0.066
Kalisurak Bridge (E2)	0.151	0.149	0.144	0.179
Mondoroko Bridge (E3)	0.048	0.036	0.045	0.040
Karanglo Bridge (E4)	0.337	0.305	0.336	0.305
Kalimewek Bridge (E5)	0.373	0.433	0.387	0.409
CI (Consistency Index)	0.040	0.020	0.020	0.008
CR (Consistency Ratio)	0.036	0.018	0.018	0.007

Based on AHP analysis result table, the weight and the value of consistency index for matrix of pairwise comparison among aspects obtain the value of CR for four criteria respectively are 0.036, 0.018, 0.018 and 0.007 meaning that the matrix of the four criteria is stated to be consistent, because the value of CR < 10%. Besides, it is known that the priority of bridges that will be widened according to all criteria (D1, D2, D3 and D4) is to prioritize "Kalimewek Bridge (E5)" which needs to be realized first.

e. Alternative Weighted Score for Aspects

Comparison between alternatives based on aspects; there are matrix of pairwise comparison where the matrix is presented completely in weight of each alternative criteria.

TABLE 11: *ALTERNATIVE PRIORITY BY CONCERNING ASPECTS*

Bridges	A	B	C	D
Simping Bridge (E1)	0.084	0.076	0.094	0.086
Kalisurak Bridge (E2)	0.153	0.155	0.111	0.150
Mondoroko Bridge (E3)	0.040	0.039	0.041	0.045
Karanglo Bridge (E4)	0.306	0.301	0.330	0.331
Kalimewek Bridge (E5)	0.417	0.430	0.425	0.389
CI (Consistency Index)	0.020	0.020	0.020	0.020
CR (Consistency Ratio)	0.018	0.018	0.018	0.018

Based on AHP analysis result table, the weight and the value of consistency index (see in Appendix 3) for matrix of pairwise comparison among aspects obtain the value of CR for the four criteria respectively are of 0.018, meaning that the matrix of the four criteria is stated to be consistent, because the value of CR < 10%. In addition, it is known that the priority of bridges that will be widened according to all criteria (A, B, C and D) is to prioritize "Kalimewek Bridge (E5)" which needs to be realized first.

3.4 Determination of Overall Alternative Priorities

Determination of overall alternative priorities is the final conclusion of some of the main priorities obtained based on aspects and criteria. The result of weight for local priority is presented in Table 12.

TABLE 12: *LOCAL PRIORITY, GLOBAL PRIORITY, AND OVERALL PRIORITY*

	A (0,462)						B (0,158)				C (0,202)					D (0,178)				Score Total
	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4	
	0,207	0,362	0,080	0,047	0,232	0,072	0,308	0,119	0,480	0,093	0,238	0,400	0,093	0,051	0,218	0,306	0,097	0,503	0,095	
E1	0,072	0,087	0,086	0,075	0,086	0,097	0,066	0,084	0,075	0,109	0,082	0,102	0,079	0,093	0,100	0,092	0,078	0,087	0,066	0,085
E2	0,172	0,157	0,114	0,163	0,151	0,130	0,168	0,141	0,164	0,075	0,144	0,087	0,163	0,153	0,079	0,151	0,149	0,144	0,179	0,144
E3	0,042	0,036	0,062	0,039	0,039	0,040	0,041	0,047	0,034	0,040	0,042	0,040	0,036	0,041	0,042	0,048	0,036	0,045	0,040	0,041
E4	0,304	0,290	0,310	0,302	0,316	0,343	0,297	0,339	0,291	0,313	0,345	0,328	0,309	0,316	0,328	0,337	0,305	0,336	0,305	0,315
E5	0,410	0,430	0,428	0,421	0,408	0,389	0,429	0,389	0,436	0,463	0,387	0,443	0,413	0,398	0,451	0,373	0,433	0,387	0,409	0,415

From the table, it can be seen that overall, the alternative of Simping Bridge 1 (E1) has an overall weight of 0.085, the alternative of Kalisurak Bridge (E2) has an overall weight of 0.144, the alternative Mondoroko Bridge (E3) has an overall weight of 0.041, Karanglo Bridge alternative (E4)) has an overall weight of 0.315 and alternative of Kalimewek Bridge (E5) has an overall weight of 0.415. With these results, thus, separately the overall alternative priority scale can be presented in the Table 13.

TABLE 13: *OVERALL PRIORITY ALTERNATIVE SCALE*

Alternative	Weight	Rank
Kalimewek Bridge (E5)	0.415	1
Karanglo Bridge (E4)	0.315	2
Kalisurak Bridge (E2)	0.144	3
Simping 1 Bridge (E1)	0.085	4
Mondoroko Bridge (E3)	0.041	5

From the table, it can be seen that overall, the fifth alternative (E5) that is Kalimewek bridge has the greatest overall weight of 41.5%, thus it can be stated that the Bridge of Kalimewek is prioritized for the allocation of funds first.

3.4 Determination of Alternative Priorities based on Budget Ceiling

Determination of the priority in determining the allocation of development funds for the bridge that will be developed based on the budget ceiling available can be seen in the Table 14.

TABLE 14: *OVERALL PRIORITY ALTERNATIVE SCALE*

No. Rank	Alternative	Cost	Cumulative Cost
1	Kalimewek Bridge	IDR 8.580.000.000,-	IDR 8.580.000.000,00
2	Karanglo Bridge	IDR 3.816.000.000,-	IDR 12.396.000.000,00
3	Kalisurak Bridge	IDR 5.500.000.000,-	IDR 17.896.000.000,00
4	Simping 1 Bridge	IDR	IDR

5	Mondoroko Bridge	2.508.000.000,- IDR 2.310.000.000,-	20.404.000.000,00 IDR 22.714.000.000,00

From the table above, it can be seen the order of priority alternatives and the cumulative cost required. Therefore, with the budget ceiling provided only IDR 20.000.000.000, then the bridge that gets full handling is segment with rank 1 to 3. While the rest of the bridges that cannot be done due to limited funds, it can be allocated to the Budget Change in budget year of 2018 or in the next budget years.

4 Conclusions and Suggestion

4.1 Conclusions

From the results of the analysis and discussion in the previous chapter, it can be concluded as follows.

1. The order of aspect weight magnitude obtained in determining alternative of bridge widening in Lawang-Malang road segment is aspect of Area Development (A), aspect of Development Results (C), Aspect of Cost (D), Aspect of Technical Implementation (B) with weight respectively are 0.462 , 0.202, 0.178 and 0.158. While the criteria weight for A1, A2, A3, A4, A5, A6, B1, B2, B3, C4, C1, C2, C3, C4, C5, D1, D2, D3 and D4 with weight respectively are 0.207, 0.362, 0.080, 0.047, 0.232, 0.072, 0.308, 0.119, 0.480, 0.093, 0.238, 0.400, 0.093, 0.051, 0.218, 0.306, 0.097, 0.503, and 0.095.
2. The order of alternative rank of Lawang-Malang bridge that needs to be widened is Kalimewek Bridge (E5) with the weight of 0.415, Karanglo Bridge (E4) with weight of 0.315, Kalisurak Bridge (E2) with weight of 0.144, Simping Bridge 1 (E1) with weight of 0.085, and Mondoroko Bridge (E3) with the weight of 0.041.
3. The priority to determine the bridge that will be widened is adjusted to the budget ceiling which is available in 2018 amounting to IDR 20.000.000.000, - is Kalimewek Bridge (E5), Karanglo Bridge (E4), and Kalisurak Bridge (E2).

4.2 Suggestions

Based on the results of the analysis of this study, it is suggested to the relevant parties (policy makers) in order:

1. That in planning the allocation of the bridge widening fund, it needs to be done with clear and measurable mechanisms. One of them is by using Analytical Hierarchy Process (AHP) method as explained above.
2. For Local Government, it is necessary to consider mechanisms in determining aspects and criteria. This mechanism can be done by socializing through formal meetings involving all elements of government and community representation as the population used in the research above.
3. A stakeholder discussion is needed to determine the proposals of all the criteria proposed by the Stakeholder, so that all interest in form of criteria can be accommodated because the political factor also determines the priority. For the community with clarity, the mechanism as above will facilitate the community in understanding the direction of local government development, thus it is expected that there will be no interest conflict at the time of proposing the handling of the bridge among the parties concerned.
4. The upcoming research can be done by using aspects, criteria, and other alternatives tailored to the needs of the region, such as Vision and Mission of Politics from policy holders and human resources in a region.

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