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THE ANALYSIS OF CONTRACTOR SELECTION PRIORITY DETERMINATION FOR THE LONG SEMAMU – LONG BAWAN 2 ROAD CONTRUCTION PROJECT, NORTH KALIMANTAN

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Abstract

Road construction is one of the fulfillment of the government's duties in providing mobility facilities for people's land transportation to move from one place to another. The government, through contractors as road construction implementers, must work carefully, so it is important for the government to select road construction contractors who meet predetermined criteria so that the road construction process can take place optimally. This study aims to find priority criteria and alternative contractors in the process of selecting Long Semamu – Long Bawan Road Construction Contractors. This study uses a quantitative descriptive approach with the aim of determining the Criteria and Alternative Variables. The population of this study were employees of the Public Works Department as the Tender Team for the Selection of Road Construction Contractors as many as 32 people with the research sample being the total population. Data collection techniques were carried out by distributing questionnaires and interviews. Data analysis techniques for research aids use the AHP method with AHP data processing software (Expert Choice version 11). The results of the study prove that the Price Criteria is a priority criterion in the selection of road construction contractors. In addition, Contractor C is an alternative priority in road construction.

Keywords: Road Construction, AHP, Contractor Selection

1. INTRODUCTION

Roads are the most important means of support in people's lives. Roads have a very crucial role as a means of mobilizing people from one place to another. In addition, the road also functions to support socio-cultural, economic, educational and regional security activities.

With the importance of these road facilities, the government as the obligation holder must accommodate the interests of roads in each region. The government has rights and obligations in the implementation of regulatory, guidance and road monitoring activities to support the successful implementation of infrastructure development (Lubis & Mulyono, 2015). Mulyono (2013) states that road infrastructure in Indonesia serves the interests of multi-sectors, various external factors that affect the performance of road services for the movement of goods and passengers cause road management problems in Indonesia.

Roads must continue to function properly in order to function optimally as a land transportation medium. Therefore, it is important to carry out a quality road construction process both in terms of work results and work processes. Road construction projects are programming and budgeting activities, technical planning, construction implementation, and road operation and maintenance (Faizal & Suprayoga, 2014).

The road construction process is carried out by the government through the services of third parties selected in the project tender. In the Tender process, contractors will be selected who are given the mandate to carry out certain works, including in the road construction process. The selection of contractors is decided based on several criteria determined by the government or the project owner.

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The selection of contractors is a process that greatly determines the success of a project. Contractors are the key to the success of any construction operation and will determine the success of infrastructure development (Ministry of Public Works and Public Housing, 2020). So it is important for the government as the Owner to select contractors with contractors who have the competence and capabilities according to the required criteria.

The criteria for selecting a contractor may differ according to the project being undertaken and the needs of each owner. According to Sandika & Rurry (2019) stated several criteria in selecting contractors, namely Price, Consumer, Performance, Design and Professional Criteria. Harianto & Budi, (2021) states that the criteria for selecting a contractor are price criteria, contractor's financial capability, contractor experience, equipment support, contractor performance and occupational health and safety (HSE). With these criteria, it will make it easier for the owner to choose a contractor who has predetermined criteria. In addition, contractor priorities can also be determined in accordance with the established priority criteria.

Based on the background above, the researcher is interested in conducting research entitled Analysis of Determining Priority for the Selection of Long Semamu – Long Bawan 2 Road Construction Project Contractors using the Analysis Hierarchy Process (AHP) Method. This study aims to find priority criteria in the process of selecting Long Semamu – Long Bawan 2 Road Construction Contractors. In addition, research was conducted to find contractors who meet the specified criteria. This is intended to help the government or the owner to determine a contractor solution that will be given the mandate to carry out the Construction of the Long Semamu – Long Bawan 2 Road.

2. LITERATURE REVIEW

2.1. Project

Projects are activities that can be planned and implemented in a unified form by using resources to obtain benefits (Gray et al, 2007; Andani, 2017). A project can be defined as a set of interrelated activities with specific starting and ending points and results. A project is usually a cross-functional organization that requires a variety of skills from various professions and organizations. A project is an effort to mobilize available resources, which is organized to achieve certain important goals, objectives and expectations, and must be completed within a limited time by agreement.

2.2. Road Construction

Road construction is a process of opening traffic spaces that overcome various geographical obstacles (Sinaga, 2019). Road construction projects are programming and budgeting activities, technical planning, construction implementation, and road operation and maintenance (Faizal & Suprayoga, 2014). The road construction process involves land transfer and logging work.

2.3. Contractor

A contractor is a person or entity that accepts work and carries out work with wages determined based on a drawing plan and rules and conditions that have been set (Ervianto, 2011). The contractor can be a sole proprietorship with a legal entity or a legal entity performing the work. The rights and obligations of the contractor are to work according to the plan, make an implementation plan that is approved by the supervisory consultant, provide production safety equipment, report the results of the work, and submit all or part of the work that has been fully completed.

2.4. Contractor Selection

Selection of a contractor is a decision-making process that involves many aspects, the results of which will affect project performance (Chandra, 2013). Contractor selection is a very crucial thing in the execution of a project. Selection of a contractor determines the success of the project, if the selected contractor does not meet the standards set, then the project will definitely be hampered and will not meet the set quality standards.

2.5. Contractor Selection Criteria

Contractor Selection Criteria is also determining the success of a project, including road Construction. If the project owner cannot determine the criteria properly, there is a chance that a contractor who fits the unfavorable criteria will have an impact on project work. According to Sandika & Rurry (2019) stated several criteria in selecting contractors, namely Price, Consumer, Performance, Design and Professional Criteria. Meanwhile, Harianto & Budi (2021) states that the criteria for selecting a contractor are price criteria, contractor's financial capability, contractor experience, equipment support, contractor performance and occupational health and safety (K3).

2.6. Analytical Hierarchy Process

The Analytical Hierarchy Process (AHP) method is a framework for making decisions effectively on complex issues by simplifying and speeding up the decision-making process. The problem is broken down into variables/aspects and alternatives which are then arranged in a hierarchy. Assess subjective judgments about the importance of each variable and synthesize these considerations to determine which variable has the highest priority and acts to influence the outcome in that situation. The working principle of AHP is the simplification of a complex problem that is unstructured, strategic and dynamic into its parts and arranges them in a hierarchy. Then the importance level of each variable is given a subjective numerical value about the relative importance of this variable compared to other variables (Marimin, 2004; Brahmantoro et al., 2019). The AHP method helps solving complex

problems by structuring a hierarchy of criteria, interested parties, results and by drawing various considerations to develop weights or priorities.

2.7. Research Model

In the research process, a research model is needed that interprets the mindset of researchers. In addition, the Research Model can help researchers carry out an analysis of the variables to be studied. The following research model in this study, namely:

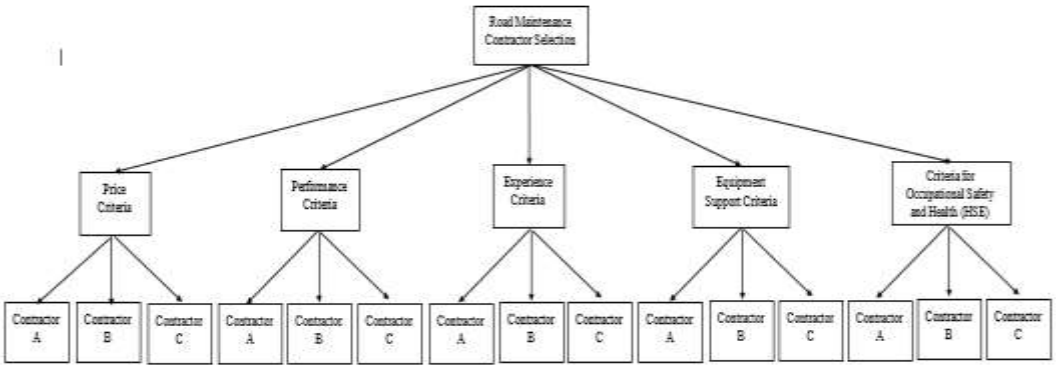

Figure 1 Research Framework

3. RESEARCH METHOD

This research is a quantitative descriptive research with the aim of determining the criteria and alternative variables in determining the Long Semamu – Long Bawan 2 Road Construction Contractor using AHP. In determining the priority, it begins with the preparation of a hierarchy, namely the determination of criteria and alternative contractors, which will later be surveyed with the help of questionnaires and interviews with respondents who are experts and competent in their fields. After that, a weighting analysis was carried out in determining the priority for Long Semamu – Long Bawan 2 Road Construction Contractors.

The population in this study were employees of the Public Works Department who served as the Tender Team for the Selection of Road Construction Contractors as many as 32 people. Where the sample in the study is the entire population. To select a contractor is determined based on established criteria. The criteria used in this study are Price Criteria, Performance Criteria, Experience Criteria, Equipment Support Criteria and Occupational Safety and Health (HSE) Criteria.

The data obtained from the results of the survey (questionnaire) will be processed to obtain information in tabular form. The results of the processed data are used to answer questions in the formulation of the problem. Data processing should pay attention to the type of data collected by being oriented towards the goals to be achieved. Accuracy in data analysis techniques greatly affects the accuracy of research results. The data analysis technique used is the AHP method with AHP data processing software tools (Expert Choice version 11).

In the distribution of questionnaires and the AHP program, priority values will be determined with a pairwise comparison scale of 9-1-9 where number 1 is the respondent's response code which states that both elements are equally important, while number 9 is the respondent's response code which states that one element is absolutely more important than on other elements as in Table 1. as follows:

Table 1 Criteria Value Level of Importance

Definition	The same Important	Very A little More Important	Relatively Rather More Important	Rather More Important	More Important	Almost Very More Important	Very More Important	Almost Absolute More Important	Absolute More Important
Scale	1	2	3	4	5	6	7	8	9
Scale	1/1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9

Source : (Saaty, 1993); (Suryadi & Nurdiana, 2015)

Furthermore, from the results of the questionnaire obtained data on the number of respondents' answers to the level of importance of an event for further analysis which discussed in the next section.

4. RESULT AND DISCUSSION

4.1. Determination of Priority Criteria

In this study, several criteria for selecting contractors were used, namely Price Criteria, Performance Criteria, Experience Criteria, Equipment Support Criteria and Occupational Health and Safety (HSE) Criteria. To find the priority of the main criteria that most influence the decision in selecting a contractor, AHP analysis is used with the expert choice program. Following are the results of determining the priority of contractor selection criteria, namely:

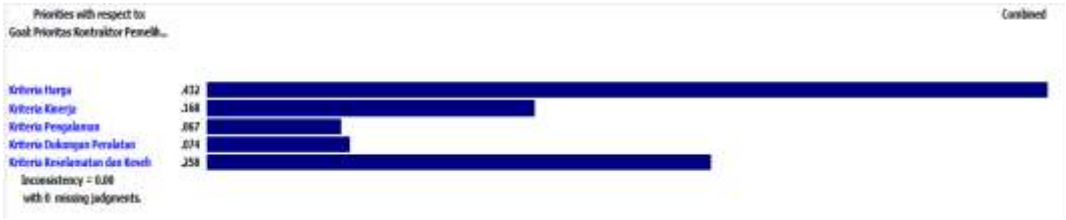

Figure 2 Determination of Priority Criteria

Based on the AHP analysis in Figure 2, it can be seen that the Price Criteria is a priority criterion with a coefficient value of 0.432 (43.2%). The Occupational Safety and Health criteria are the second priority criteria with a coefficient value of 0.258 (25.8%). The third priority is Performance Criteria with a coefficient value of 0.168 (16.8%). The fourth priority is Equipment Support Criteria with a coefficient value of 0.074 (7.4%). And the Experience Criteria is the last priority criterion with a coefficient value of 0.067 (6.7%). Hence, it can be concluded that the Price Criteria is a priority criterion in the selection of contractors. AHP measures the overall consistency of various considerations through a consistency ratio. The

consistency ratio value must be below 10% to meet the requirements with a value of 0.00 (0%) which indicates a consistent answer.

4.2. Determination of Priority Alternative

In addition to measuring, priority criteria in the selection of contractors. AHP analysis can also measure alternative priorities based on each existing criterion. The alternative here is a contractor that will be chosen by the government or the project owner. In this study, the alternatives used were Alternative Contractors A, Alternative Contractors B and Alternative Contractors C. The following results determine the priority of alternatives according to the criteria, including:

4.2.1. Alternative Priority based on Price Criteria

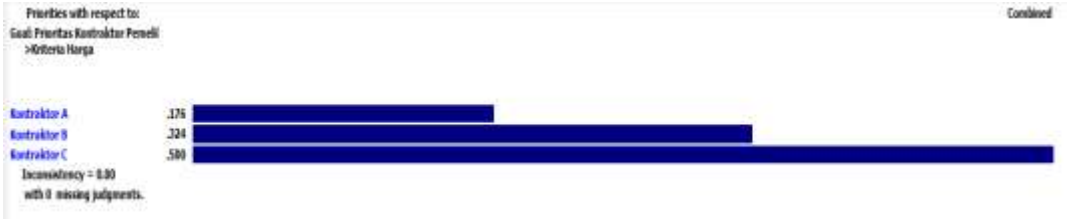

Figure 3 Alternative Priority Determination Based on Price Criteria

Based on the results of determining alternative priorities based on price criteria with AHP analysis, it can be concluded that Contractor C is the main alternative priority based on price criteria with a coefficient value of 0.500 (50%). Contractor B is the second alternative priority with a coefficient value of 0.324 (32.4%). And Contractor A as the last alternative priority with a value of 0.176 (17.6%). As such, it can be concluded that Contractor C is the main alternative priority based on price criteria. AHP measures the overall consistency of various considerations through a consistency ratio. The consistency ratio value must be below 10 percent to meet the requirements with a value of 0.00 (0%) which indicates a consistent answer.

4.2.2. Alternative Priority based on Performance Criteria



Figure 4 Alternative Priority Determination Based on Performance Criteria

Based on the results of determining alternative priorities based on performance criteria with AHP analysis, it can be concluded that Contractor A is the main alternative priority based on performance criteria with a coefficient value of 0.423 (42.3%). Contractor B is the second alternative priority with a coefficient value of 0.296 (29.6%). And Contractor C as the last alternative priority with a value of 0.281 (28.1%). Thus, it can be concluded that

Contractor A is the main alternative priority based on performance criteria. AHP measures the overall consistency of various considerations through a consistency ratio. The consistency ratio value must be below 10 percent to meet the requirements with a value of 0.00 (0%) which indicates a consistent answer.

4.2.3. Alternative Priority based on Experience Criteria



Figure 5 Alternative Priority Determination Based on Experience Criteria

Based on the results of determining alternative priorities based on experience criteria with AHP analysis, it can be concluded that Contractor A is the main alternative priority based on experience criteria with a coefficient value of 0.418 (41.8%). Contractor B is the second alternative priority with a coefficient value of 0.322 (32.2%). And Contractor C as the last alternative priority with a value of 0.260 (26.0%). So it can be concluded that Contractor A is the main alternative priority based on experience criteria. AHP measures the overall consistency of various considerations through a consistency ratio. The consistency ratio value must be below 10 percent to meet the requirements with a value of 0.00 (0%) which indicates a consistent answer.

4.2.4. Alternative Priority based on Equipment Support Criteria



Figure 6 Alternative Priority Determination Based on Equipment Support Criteria

Based on the results of determining alternative priorities based on equipment support criteria with AHP analysis, it can be concluded that Contractor C is the main alternative priority based on equipment support criteria with a coefficient value of 0.447 (44.7%). Contractor B is the second alternative priority with a coefficient value of 0.383 (38.3%). And Contractor A as the last alternative priority with a value of 0.170 (17.0%). So it can be concluded that Contractor C is the main alternative priority based on equipment support criteria. AHP measures the overall consistency of various considerations through a consistency ratio. The consistency ratio value must be below 10 percent to meet the requirements with a value of 0.00 (0%) which indicates a consistent answer.

4.2.5. Alternative Priority based on Occupational Safety and Health (HSE) Criteria

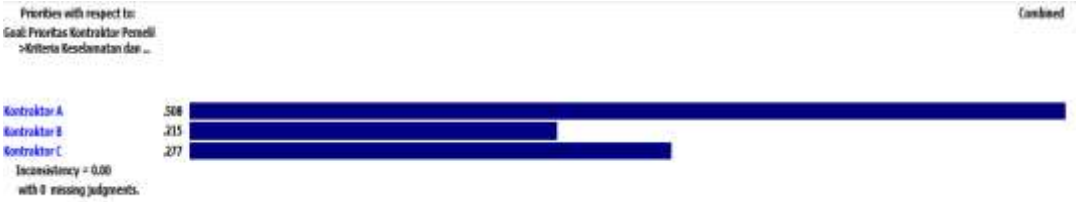

Figure 7 Alternative Priority Determination Based on Occupational Safety and Health (HSE) Criteria

Based on the results of determining alternative priorities based on Occupational Safety and Health (K3) criteria with AHP analysis, it can be concluded that Contractor A is the main alternative priority based on Occupational Safety and Health (K3) criteria with a coefficient value of 0.508 (50.8%). Contractor C is the second alternative priority with a coefficient value of 0.277 (27.7%). As well as Contractor B as the last alternative priority with a value of 0.215 (21.5%). As such, it can be concluded that Contractor A is the main alternative priority based on Occupational Safety and Health (K3) criteria. AHP measures the overall consistency of various considerations through a consistency ratio. The consistency ratio value must be below 10 percent to meet the requirements with a value of 0.00 (0%) which indicates a consistent answer.

4.3. Priority Criteria and Alternatives Summary

To make it easier to read the top priority on the criteria and alternatives, the researcher makes a summary. The priority of criteria and alternatives will be marked in bold in the table. The following is a summary of the results of the priority criteria and alternatives from the results of the AHP analysis, namely:

Table 2 Priority Summary

No.	Priority Criteria	Alternative Priority
1	**Price Criteria (43,2%)**	**Alternative Contractor C (50,0%)**
		Alternative Contractor B (32,4%)
		Alternative Contractor A (17,6%)
2	Occupational Health and Safety Criteria (25,8%)	**Alternative Contractor A (50,8%)**
		Alternative Contractor C (27,7%)
		Alternative Contractor B (21,5%)
3	Performance Criteria (16,8%)	**Alternative Contractor A (42,3%)**
		Alternative Contractor B (29,6%)
		Alternative Contractor C (28,1%)
4	Equipment Support Criteria (7,4%)	**Alternative Contractor C (44,7%)**
		Alternative Contractor B (38,3%)
		Alternative Contractor A (17,0%)
5	Experience Criteria (6,7%)	**Alternative Contractor A (41,8%)**
		Alternative Contractor B (32,2%)
		Alternative Contractor C (26,0%)

(Source: Research Processed Data, 2022)

4.4. Dynamic Sensitivity Combination Measurement

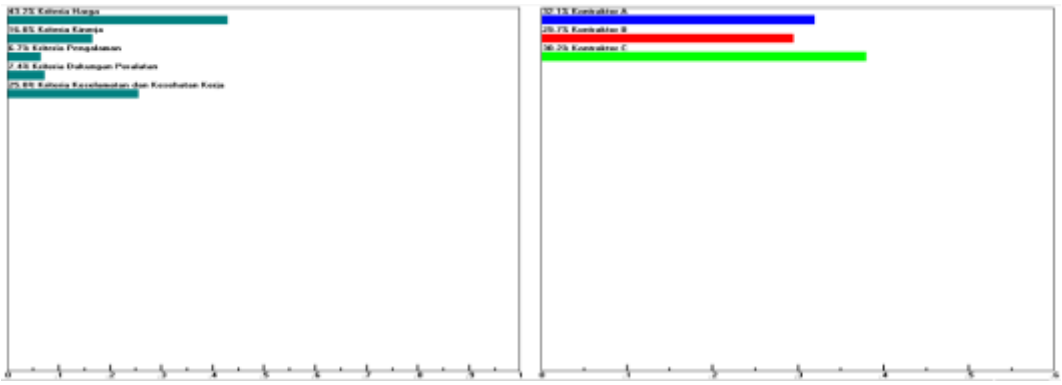

Figure 8 Dynamic Sensitivity Combination Measurement

Based on the picture above it can be seen that the price criterion has a value of 43.2% which is the largest compared to the value of other criteria. The Occupational Safety and Health Criteria is a priority for the Second Criterion with a score of 25.8%. The Performance Criteria is a priority for the Third Priority criteria with a value of 16.8%. The fourth priority is the Equipment Support criterion with a value of 7.4%. Meanwhile, the Experience criterion is the Final Priority Criterion with a value of 6.7%. Hence, it can be concluded that the Price Criteria is a Priority Criteria in the Selection of Road Construction Contractors.

Apart from that, it can also be seen that the Alternative which is the Priority for the Road Construction Contractor is Alternative Contractor C with a value of 38.2%. Alternative Contractor A becomes the second Priority Alternative with a value of 32.1%. Meanwhile Contractor Alternative B is the Last Priority Alternative with a value of 29.7%. In other words, Alternative Contractor C is a priority Alternative in the Selection of Road Construction Contractors.

4.5. Performance Combination Measurement

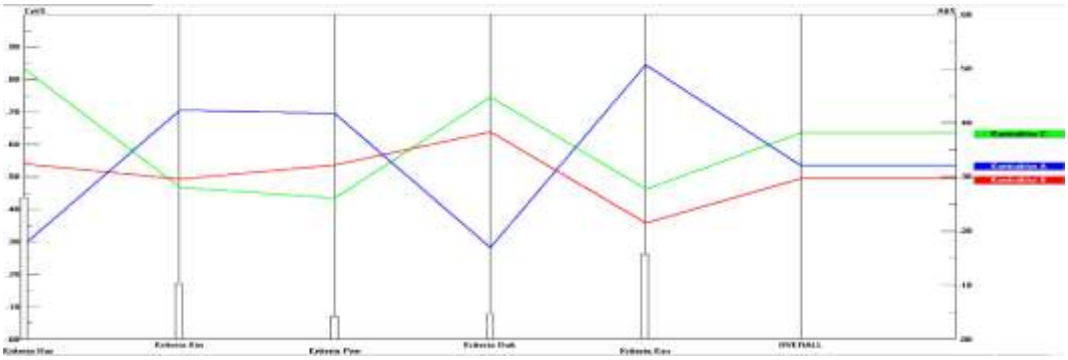

Figure 9 Performance Combination Measurement

Based on the picture above, it can be seen that the Alternative Rating is based on the Contractor Selection Criteria. In Price Criteria, Alternative Contractor C is ranked first. On Performance Criteria, Alternative Contractor A is ranked first. In the Experience Criteria, Alternative Contractor A is ranked first. On Equipment Support Criteria, Contractor Alternative C is ranked first. As well as on the Criteria for Occupational Safety and Health (K3), Alternative A is ranked first. Based on these 5 aspects, overall, Alternative Contractor C is the priority for the Road Construction Contractor.

4.5. Discussion

Based on the results of the Analytical Hierarchy Process (AHP) analysis above, it can be seen that the main priority criterion in selecting a road Construction contractor is price. Price Criteria in the Selection of Road Construction Contractors is the main concern that must be considered properly so that the road Construction process carried out by the contractor can be carried out and run well. While the Occupational Safety and Health Criteria (K3), Performance Criteria, Equipment Support Criteria and Experience Criteria are the second, third, fourth and fifth priorities in the selection of a Road Construction Contractor.

In addition, based on the results of the AHP analysis, alternative priorities can also be identified based on the established criteria. In terms of price criteria, Contractor C's alternative priority is the main alternative priority. In terms of performance criteria, Contractor A's alternative priority is the main alternative priority. Based on the experience criteria, Contractor A's alternative priority is the main alternative priority. In the equipment support criteria, Contractor C's alternative priority is the main alternative priority. As well as on the criteria for occupational safety and health (K3), Contractor A's alternative priority is the main alternative priority. Overall contractor C is an Alternative priority in selecting Road Construction Contractors.

Based on the results of the AHP analysis that has been carried out, it can be concluded that Contractor Alternative C is a priority Alternative based on 2 supporting criteria, namely Price Criteria and Equipment Support Criteria. Meanwhile, Contractor Alternative A is a priority for the second Alternative based on 3 supporting criteria, namely Performance Criteria, Experience Criteria, and Occupational Health and Safety (K3) Criteria. Meanwhile Contractor Alternative B is the last priority without any supporting criteria.

5. CONCLUSION

5.1. Conclusion

Based on the results of the analysis previously described, several conclusions can be drawn, namely:

1) Price criteria is the main criterion for choosing a road construction contractor. The criteria for Occupational Safety and Health (K3) are the second priority criteria. Performance Criteria is the third priority. The Equipment Support Criteria is the fourth priority and the Experience Criteria is the final priority for selecting a road construction contractor.
2) Contractor C is a priority. The main alternative is selecting a road construction contractor. Contractor A is the Second Alternative priority and Contractor B is the last Alternative priority.

5.2. Suggestion

Based on the results of the research that has been described previously, there are several suggestions submitted by researchers, including:

1) It is hoped that further research will be able to use other criteria and alternatives in determining the priority for the selection of road construction contractors.
2) It is hoped that the government or the project owner will be able to select a road construction contractor based on the analysis results using the AHP method as in this study.

REFERENCES

Andani, R. S. H. D. (2017). Penjadwalan Proyek dengan Limited Resource Menggunakan Resources Over Time (ROT) Algorithm (Studi Kasus : PT. Geluran Adikarya). *Universitas Muhammadiyah Malang*.

Brahmantoro, W., Sutanto, H., & Nusa, S. (2019). Roads Widening Selection In Tulungagung: Application Of AHP. *International Journal of Scientific & Technology Research*, *8*(10).

Chandra, H. P. (2013). *Prakualifikasi Dan Evaluasi Penawaran Dalam Pemilihan Kontraktor Terhadap Kinerja Proyek.* Unpar Bandung.

Ervianto, I. W. (2005). *Manajemen Proyek Konstruksi* (Revisi). ANDI.

Faizal, N., & Suprayoga, G. B. (2014). Sistem Pengadaan Untuk Pembangunan Jalan. In *Academia.Edu*. Pulitbang Jalan dan Jembatan.

Harianto, R., & Budi, S. (2021). Pemilihan Kontraktor Spesialis Oleh Kontraktor Utama Dengan Metode Analytical Hierarchy Process. *Konstruksia*, *12*(1), 45. https://doi.org/10.24853/jk.12.1.45-52

Lubis, K., & Mulyono, A. . (2015). Identifikasi Kinerja Konsultan Supervisi Proyek Penanganan Jalan Nasional (Studi Kasus: BBPJN-I Di Provinsi Sumatera Utara). *Universitas Gadjah Mada*.

Ministry of Public Works and Public Housing. (2020). *Kunci Keberhasilan Pembangunan Infrastruktur, Pelaku Konstruksi Harus Samakan Pemahaman Terhadap Kontrak Konstruksi*.

Mulyono, A. T. (2013). *Monitoring dan Evaluasi Indikator Penyedia dan Pengguna Jasa terhadap Kegiatan Penanganan Jalan Nasional di Ditbinlak Wilayah-1*. Kementerian Pekerjaan Umum Ditjen Bina Marga.

Saaty, T. L. (1993). *Pengambilan Keputusan* (2nd ed.). PT. Pustaka Binaman Presindo.

Sandika, P., & Rurry, P. (2019). Analisis Pemilihan Kontraktor Menggunakan Metode Analytical Hierarchy Process (AHP) (Studi Kasus Pembangunan Jembatan di Desa Karangan). *Integrasi : Jurnal Ilmiah Teknik Industri*, *4*(1), 1. https://doi.org/10.32502/js.v4i1.2092

Sinaga, A. (2019). Flexible Pavement Planning Using the Bina Marga Method on Jalan Sisingamangaraja. *Universitas HKBP Nommensen*.

Suryadi, A., & Nurdiana, D. (2015). Sistem Pengambilan Keputusan Untuk Pemilihan

Teknisi Lab Dengan Multi Kriteria Menggunakan Metode AHP (Analytic Hierarchy Process). *Jurnal Pendidikan Matematika*, *5*(1), 11–21.