E-ISSN : 2963-4946
Vol. 3 No. March 06, 2025
Asian Journal of Social and Humanities
https://ajosh.org/

Criteria Analysis and Application of Analytical Hierarchy Process (AHP) In Determining Road Maintenance Priorities on Cokroaminoto Bojonegoro Road Section

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KEYWORDS
Analytical Hierarchy Process (AHP), PKRMS, road maintenance, priority, bojonegoro

ABSTRACT
This study aims to develop a systematic approach for prioritizing road maintenance on Cokroaminoto Road in Bojonegoro by combining the Analytical Hierarchy Process (AHP) with PKRMS data. The research identifies eight key criteria essential for prioritizing maintenance activities, including road damage, traffic volume, safety, construction costs, implementation duration, accessibility, and weather conditions. AHP was used to assign weights to these criteria, with safety emerging as the most critical factor. The results show that road sections with high traffic intensity and significant deterioration are prioritized for preventive maintenance, especially in areas with high accident risks. By integrating technical data from the PKRMS with the AHP methodology, this study offers a transparent and objective decision-making model for road management. The findings highlight the importance of focusing on preventive maintenance to mitigate future rehabilitation costs and extend the service life of roads. This research provides valuable insights for efficient resource allocation and offers a replicable model for road infrastructure management in other regions with similar challenges.

Introduction

In prioritizing the maintenance of Cokroaminoto Road, eight main criteria have been identified based on a literature review. These criteria include level of damage, traffic volume, road user safety, maintenance cost, duration of work, implementation method, accessibility of the area, and weather conditions (Prahastyo et al., 2019; Santosa et al., 2022). Each criterion has a different weight, which will be calculated using the AHP method. The determination of these weights aims to ensure that each factor has a proportional contribution to the final decision. Thus, the maintenance process can run more effectively and efficiently (Darko et al., 2019).

AHP-based approaches have also been applied abroad. Jamil et al. (2023) used this method to evaluate rural roads in Myanmar. They considered the impact of road damage on climate and the allocation of maintenance resources. This approach demonstrated the flexibility of AHP in various geographical contexts and infrastructure needs. With positive results, the method is starting to be widely applied in various developing countries (Balubaid & Alamoudi, 2015).

As an asset management tool, PKRMS is able to identify road defects through survey data. This data includes Treatment Trigger Index (TTI) and Surface Distress Index (SDI) values that provide information on the level of flatness, physical damage, and deformation (Nababan, 2014). PKRMS enables regular monitoring of road conditions. However, challenges remain in allocating maintenance budget to road sections that really need attention. Therefore, the integration of PKRMS with AHP is a relevant solution.

In the context of Cokroaminoto Road in Bojonegoro, road maintenance is a major challenge. This road connects Nganjuk Regency with Bojonegoro Regency and has a high daily traffic volume. Based on the PKRMS survey in 2024, about 77% of the road is in good condition. Meanwhile, another 20% are in moderate condition (East Java Province Bina Marga Public Works Office, 2024). Maintenance needs to be focused on sections that are in moderate condition to prevent further deterioration (Khan & Ali, 2020).

Roads are a vital element in supporting community mobility and economic activity in a region. Good road conditions contribute to smooth traffic flow and reduced logistics costs. In addition, well-maintained roads improve connectivity between regions. However, the problem of road deterioration remains a major challenge, especially in areas with high traffic intensity. Therefore, a structured approach in determining maintenance priorities is urgently needed (Susanto, 2023).

A study in West Sumatra by Budianto et al. (2022) shows that a combination of PKRMS and AHP can optimize maintenance budget allocation. In this way, the service life of roads can be extended. The utilization of criteria weights obtained through AHP makes decisions more transparent and accountable. Technical data from PKRMS is combined with multi-criteria analysis to produce better decisions. This approach is a model that can be applied in other regions (Singh & Nachtnebel, 2016).

The AHP method has been applied in various studies to develop an objective and consistent priority hierarchy. According to Armayadi et al. (2023), AHP is able to consider various external factors, such as road connectivity and regional economic influence. This approach ensures that every decision is based on relevant and measurable data. Thus, the decision results are more accountable. This process helps reduce the risk of errors in decision-making (Cahyapratama & Sarno, 2018).

Road maintenance involves preventive and rehabilitative activities to maintain the quality and technical life of roads. In this context, the PKRMS method has been widely used to monitor road conditions and provide relevant technical data. PKRMS is a system designed to fill the gap between complex national road management and more specific local needs (Directorate General of Highways Circular Letter, 2021). The system allows for more focused analysis of road conditions at the provincial and district levels. PKRMS is therefore an important instrument in road maintenance planning (Veisi et al., 2022).

In previous research, various approaches have been applied to overcome road maintenance constraints. Kusuma and Raharjo (2023) showed that the integration of PKRMS with the AHP method can help decision makers in determining priorities. AHP is a multi-criteria decision-making method that considers various aspects such as damage level and traffic volume. In addition, economic impact is also part of the consideration (Saaty, 1980). This combination allows for more structured and effective maintenance.

The use of AHP in road management has proven to provide significant results. According to Hastuti and Budi (2022), AHP is effective in determining maintenance priorities in strategic areas. Road type and geographical constraints are an important part of the prioritization process. This is in line with the research of Amin et al. (2023), who found that AHP can accommodate various factors. These include road condition, traffic volume, and regional economic development.

Damages such as longitudinal cracking, alligator cracking, and loose aggregate on the road surface are challenges that require immediate solutions. Masagung et al. (2023) mentioned that a combination of PKRMS and AHP can provide optimal results. Maintenance prioritization includes technical and strategic aspects. Technical aspects include the level of damage and physical condition of the road. Meanwhile, strategic aspects include connectivity and economic impact (Salvia et al., 2019).

In this study, eight key criteria were identified to determine maintenance priorities. These criteria include damage level, traffic volume, road user safety, and maintenance cost. Duration of work, method of implementation, accessibility of the area, and weather conditions are also part of the criteria considered (Triyanto et al., 2019; Togelang, 2021). Each criterion has a different weight according to its level of importance. Using the AHP method, these weights will be calculated systematically.

The AHP method allows comparison between criteria in determining maintenance priorities. According to Armayadi et al. (2023), AHP helps construct an objective hierarchy. This process involves evaluating each criterion in pairs. Thus, the decision results become more consistent and measurable. This method also allows for strong justification in every maintenance decision.

Pratiwi et al. (2023) mentioned that the combination of AHP and PKRMS allows the government to plan long-term strategies. This strategy considers structural and functional criteria in determining maintenance priorities. The decisions taken support sustainable development. Therefore, this method is one of the effective approaches in road infrastructure management. This model can be applied in various regions with different characteristics.

In this study, an AHP-based approach was applied to prioritize the maintenance of Cokroaminoto Road. The main focus was to identify the criteria that should be considered in determining priorities. In addition, this research explores how AHP can be applied effectively. The ultimate goal is to formulate appropriate preservation actions. Thus, the results of this research are expected to make a significant contribution (Goepel, 2018).

Through this research, it is expected that a real contribution will be made to the management of road infrastructure in Bojonegoro Regency. The resulting model can be applied in other regions with similar characteristics. With this approach, efficiency in budget and resource allocation can be improved. In addition, this research contributes to the development of a more structured road maintenance method. The model also supports sustainable development efforts in transportation infrastructure.

Literature Review

Road Maintenance Prioritization Criteria

In prioritizing road maintenance, various criteria must be considered to ensure effective and efficient resource allocation. These criteria involve technical, economic and social aspects that affect road performance and its impact on users. Several studies emphasize the importance of considering the physical condition of the road, average daily traffic volume (LHR), and environmental factors in determining priorities.

Road deterioration is a key indicator in determining maintenance priorities. Parameters such as cracks, potholes, and surface deformation are identified through PKRMS (Provincial/District Road Management System) surveys. In addition, construction costs and implementation methods are also key in determining priorities due to budget constraints that local governments often face. By considering these aspects, decisions are more structured and targeted. The safety and comfort of road users is also an important factor in prioritization. Roads that have a high risk of accidents or inconvenience in driving need more attention. Previous studies have shown that priority is given to road sections that have great potential in supporting local economic activities and inter-regional connectivity.

Other factors considered are duration and ease of implementation. Roads that are moderately damaged, but have a major impact on community mobility, are often prioritized. This is to ensure that the preservation process is effective without significantly disrupting road user activities. Using the Analytical Hierarchy Process (AHP) method, all these criteria can be analyzed comprehensively. AHP allows pairwise comparisons between different factors to produce weights that reflect the level of importance of each criterion in determining road maintenance priorities.

Role of PKRMS Survey in Maintenance Prioritization

PKRMS surveys are an important instrument in road maintenance and preservation. The system is designed to identify road conditions on a regular basis through the collection of visual and quantitative data related to pavement damage. Data obtained from PKRMS surveys include road flatness, physical damage and deformation. The PKRMS survey results are used to calculate the Treatment Trigger Index (TTI) and Surface Distress Index (SDI) which provide a snapshot of the actual condition of the road. The TTI is used to determine whether the road requires routine, periodic or total rehabilitation maintenance. Meanwhile, the SDI classifies road conditions into good, moderate, lightly damaged and severely damaged categories.

The PKRMS survey also helps in identifying critical defect points that require immediate attention. This data forms the basis for decision-making, ensuring that road sections with high TTI scores receive higher priority in the maintenance program. With the integration of PKRMS and AHP, quantitative data from the survey is combined with qualitative assessments from experts. This creates a more comprehensive and objective approach to prioritizing road preservation. In the context of Cokroaminoto Road Bojonegoro, the PKRMS survey shows that most of the road segments are in good condition, but some segments require attention to prevent further deterioration.

Application of Analytical Hierarchy Process (AHP) Method in Road Preservation Prioritization

The Analytical Hierarchy Process (AHP) method is a multi-criteria approach used to assist decision makers in prioritizing based on various interrelated factors. In the context of road maintenance, AHP allows decision makers to evaluate and compare various criteria such as damage level, daily traffic, and maintenance costs. The first step in applying AHP is to determine the decision hierarchy structure that includes the main objective, criteria, and sub-criteria. In this research, the main objective is to prioritize preservation measures on Cokroaminoto Bojonegoro Road. The criteria used include user safety, level of damage, daily traffic, and construction cost.

Once the hierarchical structure was established, the next process was to conduct pairwise comparisons between criteria to determine the weight of each factor. This data is obtained through questionnaires and interviews with experts and stakeholders who have experience in road management. The result of the AHP process is a prioritized list that indicates road sections or segments that require immediate attention. In this study, user safety and level of deterioration were the dominant factors influencing the decision. Alternative measures such as overlay and micro surfacing were selected based on the calculated priority weights. By using AHP, local governments can develop a more structured and transparent road maintenance plan. This method not only helps in allocating resources efficiently, but also increases accountability in road infrastructure management.

The rapid deterioration of road infrastructure, especially in high-traffic areas, has become a pressing concern. Effective prioritization of road maintenance is crucial for mitigating accidents, ensuring regional connectivity, and optimizing limited resources. With growing urbanization and increased vehicle numbers, neglecting road maintenance can exacerbate safety risks, disrupt economic activities, and lead to higher future rehabilitation costs. This research addresses these urgent needs by applying a systematic method to prioritize maintenance activities on Cokroaminoto Road in Bojonegoro, a key regional road.

While various studies have explored the application of the Analytical Hierarchy Process (AHP) in road maintenance, few have integrated it with the Provincial/District Road Management System (PKRMS) to enhance decision-making in the context of developing regions. Existing literature often overlooks the importance of real-time data combined with multi-criteria decision-making methods to address specific local challenges. This research fills this gap by utilizing both AHP and PKRMS, ensuring that maintenance decisions are based on both technical road conditions and strategic regional factors.

The novelty of this study lies in its integration of the AHP method with PKRMS data, creating a comprehensive approach to road maintenance prioritization. By considering multiple criteria such as road safety, traffic volume, and construction costs alongside technical survey data, the research presents a novel model for managing road infrastructure. This model allows for more transparent, measurable, and objective decision-making, which can be applied not only to Bojonegoro but also to other regions with similar challenges.

The purpose of this study is to develop a model for prioritizing road maintenance based on an integrated approach combining AHP and PKRMS. This research aims to provide decision-makers with an efficient tool to allocate resources optimally, ensuring that road maintenance is focused on the most critical sections. The benefits of this study include enhanced safety, reduced maintenance costs, and improved regional connectivity. The model is also designed to be adaptable to other regions, offering a scalable solution for better infrastructure management.

Research Methods

Research Design

This study used quantitative and qualitative approaches to determine the priority of road maintenance on Cokroaminoto Bojonegoro Road. The quantitative approach is applied through the collection of PKRMS survey data which includes the physical condition of the road, traffic volume, and level of damage. This data was then analyzed using the Analytical Hierarchy Process (AHP) method to assign weights to each of the predetermined criteria. The qualitative approach involved interviews and questionnaires with experts in road infrastructure to gain perspectives on factors affecting maintenance.

The combination of these two methods provided comprehensive and objective results in prioritizing road preservation.

The creation of a research design involves setting up a hierarchical structure consisting of objectives, criteria, and sub-criteria. This structure allowed for an in-depth analysis of the various aspects that influence maintenance decisions. The criteria used included technical factors such as level of deterioration, as well as external factors such as budget and road user safety. This research design aims to produce maintenance priorities that are based on measurable data and analysis. Thus, the decision-making process becomes more transparent and structured.

In this design, the PKRMS survey is used as the main source to determine the factual road conditions. The data from this survey will be compared with the results of questionnaires and interviews conducted with stakeholders. This comparison aims to ensure that decisions are not only based on quantitative data, but also consider practical aspects on the ground. This research design provides a strong foundation in developing road maintenance recommendations that are in accordance with the needs and real conditions on Cokroaminoto Bojonegoro Road.

The study also considered environmental and social factors in determining maintenance priorities. Roads that have high traffic levels or serve as the main link between regions receive more attention in the analysis. In addition, the durability of materials and implementation methods were analyzed to ensure that preservation has a long-term impact. The research design was designed to be flexible and applicable to other road sections with similar characteristics.

Data Collection Technique

The data collection techniques in this study consisted of field observations, PKRMS survey, and AHP-based questionnaire. Field observations were conducted directly to assess the visual condition of the road, identify the type of damage, and evaluate the severity of the damage. The PKRMS survey provided numerical data related to the unevenness of the road surface, the number of cracks, and the deformation occurring in the pavement. This data is used as the basis for calculating the Treatment Trigger Index (TTI) and Surface Distress Index (SDI) to classify road conditions.

The questionnaire was distributed to road and transportation experts and stakeholders. Respondents were asked to provide pairwise comparison ratings of various criteria affecting road maintenance. This assessment involved the factors of construction cost, safety, daily traffic, and ease of project implementation. The results of this questionnaire were processed using the AHP method to generate prioritized weights for each criterion. This technique allows for a participatory approach to decision-making that is more inclusive.

In addition, semi-structured interviews were conducted to gain more in-depth information on factors not covered by the survey and questionnaire. The interviews involved officials from the East Java Provincial Bina Marga Public Works Office and contractors implementing road projects. Information from these interviews complemented the quantitative data and provided practical insights into field challenges. This combination of data collection techniques provides more accurate and representative results.

Data collection was conducted in several stages, starting with an initial survey to identify the general condition of the road. The next stage was more in-depth observation and distribution of questionnaires to experts. Once the data was collected, it was validated through focus group discussions to ensure that the data obtained matched the real conditions in the field. This technique ensures that every aspect of maintenance is considered holistically.

Data Analysis

Data analysis was conducted in several steps, starting with the processing of PKRMS survey results to identify the physical condition of the roads. This data was analyzed using the Treatment Trigger Index (TTI) and Surface Distress Index (SDI) to provide a quantitative picture of the level of road damage. Afterwards, the AHP questionnaire results were processed using supporting software to calculate the weight of each predetermined criterion. This analysis resulted in a maintenance priority ranking based on the level of importance and road condition.

Each criterion was analyzed in pairs to determine the extent to which it influenced the final decision. The results of this comparison are then used to construct a prioritization matrix that forms the basis for determining which road segments should be prioritized. The AHP method provides structured results and allows decision makers to see the relationships between criteria more clearly. The analysis also helps in identifying the trade-off between the costs and benefits of each maintenance action.

In addition, a sensitivity analysis is conducted to evaluate how changes in criteria weights affect the final result. This is important to ensure that the decision made remains consistent despite small changes in the assessment parameters. Sensitivity analysis provides flexibility in prioritization and allows adjustment of strategies according to actual conditions in the field.

The results of the data analysis are then presented in the form of graphs and tables to facilitate interpretation and decision making. This graph shows the comparison between criteria and maintenance priorities for each road segment. Thus, the data analysis carried out is able to provide clear and measurable recommendations in determining the priority of road preservation on the Cokroaminoto Bojonegoro Road section.

Results and Discussions

Results

Road Maintenance Prioritization Criteria

Priority criteria for road maintenance on Cokroaminoto Bojonegoro Road were determined based on the PKRMS survey results and the AHP method. Eight main criteria were identified as determining factors in this process. These criteria include the extent of road damage, construction cost, daily traffic, climate and weather, road user safety, ease of implementation, duration of work, and socio-economic impact. Each criterion has a different weight, indicating its level of importance in determining maintenance priorities. By considering these criteria, decisions are more structured and effective.

The level of road damage is the most dominant criterion in the prioritization process. Based on the survey, the damage identified includes cracks, potholes, and surface deformation. Roads with high levels of distress require more attention so as not to worsen the condition of the pavement. These criteria are calculated using the Surface Distress Index (SDI), which provides a comprehensive picture of road conditions. SDI data serves as the basis for classifying roads into good, fair, or poor categories.

Construction costs are also an important factor in determining maintenance priorities. Highly damaged roads that cost a lot of money tend to be prioritized if they have a significant impact on community mobility. In this case, a budget analysis is conducted to ensure that resources are optimally allocated. A comparison between the costs and benefits of each preservation measure is the basis for setting priorities. Thus, budget efficiency is maintained.

Average daily traffic (LHR) influences the decision to prioritize road maintenance. Road sections with high traffic volumes are at risk of deteriorating more quickly and therefore require regular maintenance. LHR data is collected through regular surveys and field observations. Roads with high vehicle intensity are given priority as they contribute greatly to economic activity and community mobility.

Table 1. Results of Pairwise Comparison between Alternatives Under Average Daily Traffic Criteria

Criteria x Alternative Comparison Matrix			
Average Daily Traffic	Recoating with CAP	*Slurry Seal Type* 1 CQS 1H QS1h	*Micro Surfacing*
Recoating with CAP	1,00	3,02	0,24
Slurry Seal Type 1 CQS 1H QS1h	0,33	1,00	0,19
Micro Surfacing	4,16	5,37	1,00
AMOUNT	5,49	9,39	1,43

Source: The results of the analysis of the comparison of criteria x alternatives *by Ms, Excel*

Road user safety is a key criteria that cannot be ignored. Roads that have a high potential accident risk are given priority in the maintenance program. This factor involves analyzing accident hotspots and potentially dangerous physical conditions of the road. By improving the quality of roads in these locations, it is expected that the number of accidents can be significantly reduced.

Application of AHP Method in Maintenance Prioritization

The Analytical Hierarchy Process (AHP) method was used as the main approach in prioritizing road maintenance on Cokroaminoto Bojonegoro Road. AHP allows decision makers to perform pairwise comparisons of various predetermined criteria. The process begins with the creation of a hierarchical structure that includes objectives, criteria, and sub-criteria. Each criterion is compared to each other to obtain a weight that reflects its level of importance.

The first step in applying the AHP was to collect data through a questionnaire distributed to experts and stakeholders. Respondents were asked to rate criteria such as damage level, construction cost, and safety. The results of the questionnaire were then processed using supporting software that produced a pairwise comparison matrix. From this matrix, the weight of each criterion is calculated.

Table 2. Criterion x Criterion Comparison Matrix

Criterion x Criterion Comparison Matrix

Criteria	Construction Cost	Road Construction Implementation Method	Average Daily Traffic	Climate and Weather	Road User Safety and Comfort	Road Damage Level	Ease of Implementation	Duration of Implementation
Construction Cost	1,00	0,67	1,37	1,72	0,42	0,43	1,54	1,33
Road Construction Implementation Method	1,49	1,00	1,88	3,76	0,33	0,50	1,34	3,59
Average Daily Traffic	0,73	0,53	1,00	1,02	0,27	0,41	0,93	0,96
Climate and Weather	0,58	0,27	0,98	1,00	0,28	0,29	0,98	1,10
Road User Safety and Comfort	2,39	3,06	3,68	3,59	1,00	1,82	3,48	2,36
Road Damage Level	2,33	2,01	2,42	3,48	0,55	1,00	1,90	3,33
Ease of Implementation	0,65	0,75	1,07	1,02	0,29	0,53	1,00	1,31
Duration of Implementation	0,75	0,28	1,04	0,91	0,42	0,30	0,76	1,00
AMOUNT	9,91	8,57	13,44	16,51	3,56	5,27	11,93	14,99

Source: Results of comparative analysis between criteria *by Ms, Excel*

Once the criteria weights are obtained, a sensitivity analysis is performed to evaluate the consistency of the results. This analysis aims to ensure that small changes in judgment do not significantly affect the final result. If inconsistencies are found, the pairwise comparison process will be repeated until it reaches the expected level of consistency. Thus, the decision taken has a high level of accuracy.

The results of the AHP method show that user safety and level of deterioration have the highest weight. Therefore, road sections with severe damage and high potential accident risk are prioritized in the maintenance program. Meanwhile, other criteria such as daily traffic and construction cost also contributed significantly to the prioritization. With this approach, the decision-making process becomes more objective and measurable.

PKRMS Survey Results and Data Analysis

The PKRMS survey conducted on Cokroaminoto Road in Bojonegoro provided a comprehensive overview of road conditions. The survey results show that 79% of the road segments are in good condition, while 21% are in moderate condition. This data forms the basis for setting maintenance priorities, where road segments in moderate condition require immediate preservation action. Preventive maintenance is carried out to prevent further deterioration.

The survey data also revealed that road segments with high traffic levels tend to deteriorate faster. Therefore, maintenance programs are focused on these segments. The survey results show that areas with heavy vehicle intensity are more prone to surface deformation. Measures such as resurfacing or overlay were prioritized to maintain road quality.

Discussion

The discussion of the results of this study highlights the interrelation and varying levels of importance of criteria in road maintenance prioritization. The analysis confirms that level of road damage and user safety are the dominant factors in determining maintenance priorities. These findings align with the principles of risk-based approaches, emphasizing the critical need to focus on physical conditions and accident mitigation in designing maintenance programs. Roads with severe damage or high safety risks are considered top priorities, as neglecting these aspects can lead to significant socioeconomic impacts, such as increased accidents, higher vehicle repair costs, and disrupted mobility.

The Analytical Hierarchy Process (AHP) method demonstrated its effectiveness in systematically integrating multiple criteria into the decision-making process. By applying AHP, decision-makers were able to assign fair and objective weights to each factor, such as construction costs, accessibility, and implementation duration. The calculated weights revealed that user safety holds the highest priority, followed by level of damage, reflecting the significance of these factors in maintaining the functionality and quality of road infrastructure. Additionally, criteria such as average daily traffic and climatic conditions also emerged as critical considerations, particularly for high-traffic segments prone to rapid deterioration.

The AHP application on Cokroaminoto Road produced results consistent with findings from previous studies (e.g., Hastuti and Budi, 2022), validating its utility in addressing complex multi-criteria decision-making scenarios. For instance, roads with moderate damage but high daily traffic volumes were prioritized for preventive maintenance actions, such as micro surfacing. This approach prevents further deterioration and ensures the continuity of regional connectivity, reducing the need for costly rehabilitations in the future.

Furthermore, the integration of AHP with PKRMS data enhanced the precision of maintenance prioritization. PKRMS provided comprehensive quantitative data, including Treatment Trigger Index (TTI) and Surface Distress Index (SDI), which served as a foundation for evaluating road conditions. Combining these metrics with the strategic insights derived from AHP allowed for a more nuanced understanding of maintenance needs. For example, road sections with moderate SDI values but located in high-risk zones (e.g., near accident-prone intersections) were given higher prioritization due to their safety implications.

The findings also underscore the importance of targeted budget allocation in road maintenance. By prioritizing segments that combine high traffic volume, moderate to severe damage, and strategic connectivity, decision-makers can optimize resource utilization. For instance, the prioritization matrix suggested focusing initial efforts on segments requiring routine maintenance to prevent further damage while reserving funds for periodic interventions, such as overlays, on heavily trafficked sections. This dual approach enhances the sustainability of maintenance programs and maximizes the return on investment.

Lastly, the study highlights the potential for further refinement of maintenance strategies by incorporating climatic factors and long-term performance evaluations into the decision-making process. Extreme weather conditions, such as heavy rainfall or prolonged dry spells, were identified as significant contributors to accelerated road deterioration. Integrating predictive models for weather impacts could enhance the proactive capacity of PKRMS and AHP-based frameworks.

In conclusion, the results of this study demonstrate that integrating AHP with PKRMS enables decision-makers to address both technical and strategic aspects of road maintenance effectively. By prioritizing safety and road damage levels while incorporating secondary criteria such as traffic volume and economic impact, this method fosters more sustainable and objective road management practices. The findings serve as a model for developing scalable road maintenance strategies in other regions with similar challenges.

Conclusion

From the research results, it can be concluded that the main criteria in determining the priority of road maintenance on Cokroaminoto Bojonegoro Road are the level of road damage, user safety, daily traffic, and construction costs. The safety factor has the highest weight in prioritization, indicating the importance of accident risk mitigation. The application of the Analytical Hierarchy Process (AHP) method proved effective in integrating multiple criteria into the decision-making process. The AHP method produces a priority ranking that helps in determining road segments that require immediate attention. By focusing on road segments with moderate to severe damage, the government can allocate budget more efficiently. These results show that the AHP approach is capable of providing objective and measurable decisions.

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