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Analysis of Road Conditions on Cokroaminoto Bojonegoro Road Section Based on PKRMS Survey

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ABSTRACT
Road infrastructure is crucial for supporting inter-regional connectivity and economic activity. However, many roads in Indonesia, including those in Bojonegoro Regency, face deterioration due to environmental factors, heavy traffic, and limited maintenance budgets. This research aims to analyze the condition of Cokroaminoto Road in Bojonegoro Regency using the Provincial/District Road Management System (PKRMS) and to prioritize maintenance actions using the Analytical Hierarchy Process (AHP). The study utilizes quantitative methods, processing data from PKRMS surveys to evaluate road conditions based on the Treatment Trigger Index (TTI) and Surface Distress Index (SDI). The results indicate that 79% of the road is in good condition, while the remaining 21% requires periodic maintenance. Based on the findings, routine maintenance, periodic overlays, and full rehabilitation are recommended depending on the severity of the damage. The integration of PKRMS and AHP allows for a more data-driven approach to road maintenance, optimizing resource allocation and ensuring that maintenance actions are both efficient and effective. This study provides valuable insights for improving road management practices in Bojonegoro Regency, offering a model that can be applied to other regions with similar conditions.

Keywords: AHP, Cokroaminoto Road, PKRMS, Road Maintenance Prioritization, SDI, TTI.

INTRODUCTION

Roads are an essential element of infrastructure in supporting inter-regional connectivity and economic activity. Good road conditions not only facilitate mobility but also improve the efficiency of distribution of goods and services. However, many roads in Indonesia, including in Bojonegoro Regency, face challenges of deterioration due to environmental factors, high traffic loads, and limited maintenance budgets (Masagung, 2023). To address these challenges, data-driven management approaches such as the Provincial/District Road Management System (PKRMS) are needed.

PKRMS is designed to provide a structured evaluation of road conditions using parameters such as Treatment Trigger Index (TTI) and Surface Distress Index (SDI). The system allows local governments to determine the type of action required, ranging from routine maintenance to full

rehabilitation (Directorate General of Highways Circular Letter, 2021). Previous research by (Armayadi et al., 2023) showed that PKRMS combined with the Analytical Hierarchy Process (AHP) method can improve the quality of decision making in determining road repair priorities.

On the other hand, the AHP method allows multi-criteria decision making by considering various factors such as road conditions, traffic volume, and economic impact (Togelang et al., 2021). Research by (Fitriawan, 2023) assessed the prioritization of road preservation in different regions of Indonesia and showed that AHP is able to provide objective weights to relevant criteria. This helps local governments in designing more efficient maintenance strategies.

Cokroaminoto Road in Bojonegoro Regency is one of the important cases in the application of PKRMS and AHP. This road is a strategic route connecting Nganjuk and Bojonegoro districts and plays a significant role in supporting regional mobility. Based on the PKRMS survey in the fourth quarter of 2024, 79% of the road is in good condition, while the remaining 21% requires periodic maintenance. This condition requires in-depth evaluation to determine the appropriate maintenance measures.

Research by (Febriamansyah, 2006) in West Sumatra using AHP to optimize road maintenance budget showed that the combination of these methods can extend the service life of roads. Another study by (Tamrin, 2023) focused on the prioritization of strategic road maintenance based on road type and geographical constraints. These findings are relevant to be applied to Cokroaminoto Road, which has similar characteristics. Frequent road defects, such as alligator cracking and aggregate wear, indicate the need for preventive action through routine maintenance. (Iskandar et al., 2024) emphasized that AHP is particularly effective for rural road systems with limited budgets. Using this approach, the government can determine the most urgent priorities for repair (Triyanto et al., 2019).

In addition, (Numata et al., 2020) showed that AHP can consider climatic factors in evaluating rural roads in Myanmar. This is also relevant for Cokroaminoto Road which is affected by extreme weather conditions. Research by (Santosa, 2022) in Indonesia also showed that integrating PKRMS and AHP data can ensure more targeted budget allocations. The combination of PKRMS and AHP further demonstrated its potential in road management through research by (Pratiwi, 2023). Their study optimized long-term preservation strategies by considering structural and functional criteria of roads. Another study by (Raharjo, 2021) that integrated AHP with GIS technology provided more accurate results in determining road maintenance priorities in Java.

(Nababan, 2014) also highlighted the importance of AHP in prioritizing road repairs in Medan City. With a data-driven approach, the government can allocate resources efficiently. (Susanto, 2023) supported these findings by showing that AHP is effective in determining alternative pavement improvements at intersections. Research related to infrastructure project risk also provides important insights. (Marleno et al., 2019) emphasized the importance of risk mitigation in infrastructure project management, while (Oetomo et al., 2017) showed how time and cost management can improve the success of infrastructure development projects. Both

approaches can be adapted to support the management of Cokroaminoto Road. Given the available evidence, the combination of PKRMS and AHP is a strategic solution in prioritizing the maintenance of Cokroaminoto Road. This approach not only improves budget efficiency but also ensures that decisions are based on objective data. For Bojonegoro District, the application of this method will have a significant positive impact on road infrastructure management.

Cokroaminoto Road in Bojonegoro Regency faces challenges in maintaining optimal road conditions, given its importance as a strategic link between Nganjuk and Bojonegoro Regencies. Based on the PKRMS survey conducted, the road condition shows that most sections are in the good category, while the rest require periodic maintenance to prevent further deterioration. The data from the PKRMS survey is an important basis in determining road repair priorities.

However, with budget constraints, a data-driven approach is needed to optimize resource allocation. Previous research shows that integrating PKRMS with the Analytical Hierarchy Process (AHP) method can provide an effective solution in prioritizing road maintenance (Masagung, 2023). AHP enables multi-criteria assessment by considering the physical condition of the road, traffic volume, and socioeconomic impacts (Prahastyo et al., 2019).

This research offers a novel approach by combining PKRMS and AHP with a focus on Cokroaminoto Road in Bojonegoro Regency, providing a case study that incorporates both local road conditions and regional development factors. Unlike previous studies, this research integrates climatic conditions, road defects, and socio-economic impacts to create a comprehensive model for road maintenance prioritization. The application of this method in a region with limited resources presents new insights for local governments to optimize road management practices and make data-driven decisions for long-term infrastructure development.

Based on the background above, the objectives of this research are to identify and analyze the factors affecting the condition of Cokroaminoto Road and to propose a prioritized maintenance strategy using the combined PKRMS and AHP method. The benefits of this research include providing a data-driven framework for road management that can be applied to other regions with similar conditions, optimizing maintenance budgets, and improving the overall quality of road infrastructure in Bojonegoro Regency.

RESEARCH METHOD

This research employs a descriptive quantitative approach to analyze the road conditions on Cokroaminoto Road in Bojonegoro Regency, utilizing data from field surveys conducted using standardized tools like the Provincial/District Road Management System (PKRMS). The research focuses on evaluating the current state of the road and determining the required maintenance actions based on quantitative data such as Treatment Trigger Index (TTI) and Surface Distress Index (SDI). Data was collected through PKRMS field surveys, which include parameters such as surface damage, flatness, and road deformation, and supplemented with secondary data like

maintenance history and traffic volumes. The analysis used these data to classify road conditions and determine the necessary maintenance measures, including routine, periodic, or rehabilitation maintenance. Additionally, the Analytical Hierarchy Process (AHP) method was applied to prioritize maintenance based on technical and strategic factors, such as traffic volume and economic impact, resulting in more efficient decision-making for road maintenance. The data was validated by trained teams, with the results compared against historical reports to ensure consistency. Finally, the evaluation of road conditions was aligned with the standards set by the Directorate General of Highways to guide the formulation of appropriate maintenance actions.

RESULT AND DISCUSSION

Physical Condition of Road

The results of the PKRMS survey on the Cokroaminoto Road section show that the physical condition of the road is mostly in the good category. Of the total length of 0.97 km, about 79% of the road is in good condition, while the rest is in moderate condition. Damages identified include crocodile cracks in the surface layer and worn aggregates that require further attention. This data serves as a reference to determine the type of maintenance required to prevent further damage.

The TTI analysis shows that most road sections still meet service standards with index values below the repair threshold. However, some deterioration points have started to show a significant decrease in index value. Such damage requires periodic maintenance measures to maintain the quality and function of the road.

The use of modern survey tools in PKRMS provides accurate and measurable results. The data obtained helps identify areas that require early prioritization of improvements. This is critical to ensure targeted resource allocation, especially in the face of budget constraints.

Table 1. Recapitulation of Pavement Condition

Road Section		Survey Length (km)	KM Stake		Pavement Type/Condition				
No.	Name		From	To	Asphalt (km)	Good (km)	Medium (km)	Lightly Damaged (km)	Heavy Damage (km)
100	Bts. Bojonegoro City - Bts. Tuban Regency	3,12	0+000	3+120	3,12	1,30	1,42	0,30	0,10
100.11K	Corn Street. Suprapto	0,57	0+000	0+570	0,57	0,00	0,20	0,37	0,00
100.12K	Jln. Sawunggaling	0,98	0+000	0+980	0,98	0,00	0,30	0,68	0,00
100.13K	Jln. Basuki Rahmad	1,54	0+000	1+540	1,54	0,40	1,00	0,04	0,10
101	Bts. Bojonegoro City - (Pajeng) Nganjuk Regency Bts.	38,42	0+000	38+420	38,42	13,92	14,20	3,00	7,30
101.11K	Jln. Cokroaminoto	0,97	0+000	0+970	0,97	0,77	0,20	0,00	0,00

101.12K	Jln. Kh. R. Moch. Rosyid	3,04	0+000	3+040	3,04	2,04	0,80	0,20	0,00
102	Bts. Bojonegoro Regency - Ponco	3,66	0+000	3+660	3,66	2,96	0,60	0,00	0,10
103	Ponco - Jatirogo (Bts. Prov. Central Java)	42,77	0+000	42+770	42,77	22,07	14,60	1,70	4,40
104	Pakah - Ponco	35,81	0+000	35+810	35,81	14,01	12,60	4,50	4,70
TOTAL		130,88			130,88	57,47	45,92	10,79	16,70

Source: PKRMS application processing results

Damage Category Evaluation

The results of grouping road conditions based on SDI values show that most road sections have minor damage. Road sections in the moderate category are generally located in areas with high traffic volumes. The main factor affecting the damage is the load pressure of heavy vehicles that pass by regularly. Longitudinal cracks and deformation are the most dominant types of damage in this section. In addition, the evaluation results indicate that there are critical points that require immediate maintenance action. Some sections in the medium category show the potential for more severe damage if not addressed immediately. Therefore, regular surveys through PKRMS are an important step to ensure timely treatment.

The damage categories generated by SDI provide in-depth information on the prioritization of actions required. By comparing this data with the results of the previous year's survey, a small increase in the level of damage was found, signaling the need for increased maintenance frequency.

Table 2. Damage Data on Cokroaminoto Road section

Section	Sta From (m)	Ke Sta (m)	1	2	3	4	5	6	7	8	9	Crack-Types	Crack-Wide	Rutting-Depth
101.11K	0	100	0	9,75	0	0	357,6	11,65	0	0	2	4	1	
101.11K	100	200	0	4	0	13	206	7,5	0	0	4	4	1	
101.11K	200	300	0	2,5	0	0	106,5	2,5	0	0	2	4	1	
101.11K	300	400	0	0	0	0	0	0	0	0	1	1	1	
101.11K	400	500	0	0	0	0	0	0	0	0	1	1	1	
101.11K	500	600	0	0	0	0	0	3	0	0	2	4	1	
101.11K	600	700	0	0	0	0	0	0	0	0	1	1	1	
101.11K	700	800	0	0	0	0	0	0	0	0	1	1	1	
101.11K	800	900	0	0	0	0	0	30	0	0	2	4	1	
101.11K	900	970	0	0,75	0	0	3	0	0	0	1	1	1	

Source: PKRMS application processing results

Figure 1. Photo of Blackvue PKRMS STA 0-100

Source: Screenshots of blackvue PKRMS

Effect of Traffic on Road Conditions

The average daily traffic volume (VLHR) on Cokroaminoto Road shows a high intensity of use. This is mainly due to the road's strategic role as the main link between Bojonegoro and Nganjuk. Heavy vehicles such as trucks and buses dominate the traffic, which puts significant pressure on the road structure. This traffic volume factor is one of the main causes of damage to several road sections. The survey results show that sections with high VLHR tend to have worse SDI values than sections with lower traffic. This reinforces the need to consider the traffic volume factor in road maintenance planning. In addition, traffic data is also used to prioritize maintenance measures. Road sections with high traffic intensity require faster treatment to prevent more extensive damage. By integrating traffic data into the PKRMS analysis, preservation measures can be planned more effectively.

Recommended Maintenance Action

Based on the results of the PKRMS survey, several maintenance measures are recommended for the Cokroaminoto Road section. Routine maintenance such as filling cracks and patching small holes is recommended for road sections with minor damage. This measure aims to prevent more serious damage. For road sections with moderate conditions, periodic maintenance such as overlaying the road surface is a top priority. This measure is expected to extend the service life of the road and restore standardized surface quality. In addition, full rehabilitation is recommended for critical points that are severely damaged. This recommendation is based on the TTI and SDI analysis, which shows the level of deterioration and maintenance needs. With proper prioritization, local governments can maximize the effectiveness of the road maintenance budget.

Discussion

The PKRMS survey results show that most sections of Cokroaminoto Road are in good condition, but there are still several points that require special attention, particularly sections that fall under the fair condition category. This finding aligns with the research of Amin et al.

(2023), which emphasizes the importance of data-based surveys in determining road maintenance priorities. Early identification of damage through the PKRMS method enables local governments to respond more quickly, ensuring that maintenance efforts prevent further deterioration and extend the service life of the road.

The damage categories identified through SDI (Surface Distress Index) provide valuable insight into the type and extent of existing damage. For instance, moderate-level damage, such as alligator cracks and deformation, was identified in specific sections. These findings support the conclusions (Tamrin, 2023), who highlighted the critical role of damage classification in establishing appropriate maintenance measures. In this study, the survey results indicate that targeted periodic maintenance, such as overlays, is necessary for these sections to prevent escalation to severe damage that would require costlier rehabilitation efforts.

One of the significant contributing factors to the road's condition is the high volume of daily traffic (VLHR), dominated by heavy vehicles such as trucks and buses. This finding aligns with (Numata et al., 2020), who demonstrated that heavy traffic intensity significantly accelerates road surface deterioration. The impact of these heavy loads is most evident in road deformation and aggregate wear. Consequently, prioritizing high-traffic sections for immediate maintenance is essential to avoid further functional and structural compromise.

The recommendations for maintenance actions generated from the PKRMS survey data are crucial for guiding road management strategies in Bojonegoro District. These recommendations align with (Pratiwi, 2023), who demonstrated that integrating PKRMS data with AHP can lead to more effective and efficient decisions in maintenance budget allocation. The AHP method, used to assign weights to various maintenance criteria, further enhances the prioritization process by balancing technical needs with economic and social considerations.

Moreover, the integration of AHP and PKRMS allows for a comprehensive evaluation of multiple factors, such as traffic intensity, road conditions, and the socioeconomic impact of road deterioration. This holistic approach ensures that limited resources are allocated optimally, focusing on sections that provide the highest benefit to regional connectivity and economic activity. For instance, roads with strategic importance for local industries or as inter-regional trade routes are identified as high-priority areas.

Finally, incorporating climatic factors into road management strategies is also essential. While this study focuses primarily on traffic-related damage, environmental influences such as heavy rainfall and extreme temperatures can exacerbate road deterioration. Adopting preventive maintenance measures that account for these external factors can further enhance the long-term functionality of the road network. In conclusion, the PKRMS survey results combined with AHP provide a robust framework for strategic road management. The findings highlight the importance of prioritizing high-traffic and moderately damaged sections for immediate action while advocating for a proactive approach to mitigate future damage. By

leveraging these integrated methodologies, Bojonegoro District can set a benchmark for sustainable and data-driven road infrastructure management.

CONCLUSION

Based on the PKRMS survey results on the Cokroaminoto Road section in Bojonegoro Regency, most of the road conditions are in the good category with a percentage of 79%, while the remaining 21% are in the medium category. The good road condition indicates that the road structure is still able to support vehicle mobility optimally. However, some damage points such as alligator cracking and aggregate deformation require regular maintenance to prevent further damage. The survey also shows that pressure from average daily traffic volume (VLHR), especially heavy vehicles, is a significant factor affecting road deterioration. The TTI and SDI data provided a comprehensive insight into the prioritization of maintenance measures that need to be taken. Overall, the integration between PKRMS survey data and multi-criteria analysis methods such as AHP enables more efficient and effective road management.

REFERENCES

Armayadi, A., Yamin, A., & Dharmawansyah, D. (2023). Penerapan Aplikasi Provincial/Kabupaten Road Management System (Pkrms) Pada Kegiatan Preservasi Jalan Di Kabupaten Sumbawa Barat. *Ganec Swara*, *17*(4), 1918–1923.

Febriamansyah, R. (2006). The use of AHP (the analytic hierarchy process) method for irrigation water allocation in a small river basin (case study in Tampo river basin in West Sumatra, Indonesia). *The 11th Conference of the International Association for the Study of Common Property*.

Fitriawan, A. A. (2023). *Arahan Penataan Sarana Sosial Ekonomi Untuk Meningkatkan Aksesibilitas Berbasis Konsep 15 Minute City Di Kawasan Suburban Kota Makassar*. Universitas Hasanuddin.

Iskandar, Y. A., Rachmawati, N. L., Kusmanto, T. A., Karwayu, M. M. U., Ramadina, P., & Sinaga, S. P. G. (2024). Penentuan Restorasi Jalan di Lampung Tengah Menggunakan Metode Analytical Hierarchy Process. *IKRA-ITH Teknologi Jurnal Sains Dan Teknologi*, *8*(2), 39–46.

Marleno, R., Witjaksana, B., & Oetomo, W. (2019). Analysis of Risk Mitigation of Development of Flood Control Reservoir of Jadi Village Tuban District. *Journal of Physics: Conference Series*, *1364*(1), 12053.

Masagung, M. (2023). *Analisis prioritas penanganan jalan kabupaten Brebes menggunakan aplikasi PKRMS kombinasi dengan metode AHP*. Universitas Islam Sultan Agung (Indonesia).

Nababan, D. (2014). Prioritas perbaikan jalan di kota Medan dengan menggunakan metode Analitycal Hierarchy Process (AHP). *Jurnal Mandiri Bina Prestasi*, *3*.

Numata, M., Sugiyama, M., & Mogi, G. (2020). Barrier analysis for the deployment of renewable-based mini-grids in Myanmar using the analytic hierarchy process (AHP). *Energies*, *13*(6), 1400.

Oetomo, W., Priyoto, P., & Uhad, U. (2017). Analisis Waktu dan Biaya dengan Metode Crash Duration pada Keterlambatan Proyek Pembangunan Jembatan Sei Hanyu Kabupaten Kapuas. *Media Ilmiah Teknik Sipil*, *6*(1), 8–22.

Prahastyo, K. Y., Sebayang, N., & Wulandari, L. K. (2019). Penentuan Skala Prioritas Pemilihan Jenis Perkerasan jalan dengan Metode Analitycal Hierarchy Process pada proyek Preservasi Rekonstruksi Jalan Sidoarjo–Pandaan–Purwosari–Malang-Kepanjen. *Infomanpro*, *8*(2), 1–16.

Pratiwi. (2023). *Penggunaan Kombinasi AHP dan PKRMS untuk Mengoptimalkan Strategi Preservasi Jangka Panjang dengan Mempertimbangkan Kriteria Struktural dan Fungsional pada Jaringan Jalan Strategis*.

Raharjo, K. (2021). *AHP dengan SIG untuk Penilaian Aset Jalan untuk Membantu Penentuan Prioritas Pemeliharaan di Jalan Raya Jawa, dengan Fokus pada Tindakan Preservasi*.

Santosa. (2022). *Prioritas Pembangunan Jalan dengan Mengintegrasikan Data PKRMS dan AHP untuk Memastikan Anggaran Pemeliharaan Dialokasikan pada Ruas Jalan yang Paling Krusial*.

Susanto, A. (2023). *Pemilihan Alternatif Perbaikan Perkerasan Jalan Pada Persimpangan Jalan Dengan Menggunakan Analytical Hierarchy Process (Studi Kasus: Simpang Empat Buntu Kabupaten Banyumas)*. Universitas Islam Sultan Agung (Indonesia).

Tamrin, K. (2023). *Analisis Penentuan Prioritas Kriteria Pemeliharaan Jalan Kabupaten Kebumen Menggunakan Metode Case Based Reasoning (CBR) Dan Analytical Hierarchy Process (AHP)*. Universitas Islam Indonesia.

Togelang, Y., Manoppo, F. J., & Dundu, A. K. T. (2021). Kajian Manajemen Risiko Pada Proyek Preservasi Jalan Dengan Metode AHP (Analytical Hierarchy Process). *Jurnal Teknik Sipil Unaya*, *7*(2), 63–72.

Triyanto, T., Syaiful, S., & Rulhendri, R. (2019). Evaluasi Tingkat Kerusakan Jalan Pada Lapis Permukaan Ruas Jalan Tegar Beriman Kabupaten Bogor. *ASTONJADRO*, *8*(2), 70–79.