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Original Article

Road Handling Priority Analysis Using Provincial/District Roads Management System Application and Analytical Hierarchy Process Method

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Abstract

This study aims to determine the priority of road handling in East Java Province by integrating the Provincial/District Roads Management System (PKRMS) application and the Analytical Hierarchy Process (AHP) method. Road condition data is obtained from PKRMS, including the physical condition of the road, traffic volume, and other parameters. The main criteria used in the AHP analysis are road condition, volume capacity ratio (VCR), connectivity, land use and priority areas of East Java Province. Each criterion was assessed and weighted based on its level of importance to produce road handling priorities. The results showed that the integration of PKRMS and AHP was able to produce a more accurate order of road handling priorities in accordance with strategic needs. In the UPT PJJ Surabaya Road Section, road improvement priorities are arranged based on the Triggered Priority Index (TPI) value obtained from the combined analysis. This research also provides cost estimates for each road section, which helps with more efficient budget planning. With this approach, it is expected that road management in East Java Province can be carried out more effectively, support inter-regional connectivity, and have a positive impact on economic growth.

Keywords: Provincial/District Roads Management System (PKRMS), Analytical Hierarchy Process (AHP), Road Handling Priority, Triggered Priority Index (TPI), East Java Province.

1. Introduction

East Java Province, as one of the largest provinces in Indonesia, has a very strategic role in the national economy. Its geographical location in the eastern part of Java Island makes East Java the gateway between the western and eastern regions of Indonesia, as well as the main route connecting various provinces in Java Island. Provincial roads in East Java are 1,671.57 km long and cover a wide area, covering lowlands to mountains, as well as crossing coastal areas rich in economic potential, such as the fishing industry and coastal tourism (BPS East Java, 2023). This road network is not only important for the smooth mobility of people within the province but also supports the flow of goods distribution from producers to consumers within and outside the province (Sushera et al., 2019).

Budget constraints are one of the main obstacles in managing road infrastructure in East Java. In this case, local governments are faced with the difficult choice of deciding which roads to prioritize for repair and which can be postponed (Girsang, 2018; Kusnadi & Warnars, 2021). Limited budgets force the government to choose the roads with the most severe damage and those that have a direct impact on economic activity and community welfare (Farhan et al., 2022). A study by Irawan et al. (2016) highlights the importance of a data-driven budget

management strategy to prioritize infrastructure improvements (Hobbs, 1995; Kusmaryono, 2021). By setting the right priorities, the government can ensure that the available budget is utilized effectively, especially for roads that have a major impact on community mobility and economy.

To face the increasingly complex challenges of road management and maintenance, the East Java Bina Marga Public Works Office has adopted the Provincial/District Roads Management System (PKRMS). PKRMS is a data-driven system specifically designed to assist the government in mapping, managing, and prioritizing road network management at the provincial and district levels. By integrating critical data such as road physical condition, traffic volume, and maintenance history, PKRMS enables the government to monitor the condition of road infrastructure in real-time, providing a key foundation for strategic decision-making.

PKRMS was developed with the main objective of improving the effectiveness of road management amidst budget constraints often faced by local governments. The system provides comprehensive data, including information on road deterioration, types of repairs needed, and estimated maintenance costs, allowing local governments to plan maintenance in a more targeted and prioritized manner (Masagung, 2023). With PKRMS, road maintenance can be carried out in a more systematic and data-driven manner, reducing the potential for budget waste due to subjective or inaccurate prioritization.

However, while PKRMS provides invaluable data for road management, it still has limitations in prioritizing improvements that consider multiple complex criteria simultaneously (Yuliani, 2021). For example, while PKRMS can show the physical condition of roads and traffic volumes, it does not directly prioritize which roads should be repaired first based on their economic impact or level of urgency based on multi-factor criteria. This is where integration with more comprehensive decision-making methods, such as the Analytical Hierarchy Process (AHP), which enables multi-criteria analysis to prioritize road improvements based on multiple criteria, is important (Susila & Munadi, 2007; Turbam et al., 1998).

Analytical Hierarchy Process (AHP) is a multi-criteria decision-making method developed to simplify the prioritization process in various scenarios. In the context of road management (Lu & Ruan, 2007; Saaty, 2001), AHP is very useful because it is able to assign weights to certain criteria that are relevant in prioritizing road improvements (Hariyadi, 2016; Simon, 1977). These criteria include the physical condition of the road, traffic volume, economic impact, and urgency of maintenance. By using AHP, the prioritization process can be done by considering each influential factor, so that the decisions taken are more comprehensive and data-based (Sugiarto, 2024).

This research aims to develop a road maintenance prioritization model in East Java Province by integrating PKRMS and AHP. With this integration, it is expected that the decision-making process related to road repair priorities can be carried out more efficiently and effectively, and support better planning for road maintenance and development in the future. The results of this research are expected to provide practical guidance for the East Java Bina Marga Public Works Office in optimizing budget use, extending road life, and supporting local economic stability through well-maintained road infrastructure that supports economic activity.

2. Methods

2.1. Population

The population in this study was determined as the first step in determining the research sample (Sugiyono, 2011). The population in this study refers to data on employees of the East Java Provincial Bina Marga Public Works Office at the Secretariat, the Regulatory and Control Division, the Development and Improvement Division, the Maintenance Division and the Surabaya Road and Bridge Management UPT itself as the research location. According to data from the staffing of the East Java Provincial Bina Marga Public Works Office, the number of employees who will be used as population data is 123 employees.

2.2. Sampling

Determination of the sample in this study was carried out by sampling technique. The technique used is non-probability sampling with a purposive sampling approach. To determine the number of samples to be used in this study, the authors used the Slovin formula as a tool in calculating the sample size (Sugiono, 2013; Sugiyono, 2016). With a population of 123 employees at UPT PJJ Surabaya, the Public Works Office of Bina Marga of East Java Province which is the object of research, the sample calculation based on the Slovin formula, the number n (sample) in this study was 33. Therefore, the distribution of this research questionnaire was only carried out to 33 respondents of the Public Works Office of Bina Marga of East Java Province.

2.3. Data Collection Procedure

Mixed method research was used in this research. Qualitative data or primary data in the form of road condition survey data is carried out by the survey method (Ahyar et al., 2020), where existing road condition survey data is collected in all UPT PJJ Surabaya roads of the East Java Province Bina Marga Public Works Office in the third quarter of 2024. LHR data was obtained from a traffic volume survey using the Moving Car Observer (MCO) method conducted by the East Java Province Bina Marga DPU Regulation and Control Division.

Quantitative research methods are based on the philosophy of positivism, which is applied to examine certain populations or samples. Sampling techniques are usually randomized, with data collected using research instruments. Data analysis is quantitative or statistical, aiming to test a predetermined hypothesis (Sugiyono, 2013: 14). Data in quantitative methods or secondary data is the result of data collection from literature studies or references obtained by the author.

2.4. Data Analysis Technique

According to Bogdan in Hardani, et al (2020: 161-162) data analysis is the process of systematically searching and compiling data obtained from interviews, field notes, and other materials so that it is easy to understand and the findings can be shared with others. Meanwhile, according to Sugiyono (2016: 60) Data analysis is a process for classifying data sorting into existing provisions to obtain results according to the data that has been obtained.

3. Results and Discussion

3.1. Performing Criteria Comparison Scores

Questionnaire data for criteria assessment is the result of respondents' evaluation of the criteria used to determine road handling priorities. In this study, there are five criteria used to determine road handling priorities, namely Road Condition (A), Road Service Level (B), Road

Connectivity (C), Priority Areas of East Java Province (D), Land Use (E). The assessment result data is as follows:

a. Comparison between Road Condition (A) and Road Service Level (B),
b. Comparison between Road Condition (A) and Road Connectivity (C),
c. Comparison between Road Condition (A) and Priority Areas of East Java Province (D),
d. Comparison between Road Condition (A) and Land Use (E),
e. Comparison between Road Service Level (B) and Road Connectivity (C),
f. Comparison between Road Service Level (B) and Priority Areas of East Java Province (D),
g. Comparison between Road Service Level (B) and Land Use (E),
h. Comparison between Road Connectivity (C) and Priority Areas of East Java Province (D),
i. Comparison between Road Connectivity (C) and Land Use (E),
j. Comparison between Priority Areas of East Java Province (D) and Land Use (E).

Based on the above comparison, a comparison table is made for each criterion as an example of the following comparison table for the criteria "Road Condition (A)" with "Road Service Level (B)":

Table 1. Comparison Table A with B

A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B

From the table 1 above, the more dominant criterion is chosen by selecting a number, so that it can be seen which criteria value comparison is more dominant. Then continue with other criteria so that all comparison values are obtained. For more details, it can be seen from one of the results of the comparison of criteria from one of the following questionnaire fillers:

Table 2. Criteria Comparison of One Questionnaire Filler

Kriteria	Skor																	Kriteria
Kondisi Jalan (A)	~~9~~	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Tingkat Pelayanan Jalan (B)
Kondisi Jalan (A)	9	~~8~~	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Konektivitas Jalan (C)
Kondisi Jalan (A)	9	8	~~7~~	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kawasan Prioritas Provinsi Jawa Timur (D)
Kondisi Jalan (A)	9	8	7	~~6~~	5	4	3	2	1	2	3	4	5	6	7	8	9	Tata Guna Lahan (E)
Tingkat Pelayanan Jalan (B)	9	~~8~~	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Konektivitas Jalan (C)
Tingkat Pelayanan Jalan (B)	9	8	~~7~~	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kawasan Prioritas Provinsi Jawa Timur (D)
Tingkat Pelayanan Jalan (B)	9	8	7	~~6~~	5	4	3	2	1	2	3	4	5	6	7	8	9	Tata Guna Lahan (E)
Konektivitas Jalan (C)	9	~~8~~	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kawasan Prioritas Provinsi Jawa Timur (D)
Konektivitas Jalan (C)	9	8	~~7~~	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Tata Guna Lahan (E)
Kawasan Prioritas Provinsi Jawa Timur (D)	9	8	7	~~6~~	5	4	3	2	1	2	3	4	5	6	7	8	9	Tata Guna Lahan (E)

Source: Researcher's Processed Results, 2024

From the results of the table 2 above, it can be seen that the values of 9, 8, and 7 where the value affects how important a value / weight comparison of one criterion with other

criteria. If the value obtained is 1, then it is considered that the criteria are equally important. The recapitulation of the answers to each respondent's perception of the criteria can be seen from Table 3 below:

Table 3. Recapitulation of Answers to Road Handling Criteria

R	Perbandingan Kriteria Penanganan Jalan									
	A	A	A	A	B	B	B	C	C	D
	B	C	D	E	C	D	E	D	E	E
R1	9	8	7	6	8	7	6	8	7	6
R2	0.125	0.143	7	5	7	8	7	8	6	0.125
R3	0.111	8	7	6	9	8	7	6	5	0.111
R4	8	9	8	9	0.125	8	9	8	7	5
R5	9	8	7	5	9	7	5	8	0.111	5

R	Perbandingan Kriteria Penanganan Jalan									
	A	A	A	A	B	B	B	C	C	D
	B	C	D	E	C	D	E	D	E	E
R6	9	8	6	0.111	6	7	0.111	7	8	0.111
R7	7	9	7	8	7	9	0.125	8	7	6
R8	9	8	8	7	8	6	8	8	7	6
R9	9	8	7	8	8	0.111	0.111	0.111	0.111	5
R10	9	8	6	0.111	5	7	0.143	0.143	0.143	0.143
R11	8	9	6	8	7	8	7	6	8	6
R12	9	8	8	7	8	0.111	0.111	0.111	0.111	7
R13	9	8	7	6	8	9	8	8	7	0.111
R14	9	9	8	9	7	8	0.111	8	0.111	6
R15	9	8	9	8	9	6	7	6	6	0.111
R16	0.125	8	7	8	8	6	8	7	8	6
R17	0.333	0.111	9	8	0.125	9	6	6	0.143	7
R18	0.111	9	8	7	9	8	8	7	8	0.125
R19	0.111	8	9	8	9	8	7	6	0.125	7
R20	8	9	8	7	8	7	8	6	8	0.125
R21	0.125	8	9	7	8	7	8	8	7	0.125
R22	0.111	9	8	8	7	8	8	8	0.125	8
R23	9	8	7	6	8	7	9	6	7	0.125
R24	0.111	9	8	7	8	7	8	8	8	0.125
R25	0.125	8	9	8	9	8	7	0.125	7	0.125
R26	9	8	7	6	8	9	6	8	0.125	7
R27	0.111	8	9	7	9	8	6	8	6	8
R28	0.125	8	8	8	9	9	9	8	5	0.125
R29	9	8	7	5	8	7	5	6	9	0.111
R30	0.111	8	9	7	9	8	7	8	0.125	5
R31	9	8	6	5	6	8	9	9	7	8
R32	0.125	9	8	7	5	9	6	5	0.125	9
R33	8	9	7	6	8	9	7	8	7	0.125

Source: Researcher's Processed Results, 2024

The description of Table 3 above is:
R : Respondents (from respondents 1 to 33)
A/B : Comparison between road condition (A) and road service level (B)
A/C : Comparison between road condition (A) and road connectivity (C)

A/D : Comparison between road conditions (A) and priority areas of East Java province (D)
A/E : Comparison between road conditions (A) and land use (E)
B/C : Comparison between road service level (B) and road connectivity (C)
B/D : Comparison between road service level (B) and priority areas of East Java province (D)
B/E : Comparison between road service level (B) with land use (E)
C/D : Comparison between road connectivity (C) and priority areas of East Java province (D)
C/E : Comparison between road connectivity (C) and land use (E)
D/E : Comparison between East Java provincial priority area (D) and land use (E).

3.1.1. Calculating the Geometric Mean of Criteria

From table 3, recapitulation of answers to road handling criteria, the next step is to calculate the geometric mean with formula 2.9, namely:

$$Geometric\ Mean: \left(\prod_{i=1}^{n} xi\right)^{\frac{1}{n}}$$

For further calculations,

A/B = $(9x0{,}125x0{,}111x8x9x9x7x9x9x9x8x \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 1,442
A/C = $(8x0{,}143x8x9x8x8x9x8x8x9x8x8x8x \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 6,356
A/D = $(7x7x7x8x7x6x7x8x7x6x6x8x7x6x6x \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 7,413
A/E = $(6x5x6x9x5x0{,}111x8x7x8x0{,}111x8x7x\ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 5,353
B/C = $(8x7x9x0{,}125x9x6x7x8x8x5x7x8x8x5 \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 5,936
B/D = $(7x8x8x8x7x7x9x6x0{,}111x7x8x0{,}111x \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 5,946
B/E = $(6x7x7x9x5x0{,}111x0{,}125x8x0{,}111x9x \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 3,392
C/D = $(8x8x6x8x8x7x8x8x0{,}111x0{,}143x6x \ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 4,392
C/E = $(7x6x5x7x0{,}111x8x7x7x0{,}111x8x7x7x\ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 1,410
D/E = $(6x0{,}125x0{,}111x5x5x0{,}111x6x6x\ldots\ldots\ldots\ldots x8)^{\frac{1}{33}}$ = 1,055

The results of the above calculations can show the relative comparison between the two criteria. For example, A/B means that road condition is considered 1.442 times more important than level of service.

3.1.2. Pairwise Comparison Matrix of Criteria

The data obtained from the geometric mean is formed into a matrix as follows:

Table 4. Criteria Pairwise Comparison Matrix

Criteria	A	B	C	D	E
A	1	1,442	6,355	7,413	5,353
B	0,694	1	5,936	5,946	3,397
C	0,157	0,168	1	4,392	1,410
D	0,135	0,168	0,228	1	1,055
E	0,187	0,294	0,709	0,948	1
Total	2,173	3,073	14,228	19,698	12,215

Source: Researcher's Processed Results, 2024

From the matrix above, the value of the normalization matrix of the value of each alternative cell can be known. The calculation method is the same as finding the criteria normalization matrix. Then look for the total value for each column and divide according to the number of 5 x 5 matrices, namely the total results of each column divided by 5 to find out the normalization value of each alternative. Then the following table is obtained:

Table 5. Alternative Normalization Matrix for Criteria

Criteria	A	B	C	D	E
A	0,460	0,469	0,447	0,376	0,438
B	0,319	0,325	0,417	0,302	0,278
C	0,072	0,055	0,070	0,223	0,115
D	0,062	0,055	0,016	0,051	0,086
E	0,086	0,096	0,050	0,048	0,082

Source: Researcher's Processed Results, 2024

The normalized weights for each criterion are as follows:

a. Weight of A $=\frac{0,460+0,319+0,072+0,062+0,086}{5}= 0,438$

b. Weight of B $=\frac{0,469+0,325+0,055+0,055+0,096}{5}= 0,328$

c. Weight of C $=\frac{0,447+0,417+0,070+0,016+0,050}{5}= 0,107$

d. Weight of D $=\frac{0,376+0,302+0,223+0,051+0,048}{5}= 0,054$

e. Weight of E $=\frac{0,438+0,278+0,115+0,086+0,082}{5}= 0,072$

From the normalized weight, correction is then made by adding up the total weight:

$$0,438+0,328+0,107+0,054+0,072 = 1$$

Therefore, it can be concluded that the calculation results above are correct.

3.1.3. Consistency Ratio Calculation

The next step is to measure the consistency ratio. AHP has a formula used to check the inconsistency of the entire matrix through a consistency test with the formula:

$$A.w = \lambda.w$$

description:

A : comparison matrix

w : priority weight

λ : eigin vector

Enter the value obtained:

$$\begin{pmatrix} 1 & 1,442 & 6,355 & 7,413 & 5,353 \\ 0,694 & 1 & 5,936 & 5,946 & 3,397 \\ 0,157 & 0,168 & 1 & 4,392 & 1,410 \\ 0,135 & 0,168 & 0,228 & 1 & 1,055 \\ 0,187 & 0,294 & 0,709 & 0,948 & 1 \end{pmatrix} \begin{pmatrix} 0,438 \\ 0,328 \\ 0,107 \\ 0,054 \\ 0,072 \end{pmatrix}$$

Based on the AHP analysis that has been carried out, the weight value of the criteria is obtained, summarizing the respondent's assessment for the criteria that have been determined, as follows.

Table 6. Summary of Criteria Priority Weights of AHP Analysis Results

No	Criteria	Criteria Description	Weight	Order
1	A	Road Condition	0,438	1
2	B	Road Service Level	0,328	2
3	C	Road Connectivity	0,107	3
4	D	Priority Areas of East Java Province	0,054	5
5	E	Land Use	0,072	4

Source: Researcher's Processed Results, 2024

From the results of the weight order of the criteria that affect the priority of road handling based on the AHP method, namely road condition criteria 43.80%, road service level 32.80%, road connectivity 10.70%, land use 7.20%, and Priority Areas of East Java Province 5.40%.

The final weighting for road handling priorities in UPT PJJ Surabaya is obtained by multiplying the local weight of the alternatives on each criterion by the global weight of the criteria. An example of calculating the Krian by pass road section (intersection four) - Krian (intersection five) using formula 2.12.

$$Y = 0.438x(0+0+0) + 0.107x0.046 + 0.328x0.043 + 0.054x0.045 + 0.072x(0.037+0+0.028) = 0.026$$

The calculation of the final weights of other road sections can be seen in Table 8 below.

Table 7. Final Weight Calculation of UPT PJJ Surabaya Using AHP Method Analysis

No.	No. Link	Nama Ruas	Kondisi Jalan			Konektivitas Jalan	VCR	Kawasan Prioritas	Tata Guna Lahan			Bobot Akhir
			0.438						0.072			
			Sedang	Rusak Ringan	Rusak Berat	0.107	0.328	0.054	Sosial Budaya	Pertanian & Perkebunan	Industri	
1	068	KRIAN BY PASS (SIMPANG EMPAT) - KRIAN (SIMPANG LIMA)	0	0	0	0.056	0.043	0.045	0.037	0	0.028	0.027
2	069	KRIAN - BTS. KAB. MOJOKERTO	0.104	0.040	0	0.028	0.046	0.045	0.15	0.083	0.149	0.111
3	070	BTS. KOTA SIDOARJO - KRIAN	0.063	0.000	0	0.056	0.059	0.045	0.263	0.083	0.066	0.085
4	070.11K	JLN. PAHLAWAN	0.005	0	0	0.056	0.049	0.045	0	0	0	0.027
5	071	SEPANJANG - TAMAN	0.005	0	0	0.056	0.029	0.045	0.038	0	0.011	0.024
6	072	MLIRIP - BTS. KAB. MOJOKERTO	0.005	0.020	0	0.056	0.036	0.045	0	0.042	0	0.034
7	105	BABAT - BTS. KAB. JOMBANG	0.330	0.320	0.486	0.056	0.047	0.045	0.125	0.083	0.033	0.539
8	106	BTS. KOTA LAMONGAN - BTS. KAB. MOJOKERTO	0.160	0.160	0.071	0.028	0.053	0.045	0.038	0.083	0.061	0.207
9	106.11K	JLN. LAMONG REJO	0	0	0	0.056	0.041	0.045	0	0	0	0.022
10	106.12K	JLN. ACMAD DAHLAN	0	0	0	0.028	0.027	0.045	0.013	0	0	0.015
11	106.13K	JLN. SUNAN DRAJAD	0	0	0	0.028	0.044	0.045	0	0	0	0.020
12	106.14K	JLN. RAYA MANTUP (JLN. GAJAH MADA)	0.005	0	0	0.028	0.037	0.045	0.025	0.083	0.011	0.028
13	107	SUKODADI - SUMBERWUDI	0.041	0.100	0.129	0.056	0.048	0.045	0.063	0.083	0.017	0.154
14	108	SUMBERWUDI - KARANG GENENG	0.018	0.100	0.100	0.028	0.043	0.045	0.038	0.083	0.011	0.124
15	109	BANJARWATI - PETIIN	0.028	0.060	0.057	0.056	0.039	0.045	0.063	0.083	0	0.095
16	110	BTS. KOTA SURABAYA - DRIYOREJO - LEGUNDI	0.048	0.020	0	0.056	0.041	0.045	0.038	0.083	0.227	0.077
17	111	LEGUNDI - BTS. KAB. MOJOKERTO	0.063	0.040	0	0.056	0.034	0.045	0.05	0.083	0.21	0.090
18	112	PETIIN (BTS. KAB. LAMONGAN) - KARANGCANGKRING (BTS. KAB. LAMONGAN)	0.038	0.060	0.114	0.028	0.043	0.045	0.013	0.083	0.017	0.121
19	132.11K	JLN. MASTRIP	0.074	0.080	0.043	0.056	0.072	0.045	0.038	0.042	0.16	0.135
20	132.12K	JLN. PRABU SILIWANGI	0.005	0	0	0.056	0.062	0.045	0	0	0	0.031
21	132.13K	JLN. GUNUNGSARI	0.008	0	0	0.028	0.052	0.045	0.013	0	0	0.027
22	133.11K	JLN. JOYOBOYO	0	0	0	0.056	0.054	0.045	0	0	0	0.026

Source: Researcher Processed Data, 2024

From Table 7 above, it can be seen that the Babat - Bts. Jombang Regency has the greatest weight of 0.539, for the priority order of handling other roads as follows.

Table 8. Priority Order of UPT PJJ Surabaya Road Handling Using AHP Method Analysis

No	Link Number	Section Name	Final Weight	Priority Order
1	068	Krian By Pass (Simpang Empat) – Krian (Simpang Lima)	0.027	15
2	069	Krian – Bts. Kab. Mojokerto	0.111	7
3	070.11k	Jln. Pahlawan	0.027	15
4	070	Bts. Kota Sidoarjo - Krian	0.085	10
5	071	Sepanjang - Taman	0.024	17
6	072	Mlirip – Bts. Kab. Mojokerto	0.034	12
7	105	Babat – Bts. Kab. Jombang	0.539	1
8	106.11k	Jln. Lamong Rejo	0.022	18
9	106.12k	Jln. Achmad Dahlan	0.015	20
10	106.13k	Jln. Sunan Drajad	0.020	19
11	106.14k	Jln. Raya Mantup (Jln. Gajah Mada)	0.028	14
12	106	Bts. Kota Lamongan – Bts. Kab. Mojokerto	0.207	2
13	107	Sukodadi – Sumberwudi	0.154	3
14	108	Sumberwudi – Karang Geneng	0.124	5
15	109	Banjarwati – Peti'in	0.095	8
16	110	Bts. Kota Surabaya – Driyorejo – Legundi	0.077	11
17	111	Legundi – Bts. Kab. Mojokerto	0.090	9
18	112	Peti'in (Bts. Kab. Lamongan) – Karangcangkring (Bts. Kab. Lamongan)	0.121	6
19	132.11k	Jln. Mastrip	0.135	4
20	132.12k	Jln. Prabu Siliwangi	0.031	13
21	132.13k	Jln. Gunungsari	0.027	15
22	133.11k	Jln. Joyoboyo	0.026	16

Source: Researcher Processed Data, 2024

3.2. Provincial/District Roads Management System (PKRMS) Application Analysis

The results of the analysis using PKRMS produce outputs that are useful as a reference for road management actions in accordance with the recommendations generated. One of the main outputs that can be displayed is the strip map. This strip map is a simple map that is generated based on the inventory data and road conditions that have been inputted. The map also provides information on the type of road damage, such as good, moderate, lightly damaged, or heavily damaged.

Figure 1. Example of Strip Map Results for the Babat - Bts Road Section. Jombang Regency

KONDISI JALAN PER SURVEI SEGMENT

Data Kondisi Jalan berdasarkan panjang segmen

NOMOR RUAS	105
NAMA RUAS	Babat - Bts. Kab. Jombang
PANJANG	30,850 meter

STA AWAL	STA AKHIR	KONDISI
0+000	4+300	BAIK
4+300	4+400	SEDANG
4+400	5+300	BAIK
5+300	6+100	SEDANG
6+100	6+200	BAIK
30+700	30+850	BAIK

KONDISI JALAN PER SURVEI SEGMENT

No.	Nomor Ruas	Nama Ruas	Panjang Ruas (Km)	STA Awal	STA Akhir	Kondisi
1	2	3	4	5	6	7
1	105	Babat - Bts. Kab. Jombang	30.85	0+000	0+100	B
				0+100	0+200	B
				0+200	0+300	B
				0+300	0+400	B
				0+400	0+500	B
				0+500	0+600	B
				0+600	0+700	B
				0+700	0+800	B
				0+800	0+900	B
				30+100	30+200	RB
				30+200	30+300	B
				30+300	30+400	B
				30+400	30+500	B
				30+500	30+600	B
				30+600	30+700	S
				30+700	30+800	B
				30+800	30+850	B

KODE KONDISI	
B	BAIK
S	SEDANG
RR	RUSAK RINGAN
RB	RUSAK BERAT

Figure 2. Road Condition Per Survey

PKRMS also produces statistical data in the form of recapitulated information in MS-Excel format. This report includes the percentage of roads that are in a stable or unstable condition, and supports decision-making planning related to road handling priorities. In addition, PKRMS also provides details of the road stability level for each analyzed section. The

results obtained by using 100% MCA on the five predetermined criteria can be seen in the table below.

Table 9. Recapitulation of TTI Conditions Using PKRMS Application

Ruas Jalan		Panjang Survei (km)	Patok KM		Tipe / Kondisi Perkerasan				Tak Dapat Dilalui (Km)	Lebar Perkerasan (m)
NOMOR	Nama		Dari	Ke	Baik (km)	Sedang (km)	Rusak Ringan (km)	Rusak Berat (km)		
068	KRIAN BY PASS (SIMPANG EMPAT) - KRIAN (SIMPA	1,33	0+000	1+328	1,33	0,00	0,00	0,00	0,00	9,48
069	KRIAN - BTS. KAB. MOJOKERTO	7,59	0+000	7+589	6,80	0,79	0,00	0,00	0,00	10,43
070	BTS. KOTA SIDOARJO - KRIAN	14,90	0+000	14+900	13,70	1,20	0,00	0,00	0,00	8,82
070.11K	JLN. PAHLAWAN	3,42	0+000	3+420	3,42	0,00	0,00	0,00	0,00	14,56
071	SEPANJANG - TAMAN	1,44	0+000	1+443	1,44	0,00	0,00	0,00	0,00	9,31
072	MLIRIP - BTS. KAB. MOJOKERTO	0,64	0+000	0+639	0,44	0,20	0,00	0,00	0,00	7,21
105	BABAT - BTS. KAB. JOMBANG	30,88	0+000	30+875	19,48	8,50	1,20	1,70	0,00	7,01
106	BTS. KOTA LAMONGAN - BTS. KAB. MOJOKERTO	21,76	0+000	21+756	12,06	8,60	0,60	0,50	0,00	6,64
106.11K	JLN. LAMONG REJO	1,10	0+000	1+101	1,10	0,00	0,00	0,00	0,00	12,00
106.12K	JLN. ACMAD DAHLAN	0,09	0+000	0+090	0,09	0,00	0,00	0,00	0,00	12,00
106.13K	JLN. SUNAN DRAJAD	0,71	0+000	0+710	0,71	0,00	0,00	0,00	0,00	12,00
106.14K	JLN. RAYA MANTUP (JLN. GAJAH MADA)	2,19	0+000	2+193	2,00	0,19	0,00	0,00	0,00	8,00
107	SUKODADI - SUMBERWUDI	10,80	0+000	10+800	8,20	2,10	0,10	0,40	0,00	6,37
108	SUMBERWUDI - KARANG GENENG	2,00	0+000	2+000	0,50	0,60	0,40	0,50	0,00	6,00
109	BANJARWATI - PETI'IN	11,50	0+000	11+500	10,10	0,80	0,00	0,60	0,00	5,12
110	BTS. KOTA SURABAYA - DRIYOREJO - LEGUNDI	11,43	0+000	11+425	11,23	0,20	0,00	0,00	0,00	9,86
111	LEGUNDI - BTS. KAB. MOJOKERTO	9,73	0+000	9+726	9,33	0,40	0,00	0,00	0,00	8,50
112	PETIIN (BTS. KAB. LAMONGAN) - KARANGCANGKR	3,70	0+000	3+700	1,30	1,90	0,20	0,30	0,00	7,00
132.11K	JLN. MASTRIP	7,87	0+000	7+870	7,27	0,60	0,00	0,00	0,00	10,50
132.12K	JLN. PRABU SILIWANGI	0,61	0+000	0+610	0,61	0,00	0,00	0,00	0,00	12,00
132.13K	JLN. GUNUNGSARI	2,82	0+000	2+820	2,82	0,00	0,00	0,00	0,00	12,43
133.11K	JLN. JOYOBOYO	0,89	0+000	0+890	0,89	0,00	0,00	0,00	0,00	12,18
TOTAL		147,39			114,80	26,08	2,50	4,00	0,00	
Persentase					77,89%	17,70%	1,70%	2,71%	0,00%	

Source: Researcher Processed Data, 2024

Road stability in the Surabaya Road and Bridge Management Unit in quarter 3 of 2024 is also the result of processed data in PKRMS.

Table 10. Road stability condition of UPT PJJ Surabaya

Long (Km)	Stable (steady)		Not Stable (unsteady)	
	Km	%	Km	%
147,39	140,89	95,59%	6,50	4,41%

Source: Researcher Processed Data, 2024

Table 10 shows the percentage of road stability in UPT PJJ Surabaya where 95.59% of roads are in a stable condition, while the remaining 4.14% require further improvement. Other results include the total damage incurred on all road sections analyzed, along with recommended treatments as a solution to maintain road stability.

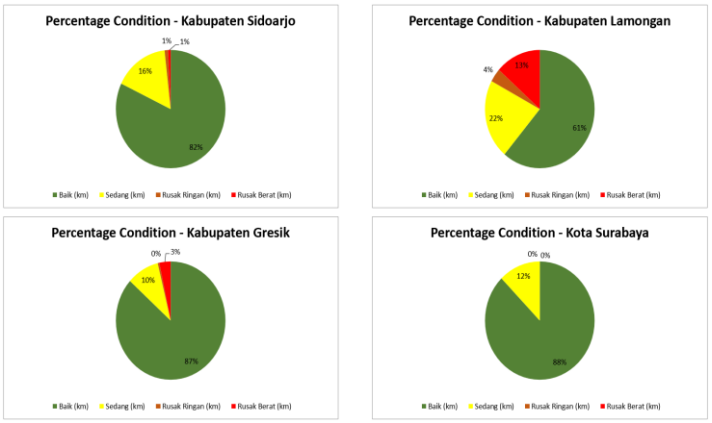

Figure 3. Percentage of Road Condition in UPT PJJ Surabaya

The value that shows the priority order of road subscriptions is the TPI or Triggered Priority Index value, from the results of the calculation and analysis above, the priority order of road handling in UPT PJJ Surabaya based on the PKRMS application is as follows.

Table 11. Priority Order of UPT PJJ Surabaya Road Subscription with Analysis Using PKRMS Application

No	Link Number	Section Name	TPI Value	Priority Order
1	068	Krian By Pass (Simpang Empat) – Krian (Simpang Lima)	7.2	11
2	069	Krian – Bts. Kab. Mojokerto	2.1	13
3	070.11k	Jln. Pahlawan	11.2	9
4	070	Bts. Kota Sidoarjo - Krian	11.9	8
5	071	Sepanjang - Taman	1.5	16
6	072	Mlirip – Bts. Kab. Mojokerto	27.6	3
7	105	Babat – Bts. Kab. Jombang	23.1	4
8	106.11k	Jln. Lamong Rejo	0	19
9	106.12k	Jln. Achmad Dahlan	0	19
10	106.13k	Jln. Sunan Drajad	0	19
11	106.14k	Jln. Raya Mantup (Jln. Gajah Mada)	3.7	12
12	106	Bts. Kota Lamongan – Bts. Kab. Mojokerto	22.8	5
13	107	Sukodadi – Sumberwudi	19.4	7
14	108	Sumberwudi – Karang Geneng	56.0	1
15	109	Banjarwati – Peti'in	10.4	10
16	110	Bts. Kota Surabaya – Driyorejo – Legundi	21.8	6
17	111	Legundi – Bts. Kab. Mojokerto	1.7	14
18	112	Peti'in (Bts. Kab. Lamongan) – Karangcangkring (Bts. Kab. Lamongan)	53.7	2
19	132.11k	Jln. Mastrip	1.3	17
20	132.12k	Jln. Prabu Siliwangi	1.1	18
21	132.13k	Jln. Gunungsari	1.6	15
22	133.11k	Jln. Joyoboyo	0	19

Source: Researcher Processed Data, 2024

4. Conclusion

Integration of the Provincial/District Roads Management System (PKRMS) with the Analytical Hierarchy Process (AHP) method to determine road handling priorities in East Java Province is carried out by calculating priority weights using AHP. These priority weights are used as guidelines for determining Multi-Criteria Analysis (MCA) parameters. Next, the MCA criteria values and MCA values for each road section are inputted into the system. The next stage is to conduct an analysis using PKRMS to obtain the Triggered Priority Index (TPI), which then becomes the basis for determining the priority of road handling in the UPT PJJ Surabaya Road Section.

The priority order of road handling in the UPT PJJ Surabaya Road Section in East Java Province using the Provincial / Regency Roads Management System (PKRMS) application combined with the Analytical Hierarchy Process (AHP) method is as follows: Jalan Sumberwudi - Karang Geneng with a TPI value of 56, Jalan Peti'in (Bts. Lamongan Regency) - Karangcangkring (Bts. Lamongan Regency) with a TPI value of 53.7, Jalan Bts. Lamongan City - Bts. Mojokerto Regency with a TPI value of 34.2, Road Bts. Surabaya City - Driyorejo - Legundi with a TPI value of 32.7, Babat Road - Bts. Jombang Regency with a TPI value of 28.9, Mlirip Road - Bts. Mojokerto district with TPI value 27.6, Sukodadi - Sumberwudi road with TPI value 24.2, Bts. Sidoarjo City - Krian with TPI value 17.9, Banjarwati - Peti'in Road with TPI value 10.4, Krian By Pass (Simpang Empat) - Krian (Simpang Lima) Road with TPI value 7.2, Jln. Raya Mantup (Jln. Gajah Mada) with TPI value 3.7, Krian - Bts. Mojokerto Regency with a TPI value of 3.1, Jalan Legundi - Bts. Mojokerto with TPI value of 2.5, Jln. Gunungsari with TPI value of 2, Jalan Sepanjang - Taman with TPI value of 1.5, Jln. Prabu Siliwangi with TPI value of 1.4, Jln. Lamong Rejo, Jln. Achmad Dahlan, Jln. Sunan Drajad and Jln. Joyoboyo with TPI value of 0.

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