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Analysis of the Determination of the Priority Level of Road Handling Based on the Multi-Criteria Analysis Method (MCA) on Provincial Roads in Sidoarjo

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Abstract
East Java Provincial Roads are very important infrastructure supporting the economic and social activities of the community. However, the diverse road conditions—ranging from minor to severe damage—pose a serious challenge to smooth transportation and various economic activities. Limited maintenance budgets, coupled with increased traffic loads, exacerbate this situation. Therefore, determining priorities in road handling is a crucial step to ensure the effective use of budgets and the optimization of benefits for the community. The method used to determine the priority of road handling is multi-criteria Analysis. This study aims to formulate road handling priorities in East Java Province by considering various factors. These factors are grouped into two broad categories: policy and technical. In terms of policy, the main considerations include conformity with the Strategic Plan of the East Java Provincial Public Works Office (Renstra), which contains priority policies for regional development, and the Regional Spatial Plan (RTRW). Meanwhile, for technical factors, attention is paid to several aspects, such as road width, road stability conditions, traffic volume, and degree of saturation. The results of this research are expected to be recommendations for local governments in formulating more effective and sustainable road management policies.
Keywords: Road Handling Priorities, Strategic Plan, Criteria Analysis

INTRODUCTION

Road transportation plays a pivotal role in regional development (Pratiwi et al., 2024). High-quality roads enhance connectivity and accessibility, facilitating the efficient movement of goods and people, which in turn supports economic growth, improves quality of life, and fosters national integration. Properly maintained road infrastructure ensures the smooth flow of goods, services, and people, contributing to societal efficiency and growth (Ivanova & Masárová, 2013). Moreover, improved transportation accessibility facilitates an increase in regional competitiveness by reducing transportation costs and allowing individuals and firms to access broader markets (Chen et al., 2020). The development of road infrastructure is critical in driving economic growth and improving social activities (Ng et al., 2019). A well-developed road network is crucial for the economic, social, and overall development of a country, serving as a lifeline for transportation and connecting people, goods, and services across different regions (Paunova & Tzonevska, 2023). Furthermore, investments in road infrastructure not only improve economic efficiency and productivity but also contribute to reducing social and economic inequality by expanding access to markets and employment opportunities (Bado & Dunakhir, 2024).

Provincial roads in East Java serve as the backbone of connectivity between regions and are central to the area's economic growth. To ensure the smooth operation of this connectivity, the East Java Provincial Government carries out road maintenance through its Regional Apparatus Organizations (OPDs), which hold duties and authority in road management and maintenance (Baihaqi & Hermawan, 2023). One of these OPDs is the East Java Provincial Highway Public Works Office, responsible for maintaining 1,671.57 km of provincial roads, as stipulated in the Decree of the Governor of East Java Number 188/210/KPTS/013/2023 concerning the Determination of the Status of Road Sections as Provincial Roads (Akbar, Patriadi, & Sajiyo, 2025). The Public Works and Highways Office executes road maintenance via the Technical Implementation Unit (UPT), which is divided into 11 regions; each UPT manages its own area, including UPT Surabaya (Baihaqi & Hermawan, 2025). This decentralized approach allows for more localized and efficient management of road maintenance activities (Public Works and Housing Ministry of Indonesia, 2023). The UPTs are tasked with conducting routine and periodic maintenance, rehabilitation, and reconstruction of provincial roads to ensure their functionality and safety. These efforts are critical in supporting the mobility of goods and people, thereby contributing to the overall development and economic stability of East Java Province (PwC Indonesia, 2023). However, challenges such as budget constraints and varying road conditions require careful planning and prioritization of maintenance activities to optimize resource allocation and achieve sustainable infrastructure development (Baihaqi & Hermawan, 2023).

The Technical Implementation Unit (UPT) of Road and Bridge Management functions as a technical implementation element of the Agency that carries out operational tasks in the field. Led by the Head of UPT, this unit operates under the direct responsibility of the Head of the Service (PU, 2019). The Road and Bridge Management Unit has the authority to carry out part of the Office's duties in the management and maintenance of roads and bridges, administration, and public services. UPT Surabaya is responsible for provincial roads in the Surabaya City area, Sidoarjo Regency, Lamongan Regency, and Gresik Regency, managing a total road length of 147.39 km, where congestion frequently occurs. This responsibility is stipulated in the Decree of the Governor of East Java Number 188/210/KPTS/013/2023 concerning the Determination of the Status of Road Sections as Provincial Roads. The Public Works and Highways Office executes road maintenance via the Technical Implementation Unit (UPT), which is divided into 11 regions; each UPT manages its own area, including UPT Surabaya (Baihaqi & Hermawan, 2023). This decentralized approach allows for more localized and efficient management of road maintenance activities. The UPTs are tasked with conducting routine and periodic maintenance, rehabilitation, and reconstruction of provincial roads to ensure their functionality and safety. These efforts are critical in supporting the mobility of goods and people,

thereby contributing to the overall development and economic stability of East Java Province. However, challenges such as budget constraints and varying road conditions require careful planning and prioritization of maintenance activities to optimize resource allocation and achieve sustainable infrastructure development. Studies have shown that integrating systems like the Provincial/District Roads Management System (PKRMS) with decision-making tools such as the Analytical Hierarchy Process (AHP) can enhance the prioritization and efficiency of road maintenance (Farida et al., 2025). Additionally, factors like organizational culture and work ethic have been found to significantly influence employee motivation and performance within UPT Surabaya, impacting the effectiveness of road management operations (Rahadianto, 2022).

The government, through the relevant agencies appointed as road operators, needs funding to ensure that roads remain in good condition. The budgeting process for road maintenance involves stages of proposal, discussion, and allocation. Priority determination in this process is governed by policies that consider which proposed road sections will be addressed first. Evaluating various alternatives, considering resource limitations, and choosing the options deemed most effective and efficient are crucial parts of decision-making. However, the lengthy process often results in delays in prioritization.

The current situation on provincial roads in the Sidoarjo region shows varied conditions, ranging from light to severe damage. This poses a serious obstacle to smooth transportation and local economic activities. Congestion caused by the high volume of vehicles also disrupts driving comfort for road users. Coupled with a limited maintenance budget and increasing traffic loads, the problem worsens. Therefore, prioritizing road handling is a vital step to ensure effective use of available funds and to optimize benefits for the community.

Previous research by Widodo et al. (2019) focused on road maintenance in urban areas, evaluating road conditions and suggesting maintenance priorities based on traffic volume and damage levels. While this study provided valuable insights into the relationship between traffic volume and road deterioration, it did not incorporate a comprehensive evaluation of policy aspects and funding constraints in decision-making for road prioritization. A similar study by Budianto and Aryanto (2021) used cost-benefit analysis to assess road maintenance strategies in rural areas but lacked an in-depth examination of socio-economic impacts and regional differences in maintenance priorities. Both studies contributed significantly to understanding road maintenance challenges but did not address the complexities of decision-making involving multiple criteria beyond technical aspects.

This study aims to determine the order of priorities in road handling by utilizing *Multi-Criteria Analysis (MCA)*. With this approach, it is hoped that the research can provide strategic guidance for decision-making, allowing road handling to be carried out more effectively and efficiently by considering

relevant technical and policy aspects. The results of this study are expected to provide useful recommendations for local governments, especially the East Java Provincial Public Works Office, in formulating road management policies on provincial roads. This research will focus on three regions: Surabaya Regency, Surabaya City, and Batu City. In addition, the expected benefit of this study is to increase accessibility for the community as road users, enabling smoother mobility.

METHOD

This study adopted a quantitative approach using the Multi-Criteria Analysis Method (MCA) to determine the priority of road handling based on the weighted influence of various criteria. The subjects involved stakeholders from the East Java Provincial Public Works Agency, including echelon officials, regional stakeholders, and employees of the Surabaya Road and Bridge Management UPT. The research focused on provincial roads in Sidoarjo and was conducted over two months, covering observation surveys, data collection, and analysis.

Two types of data were collected: primary and secondary. Primary data were obtained through questionnaires distributed to stakeholders to determine the importance and weight of each criterion on a scale from 1 to 6, ensuring the total weight of all criteria summed to 100. Secondary data included information on road sections based on the Governor's 2023 decree on Provincial Road Status, average daily traffic (LHR) data from 2023, road conditions reported by UPT Surabaya in 2024, and development priority policies from the East Java Highway Public Works Office Strategic Plan for 2019–2024.

Data analysis was conducted systematically using the MCA method. The first step involved defining principles, criteria, and indices, such as traffic density, traffic volume, road conditions, cost requirements, and development priority policies. Primary data from the questionnaires were processed using a pairwise comparison matrix and a consistency test to calculate the weight of each criterion. The averaged weights produced an overall score, which was then analyzed alongside secondary data to determine the prioritization of alternative road handling options.

The results identified priorities for road handling based on objective criteria and data. This research is expected to contribute strategically to decision-making regarding road infrastructure management in East Java Province, especially in the Sidoarjo area.

RESULTS AND DISCUSSION

Development Priority Policy Data

This priority policy data is in accordance with the strategic plan of the Highway Public Works Office 2019 – 2024 Amendment II. In the strategic

plan, it is stated that the East Java Provincial Public Works Highway Office divides the priorities for handling road sections according to the designation of strategic areas, namely:

Based on the Strategic Plan Study of Ministries / Institutions related to development (Presidential Decree Number 80 of 2019)

a. Provincial roads that support access to the Gerbangkertosusila Priority Area and its surroundings:
   1) Bts. Regency Sidoarjo - Bts. Mojosari City (Link. 157)
   2) Bts. Gresik Regency – Mlirip (Link. 161)
   3) Bts. Regency Sidoarjo – Mojokerto (Link. 162)
   4) Mojokerto – Deck (Link. 163)
   5) Jln. Wahab Hasbullah (Link. 168.11K)
   6) Jln. Hasyim Ashari (Link. 168.12K)
   7) Bts. Jombang City – Pulorejo (Link. 169)
b. Provincial roads that support access to the Madura and Islands Region as a Support for the Gerbangkertosusila Area and its surroundings:
   1) Bts. Kota Sampang – Ketapang (Link. 228)
   2) Bts. Sampang City – Omben (Link. 229)
   3) Drink - Bts. Pamekasan Regency (Link. 230)
   4) Bts. Sampang Regency - Bts. Pamekasan City (Link. 232)
c. Provincial roads that support access to the Ijen Ring Area as a Support for the Bromo - Tengger - Semeru Area and its surroundings:
   1) Bts. Pasuruan City – Kejayan (Link. 195)
   2) Kejayan – Tosari (Link. 196)
d. Provincial roads that support access to the Selingkar Wilis Priority Area and its surroundings:
   1) Arjosari - Purwantoro (Bts. Prov. Central Java) (Link. 137)
   2) Wareng – Kemukus (Link. 138)
e. Provincial roads that support access to the South Cross Road and its surroundings:
   1) Bts. Malang City – Turen (Link. 189)

Based on the Regional Spatial Plan Study

a. Intercity Freeway/Toll Road Development Plan:
   1) Kertosono – Kediri (+ 40.50 km) (Presidential Decree No. 80/2019)
   2) Manyar – Tuban (+65.00 km)
   3) Demak – Tuban (+174.00 km)
   4) Mojokerto – Gempol (+38.71 km) (Presidential Decree No. 80/2019)
   5) Malang – Kepanjen (+ 24.00 km) (Presidential Decree No. 80/2019)
   6) Singosari – Batu (+00.00 km)
   7) Suramadu - Tanjung Bulupandan (+ 15.30 km) (Presidential Decree No. 80/2019)
   8) Sukorejo - Batu (+ 40.00 km)
   9) Batu - Kediri (+ 70.00 km)
   10) Kediri - Tulungagung (+ 20.35 km) (Presidential Decree No. 80/2019)

11) Probolinggo - Lumajang (+ 32.00 km) (Presidential Decree No. 80/2019)
12) Juanda - Gempol (+ 46.00 km)
13) Ngawi - Bojonegoro - Tuban - Lamongan - Gresik (+ 186.80 km) (Presidential Decree No. 80/2019)
14) Krian - Pucukan (+ 00.00 km)
15) Mojokerto - Lamongan (+00.00 km)
16) Situbondo - Bondowoso - Jember (+ 65.00 km)
17) Lumajang - Jember (+56.32 km)
18) Jember - Banyuwangi (+105.82 km)
19) Lumajang - Kepanjen (+ 00,00 km)
20) Kepanjen – Tulungagung (+ 00.00 km)
21) Tulungagung - Trenggalek (+ 00,00 km)
22) Trenggalek – Pacitan (+00.00 km)
23) Pacitan - Yogyakarta (+ 00.00 km)
24) Pasuruan - Sukorejo (+00.00 km)

b. Inner City Freeway/Toll Road in accordance with Presidential Regulation No. 80/2019:
   1) Waru (Aloha) - Wonokromo - Tanjung Perak (+ 18.20 km)
   2) Juanda Airport - Tanjung Perak (+ 23.00 km)
c. Primary Collector Road Network 2 (JKP-2) in East Java Province
   1) Nganjuk - Bojonegoro - Ponco - Jatirogo - Bts. Central Java
   2) Tuban – Bojonegoro - Nganjuk
   3) Poncho - Pakah
   4) Kandangan - Pulorejo - Jombang - Ploso - Babat
   5) Gedek - Lamongan
   6) Mojokerto - Mlirip - Legundi - Driyorejo - Joyoboyo
   7) Turen - Malang - Batu - Kandangan - Pare - Kediri
   8) Batu - Pacet - Mojosari - Krian By Pass
   9) Sidoarjo - Krian
   10) Karanglo - Pendem
   11) São Paulo - São Paulo
   12) Pandaan – Tretes
   13) Copyright © 2019 Copyright © 2019 Copyright © 2019
   14) The Importance of Teaching - Teaching
   15) Kejayan - Tosari
   16) Walk - Kencong - Pity - Balung - Ambulu - Mangli
   17) Poor Shepherd - Poor Shepherd
   18) Jember - Bondowoso - Situbondo
   19) Copyright © 2019 Rogojampi. All Rights Reserved.
   20) Blitar - Srengat - Kediri - Nganjuk

21) Arjosari - Nawangan
22) Pacitan - Arjosari – Dengok
23) Wareng - Mucus
24) Maospati - Magetan - Cemorosewu
25) Ponorogo - Biting
26) Ngantru – Srengat

d. Primary Collector Road Network 3 (JKP-3) in East Java Province
   1) Along - Garden
   2) Mojokerto - Gedek - Bts. Kab. Jombang/Bts. Kab. Mojokerto - Ploso
   3) Grobogan - Bts.Kab.Jember/Bts.Kab.Lumajang - Pondokdalem
   4) Balong - Rambipuji
   5) Maesan - Kalisat - Smash
   6) The Devil Wears Prada - Goodbye
   7) The Battle of the Bulge - O'Neill
   8) Five Years of Silence - A Five-Year-Old Story
   9) The Great Barrier Reef - The Great Barrier Reef
   10) The Great Barrier Reef - Dunkin' Donuts
   11) Sampang - Ketapang
   12) Sampang - Drink – Pamekasan
   13) Pamekasan - Sotabar
   14) The Walking Dead - The Beach Boys

e. Provincial strategic road network:
   1) Dengok – Pacitan (supporting the border areas of Golekpawon / Ponorogo, Trenggalek, Pacitan, Wonogiri, Pawonsari / Pacitan, Wonogiri, Wonosari and Karismapawirogo / Karanganyar, Wonogiri, Sragen, Magetan, Pacitan, Ngawi, Ponorogo)
   2) Ponorogo - Biting (Bts. Prov. Central Java) (supporting the border areas of Golekpawon / Ponorogo, Trenggalek, Pacitan, Wonogiri and Karismapawirogo / Karanganyar, Wonogiri, Sragen, Magetan, Pacitan, Ngawi, Ponorogo)
   3) Maospati – Magetan (supporting the border areas of Karismapawirogo / Karanganyar, Wonogiri, Sragen, Magetan, Pacitan, Ngawi, Ponorogo)
   4) Bojonegoro - Nganjuk - Guyangan - Simpang Empat Candi – Kediri (supporting the Selingkarwilis area, the golden triangle / Lamongan, Tuban, Bojonegoro, natural gas / Exxon and Kediri Airport)
   5) Pakah – Ponco (supporting the border areas of Ratubangnegoro / Blora, Tuban, Rembang, Bojonegoro, Golden Triangle / Lamongan, Tuban, Bojonegoro and natural gas)
   6) Tripe – Jombang (supporting the golden triangle area / Lamongan, Tuban, Bojonegoro)
   7) Joyoboyo - Driyorejo - Legundi - Mlirip - Mojokerto - Gedek - Ploso (supporting the Gerbangkertasusila area)

8) Krian By Pass - Krian – Mojosari (supports Gerbangkertasusila area)
9) Sidoarjo – Krian (supporting the Gerbangkertasusila area)
10) Karanglo – Batu (supporting the BTS area, Malangraya)
11) Turen - Malang - Batu - Bts. Kediri Regency (supports the BTS area, Malangraya)
12) Pandaan – Tretes (supporting the geothermal area of Mount Welirang, Mount Arjuno)
13) Pasuruan - Kejayan – Tosari (supporting the BTS area)
14) Kejayan – Purwosari (supporting the BTS area)
15) Purwodadi – Nongkojajar (supporting the BTS area)
16) Lumajang – Kencong – Kasian – Balung – Rambipuji (supporting tourism/beach areas and puger cement factory plans)
17) Jember - Arjasa - Maesan - Bondowoso - Situbondo (supporting the Mount Ijen area)
18) Kulon Tile - Wonorekso – Rogojampi (supports the Mount Ijen area and the air port)
19) Jajag - Simpang Lima Peran – Pasanggaran (supporting the Mount Ijen area)

From the data of the Strategic Plan, several provincial sections in the Sidoarjo area are included in the handling priority, both as listed sections and as supporting sections. Here's a recap for each section

Budgeting Cost Standard Data

In budgeting planning, the East Java Provincial Government uses cost standards to budget an activity. In Governor's Regulation no. 18 of 2024 concerning Expenditure Standard Analysts and Technical Standards, the costs for road handling are as follows:

Table 1. Recap of pricing standards for budgeting

Handling Type	Handling Type	Unit	Cost (Rp)
Routine Maintenance of Good Condition Roads	Holding treatment	Miles	164.672.144
Routine Maintenance of Medium Condition Roads	Holding treatment	Miles	351.850.128
Periodic maintenance of 6 m wide road	Maintenance of pavement, road shoulders, and foundation layers	Miles	3.892.340.256
Periodic maintenance of 6 – 7 m wide roads	Maintenance of pavement, road shoulders, and foundation layers	Miles	3.892.340.256
Periodic maintenance of 7 – 9 m wide roads	Maintenance of pavement, road shoulders, and foundation layers	Miles	5.359.676.896
Periodic maintenance of 9 - 11 m wide roads	Maintenance of pavement, road shoulders, and foundation layers	Miles	6.337.901.360
Road Reconstruction / Widening	2 meter road widening with 6 meter road width overlay	Miles	6.639.708.992
Road Reconstruction / Widening	2 meter road widening with 7 meter road width overlay	Miles	7.138.299.952

Handling Type	Handling Type	Unit	Cost (Rp)
Road Reconstruction / Widening	3 meter road widening with 7 meter road width overlay	Miles	8.064.524.720
Road Reconstruction / Widening	2-meter road widening with 9-meter road width overlay	Miles	8.135.481.984
Road Reconstruction / Widening	2-meter road widening with 11-meter road width overlay	Miles	10.985.113.552

Source: Processed Researcher, 2024

In this study, for handling good conditions, the Good Condition Road Routine Maintenance budget will be used, for handling moderate conditions, the Medium Condition Road Routine Maintenance budget will be used, for handling lightly damaged conditions, the periodic road maintenance budget will be used by adjusting the width of the road, for handling heavy damaged conditions, the Road Reconstruction / Widening budget will be used by adjusting the width of the handling road.

The budgeting calculation is carried out by multiplying the length of the section according to the road condition by the budget value according to the road condition. Then, from each condition in one segment is accumulated. The following is an example of the calculation of the budgeting costs needed.

Budget needs for good road handling:
Anggaran
= Panjang kondisi baik X Satuan biaya anggaran pemeliharaan kondisi baik

Priority Selection of Road Handling with MCA

The priority selection of the road management program uses a multi-criteria analysis method to determine the priorities for handling provincial roads in the Sidoarjo area. The analysis is carried out using a simple matrix with predetermined criteria with a certain assessment system that will produce a value or weight which is then used as the basis for selecting road handling priorities.

To determine the choice of priority for handling provincial roads in the Sidoarjo area, there are several considerations that must be considered. These considerations are then used as criteria and sub-criteria in the assessment of each road section so that the selected handling priorities will be obtained in the planning of road widening maintenance development. The criteria and sub-criteria are outlined in the following table.

Table 2. Criteria and Sub-Criteria

No	Criterion	Sub-Criteria
1	Technical Factors	Road Width
		LHR
		Degree of Saturation (DS)
		Road Damage Conditions

No	Criterion	Sub-Criteria
2	Policy Factors	Strategic Plan of Ministries / Institutions related to development
		Regional Spatial Plan
		Budgeting Cost Needs

Source: Processed Researcher, 2024

The following is an explanation of each of the criteria and sub-criteria above:

1. Technical Factors
   a. Road Width

      Road width is an important factor in road handling because it affects the ability of road capacity to accommodate vehicles passing through the road.
   b. LHR

      Average daily traffic is very important in assessing road conditions, if traffic conditions are large or exceed the existing road capacity, it can result in road conditions easily being damaged faster outside of the initial planning conditions and also interfere with the performance of traffic flow.
   c. Degree of Saturation

      The degree of saturation is a factor that is considered, because it is an indicator that the road can be categorized as experiencing congestion or not, in other words it is a *Level of Service* (LOS) indicator.
   d. Road Damage Conditions

      The condition of road damage is good and is in the category of stable road conditions. Meanwhile, the condition of light damage and heavy damage is included in the condition of the road is not stable.
2. Policy factors
   a. Strategic Plan of Ministries / Institutions related to development

      This policy is based on Presidential Regulation Number 80 of 2019 concerning the Acceleration of Economic Development in the Gresik - Bangkalan - Mojokerto - Surabaya - Sidoarjo - Lamongan Area, Bromo - Tengger - Semeru Area, and the Wilis and South Lintas Areas. The East Java Provincial Public Works Office as a regional apparatus aligns its vision in development with this Presidential Regulation through the official strategic plan that has been prepared.
   b. Regional Spatial Plan

      This policy was also adopted by the East Java Provincial Public Works Office to emphasize the integration of development by paying attention to regional development plans.
   c. Budgeting Cost Needs

      The need for budgeting costs uses the reference to cost standards that apply in the province of East Java such as in the East Java Governor's Regulation on ASB (Cost Standard Analysis) which in the

appendix contains ASB for road handling with a unit price per kilometer.

Analyze the condition of each segment

From the explanation of several criteria for determining priorities, it is necessary to analyze the condition of each section to be able to conduct an assessment according to the criteria that have been determined. The following is an explanation of the conditions of each section. The following is an explanation of the conditions of each alternative.

Table 3. Code for each section

Code	Field Name
R1	Krian By Pass (Simpang Empat) – Krian (Simpang Lima)
R2	Copyright © 2019 Mojokerto District. All Rights Reserved.
R3	Stuttgart
R4	Bts. Sidoarjo City - Krian
R5	Along - Garden
R6	Mlirip – Bts. Mojokerto Regency

Source: Processed Researcher, 2024

Determination of criteria weights based on questionnaires

Numerical scales are used to compare each assessment parameter to determine which parameters are considered more important than others. In this thesis, a numerical scale of numbers 1 – 5 is used, with a value of 1 for non-essential, linear to a value of 5 which indicates that it is very important. The respondents will fill out a questionnaire and give a score on each criterion. From the results of the questionnaire, it will be calculated with a total score of 100 and become the weight of each criterion. The following are the weighting results for each criterion.

Table 4. Results Weighting Criteria

Criterion	Response Results						Total weight
	1	2	3	4	5	Sum	%
Road Width		1	4	8	6	76	0,146
LHR		1	3	7	7	74	0,142
Degree of saturation (DS)			2	10	6	76	0,146
Road Damage Conditions				9	9	81	0,155
Development Priority Area Policy			7	7	4	69	0,132

Criterion	Response Results						Total weight
	1	2	3	4	5	Sum	%
Regional Spatial Plan (RTRW) Policy		1	5	9	3	68	0,130
Budget Needs			2	8	8	78	0,149
					Total	**522**	**1**

Source: Processed Researcher, 2024

Determination of the score of each criterion

Each criterion is scored based on several constraints. In this study, limits were used to obtain low, medium, and high limit values adjusted to the conditions of each alternative. For the low limit, it is given a value of 1, medium is given a value of 2, while the high is given a value of 3. Each section will be accumulated in value.

Table 5. Criteria Limitations

No	Criterion	Limitation		
		Low	**Medium**	**High**
1	**Technical Factors**			
	Road Width	>10 m	7-10 m	<7 m
	LHR	<1000 smp/h	1000 - 2000 smp/h	>2000 junior high school/hour
	Degree of saturation (DS)	<0.85	0,85 - 1,00	>1.00
	Road damage conditions	100% Road Stability Percentage	Road Stability Percentage 85% - 100%	Road Stability Percentage <85%
2	**Policy Factors**			
	Development Priority Area Policy	Fields Not Listed	Segment Not Listed, but is the fin of the segment supporting segment listed	Listed Fields
	Regional Spatial Plan (RTRW) Policy			
	toll	Fields Not Listed	Segment Not Listed, but is the fin of the segment supporting segment listed	Listed Fields
	JKP-2	Fields Not Listed	Segment Not Listed, but is the fin of the segment supporting segment listed	Listed Fields
	JKP-3	Fields Not Listed	Segment Not Listed, but is the fin of the segment supporting segment listed	Listed Fields
	Strategic Network	Fields Not Listed	Segment Not Listed, but is the fin of the	Listed Fields

No	Criterion	Limitation		
		Low	Medium	High
			segment supporting segment listed	
	Budget Needs	The need for a handling budget reaches <300,000,000	The need for a handling budget reaches 300,000,000 - 1,000,000,000	The need for a handling budget reaches >1,000,000,000

Source: Processed Researcher, 2024

From the limitations of these criteria, scores will be given for each criterion in each section. The score will be multiplied by the weight we have calculated based on Table 4.18. The calculation of the final score of each section uses the following formula.

$$S_i = \sum_{j=1}^{n} w_j s_{ij} = w_1 s_{i1} + w_2 s_{i2} + \cdots + w_n s_{in}$$

Where:

S_i = total score or final score for the criteria

w_j = weighting criteria

s_{ij} = criterion score

The following are the score results for each section based on the table below

Table 6. Priority ranking of road handling

Code	Field Name	Final score	Rank
R1	Krian By Pass (Simpang Empat) – Krian (Simpang Lima)	156,40	5
R2	Copyright © 2019 Mojokerto District. All Rights Reserved.	201,30	1
R3	Stuttgart	164,40	4
R4	Bts. Sidoarjo City - Krian	185,80	3
R5	Along - Garden	141,80	6
R6	Mlirip – Bts. Mojokerto Regency	200,90	2

Source: Processed Researcher, 2024

From the results of the analysis and calculation of the selection of priority road handling with *Multi Criteria Analysis* (MCA) obtained results that the greatest value was in R2 with a value of 279.30, so that R2 will be used as a priority for handling selected roads. And for a recapitulation of each alternative can be seen in the table above.

For the budget needed to handle all sections, Rp. 7,928,143,285.00 is needed. However, if the budget received by UPT PJJ Surabaya for road handling in Sidoarjo does not reach what is needed, then *holding treatment will be carried* out for road sections that have not been allocated the budget.

CONCLUSION

The analysis using the Multi-Criteria Analysis (MCA) method identified the key criteria influencing road handling priorities on provincial roads in Sidoarjo, with road stability (15.50%) having the greatest weight, followed closely by budget needs, road width, degree of saturation, Average Daily Traffic, and relevant policy considerations. Based on these criteria, the highest priority for road handling was assigned to the R2 section (Krian – Mojokerto Regency Boundary), followed by R6, R4, R3, R1, and R5 sections, providing an objective basis for resource allocation and infrastructure improvement in the upcoming fiscal year. For future research, it is recommended to incorporate real-time traffic and environmental impact data to further refine prioritization and support more dynamic road management decisions.

REFERENCES

Akbar, S. F., Patriadi, A., & Sajiyo. (2025). Analysis of the influence of road handling based on technical and policy factors on provincial roads in Sidoarjo. *Enrichment: Journal of Multidisciplinary Research and Development, 3*(2), 364–373. Retrieved from

Bado, B., & Dunakhir, S. (2024). The role of infrastructure in driving economic growth: A qualitative literature study. *Formosa Journal of Multidisciplinary Research, 3*(11), 4279–4288. https://doi.org/10.55927/fjmr.v3i11.12352

Baihaqi, H. D., & Hermawan, H. (2023). Analysis of determining priority of road maintenance using the Provincial/District Road Management System in East Java. *Journal of Civil Engineering, 38*(1), 17–30. Retrieved from

Baihaqi, H. D., & Hermawan, H. (2025). Optimization of road handling priorities using Provincial/District Roads Management System integration and Analytical Hierarchy Process at UPT PJJ Surabaya, East Java. *ResearchGate.* Retrieved from

Chen, Z., Zhang, Y., & Chen, J. (2020). Transportation accessibility and regional growth in the Yangtze River Delta, China. *Transportation Research Part A: Policy and Practice, 134,* 1–14. https://doi.org/10.1016/j.tra.2020.01.004

Farida, N. A., Nugroho, L. D., & Muhammadun, H. (2025). Optimization of road handling priorities using Provincial/District Roads Management System integration and Analytical Hierarchy Process at UPT PJJ Surabaya, East Java. *Transpublika International Research in Exact Sciences, 4*(1), 17–30. https://doi.org/10.55047/tires.v4i1.1568

Governor of East Java. (2023). *Keputusan Gubernur Jawa Timur Nomor 188/210/KPTS/013/2023 tentang Penetapan Status Ruas Jalan sebagai Jalan Provinsi.* Retrieved from https://jdih.jatimprov.go.id/

Ivanova, E., & Masárová, J. (2013). Importance of road infrastructure in the

economic development and competitiveness. *Proceedings of the 18th International Conference on Management,* 4253–4261. https://doi.org/10.5755/j01.em.18.2.4253

Ng, C. P., Law, T. H., Jakarni, F. M., & Kulanthayan, S. K. (2019). Road infrastructure development and economic growth. *IOP Conference Series: Materials Science and Engineering, 512*(1), 012045. https://doi.org/10.1088/1757-899X/512/1/012045

Paunova, D., & Tzonevska, D. (2023). Strategic development of the national road network. *IOP Conference Series: Materials Science and Engineering, 1297*(1), 012016. https://doi.org/10.1088/1757-899X/1297/1/012016

Pratiwi, A. S., Syartinilia, & Pravitasari, A. E. (2024). Perubahan Tutupan Lahan, Degradasi, dan Deforestasi Hutan di Kabupaten Nabire Periode 2000-2019. *Jurnal Lanskap Indonesia*, *16*(2), 199–207. https://doi.org/10.29244/jli.v16i2.54249

Public Works and Housing Ministry of Indonesia. (2019). *Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia Nomor 17/PRT/M/2019 tentang Organisasi dan Tata Kerja Unit Pelaksana Teknis.* Retrieved from https://jdih.pu.go.id/

Public Works and Housing Ministry of Indonesia. (2023). *Provincial Road Improvement and Maintenance (PRIM) program end-of-program review*. Retrieved from https://www.dfat.gov.au/sites/default/files/prim-epr-report.pdf

PwC Indonesia. (2023). *Road infrastructure: Regions accelerate repairs.*

Rahadianto, A. I. (2022). Organizational culture, work ethos on employees' motivation and performance at UPT Surabaya Road–Bridge Management. *Indonesian Journal of Multidisciplinary Science, 1*(6), 623–627.