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ANALYSIS OF DETERMINING ROAD DAMAGE REPAIR METHODS BASED ON AVAILABILITY OF BUDGET ON THE ROAD SEGMENT OF EAST JAVA PROVINCE

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ABSTRACT

Pavement damage on the Maospati - Magetan - Cemorosewu Road is severe, with issues such as potholes, surface deformation, peeling asphalt layers, and structural deflections due to heavy vehicle loads. These conditions pose significant risks, particularly during the rainy season, leading to hazardous driving conditions. This research aims to analyze the extent of road surface damage and recommend appropriate maintenance solutions using the PKRMS (Provincial/District Road Management System) method and the Bina Marga method. Data were collected through field surveys and official agency reports to assess road conditions. The findings indicate that the overall road condition is relatively good, with low levels of damage. Based on the Bina Marga and PKRMS assessments, routine maintenance is the most suitable repair strategy to prevent further deterioration and enhance road safety. The research underscores the importance of proactive and regular road maintenance planning to ensure long-term road durability. Future research should explore cost optimization strategies and predictive maintenance models to improve infrastructure sustainability.

Keywords: *bina marga; maintenance cost; Multi Criteria Analysis (MCA); PKRMS; road maintenance recommendation*

INTRODUCTION

Indonesia's growing economy encourages increased mobility of goods and people, making road infrastructure a vital element in supporting the welfare of society. Roads are essential in various aspects, such as economic, social, political, and national defense, as stipulated in Law Number 38 of 2004. Good road infrastructure facilitates the distribution of goods and services and improves people's standard of living. One type of pavement that is commonly used is flexible pavement, the quality of which is highly dependent on the thickness and quality of the appropriate materials (Aprizaldy et al., 2017). However, road construction often faces challenges, including excessive traffic loads, unstable environmental conditions, and the use of low-quality materials that can accelerate road deterioration. Therefore, periodic maintenance is crucial to ensure roads remain serviceable and support economic activity (Lestari et al., 2018).

Road damage problems often occur in various regions due to factors such as vehicle loads that exceed capacity, extreme weather conditions, and poor quality materials (Latifa et al., 2021). If maintenance is not carried out regularly, minor defects can develop into more severe ones, affecting the safety of road users and increasing repair costs (Soltan & Ashrafi, 2020). Early road deterioration often occurs on newly constructed pavements or those that have been repaired through the overlay method, influenced by factors such as increased traffic volume, unstable subgrade characteristics, and poor drainage systems (Darwoto et al., 2023). Therefore, road infrastructure maintenance must follow appropriate technical procedures to ensure long-term durability and safety of the road (Ferdian & Reski, 2020).

Poor road conditions also impact driving speed, congestion, and increase the risk of traffic accidents (Lestari et al., 2018). Heavy vehicle loads such as trucks and buses can cause deformation, cracks, and wear on the road surface, which is further exacerbated by high traffic frequency and non-strict vehicle load regulations (Chen & Lin, 2025; Di Bacco et al., 2024; Ma & Lee, 2025). Road damage cases like the one on the Maospati - Magetan - Cemorosewu Road show that combining excessive vehicle loads and standing water can accelerate pavement degradation (Supardi & Mokhtar, 2023). During the rainy season, water that seeps into the pavement can be trapped below the surface, causing voids that accelerate the formation of potholes and a decrease in road durability (Hidayat & Santosa, 2018). Therefore, greater attention to road maintenance is needed to prevent further damage and maintain transportation safety and efficiency (Aulia Dewi Fatikasari, 2021).

In practice, the function of road pavement often does not align with expectations, as it should provide optimal service without experiencing significant damage during its operational period (Chen & Lin, 2025; Ma & Lee, 2025). According to the Bina Marga method, the road improvement program is planned by considering daily traffic volume and the level of road damage, which includes routine maintenance, periodic maintenance, and road upgrades (Delfina et al., 2023). Routine maintenance is performed periodically to address minor damage, while periodic maintenance is conducted at specific intervals to repair more serious damage (Yusup & Kartika, 2019). Meanwhile, road upgrades aim to enhance road capacity and quality to meet transportation needs. Road condition assessments can be conducted through various methods, such as visual inspections, non-destructive techniques using Ground Penetrating Radar (GPR) and deflectometers, and modeling methods that utilize analysis software to forecast road service life (Ribolini et al., 2025). Additionally, the Pavement Condition Index (PCI) and Visual Condition Assessment (VCA) methods are employed to categorize the type and level of road defects to determine maintenance priorities (Ruiz-Guzman et al., 2025). By combining these methods, road conditions can be assessed comprehensively, enabling effective repairs and maintenance to enhance the safety and comfort of road users.

Research by Latifa et al. (2021) showed that analysis using the PCI (Pavement Condition Index) method resulted in an average PCI value of 30.44 on Jalan Kebangkitan Nasional, so the recommended corrective action is immediate reconstruction. Meanwhile, research by Salsabilla et al. (2020) compared the Bina Marga 1990 and PCI methods to determine a more significant level of road damage. In addition, Hidayat (2018) used the IRI (International Roughness Index) method based on LHR (Average Daily Traffic) values to assess road conditions and design appropriate maintenance programs, confirming the importance of diverse approaches to road condition assessment to improve the quality of transportation infrastructure (Zulham et al., 2025). Pembuain et al. (2019) also applied the IRI method with the NAASRA Roughness Meter tool and analyzed the relationship between IRI and road defects using bivariate and multivariate approaches. Their results yielded two multiple regression models with R^2 values of 0.550 and 0.571, respectively, indicating a strong relationship between IRI and road condition. These findings underscore the importance of appropriate analytical methods in accurately predicting and addressing road deterioration to improve the effectiveness of future transportation infrastructure maintenance.

While existing studies have explored road assessment methods like PCI and IRI, a gap remains in the comprehensive application and comparative analysis of the PKRMS and Bina Marga methods, particularly within the specific context of East Java province road segments. This research addresses this gap by providing a detailed analysis of road damage on the Maospati - Magetan - Cemorosewu road section using the PKRMS and Bina Marga methods. By integrating these two methodologies and considering the budgetary constraints specific to the region, this research offers new insights into optimizing road maintenance strategies and resource allocation for East Java road infrastructure. This approach contributes a more nuanced understanding of road deterioration patterns and effective intervention strategies tailored to the region's local conditions and financial realities.

Based on the problems identified in this research, road repair measures are necessary to address the damage that has occurred. The improvement process begins with a road damage assessment to identify the type and extent of existing damage. Next, it is important to analyze traffic characteristics through surveys to understand the pattern and intensity of road use. Once data on the extent of damage and traffic characteristics has been collected, the next step is to calculate maintenance costs for the detected damage, and assess the available budget for the repairs. With this structured approach, it is expected that repairs will be effective and efficient, thereby improving the quality and safety of road infrastructure in the future. An in-depth understanding of road conditions and traffic characteristics will enable better maintenance planning, ensuring that investments are maximized and sustainable. This is essential to support economic growth and increased mobility. This research aims to analyze the level of road surface damage and provide recommendations for proper handling on the Maospati - Magetan - Cemorosewu road section, Km 180+040 to Km 219+100, using the PKRMS method and the Bina Marga method.

METHOD

This research aims to analyze the level of road damage, provide recommendations for proper handling, and optimize the maintenance budget on the Maospati - Magetan - Cemorosewu Road section, Km 180+040 to Km 219+100, with a total length of 39.6 kilometers. The research began with a literature review to understand the concept of road damage assessment based on the Bina Marga method, including calculating maintenance costs and optimizing budget allocations. The data collection stage included primary and secondary data. Primary data were obtained through field surveys using the Bina Marga method, including measurements of road damage and drainage channel conditions. Secondary data were obtained from DPU Bina Marga UPT PJJ Madiun Region's official documents, including previous road damage data, average daily traffic (LHR) data, and road maintenance budget.

A road damage survey was conducted to identify the type and extent of damage by measuring the length and extent of damage on each 100 meter segment. Drainage channel condition assessment was conducted in conjunction with the visual field survey. The collected data were then analyzed to determine the value of road damage and the priority scale of handling based on damage value, LHR class, and road function. The priorities were grouped into three categories: road improvement for segments with priority scores 0-3, periodic maintenance for priority scores 4-6, and routine maintenance for priority scores 7-9.

RESULTS AND DISCUSSION

Road Condition Assessment with PKRMS

Road condition assessment is an assessment of technical criteria that is quantified into a score for determining road handling priorities. The road condition assessment uses the Provincial / Regency Road Management System (PKRMS) where the damage data is the survey data from the DPU Bina Marga of East Java Province. The following is data on the assessment of road conditions in 2022 on the Maospati - Magetan - Cemorosewu section, Km 180 + 040 - Km 219 + 100 in the Madiun UPT PJJ Region on the section there are several links, among others: Link 141; Link 141 (11K); Link 141 (12K); Link 141 (13K); Link 141 (14K); Link 141 (15K); Link 141 (16K); Link 141 (17K); and Link 142.

Table 1. Recapitulation of Road Performance Condition with PKRMS Method

Research Location Link	Type of Damage				
	Good	Medium	Lightly Damaged	Severely Damaged	Not Passable
Link 141	88,04%	11,96%	00,00%	00,00%	00,00%
Link 141.11K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 141.12K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 141.13K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 141.14K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 141.15K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 141.16K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 141.17K	100,00%	00,00%	00,00%	00,00%	00,00%
Link 142	86,36%	11,16%	2,48%	00,00%	00,00%
Average Percentage	**97,16%**	**2,57%**	**0,48%**	**00,00%**	**00,00%**

Source: Processed by Researcher, 2024

From the results of the recapitulation of road conditions on the Maospati - Magetan - Cemorosewu section, Km 180 + 040 - Km 219 + 100 above states that the average assessment of road conditions with "Good" damage conditions is around 97.16%; "Moderate" damage conditions are around 2.57%; "Light Damage" damage conditions are around 0.48%; "Heavy Damage" conditions are around 00.00%; and "Unpassable" conditions are around 00.00%.

Road Condition Assessment with Bina Marga Method

The Bina Marga method is one of the road condition assessment methods. The final result is a priority order to determine the road damage repair program. In addition, the Bina Marga method can be used to assess drainage damage, where the final result is the value of drainage damage conditions to determine the drainage condition maintenance program.

In the analysis of road damage assessment with the Bina Marga method, the following is data on the assessment of road conditions in 2022 on the Maospati - Magetan - Cemorosewu section, Km 180 + 040 - Km 219 + 100 in the Madiun UPT PJJ Region on the section there are several links, among others:

Link 141; Link 141 (11K); Link 141 (12K); Link 141 (13K); Link 141 (14K); Link 141 (15K); Link 141 (16K); Link 141 (17K); and Link 142. For the assessment of road conditions with the Bina Marga method, the division per segment is 100 m.

Pavement Condition Assessment

The assessment of pavement condition in the Bina Marga method is influenced by two main factors: daily traffic volume and the physical condition of road damage. Daily traffic volume is the total number of vehicles passing through the road section in one day. The daily traffic volume greatly affects the performance of a pavement. The higher the traffic volume on the road section, the greater the effect on road damage. The daily traffic volume is obtained from the Average Daily Traffic (LHR) data. The physical condition of road damage is the level and extent of damage to the road section under review. The type of damage assessed is in the form of surface texture, potholes, patching, cracking, rutting, and depression. A visual survey was conducted to determine the type of damage contained in the road section.

Determination of Road Class Based on LHR Data

Based on the results of the average traffic data (LHR), the total number (vehicles/day) of each link on the Maospati - Magetan - Cemorosewu section, Km 180 + 040 - Km 219 + 100 in the Madiun PJJ UPT Area with several links, including: links 141, 141.11K, 141.17K, and 142 have 2-way roads while for links 141.12K, 141.13K, 141.14K, 141.15K, 141.16K are 1-way roads. Based on the above results, the total number of vehicles on link 141 is 53,169 vehicles/day, for link 141.11K is 49,537 vehicles/day, for link 141.12K is 49,537 vehicles/day, for link 141.13K is 31.952 vehicles/day, for link 141.14K by 40,391 vehicles/day, for link 141.15K by 23,895 vehicles/day, for link 141.16K by 23,443 vehicles/day, for link 141.17K by 42,872 vehicles/day, and for link 142 by 41,857 vehicles/day.

From the results of research on traffic classes for maintenance work, a road class value is obtained on the Maospati - Magetan - Cemorosewu section, Km 180 + 040 - Km 219 + 100 in the Madiun UPT PJJ Region. Based on the above results for the road class value on link 141 obtained by 8, for the road class value on link 141.11K obtained by 7, for the road class value on link 141.12K by 7, for the road class value on link 141.13K by 7, for the road class value on link 141.14K by 7, for the road class value on link 141.15K by 7, for the road class value on link 141.16K by 7, for the road class value on link 141.17K by 7, and for the road class value on link 142 by 7.

Recapitulation of Road Condition Data

In the Bina Marga method, road damage is assessed per 100 meters, followed by determining the type of road damage and the percentage of length or area of damage for each type of road damage. The types of road damage analyzed in the Bina Marga method include cracks (which consist of alligator, random, transverse, and longitudinal), furrows, patches, potholes, collapse, and roughness (which consists of close texture, fatty, rough, grain release, and disintegration).

A ruler, a meter, and a roll meter were used to measure road damage. The measured road condition is then entered into the form to calculate the damage area for each type of damage and the percentage of the damage area. The following is an example of road condition data on link 142 segment 46.

Table 2. Example of Road Damage Calculation on Segment 46

STA	Pavement Surface Type		Flexible Pavement
	Damage Type		Percentage of Damage Area
Segment 46	**Roughness**		
		Extensive	
	Fatty (F)		0,16%
	Rough		
	Disintegration (D)		
	Loose Granules	1,14	
	Hole		
	Total =	3	0,14%
		0,98	
	Patches		

Quantity =	$\frac{2}{1,71}$	0,24%
Crack		
Crocodile Crack		0,51%
Random Crack	3,6	
Longitudinal Cracks		
Transverse Crack		
Flow		
Depth =	1	3,20%
Length =	3,2	
Amblas		
Depth =	0,8	0,09%
Total Area =	0,61	

Source: Processed by Researcher, 2024

Calculation example:

a. Area of road with loose grain = 0,36 m²
   Percentage of damage area $= \frac{0{,}36\ m^2}{100\ m \times 7{,}12m} = 0{,}16\%$

b. Number of holes in segment 46 = 3
   Area of road with potholes = 0,3 m²
   Percentage of damage area $= \frac{0{,}98\ m^2}{100\ m \times 7{,}12\ m} = 0{,}14\%$

c. Number of patches on segment 46 = 2
   Road area with patches = 1,71 m²
   Percentage of damage area $= \frac{1{,}71\ m^2}{100\ m \times 7{,}12\ m} = 0{,}24\%$

d. Area of road with random cracking = 3,6 m²
   Percentage of damage area $= \frac{3{,}6\ m^2}{100\ m \times 7{,}12\ m} = 0{,}51\%$

e. Length of road that is grooved = 3,2 m
   Percentage of damage length $= \frac{3{,}2\ m}{100\ m} = 3{,}2\%$

f. Number of collapses in segment 46 = 2
   Road area with patches = 0,61 m²

g. Percentage of damage area $= \frac{0{,}61\ m^2}{100\ m \times 7{,}12\ m} = 0{,}09\%$

In segment 46 there are cracks with random crack type, which has a damage number of 4. Random crack width > 2 mm which has a damage number of 3. The total area of random cracks is 3.6 m2 or 0.51% of the total area of segment 46 which has a damage number of 1. There is a groove depth of 6 - 10 mm with a damage number of 3. There are 2 patches with a total area of 1.71 m2 or 0.24% of the total area of segment 46 and 3 holes with a total area of 0.98 m2 or 0.14% of the total area of segment 46, which has a damage rate of 0. There is roughness with grain release type which has a damage rate of 3. There is a collapse depth of 2 - 5 cm with a total area of 0.61 m2 or 0.09% of the total area of segment 46 which has a damage rate of 2.

Prioritization

Prioritization is obtained by reducing the coefficient with the road class value and road condition value in each segment. The road improvement program is divided into 3 types. The improvement program is carried out when the road condition value is between 0 - 3. The periodic maintenance program is carried out when the road condition value is between 4 - 6. The routine maintenance program is carried out when the road condition value is between 7 - 9.

As for the recapitulation of condition values based on the type of road condition along with the improvement program on the Maospati - Magetan - Cemorosewu section, Km 180 + 040 - Km 219 + 100 in the Madiun UPT PJJ Region for each link can be seen in Table.

Table 3. Road Condition Score on Link 141 Segments per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
60	180+040 - 180+100	3	1	9	Routine Maintenance
100	180+100 - 180+200	3	1	9	Routine Maintenance
100	180+200 - 180+300	1	1	9	Routine Maintenance
100	180+300 - 180+400	1	1	9	Routine Maintenance
100	180+400 - 180+500	1	1	9	Routine Maintenance
100	180+500 - 180+600	1	1	9	Routine Maintenance
100	180+600 - 180+700	1	1	9	Routine Maintenance
100	180+700 - 180+800	2	1	9	Routine Maintenance
100	180+800 - 180+900	2	1	9	Routine Maintenance
100	180+900 - 181+000	2	1	9	Routine Maintenance
100	181+000 - 181+100	1	1	9	Routine Maintenance
100	181+100 - 181+200	1	1	9	Routine Maintenance
100	181+200 - 181+300	1	1	9	Routine Maintenance
100	181+300 - 181+400	2	1	9	Routine Maintenance
100	181+400 - 181+500	2	1	9	Routine Maintenance
100	181+500 - 181+600	2	1	9	Routine Maintenance
100	181+600 - 181+700	1	1	9	Routine Maintenance
100	181+700 - 181+800	1	1	9	Routine Maintenance
100	181+800 - 181+900	1	1	9	Routine Maintenance
100	181+900 - 182+000	11	4	6	Periodic Maintenance
100	182+000 - 182+100	14	5	5	Periodic Maintenance
100	182+100 - 182+200	14	5	5	Periodic Maintenance
100	182+200 - 182+300	12	4	6	Periodic Maintenance
100	182+300 - 182+400	10	4	6	Periodic Maintenance
100	182+400 - 182+500	13	5	5	Periodic Maintenance
100	182+500 - 182+600	12	4	6	Periodic Maintenance
100	182+600 - 182+700	1	1	9	Routine Maintenance
100	182+700 - 182+800	1	1	9	Routine Maintenance
100	182+800 - 182+900	1	1	9	Routine Maintenance
100	182+900 - 183+000	1	1	9	Routine Maintenance
100	183+000 - 183+100	2	1	9	Routine Maintenance
100	183+100 - 183+200	2	1	9	Routine Maintenance
100	183+200 - 183+300	2	1	9	Routine Maintenance
100	183+300 - 183+400	2	1	9	Routine Maintenance
100	183+400 - 183+500	2	1	9	Routine Maintenance
100	183+500 - 183+600	1	1	9	Routine Maintenance
100	183+600 - 183+700	2	1	9	Routine Maintenance
100	183+700 - 183+800	1	1	9	Routine Maintenance
100	183+800 - 183+900	1	1	9	Routine Maintenance
100	183+900 - 184+000	1	1	9	Routine Maintenance
100	184+000 - 184+100	1	1	9	Routine Maintenance
100	184+100 - 184+200	1	1	9	Routine Maintenance
100	184+200 - 184+300	1	1	9	Routine Maintenance
100	184+300 - 184+400	2	1	9	Routine Maintenance
100	184+400 - 184+500	2	1	9	Routine Maintenance
100	184+500 - 184+600	2	1	9	Routine Maintenance
100	184+600 - 184+700	2	1	9	Routine Maintenance
100	184+700 - 184+800	2	1	9	Routine Maintenance
100	184+800 - 184+900	1	1	9	Routine Maintenance
100	184+900 - 185+000	1	1	9	Routine Maintenance
100	185+000 - 185+100	2	1	9	Routine Maintenance
100	185+100 - 185+200	1	1	9	Routine Maintenance
100	185+200 - 185+300	1	1	9	Routine Maintenance
100	185+300 - 185+400	1	1	9	Routine Maintenance
100	185+400 - 185+500	1	1	9	Routine Maintenance
100	185+500 - 185+600	2	1	9	Routine Maintenance
100	185+600 - 185+700	1	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	185+700 - 185+800	13	5	5	Periodic Maintenance
100	185+800 - 185+900	16	6	4	Periodic Maintenance
100	185+900 - 186+000	15	5	5	Periodic Maintenance
100	186+000 - 186+100	13	5	5	Periodic Maintenance
100	186+100 - 186+200	2	1	9	Routine Maintenance
100	186+200 - 186+300	2	1	9	Routine Maintenance
100	186+300 - 186+400	2	1	9	Routine Maintenance
100	186+400 - 186+500	2	1	9	Routine Maintenance
100	186+500 - 186+600	2	1	9	Routine Maintenance
100	186+600 - 186+700	2	1	9	Routine Maintenance
100	186+700 - 186+800	1	1	9	Routine Maintenance
100	186+800 - 187+900	1	1	9	Routine Maintenance
100	186+900 - 187+000	1	1	9	Routine Maintenance
100	187+000 - 187+100	1	1	9	Routine Maintenance
100	187+100 - 187+200	1	1	9	Routine Maintenance
100	187+200 - 187+300	1	1	9	Routine Maintenance
100	187+300 - 187+400	1	1	9	Routine Maintenance
100	187+400 - 187+500	1	1	9	Routine Maintenance
100	187+500 - 187+600	2	1	9	Routine Maintenance
100	187+600 - 187+700	2	1	9	Routine Maintenance
100	187+700 - 187+800	2	1	9	Routine Maintenance
100	187+800 - 187+900	2	1	9	Routine Maintenance
100	187+900 - 188+000	2	1	9	Routine Maintenance
100	188+000 - 188+100	2	1	9	Routine Maintenance
100	188+100 - 188+200	2	1	9	Routine Maintenance
100	188+200 - 188+300	2	1	9	Routine Maintenance
100	188+300 - 188+400	1	1	9	Routine Maintenance
100	188+400 - 188+500	1	1	9	Routine Maintenance
100	188+500 - 188+600	1	1	9	Routine Maintenance
100	188+600 - 188+700	1	1	9	Routine Maintenance
100	188+700 - 188+800	1	1	9	Routine Maintenance
100	188+800 - 188+900	2	1	9	Routine Maintenance
100	188+900 - 189+000	2	1	9	Routine Maintenance
100	189+000 - 189+100	2	1	9	Routine Maintenance
90	189+100 - 189+190	2	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 4. Road Condition Values on Link 141.11K Segments per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
20	194+280 - 194+300	3	1	9	Routine Maintenance
100	194+300 - 194+400	2	1	9	Routine Maintenance
100	194+400 - 194+500	2	1	9	Routine Maintenance
100	194+500 - 194+600	3	1	9	Routine Maintenance
100	194+600 - 194+700	2	1	9	Routine Maintenance
100	194+700 - 194+800	2	1	9	Routine Maintenance
100	194+800 - 194+900	3	1	9	Routine Maintenance
20	194+900 - 194+920	2	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 5. Road Condition Score on Link 141.12K Segments per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
60	193+840 - 193+900	3	1	9	Routine Maintenance
100	193+900 - 194+000	2	1	9	Routine Maintenance
100	194+000 - 194+100	4	2	8	Routine Maintenance
100	194+100 - 194+200	2	1	9	Routine Maintenance
80	194+200 - 194+280	3	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 6. Road Condition Value at Link 141.13K Segment per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
30	193+570 - 193+600	2	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	193+600 - 193+700	2	1	9	Routine Maintenance
100	193+700 - 193+800	4	2	8	Routine Maintenance
40	193+800 - 193+840	2	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 7. Road Condition Value at Link 141.14K Segment per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
20	192+780 - 192+800	4	2	8	Routine Maintenance
100	192+800 - 192+900	1	1	9	Routine Maintenance
100	192+900 - 193+000	3	1	9	Routine Maintenance
100	193+000 - 193+100	5	2	8	Routine Maintenance
100	193+100 - 193+200	3	1	9	Routine Maintenance
100	193+200 - 193+300	1	1	9	Routine Maintenance
100	193+300 - 193+400	1	1	9	Routine Maintenance
100	193+400 - 193+500	3	1	9	Routine Maintenance
70	193+500 - 193+570	3	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 8. Road Condition Score on Link 141.15K Segments per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
60	192+240 - 192+300	5	2	8	Routine Maintenance
100	192+300 - 192+400	3	1	9	Routine Maintenance
100	192+400 - 192+500	2	1	9	Routine Maintenance
100	192+500 - 192+600	2	1	9	Routine Maintenance
100	192+600 - 192+700	2	1	9	Routine Maintenance
80	194+700 - 194+780	2	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 9. Road Condition Value on Link 141.16K Segment per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
50	191+650 - 191+700	2	1	9	Routine Maintenance
100	191+700 - 191+800	1	1	9	Routine Maintenance
100	191+800 - 191+900	2	1	9	Routine Maintenance
100	191+900 - 192+000	1	1	9	Routine Maintenance
100	192+000 - 192+100	2	1	9	Routine Maintenance
100	192+100 - 192+200	2	1	9	Routine Maintenance
40	192+200 - 192+240	2	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 10. Road Condition Value at Link 141.17K Segment per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
10	189+190 - 189+200	1	1	9	Routine Maintenance
100	189+200 - 189+300	1	1	9	Routine Maintenance
100	189+300 - 189+400	1	1	9	Routine Maintenance
100	189+400 - 189+500	2	1	9	Routine Maintenance
100	189+500 - 189+600	2	1	9	Routine Maintenance
100	189+600 - 189+700	2	1	9	Routine Maintenance
100	189+700 - 189+800	2	1	9	Routine Maintenance
100	189+800 - 189+900	1	1	9	Routine Maintenance
100	189+900 - 190+000	3	1	9	Routine Maintenance
100	190+000 - 190+100	3	1	9	Routine Maintenance
100	190+100 - 190+200	1	1	9	Routine Maintenance
100	190+200 - 190+300	1	1	9	Routine Maintenance
100	190+300 - 190+400	1	1	9	Routine Maintenance
100	190+400 - 190+500	1	1	9	Routine Maintenance
100	190+500 - 190+600	1	1	9	Routine Maintenance
100	190+600 - 190+700	2	1	9	Routine Maintenance
100	190+700 - 190+800	2	1	9	Routine Maintenance
100	190+800 - 190+900	2	1	9	Routine Maintenance
100	190+900 - 191+000	2	1	9	Routine Maintenance
100	191+000 - 191+100	2	1	9	Routine Maintenance
100	191+100 - 191+200	1	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	191+200 - 191+300	1	1	9	Routine Maintenance
100	191+300 - 191+400	1	1	9	Routine Maintenance
100	191+400 - 191+500	1	1	9	Routine Maintenance
100	191+500 - 191+600	1	1	9	Routine Maintenance
50	191+600 - 191+650	1	1	9	Routine Maintenance

Source: Processed by Researcher, 2024

Table 11. Road Condition Score on Link 142 Segment per 100 m

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
80	194+920 - 195+000	2	1	9	Routine Maintenance
100	195+000 - 195+100	1	1	9	Routine Maintenance
100	195+100 - 195+200	2	1	9	Routine Maintenance
100	195+200 - 195+300	2	1	9	Routine Maintenance
100	195+300 - 195+400	2	1	9	Routine Maintenance
100	195+400 - 195+500	2	1	9	Routine Maintenance
100	195+500 - 195+600	1	1	9	Routine Maintenance
100	195+600 - 195+700	2	1	9	Routine Maintenance
100	195+700 - 195+800	2	1	9	Routine Maintenance
100	195+800 - 195+900	2	1	9	Routine Maintenance
100	195+900 - 196+000	2	1	9	Routine Maintenance
100	196+000 - 196+100	12	4	6	Periodic Maintenance
100	196+100 - 196+200	2	1	9	Routine Maintenance
100	196+200 - 196+300	11	4	6	Periodic Maintenance
100	196+300 - 196+400	2	1	9	Routine Maintenance
100	196+400 - 196+500	1	1	9	Routine Maintenance
100	196+500 - 196+600	2	1	9	Routine Maintenance
100	196+600 - 196+700	11	4	6	Periodic Maintenance
100	196+700 - 196+800	13	5	5	Periodic Maintenance
100	196+800 - 196+900	1	1	9	Routine Maintenance
100	196+900 - 197+000	2	1	9	Routine Maintenance
100	197+000 - 197+100	1	1	9	Routine Maintenance
100	197+100 - 197+200	2	1	9	Routine Maintenance
100	197+200 - 197+300	2	1	9	Routine Maintenance
100	197+300 - 197+400	2	1	9	Routine Maintenance
100	197+400 - 197+500	2	1	9	Routine Maintenance
100	197+500 - 197+600	17	6	4	Periodic Maintenance
100	197+600 - 197+700	1	1	9	Routine Maintenance
100	197+700 - 197+800	2	1	9	Routine Maintenance
100	197+800 - 197+900	14	6	4	Periodic Maintenance
100	197+900 - 198+000	2	1	9	Routine Maintenance
100	198+000 - 198+100	2	1	9	Routine Maintenance
100	198+100 - 198+200	1	1	9	Routine Maintenance
100	198+200 - 198+300	1	1	9	Routine Maintenance
100	198+300 - 198+400	1	1	9	Routine Maintenance
100	198+400 - 198+500	11	4	6	Periodic Maintenance
100	198+500 - 198+600	13	5	5	Periodic Maintenance
100	198+600 - 198+700	2	1	9	Routine Maintenance
100	198+700 - 198+800	2	1	9	Routine Maintenance
100	198+800 - 198+900	1	1	9	Routine Maintenance
100	198+900 - 199+000	1	1	9	Routine Maintenance
100	199+000 - 199+100	2	1	9	Routine Maintenance
100	199+100 - 199+200	2	1	9	Routine Maintenance
100	199+200 - 199+300	2	1	9	Routine Maintenance
100	199+300 - 199+400	13	5	5	Periodic Maintenance
100	199+400 - 199+500	16	6	4	Periodic Maintenance
100	199+500 - 199+600	13	5	5	Periodic Maintenance
100	199+600 - 199+700	15	6	4	Periodic Maintenance
100	199+700 - 199+800	15	6	4	Periodic Maintenance
100	199+800 - 199+900	14	6	4	Periodic Maintenance
100	199+900 - 200+000	1	1	9	Routine Maintenance
100	200+000 - 200+100	2	1	9	Routine Maintenance
100	200+100 - 200+200	1	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	200+200 - 200+300	2	1	9	Routine Maintenance
100	200+300 - 200+400	1	1	9	Routine Maintenance
100	200+400 - 200+500	1	1	9	Routine Maintenance
100	200+500 - 200+600	1	1	9	Routine Maintenance
100	200+600 - 200+700	1	1	9	Routine Maintenance
100	200+700 - 200+800	1	1	9	Routine Maintenance
100	200+800 - 200+900	1	1	9	Routine Maintenance
100	200+900 - 201+000	18	6	4	Periodic Maintenance
100	201+000 - 201+100	18	6	4	Periodic Maintenance
100	201+100 - 201+200	17	6	4	Periodic Maintenance
100	201+200 - 201+300	17	6	4	Periodic Maintenance
100	201+300 - 201+400	18	6	4	Periodic Maintenance
100	201+400 - 201+500	17	6	4	Periodic Maintenance
100	201+500 - 201+600	14	6	4	Periodic Maintenance
100	201+600 - 201+700	17	6	4	Periodic Maintenance
100	201+700 - 201+800	15	6	4	Periodic Maintenance
100	201+800 - 201+900	14	6	4	Periodic Maintenance
100	201+900 - 202+000	16	6	4	Periodic Maintenance
100	202+000 - 202+100	16	6	4	Periodic Maintenance
100	202+100 - 202+200	15	6	4	Periodic Maintenance
100	202+200 - 202+300	2	1	9	Routine Maintenance
100	202+300 - 202+400	1	1	9	Routine Maintenance
100	202+400 - 202+500	2	1	9	Routine Maintenance
100	202+500 - 202+600	2	1	9	Routine Maintenance
100	202+600 - 202+700	2	1	9	Routine Maintenance
100	202+700 - 202+800	1	1	9	Routine Maintenance
100	202+800 - 202+900	2	1	9	Routine Maintenance
100	202+900 - 203+000	2	1	9	Routine Maintenance
100	203+000 - 203+100	1	1	9	Routine Maintenance
100	203+100 - 203+200	2	1	9	Routine Maintenance
100	203+200 - 203+300	2	1	9	Routine Maintenance
100	203+300 - 203+400	2	1	9	Routine Maintenance
100	203+400 - 203+500	1	1	9	Routine Maintenance
100	203+500 - 203+600	2	1	9	Routine Maintenance
100	203+600 - 203+700	1	1	9	Routine Maintenance
100	203+700 - 203+800	1	1	9	Routine Maintenance
100	203+800 - 203+900	1	1	9	Routine Maintenance
100	203+900 - 204+000	1	1	9	Routine Maintenance
100	204+000 - 204+100	1	1	9	Routine Maintenance
100	204+100 - 204+200	1	1	9	Routine Maintenance
100	204+200 - 204+300	1	1	9	Routine Maintenance
100	204+300 - 204+400	2	1	9	Routine Maintenance
100	204+400 - 204+500	2	1	9	Routine Maintenance
100	204+500 - 204+600	2	1	9	Routine Maintenance
100	204+600 - 204+700	2	1	9	Routine Maintenance
100	204+700 - 204+800	2	1	9	Routine Maintenance
100	204+800 - 204+900	2	1	9	Routine Maintenance
100	204+900 - 205+000	2	1	9	Routine Maintenance
100	205+000 - 205+100	2	1	9	Routine Maintenance
100	205+100 - 205+200	2	1	9	Routine Maintenance
100	205+200 - 205+300	2	1	9	Routine Maintenance
100	205+300 - 205+400	2	1	9	Routine Maintenance
100	205+400 - 205+500	2	1	9	Routine Maintenance
100	205+500 - 205+600	2	1	9	Routine Maintenance
100	205+600 - 205+700	2	1	9	Routine Maintenance
100	205+700 - 205+800	1	1	9	Routine Maintenance
100	205+800 - 206+900	1	1	9	Routine Maintenance
100	205+900 - 206+000	1	1	9	Routine Maintenance
100	206+000 - 206+100	1	1	9	Routine Maintenance
100	206+100 - 206+200	2	1	9	Routine Maintenance
100	206+200 - 206+300	2	1	9	Routine Maintenance
100	206+300 - 206+400	2	1	9	Routine Maintenance
100	206+400 - 206+500	2	1	9	Routine Maintenance
100	206+500 - 206+600	2	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	206+600 - 206+700	2	1	9	Routine Maintenance
100	206+700 - 206+800	1	1	9	Routine Maintenance
100	206+800 - 206+900	1	1	9	Routine Maintenance
100	206+900 - 207+000	1	1	9	Routine Maintenance
100	207+000 - 207+100	1	1	9	Routine Maintenance
100	207+100 - 207+200	1	1	9	Routine Maintenance
100	207+200 - 207+300	1	1	9	Routine Maintenance
100	207+300 - 207+400	1	1	9	Routine Maintenance
100	207+400 - 207+500	2	1	9	Routine Maintenance
100	207+500 - 207+600	1	1	9	Routine Maintenance
100	207+600 - 207+700	1	1	9	Routine Maintenance
100	207+700 - 207+800	1	1	9	Routine Maintenance
100	207+800 - 207+900	1	1	9	Routine Maintenance
100	207+900 - 208+000	1	1	9	Routine Maintenance
100	208+000 - 208+100	2	1	9	Routine Maintenance
100	208+100 - 208+200	2	1	9	Routine Maintenance
100	208+200 - 208+300	2	1	9	Routine Maintenance
100	208+300 - 208+400	2	1	9	Routine Maintenance
100	208+400 - 208+500	2	1	9	Routine Maintenance
100	208+500 - 208+600	2	1	9	Routine Maintenance
100	208+600 - 208+700	2	1	9	Routine Maintenance
100	208+700 - 208+800	2	1	9	Routine Maintenance
100	208+800 - 208+900	2	1	9	Routine Maintenance
100	208+900 - 209+000	2	1	9	Routine Maintenance
100	209+000 - 209+100	2	1	9	Routine Maintenance
100	209+100 - 209+200	2	1	9	Routine Maintenance
100	209+200 - 209+300	2	1	9	Routine Maintenance
100	209+300 - 209+400	2	1	9	Routine Maintenance
100	209+400 - 209+500	2	1	9	Routine Maintenance
100	209+500 - 209+600	2	1	9	Routine Maintenance
100	209+600 - 209+700	1	1	9	Routine Maintenance
100	209+700 - 209+800	1	1	9	Routine Maintenance
100	209+800 - 209+900	1	1	9	Routine Maintenance
100	209+900 - 210+000	2	1	9	Routine Maintenance
100	210+000 - 210+100	1	1	9	Routine Maintenance
100	210+100 - 210+200	1	1	9	Routine Maintenance
100	210+200 - 210+300	2	1	9	Routine Maintenance
100	210+300 - 210+400	2	1	9	Routine Maintenance
100	210+400 - 210+500	2	1	9	Routine Maintenance
100	210+500 - 210+600	2	1	9	Routine Maintenance
100	210+600 - 210+700	1	1	9	Routine Maintenance
100	210+700 - 210+800	2	1	9	Routine Maintenance
100	210+800 - 210+900	1	1	9	Routine Maintenance
100	210+900 - 211+000	2	1	9	Routine Maintenance
100	211+000 - 211+100	1	1	9	Routine Maintenance
100	211+100 - 211+200	2	1	9	Routine Maintenance
100	211+200 - 211+300	1	1	9	Routine Maintenance
100	211+300 - 211+400	2	1	9	Routine Maintenance
100	211+400 - 211+500	2	1	9	Routine Maintenance
100	211+500 - 211+600	2	1	9	Routine Maintenance
100	211+600 - 211+700	2	1	9	Routine Maintenance
100	211+700 - 211+800	1	1	9	Routine Maintenance
100	211+800 - 211+900	2	1	9	Routine Maintenance
100	211+900 - 212+000	1	1	9	Routine Maintenance
100	212+000 - 212+100	2	1	9	Routine Maintenance
100	212+100 - 212+200	2	1	9	Routine Maintenance
100	212+200 - 212+300	2	1	9	Routine Maintenance
100	212+300 - 212+400	2	1	9	Routine Maintenance
100	212+400 - 212+500	1	1	9	Routine Maintenance
100	212+500 - 212+600	1	1	9	Routine Maintenance
100	212+600 - 212+700	2	1	9	Routine Maintenance
100	212+700 - 212+800	1	1	9	Routine Maintenance
100	212+800 - 212+900	1	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	212+900 - 213+000	1	1	9	Routine Maintenance
100	213+000 - 213+100	1	1	9	Routine Maintenance
100	213+100 - 213+200	1	1	9	Routine Maintenance
100	213+200 - 213+300	2	1	9	Routine Maintenance
100	213+300 - 213+400	1	1	9	Routine Maintenance
100	213+400 - 213+500	1	1	9	Routine Maintenance
100	213+500 - 213+600	2	1	9	Routine Maintenance
100	213+600 - 213+700	2	1	9	Routine Maintenance
100	213+700 - 213+800	1	1	9	Routine Maintenance
100	213+800 - 213+900	2	1	9	Routine Maintenance
100	213+900 - 214+000	1	1	9	Routine Maintenance
100	214+000 - 214+100	1	1	9	Routine Maintenance
100	214+100 - 214+200	1	1	9	Routine Maintenance
100	214+200 - 214+300	1	1	9	Routine Maintenance
100	214+300 - 214+400	2	1	9	Routine Maintenance
100	214+400 - 214+500	2	1	9	Routine Maintenance
100	214+500 - 214+600	1	1	9	Routine Maintenance
100	214+600 - 214+700	2	1	9	Routine Maintenance
100	214+700 - 214+800	1	1	9	Routine Maintenance
100	214+800 - 214+900	1	1	9	Routine Maintenance
100	214+900 - 215+000	1	1	9	Routine Maintenance
100	215+000 - 215+100	1	1	9	Routine Maintenance
100	215+100 - 215+200	1	1	9	Routine Maintenance
100	215+200 - 215+300	1	1	9	Routine Maintenance
100	215+300 - 215+400	1	1	9	Routine Maintenance
100	215+400 - 215+500	1	1	9	Routine Maintenance
100	215+500 - 215+600	1	1	9	Routine Maintenance
100	215+600 - 215+700	1	1	9	Routine Maintenance
100	215+700 - 215+800	1	1	9	Routine Maintenance
100	215+800 - 215+900	1	1	9	Routine Maintenance
100	215+900 - 216+000	1	1	9	Routine Maintenance
100	216+000 - 216+100	1	1	9	Routine Maintenance
100	216+100 - 216+200	1	1	9	Routine Maintenance
100	216+200 - 216+300	1	1	9	Routine Maintenance
100	216+300 - 216+400	1	1	9	Routine Maintenance
100	216+400 - 216+500	1	1	9	Routine Maintenance
100	216+500 - 216+600	1	1	9	Routine Maintenance
100	216+600 - 216+700	1	1	9	Routine Maintenance
100	216+700 - 216+800	1	1	9	Routine Maintenance
100	216+800 - 216+900	1	1	9	Routine Maintenance
100	216+900 - 217+000	1	1	9	Routine Maintenance
100	217+000 - 217+100	1	1	9	Routine Maintenance
100	217+100 - 217+200	1	1	9	Routine Maintenance
100	217+200 - 217+300	2	1	9	Routine Maintenance
100	217+300 - 217+400	2	1	9	Routine Maintenance
100	217+400 - 217+500	2	1	9	Routine Maintenance
100	217+500 - 217+600	2	1	9	Routine Maintenance
100	217+600 - 217+700	2	1	9	Routine Maintenance
100	217+700 - 217+800	2	1	9	Routine Maintenance
100	217+800 - 217+900	2	1	9	Routine Maintenance
100	217+900 - 218+000	2	1	9	Routine Maintenance
100	218+000 - 218+100	2	1	9	Routine Maintenance
100	218+100 - 218+200	2	1	9	Routine Maintenance
100	218+200 - 218+300	2	1	9	Routine Maintenance
100	218+300 - 218+400	10	4	6	Periodic Maintenance
100	218+400 - 218+500	11	4	6	Periodic Maintenance
100	218+500 - 218+600	12	4	6	Periodic Maintenance
100	218+600 - 218+700	14	5	5	Periodic Maintenance
100	218+700 - 218+800	13	5	5	Periodic Maintenance
100	218+800 - 218+900	14	5	5	Periodic Maintenance
100	218+900 - 219+000	2	1	9	Routine Maintenance
100	219+000 - 219+100	2	1	9	Routine Maintenance
100	216+800 - 216+900	1	1	9	Routine Maintenance
100	216+900 - 217+000	1	1	9	Routine Maintenance

Segment	STA	Total Damage Rate	Value	Priority Order	Damage Repair
100	217+000 - 217+100	1	1	9	Routine Maintenance
100	217+100 - 217+200	1	1	9	Routine Maintenance
100	217+200 - 217+300	2	1	9	Routine Maintenance
100	217+300 - 217+400	2	1	9	Routine Maintenance
100	217+400 - 217+500	2	1	9	Routine Maintenance
100	217+500 - 217+600	2	1	9	Routine Maintenance
100	217+600 - 217+700	2	1	9	Routine Maintenance
100	217+700 - 217+800	2	1	9	Routine Maintenance
100	217+800 - 217+900	2	1	9	Routine Maintenance
100	217+900 - 218+000	2	1	9	Routine Maintenance
100	218+000 - 218+100	2	1	9	Routine Maintenance
100	218+100 - 218+200	2	1	9	Routine Maintenance
100	218+200 - 218+300	2	1	9	Routine Maintenance
100	218+300 - 218+400	10	4	6	Periodic Maintenance
100	218+400 - 218+500	11	4	6	Periodic Maintenance
100	218+500 - 218+600	12	4	6	Periodic Maintenance
100	218+600 - 218+700	14	5	5	Periodic Maintenance
100	218+700 - 218+800	13	5	5	Periodic Maintenance
100	218+800 - 218+900	14	5	5	Periodic Maintenance
100	218+900 - 219+000	2	1	9	Routine Maintenance
100	219+000 - 219+100	2	1	9	Routine Maintenance
100	217+200 - 217+300	2	1	9	Routine Maintenance
100	217+300 - 217+400	2	1	9	Routine Maintenance
100	217+400 - 217+500	2	1	9	Routine Maintenance
100	217+500 - 217+600	2	1	9	Routine Maintenance
100	217+600 - 217+700	2	1	9	Routine Maintenance
100	217+700 - 217+800	2	1	9	Routine Maintenance
100	217+800 - 217+900	2	1	9	Routine Maintenance
100	217+900 - 218+000	2	1	9	Routine Maintenance
100	218+000 - 218+100	2	1	9	Routine Maintenance
100	218+100 - 218+200	2	1	9	Routine Maintenance
100	218+200 - 218+300	2	1	9	Routine Maintenance
100	218+300 - 218+400	10	4	6	Periodic Maintenance
100	218+400 - 218+500	11	4	6	Periodic Maintenance
100	218+500 - 218+600	12	4	6	Periodic Maintenance
100	218+600 - 218+700	14	5	5	Periodic Maintenance
100	218+700 - 218+800	13	5	5	Periodic Maintenance
100	218+800 - 218+900	14	5	5	Periodic Maintenance
100	218+900 - 219+000	2	1	9	Routine Maintenance
100	219+000 - 219+100	2	1	9	Routine Maintenance
100	218+200 - 218+300	2	1	9	Routine Maintenance
100	218+300 - 218+400	10	4	6	Periodic Maintenance
100	218+400 - 218+500	11	4	6	Periodic Maintenance
100	218+500 - 218+600	12	4	6	Periodic Maintenance
100	218+600 - 218+700	14	5	5	Periodic Maintenance
100	218+700 - 218+800	13	5	5	Periodic Maintenance
100	218+800 - 218+900	14	5	5	Periodic Maintenance
100	218+900 - 219+000	2	1	9	Routine Maintenance
100	219+000 - 219+100	2	1	9	Routine Maintenance
100	218+600 - 218+700	14	5	5	Periodic Maintenance
100	218+700 - 218+800	13	5	5	Periodic Maintenance
100	218+800 - 218+900	14	5	5	Periodic Maintenance
100	218+900 - 219+000	2	1	9	Routine Maintenance
100	219+000 - 219+100	2	1	9	Routine Maintenance

Based on the results of the analysis above, the Maospati—Magetan—Cemorosewu section, Km 180 + 040—Km 219 + 100 in the UPT PJJ Madiun Region, has two different types of damage repair: routine maintenance and periodic maintenance. In this case, the average road segment on the Maospati—Magetan—Cemorosewu section, Km 180 + 040—Km 219 + 100 in the UPT PJJ Madiun Region, is repaired using routine maintenance.

CONCLUSION

Based on the research objectives and analysis, the Maospati—Magetan—Cemorosewu road section, from km 180+040 to km 219+100, is in generally good condition with low levels of damage. The assessment using the Bina Marga and PKRMS methods indicates that routine maintenance is the most suitable maintenance approach, as the identified damage is not severe. Implementing timely maintenance will prevent minor defects from escalating into major structural issues, ensuring road safety and extending pavement lifespan. To improve the effectiveness of road maintenance, local authorities are advised to implement a scheduled inspection program using standardized assessment methods, such as PKRMS and Bina Marga, to monitor road conditions more accurately. Additionally, incorporating predictive maintenance models and budget optimization strategies can help allocate resources efficiently, minimizing long-term repair costs. This research highlights the importance of adopting data-driven maintenance planning to prioritize repairs based on actual road conditions and traffic load for other regions facing similar infrastructure challenges. Further research should explore integrating technology-based road monitoring systems, such as drones or IoT-enabled sensors, to enhance real-time data collection and decision-making for road maintenance. By implementing these strategies, regional governments can ensure safer, more durable, and cost-effective road networks, supporting transportation efficiency and economic development.

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