

Analysis of the Correspondence Between the Type of Road Damage and the Budget Costs Incurred in Handling on Provincial Roads in the Madura Region

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Abstract. This study aims to analyze the suitability between the type of road damage and the budget costs incurred on provincial roads in the Madura region. The research method used road condition survey and questionnaire distribution to contractors, consultants, budget users, and local communities. Data analysis was done descriptively qualitatively, including the type, volume, and location of road damage. The results showed that the three most common types of road damage were cracks, potholes and raveling. The total area of damage identified was 261.95 m², with a repair cost of Rp 57,586,900. This research emphasizes the importance of detailed road defect analysis and appropriate budget allocation to improve repair efficiency and support the region's economic activity. The findings conclude that detailed road defect analysis and budget efficiency can improve road quality and support mobility and economy in the Madura region. The results provide a basis for local governments to plan road infrastructure improvements more effectively and efficiently.

Keywords: Road Damage, Budget Costs, Road Infrastructure

1. INTRODUCTION

Roads are vital infrastructure that support the economic development of a region, where road quality is a top priority for the safety and comfort of users (Almufid, 2016). Road planning includes geometric aspects and pavement thickness designed for cost and time efficiency according to the guidelines of the Bina Marga Public Works Department. However, various road damages often occur earlier than their service life due to human factors such as excess tonnage of heavy vehicles and increased traffic volume, as well as unavoidable natural factors (Mashudi et al., 2024; Talani, 2018).

Road damage not only reduces user comfort and safety, but also affects pavement performance and results in an overall decrease in road quality (Rahmah et al., 2020; Ramadhani et al., 2022). This impact extends to hampering the economy and affecting various social aspects. In the Madura region, for example, pavement damage poses serious challenges to community accessibility and mobility, which in turn disrupts economic and social activities.

Overcoming the problem of road damage requires appropriate and effective handling. One of the challenges is to ensure that the budget allocated for road repairs is used efficiently and in accordance with the level of damage. The large road infrastructure budget must be

managed well to have maximum impact on improving road quality and supporting the overall progress of the region.

Based on these issues, this study aims to determine the suitability of the type of road damage and the budget required, so as to provide an effective and efficient solution in handling road damage.

2. LITERATURE REVIEW

Recently, there has been a lot of early pavement damage in the city of Cirebon in the form of cracks, raveling and peeling of the pavement layer which has resulted in the continued increase in road maintenance costs in each year due to many influencing factors from planning, implementation to maintenance of these road projects. This study aims to find the dominant factors that affect the increase in road maintenance costs in Cirebon City, so that the results of the study are expected to provide positive input to the relevant agencies. The study used a survey method, through distributing questionnaires to respondents consisting of contractors, consultants, assignors and experts in their fields, then the questionnaire data were processed with SPSS 19 statistical analysis to produce a level of relationship between the independent variable (X) in the form of risk factors that affect the increase in maintenance costs and variable (Y) in the form of maintenance costs. From the results of the study concluded that there are 6 (six) factors that most dominantly affect the increase in maintenance costs, namely too low price quotes (77.69), weak project control (74.35), cost estimation errors (70.39), materials sent not as requested (68.35), subcontractors not working optimally (67.57) and the occurrence of natural disasters (62.88) to maintenance costs (Mulyana, 2021).

Roads are transportation infrastructure that includes all parts of the road, including supporting facilities and vehicles, which are located above and below ground. Road damage to soft pavements is very common and is caused by many factors (Hidayat et al., 2020). From vehicle loads that exceed the plan and soil bearing capacity. In this study conducted on Jl. Raya Gresik - Lamongan road length of 4 km and width of 7 m. In analyzing this road damage using the PCI (Pavement Condition Index) method with the intention of finding the value of damage that occurs on Jl. Raya Gresik - Lamongan and selecting alternative handling to repair damage and planning a budget for repairs. The results of this study obtained an average PCI value of 35.03 which is categorized as poor condition with alternative maintenance treatments of rehabilitation or overlay and planning a cost budget for overlay repairs that cost Rp. 10,334,242,000, - (Hendrawan et al., 2022).

Roads are transportation infrastructure that plays a very important role in flowing traffic. Bireuen - Takengon Road KM 9 + 000 to KM 13 + 000 is a collector road that is often traveled by heavy vehicles. The road section under review is 4 kilometres long where heavy vehicles often pass through the road and cause damage to the road surface and foundation. This study aims to determine the condition value based on the types of damage so that it can determine the handling and calculate the repair costs. The method used in this research is the Pavement Condition Index (PCI) and the analysis to calculate repair costs using the 2016 AHSP analysis. The results of this study obtained the types of damage, namely: hair cracking 5%, pothole 3%, edge cracking 15%, depression 45%, ravelling 5%, patching 5%, alligator cracking 13% and shoving 9% and obtained PCI value of 30.75 which is in poor condition. The repair cost obtained from the 2016 AHSP calculation results amounted to Rp. 682,671,000.00 (Rizal et al., 2019).

3. METHODS

This research method involves a research subject in the form of pavement damage analysis based on road condition survey data which is then processed using a questionnaire method. The research location was on provincial roads in Pamekasan, Madura, with a research duration of two weeks, including field survey and questionnaire distribution. Primary data was obtained through road condition surveys in the field, while secondary data was in the form of road condition survey data available at the East Java Province Bina Marga Public Works Office. After the data was collected, a questionnaire was created using Google Forms and distributed to respondents consisting of contractors, consultants, budget users, and the general public in the Madura region. The results of this questionnaire were analyzed to obtain the necessary information. The data analysis technique used is descriptive qualitative, namely by processing and explaining the data obtained, including the type of road damage, the volume of damage (length and width), and the location of the damage, in order to produce relevant information and provide solutions to the problems studied.

4. RESULTS

Data analysis and results obtained, the types of road damage that occur in the Madura Region that often occur based on the results of the questionnaire are the most 3 types of road damage, namely Cracks, Potholes and Ravelling. From the three types of road damage based on the results of the questionnaire, respondents chose Crack damage as a priority, namely 8 Respondents at 57.1%. For the type of road damage Potholes 11 respondents chose very high

priority, namely 78.6%. Ravelling 9 respondents or 64.3% are not priorities. With these results, researchers determine the types of road damage that are not priorities, priorities and very high priorities, namely the three road damages.

Furthermore, researchers surveyed road conditions in the field where there was road damage to the three types of road damage. From the results of research on the road section Bts. Pamekasan City - Sotabar (Link. 118) from Km. 7+000 - 8+000, it was found that there were 7 points of damage to the road, including Cracks, Potholes, Ravelling. Table 1 describes the location of road damage, the extent of road damage, namely length and width.

Table 1. Road Damage Survey Results

No	S T A (Km)			Position			Damage/Handling Category	Size		
				Left	AS	Right		P (M')	L (M')	A (M2)
1	7 + 676	-		√			Ravelling	5,50	1,30	7,15
2	7 + 681	-		√			Crack	18,00	2,40	43,20
3	7 + 828	-		√			Ravelling	8,00	2,30	18,40
4	7 + 836	-		√			Ravelling	19,00	2,00	38,00
5	7 + 940	-		√			Potholes	14,00	2,80	39,20
6	7 + 952	-		√			Ravelling	25,00	2,00	50,00
7	7 + 977	-		√			Crack	22,00	3,00	66,00

The type of road damage is Crack at the location of Km. 7+681 and Km. 7+977 where the length of the road damage is 18 meters and 22 meters, respectively, for the width of 2.4 meters and 3 meters. While the most ravelling is at Km. 7+676 the handling length is 5.5 meters and width is 1.3 meters; at Km. 7+828 the handling length is 8 meters with a width of 2.3 meters; for the location of Km. 7+836 the handling length is 19 meters and a width of 2 meters; and the last one at Km. 7+952 with a handling length of 25 meters and a width of 2 meters. For the type of road damage Potholes at the location of Km. 7+940 where the handling length is 14 meters and a width of 2.8 meters.

The East Java Province Bina Marga Public Works Office, especially in the Madura Region, namely in the Pamekasan Road and Bridge Management Technical Implementation Unit (UPT), is handling road damage in the region on the Bts road section. Pamekasan City - Sotabar (Link. 118).

Unit Price Analysis

Table 2. Unit Price Analysis of Work
(East Java Provincial Bina Marga Public Works Office)

Patching with CPHMA	m ²	35,60	Work output per day	
Material				
CPHMA	Ton	0,112	2.164.500,00	243.202,25
CRS-1	Ltr	0,599	20.579,00	12.330,06
Wages				
Foreman	OH	0,028	263.900,00	7.412,92
Workers	OH	0,281	122.200,00	34.325,84
Patching with CPHMA	M3	1,000	46.330,03	46.330,03
Fuel				
Solar (Dump Truck)	ltr	0,224	17.200,00	3.852,80
Solar (Flat Bed truck Crane)	ltr	0,224	17.200,00	3.852,80
Solar (Vibro Roller)	ltr	0,140	17.200,00	2.408,00
Cost per 1 m ²				311.975,93

Table 3. Analysis Result

No	S T A (Km)	Position			Damage/Handling Category	Size		
		Left	AS	Right		P (M')	L (M')	A (M2)
1	7 + 676	√			Ravelling	5,50	1,30	7,15
2	7 + 681	√			Crack	18,00	2,40	43,20
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6	7 + 952	√			Ravelling	25,00	2,00	50,00
7	7 + 977	√			Crack	22,00	3,00	66,00
Total								261,95

From the results of the analysis between the road handling areas in Table 2 Analysis Results, the total road handling that must be handled is 261.95 m². Furthermore, to find out the costs required for handling the road from the area obtained, it is calculated using unit price analysis to be included in the RAB (Budget Plan Cost), so the amount needed can be obtained in Table 4 RAB (Budget Plan Cost).

$$\begin{aligned} \text{Volume Zak} &= \text{Volume} \times 0,5 = 261,95 \times 0,05 = 13,0975 \\ &= 13,095 \times 2,1 = 27,50475 \text{ Ton} \times 1000 = 27504,75 \text{ Kg} \\ &= 27504,75/25 = 1100 \text{ Zak} \end{aligned}$$

$$\text{Volume CRS-1} = 1 \text{ Drum} = 200 \text{ Liter (Assumed 1x asphalt rollout)}$$

Table 4. Cost Budget Plan

RAB TA. 2024					
UPT PJJ PAMEKASAN WILAYAH I DI PAMEKASAN					
Kegiatan	: Rehabilitasi / Pemeliharaan Jalan UPT Pamekasan Wilayah I				
Pekerjaan	: Belanja Bahan Baku Bangunan (Perbaikan Perkerasan Jalan)				
Jurusan	: Pamekasan - Sotabar, Lnk 119				
Km. Pmkns	: 7+000 - 8+000				
Nama Pengawas	:				
Nilai Pagu / HPS	: Rp 57.486.900,00				
NO	URAIAN PEKERJAAN	VOLUME	SAT.	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
I. PEKERJAAN					
1.	Belanja Bahan Baku Bangunan (CPHMA)	261,95	m2		
II. PERENCANAAN & PENGAWASAN					
III. BAHAN MATERIAL					
1.	CPHMA (Kemasan Kantong)	1.100,00	zak	Rp. 44.200,00	Rp. 48.620.000,00
2.	Aspal Emulsi (CRS-1)	200,00	Liter	Rp. 15.850,00	Rp. 3.170.000,00
IV. UPAH BORONG					
V. BAHAN BAKAR PERALATAN					
A. JUMLAH					Rp. 51.790.000,00
B. PPN 11 %					Rp. 5.696.900,00
C. JUMLAH + PPN 11%					Rp. 57.486.900,00
D. DIBULATKAN					Rp. 57.486.900,00
Terbilang : === Dua ratus tujuh belas juta delapan ratus sembilan puluh enam ribu empat ratus rupiah ===					

Based on Table 3 RAB (Budget Plan Cost), the budget costs required for the area of handling road damage 261.95 m² require material costs of Rp. 57,586,900. The calculation does not include the cost of wages (foremen, builders and workers) and does not include planning and supervision costs.

From the results of the study, the types of road damage that occur in the Madura Region that are most often encountered are 3 types of road damage, namely Cracks, Ravelling and Potholes. After conducting a location survey to find the type of road damage, the location of damage and the area of road handling that needs to be repaired are obtained.

Road damage that occurs can cause obstruction of activities so that road repairs need to be carried out, it is necessary to calculate the appropriate costs for immediate repairs (Fitriani, 2018). From the survey results, the area of road handling was found, to analyze the price requirements, the handling cost required for the damage was obtained at Rp. 57,586,900.

The cause of road damage that occurs due to lack of drainage is a channel that is lacking, as a result if there is rain puddles make the road damage occur. The road maintenance method is in accordance with the 2018 General Specifications for Road and Bridge Construction Work (Revision 2). Asphalt-covered pavement maintenance work includes activities that primarily aim to maintain the flatness of the traffic lane surface, close structural cracks or small cracks that spread, patching holes, spot levelling, pavement edge repair, crack repair, repair of bumpy

or corrugations, and levelling deep rutting to maintain standard road cross slopes (Bina Marga General Specifications, 2018). This pavement maintenance work is also to restore the structural condition of the pavement if it is considered as part of the repair work and to prevent greater damage so that the pavement can function properly.

5. CONCLUSION

Based on the research conducted, the total area of road damage identified on the Bts. Pamekasan City - Sotabar is 261.95 m², with details of damage including cracks, holes, and grain release. The budget cost required to handle the damage is estimated at Rp 57,586,900, based on the unit price analysis of the East Java Province Bina Marga Public Works Office. Proper handling can help minimize budget wastage and improve. This research shows that detailed damage analysis and appropriate budget allocation are essential to maintain road quality and support economic activity in the Madura region.

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