System Model For Physical Conditions of Road Components In Magetan District

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Introduction

The road is one of the most important infrastructures in supporting the economy and social activities of the people, connecting one city to another, between town and village, and between villages. In addition, roads can also increase access to potential areas (tourism, industry, agriculture, fisheries and crops), opening up remote areas and supporting the development of border areas. Another problem faced by local road operators is the absence of a database to accommodate current road condition data and its supporting components and unavailability of road condition assessments related to equipment and limited allocation of funds for road condition surveys.



J. Samodra

In this study, selected 4 point road in Magetan regency, which is often used by society in driving,, that is :

- 1. Ahmad Yani Street
- 2. Dr. Soetomo Street
- 3. Diponegoro Street
- 4. Munginsidi Street

Method of Use

Weight Determination of Road Components

• The weighting of road component damage is determined based on its importance because until now there has been no weighting for each of the road components. Pairwise comparisons are often used to determine the relative importance of existing elements and criteria. For each paired comparison criterion and alternative (pairwise comparison) is to compare each other element at each level of the hierarchy in pairs so that the importance of the element in the form of qualitative opinion. For quantitative qualitative opinions the assessment scale is used so that the value of opinions will be obtained in the form of numbers (qualitative).

Values and Definitions of Qualitative Opinion on a Comparative Scale

level of importance	information	explanation
1	Both Elements are the same (same as Important)	Two elements have the same effect on purpose
3	is more important	One element is slightly more important than the other
5	important, stronger impotant	One element is clearly more important than the other elements
7	shows its importance	One element is clearly more important than the other
9	really more important	The absolute element is more important than the other elements
2,4,6,8	gray area	The value between the moment of doubt between two adjacent space values

Calculation of Physical Condition Analysis of Pavement

Pavement Condition Index (PCI)

Pavement Condition Index (PCI) is an approximate road condition with a rating system to state actual pavement conditions with reliable and objective data. The PCI level is written in levels 0 - 100. According to Shahin (1994) the sidewalk conditions are divided into several levels such as

PCI Values and Definitions

PCI value	Pavement Conditions
0-10	Failed
10-25	Very Poor
25-40	Poor
40-55	Fair
55-70	Good
70-85	Very Good
85-100	Exellent

Calculate the PCI value for each sample unit of the road segment

Finding Percentage of Damage (Density)

One of the percentage of damage level in the sample area of the unit under review, the density obtained by dividing the level of damage by the unit sample area. The formula looks for density values:

Density = Ad / Ld x100% Ad = Total damage area for each level of

- damage (m²)
- Ld =Total length of damage type for each damage level (m)
- US= Area of total segment units (m²)

Survey Data

ASPHALT SURFACE ROADS AND PARK. LOTS CONDITION SURVEY DATA SHEET FOR SAMPLE UNIT									SKETCH:				
BRANCH					DATE			2					
SURVEYED BY					SAMPLE	UNIT							
SECTION					SAMPLE	AREA							
1. ALIGATOR CRACKING 6. DEPP					ESSION		11. PATCH	HING AND	UTILL CUT PATCHING	16. SHO\	6. SHOVING		
2. BLEEDING				7. EDGE	CRACKING		12. POLIS	HING AGG	REGATE	17. SLIPA	AGE CRACKING		
3. BLOCK CRA	ACKING			8. REFLE	CTION CRA	CKING	13. POTHOLES			18. SWEL	L		
4. BUMPS AN	ND SAGS			9. LANE	SHOULDER	R DROPOFF	14. RAILE	OAD CROS	HING	19. WEA	ATERING / RAVELING		
5. CURRUGA	TION			10. LON	G AND TRA	NS CRACKING	15. RUTT	15. RUTTING					
DISTRESS SEVERITY	QUANTITY QUANTITY									TOTAL	DENSITY %		
3 H	321.6										321.6	45.94	
11 H	2.7	1.4	0.56	4.2	- 25	3 X	8	26			8.86	1.27	
9 H	0				1		2				0	0.00	
				1	1		~	4 ×			°		

Looking for CDV Value

The CDV value can be sought after the value of q is known by summing the Deduct Value value and then subtracting the sum of the deductive values in the CDV graph according to the q value.

Determining the PCI Value

After the CDV value is known, PCI value can be determined by using the following formula : PCI = 100 - CDV

Nilai Dv Nilai	Milet as	Nilai Dv	Hitungan PCI untuk Jalan dengan permukaan Diperkeras										
	WINDER TH	terurut	No.	41		DV	1 20 20	TDV	q	CDV	PCI	PCI terpakai	
57	4.95	57.00	1	57	21	19		97	3	62	38	38	
21		21.00	2	57	21	2		80	2	58	42		
19		19.00	3	57	2	2		61	1	58	42		
	NU 0	1. S	0 - 38,0	<i>90</i>	04,0	Kesimp	ulan	40 X		40 S		Fair	

Calculation of Physical Condition Analysis Outside of the Pavement

Form Survey Data

n	Inventarisir Komponen							Survei Kerusakan Fisik Komponen																
Km.	Trotoar (I)	Bahu Jalan (II)	Bahu Jalan (II)	Drainase Tepi (III)	Lereng (IV)	Perl	engka	pan Ja	lan (V)	Trotoar (I)		Bab	iu Jala	n (II)		D	rainase	Tepi	(III)	Lereng (IV)	Perle	engkaj	oan Ja	lan (V)
					107.618	1	1 2 3 4	1	1	2	3	4	5	1	2	3	4	1	1	2	3	4		
0,10	-	200	100		1			300	-				100	-	100	-1	-	2.00	11:53	1		3	300	
0,20		200	200	(e	-		8	300		183		ેલ્ટો	200		100	-9	8	100		-0		2.0	300	
0,30		200	100		28			300	- 10	20			80	1.00	100	- 5		8.00		-		20	300	
0,40		200	100	-	14	-	8	300		140	1	-	200	-	100		8	198	100		-	34	300	
0,50	- 23	200	100	12	1	12	9	300	- 11 J	- 445	1		100	141	145	1.2	1	100	1445	- ÷	1993	14	300	
0,60	2	200	100	3	1	8	13	300	10	- 22	-	-	2		141	1.2	1.2	100	82	2	-	12	300	
0,70	1	200	100	S	8	8	7	300	- 25	25	212	jer(75	2	12	. 8	22	100	353	2	12	8	220	
0,80		200	100	5	(a)	-		300	52	10	250	200				51		100	ಚೌದ	- 20	0.54	1.5	300	
0,90	-	200	200		(a) (i	-		300	5.	100	120	°	100	a 🚽	· -	8 <u>5</u> 2		200	50	0 30	0. <u>.</u>	12	300	
1	-	200	100		1.5		10	300	-		•	•	-	•	•		-	100	1.00	- 5	-	-	300	
1,10	-	200	100		3			300	-			1. A.	100	-	100	-		1.00	11:53	-		100	220	
1,20	-	200	100	ie.	1		9	300	-0	100			100	-	100	-0	8			-	-	2.4	200	
1,30	-	200	100	-	34 J	-		300		160			8			- 62	-8	100		-		14	200	
1,40	2	200	100	1	- s ()	12		300		44			3	1.	145	1.2	1.2	100	1445	1	122	14	200	
1,50	2	200	100	1	- ¥4	12		300		40			2	1.4	0.145		1	100	1445	1	82	14	200	
1,60	<u></u>	200	100	8	12	8		300	10	120	8	-	2	1.1	1.1	1.27	1.2	100	82	2	-	1	200	
1,70	3	200	100	22	8	8	8	300	- 25	100	1422	1520	8	12	12	100	22	22	25.0	-28	0.20	8	200	
1,80		200	100	2	. e 8			300	50 ⁽⁰		1200	S	8	8. .		100		35	150	8	0. <u>.</u>	3	200	
1,90	5	200	200	2			-	300			1920	1		0 15	с т.	0 70	-	100	1.2	3 10			200	
2		200	200	3	2			300	7	17.	100		\$				•	100	180	. •	80	12 J	200	
Jumlah	0	<mark>4.000</mark>	2.400	0	6	0	48	6.000	0	145	100	0	1.055	0	600	200	0	1.300	0	1	0	0	4.940	

I. Trotoar 1. Berbahaya

II. Bahu Jalan

L Erosi ringan 2. Erosi berat 3. Lebih tinggi dari jalan 4. Lebih rendah dari jalan III. Drainase Tepi

- 1. Tersumbat
- 2. Tergerus
- 3. Runtuh
- 4. DIbutuhkan pasangan batu
- 5. Dibutuhkan rabat

IV. Lereng 1. Runtuh

V. Perlengkapan Jalan

- 1. Rambu (No.)
- 2. Pagar pengaman (m)
- 3. Patok pengarah (m)
- 4. Marka jalan (m)

Analys to Get Prosentation About Volume of Damage Compared with Overall Volume

	3	Jumlah Kerusakan Fisik Komponen														
No.	Nama Ruas Jalan	Trotoar (I)	Bahu Jalan (II)					1	Drainase 1	Tepi (III)	1	Lereng (IV)	Perlengkapan Jalan (V)			
	5	1	1	2	3	4	5	1	2	3	4	1	1	2	3	4
1	Bts. Kab. Pamekasan- Bts. Kota Sumenep	45,71%	0,70%	0,20%	5,41%	25,39%	6,66%	19,86%	0,09%	1,83%	57,57%	12,50%	12,12%	0,00%	0,00%	39,62%
2	Raya Pamekasan	0,00%	0,00%	0,45%	52,95%	2,50%	0,00%	33,33%	0,00%	0,00%	0,00%	0,00%	6,67%	0,00%	0,00%	41,67%
3	Тпипојоуо	10,16%	0,00%	0,00%	8,33%	0,00%	0,00%	16,67%	16,67%	0,00%	41,67%	0,00%	6,56%	0,00%	0,00%	39,07%
4	Bts. Kota Sumenep- Kalianget	0,00%	0,00%	0,22%	4,02%	7,39%	0,00%	44,61%	0,00%	0,88%	16,67%	0,00%	37,84%	0,00%	0,00%	70,07%
5	Jenderal Sudirman	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	25,00%	0,00%	0,00%	33,33%
6	Ahmad Yani	27,50%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	66,67%
7	Urip Sumoharjo	31,25%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	72,71%
8	Slamet Riyadi	20,00%	0,00%	4,50%	10,75%	13,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	71,43%	0,00%	0,00%	73,33%
9	Yos Sudarso	0,00%	0,00%	0,78%	8,91%	7,50%	0,00%	35,91%	0,45%	2,27%	40,91%	0,00%	41,67%	0,00%	0,00%	79,90%
10	Bts. Kab. Pamekasan/ Sumenep-Bts. Kota Sumenep	0,00%	0,21%	0,03%	14,47%	8,07%	0,28%	21,84%	0,06%	1,13%	68,65%	0,00%	19,18%	23,53%	0,00%	66,78%
11	Raya Manding	0,00%	3,63%	2,50%	0,00%	26,38%	0,00%	25,00%	8,33%	0,00%	54,17%	0,00%	16,67%	0,00%	0,00%	82,33%
12	Halim Perdana Kusuma	8,64%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	66,67%

Calculation Index of Physical Condition per Component

Sub Komponen	Jenis Kerusakan	Volume Kerusakan	Faktor Koreksi	Nilai Pengurang	Indeks Kondisi Fisik Sub Komponen				
	Tersumbat	25,00%	0,44	50	e				
Saluran/	Tergerus	8,33%	0,21	25	100- ((0,44x50)+(0,21x25)+ (0,24x0)+(0,11x100)) =				
Drainase	Runtuh	0,00%	0,24	0					
Tepi	Dibutuhkan pasangan batu	54,17%	0,11	100	61,75				
Lereng Tepi	Runtuh	0,00%	1	0	100-(1x0) = 100				
Trotoar	Berbahaya	0,00%	1	0	100-(1x0) = 100				
	Rambu Jalan	16,67%	0,44	25					
Perlengkapan	Pagar Pengaman	0.00%	0,24	0	100- ((0.44x25)+(0.24x0)+				
Jalan	Patok pengarah	Patok pengarah 0,00%		0	(0,16x0)+(0,16x100)) = 73,00				
	Marka Jalan	82,33%	0,16	100					

The grouping of roads based on their status aims to bring order and legal certainty of road operation in accordance with the authority of the government and local government.

Damage Volume and Subtracting Value

Determination of component condition value begins by observing the condition of sub component. Observations were made on the type and volume of damage to each sub component. In the assessment of the condition of building components performed by Wijayanti (2013) used the value of the deduction of the amount depends on the percentage of damage volume. The reduced value (NP) for each volume range of sub component damage outside the pavement is divided into: minor damage (0% - <25%) with NP = 25, moderate damage (25% - <50%) with NP = 50 and a heavy workload (\geq 50%) with NP = 100.

• Correction Factor

Each sub component has a maximum reduction value of one hundred, then for a sub component with more than one type of damage, the deduction value of the type of damage shall be multiplied by a correction factor in order that the total deductible value shall not exceed one hundred. The correction factor used is the weighted value of interest of each type of damage that occurs on each sub component

Conclusion

Based on the results of the analysis and discussion that have been done in the previous chapter, the following conclusions can be drawn:

• The assessment model of the national road component condition in Magetan district was developed by adopting a condition index system according to the weight and hierarchy of each road component. The weighting of road components using the Analytical Hierarchy Process (AHP) method through questionnaires resulted in the weight of pavement components 0.80 and for the components outside the pavement of 0.20. In the ponenic component has a weight of 0.37; drainage channel / edge 0.33; edge slopes 0.15; sidewalks 0.09 and 0.06

 Results of performance data, priority order and type of maintenance are as follows:

Name Of Street	PCI values	Outside Pavement Values	Total Physical Performance of the Road	List of Priority	Type of Maintanance
Munginsidi St.	31	87.8	42.3	1	Periodic
Diponegoro St.	32	94.5	44.5	2	Periodic
Dr. Soetomo St.	38	94.5	49.3	3	Periodic
Ahmad Yani St.	40	98.2	51.6	4	Periodic

Thank you