CERUCUK
Volume 7 No. 7 2023 (373-382)

ANALYSIS OF ROAD DAMAGE CONDITION USING THE PAVEMENTCONDITION INDEX (PCI) METHOD ON THE ROAD SEGMENT OF GUBERNUR SARKAWI, BARITO KUALA REGENCY (STA 4+000 – 9+000)

Muhammad Alvin Rachim dan Muhammad Arsyad

Program Studi Teknik Sipil Universitas Lambung Magkurat
E-mail : alvin.xi.ipa.2013@gmail.com

ABSTRACT

Gubernur Sarkawi road (STA. 4+000 – 9+000) is located in Barito kuala Regency. This Road of flexible pavement has a length about 27.024 km and width 10- 15 m where the width of road body is 6-8 m with 1 track, 2 lanes 2 ways. On this road section, there are several point of damage that are reviewed using the PCI (Pavement condition index) Method, such as cracks, holes, sinking grooves and other type of damage, which is needs to be repaired using reconstruction workbecause based on the PCI value Obtained at Sta 5+000 Up to 5+500 it is obtained at 10 with a failed condition, a redesign is neeed. The redesign using the Manual Desighn Method 2017. Re-design planning with a design life of 20 thickness of the pavement layer,such as 1550 mm for the support layer, 160mm For the LFA Calss A layer, 150mm For The Cement Treated Based layer, 125mm for the AC-Base layer, 60mm For the AC-BC layer, and 40mm for AC-WC layer.

***Keywords**: Pavement Condition Index, Flexible Pavement Manual Design Pavement 2017*

1. INTRODUCTION

PCI (Pavement Condition Index) is the condition of the pavement surface that can be viewed from the damaged pavement surface. (Hardiyatmo, 2015). This method has a function to provide information when a survey is conducted on pavement conditions, but this method cannot provide an overview of predictive information for future damage. predictable, can also be used for more precise measurement recommendations (Hardiyatmo, 2015).

This PCI method is a numeric index whose values range between 0 to 100. A value of 0, indicates the pavement is in very bad condition, while a value of 100 indicates the pavement is still in perfect condition. This PCI is based on the results of a visual condition survey. A condition survey is a survey intended to determine the condition of the pavement at a certain time. This type of survey does not evaluate pavement strength.

The main purpose of road maintenance is to maintain the infrastructure that has been built so that it is always in a condition that is close to its original condition (steady condition, namely good and moderate) in order to be able to provide optimal services to support regional social and economic activities.

2. THEORITICAL STUDY

2.1 Theoritical Foundation

PCI is done to give an index value of a damage condition on the pavement surface. The pavement damage data obtained is a part of the direct visual survey in the field, where the results of the survey can provide information to researchers regarding the cause of a damage and whether it has anything to do with vehicle load or climate related to the damage (Hardiyatmo, 2015) .

In the PCI analysis, there are 3 main factors for the level of damage or severity of a pavement, namely : (Hardiyatmo, 2015):

1. The type of damage that occurred.
2. The level of damage of a pavement.
3. Amount of damage.

2.2 Input Data

2.2.1 TYPES OF DAMAGE

The types of damage to flexible pavement (asphalt), are generally classified as follows (Hardiyatmo, 2015):

1. Damage to surface texture: loose grain, slippery aggregate, fatness, stripping, and peeling.
2. Damage to potholes, railroad crossings and fillings
3. Deformation: subside, wavy, bump, groove, bump, expand and descend.
4. Damage to pavement edges: cracked/cracked edges and drooping shoulders.
5. Cracks: transverse, longitudinal, diagonal, block, reflective, crocodile skin and crescent shape.

2.2.2 Penilaian Kondisi Jalan dengan *Pavement Condition Index* (PCI)

The classification of road conditions based on PCI values is presented in **Table 2.1** (Hardiyatmo, 2015)

Table 2.1 Relationship of PCI Value with Road Condition Level.

Nilai PCI	Kondisi Jalan
86 – 100	SEMPURNA (*excellent*)
71 – 85	SANGAT BAIK (*very good*)
56 – 70	BAIK (*good*)
41 – 55	SEDANG (*fair*)
26 – 40	BURUK (*poor*)
10 – 25	SANGAT BURUK (*very poor*)
0 – 10	GAGAL (*failed*)

Source : Hardiyatmo, 2015.

2.2.3 PCI Method Procedure (Hardiyatmo, 2015)

1. Setting the deduct value

a. Add up the total for each type of damage at each level of severity.

b. Divide the calculation results a) by the total road segment to find the density, which is formulated as follows:

a. Density $(\%) = \frac{\text{area total damage}}{\text{Total Area of sample unit}} \times 100$

c. Determine the deduct value for each type of damage and the combination of severity based on the deduct value determination curve.

2. Determine the allowable value of the deduct (m)

a. If there is only one deduct value with a value > 5 for airports and > 2 for roads, then the total deduct value is used as the corrected deduct value, if not then proceed to the following steps.

b. Sort deduct value from the largest value.

c. Determine the value of m using the formula:

m = 1 + (9/98)*(100 – HDV) (3)

Where :

m = clearance deduct

HDV = highest value of deduct.

d. Each deduct value is deducted against m. If the sum of subtraction values smaller than m exists then all deduct values can be used.

3. Determining the Maximum CDV (Corrected Deduct Value)

   a. Determine the number of deduct greater than 2 (q).

   b. Determine the total deduct by adding up each deduct.

   c. Determine the CDV from calculations a) and b) using the deduct value correction curve.

   d. The smallest deduct value is subtracted from 2.0 then repeat Steps a to c until you get a value of q = 1.

   e. The maximum CDV is the largest CDV in the iteration process above

4. Calculates PCI (Pavement Condition Index) with the formula:

   PCI = 100 – CDVmax

3. METHOD

3.1 Research Location and Time

The location that will be used as the object of research is in the SP. Handil Bakti (SP. Serapat), Barito Kuala Regency, South Kalimantan, with a road segment length of 27.024 KM and a width of 8-15 m. during peak hours from 04.00 s/d 22.00 WITA.

3.2 Research Stage

3.2.1 Preparation

a. Consolidation of research methods, determination of methods, and analysis used in the study.
b. Survey preparation to facilitate on-site implementation.

3.2.2 Data Collection

a. The stage of preparing survey forms, survey resources, and making a schedule for survey implementation according to the survey method used.
b. The need for secondary data in the form of a collection of theories, provisions, and supporting regulations. Meanwhile, the field survey helped validate the data obtained through secondary data collection.

c. Data was collected through a secondary survey, namely collecting the necessary data from relevant agencies and direct observation in the field for primary data collection.
d. In carrying out the traffic volume survey, the surveyor will survey by observing directly at the location.

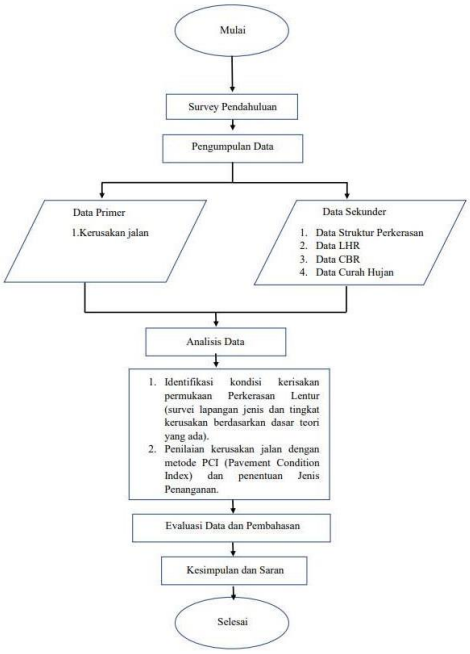

Figure 1. Research Flowchart

4. RESULTS AND DISCUSSION

4.1 Research Data

4.1.1 Dimensional data of road pavement damage of segment 1 (STA 4+000-STA 4+500)

Table 4.1 Dimensional data of road pavement damage for segment 1 (STA 4+000 – STA 4+500)

Source: Field survey Result

NO	Damage Type		Dimension		
		condition	Long (P) (m)	Wide (L) (m)	Area (A) (m2)
1	Edge Crack	M	1,5	1,5	2,25
2	Aligator Crack	M	0,5	1	0,5
3	Aligator Crack	M	1,2	2,2	2,64
4	pothole	H	1,7	0,5	0,85
5	pothole	H	3,5	2,5	8,75
6	Diagonal Crack	L	5	1,2	6
7	Depression	H	50	8	400
8	Edge Crack	M	7	1,7	11,9
9	Ravelling	H	3,6	0,5	1,8
10	Ravelling	H	5,3	3,6	19,08
11	pothole	H	4,4	1,8	7,92
12	Edge Crack	M	6,8	0,4	2,72
13	Rutting	M	1,2	2,2	2,64
14	Rutting	M	7	3,6	25,2

4.1.2 Calculation Result of Segment 1

- Flow Calculation Example
- Total area of damage (Ad) = 27.84 m^2
- The total area of the sample unit (As)= 8 m x 500 m = 4000 m^2
- Damage level = M (*medium)*
- (*density*)(%) $= \frac{Ad}{As} \; x \; 100 = \frac{27,84}{4000} \; x \; 100 = \; 0,7$

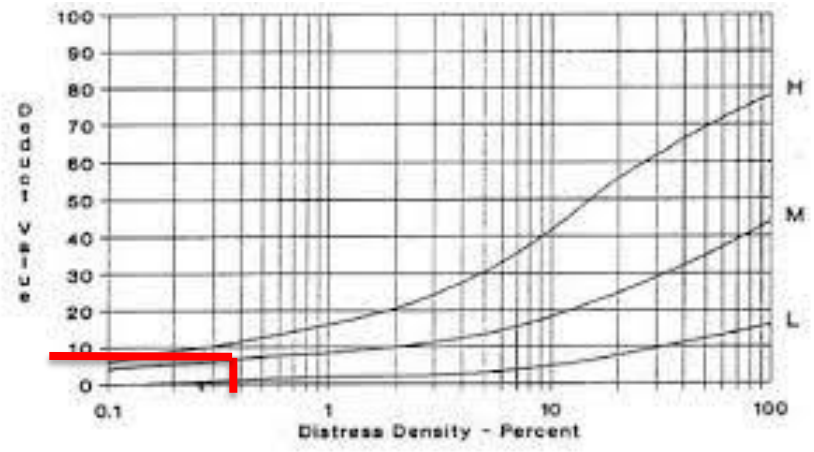

Figure 2 Chart Rutting

Then with the graph of the relationship between density and the subtraction value for the Rutting (2) we get adeduct value of 9.

Figure 3 Chart Total Deduct Value

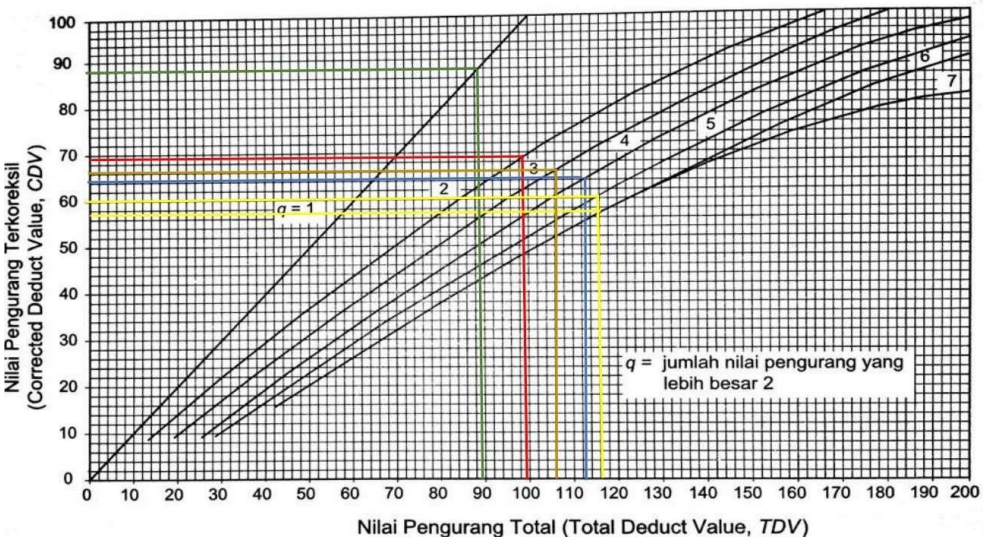

Table 4.2. Segment Calculation 1 STA 4+000 – 9+000

HD Vi	Mi	TDV							TOTAL TDV	Q	CDV (GRAFIK)	PCI
42	6,33	42	39	12	9	9	5		116	6	55	12
		42	39	12	9	9	5		116	5	60	
		42	39	12	9	9	2		113	4	64	
		42	39	12	9	2	2		106	3	66	
		42	39	12	2	2	2		99	2	69	
		42	39	2	2	2	2		89	1	88	

For the PCI value of segment 1 pavement on STA 4+000 – STA 4+500, it is obtained by 50 with the following calculation:

PCI = 100 - CDV

PCI = 100 - 88

PCI = 12

The rating obtained is *Very Poor.*

The recapitulation of the PCI Calculation results on the Governor Sarkawi road section is shown in Table **Table 4.2.**

Table 4.2. Recapitulation of the PCI Calculation

SEGMENT	STA	PCI	RATING
1	4+000 - 4+500	12	(Very poor)
2	4+500 - 5+000	30	(Poor)
3	5+000 - 5+500	10	(Failed)
4	5+500 - 6+000	60	(Good)
5	6+000 - 6+500	47	(Fair)
6	6+500 - 7+000	62	(Good)
7	7+000 - 7+500	59	(Good)
8	7+500 - 8+000	66	(Good)
9	8+000 - 8+500	30	(Poor)
10	8+500 - 9+000	44	(Fair)
	Average	42	(Fair)

Source:: The calculation result

So that we get the following

results: = (12+30+10+60+47+62+59+66+30+44)/10 = 42

Then the PCI value obtained is 42 rating category Fair

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

Based on the findings and discussions conducted at Jalan Governor Zarqawi, Barito Kuala Regency, the following conclusions are made:

1. The condition of the road surface damage is considered based on the type and extent of the road damage that occurs. Data obtained from surveys carried out visually directly in the field, namely:
   a. The damage condition of the Jalan Governor Zarqawi, Barito Kuala Regency section varies, there are different types of damage viz. grooving, crocodile skin cracking, edge cracking, holes, subsidence and loose grain weathering.
   b. The type and extent of road surface damage at Sta 4+000 to Sta 9+000, which occurred based on the type of road damage data from the results of field investigations varying from low (low) to high (high), each Damage, for PCI conditions 30-<80, overlay or overlay and PCI conditions >80-100 can be performed Preventive measures or routine maintenance.

2. The lowest PCI score is Sta 5+000 to 5+500 out of 10 *failed* and for the average PCI score at Sta 4+000 to Sta 9+000 it becomes at 42 with a condition score of Medium (*reasonable)*.
3. The type of treatment performed for the lowest PCI value is reconstruction by pavement thickness redesign using the 2017 Pavement Design Manual Method, as it has a PCI value of 10 at Sta 5+000 to 5+500.

5.2 Suggestions

Also make suggestions for improvements such as the settlement of Governor Zarkawi Road, Barito Kuala District, including:

1. It is necessary to carry out repairs and proper handling to reduce the risk of accidents due to road damage.
2. The above sample unit data was taken at a distance of 500m, while further investigation will need a shorter sample length to obtain a more accurate PCI value, because the shorter the road repair cost, the more accurate the PCI assessment results will be can be cheaper.
3. Overlay calculations or additional layers were not considered in this study because the authors did not get any deflection data back, so the overlay calculations could not be performed.
4. As a predictor of future damage and as a basis for routine actions, conduct regular surveys of damage condition, particularly on sidewalks, so that road measurements and treatments can be performed in more detail.
5. It is hoped that the relevant government agencies will be able to carry out routine, responsive and appropriate road maintenance in the event of damage occurring to the road surface.
6. Comparisons with other methods should be necessary to ensure repairs and more appropriate handling.
7. Preferably, future road design should take into account the presence of drainage, considering that suboptimal water disposal is one of the factors in road damage.

REFERENCES

1. BPS Barito Kuala. 2021. *Barito Kuala Regency In Figures*. Bartito Kuala: BadanPusat Statistik .
2. Direktorat Bina Marga. 2017. *Manual Desain Perkerasan Jalan (No. 02/M/BM/2017)*. Jakarta: Kementerian Pekerjaan Umum.
3. Direktorat Bina Marga. 1997. *Manual Kapasitas Jalan Indonesia*. Jakarta: Kementerian Pekerjaan Umum.
4. Hardiyatmo, Hary Christady. 2015. *Pemeliharaan Jalan Raya.* Yogyakarta: UGMPress.
5. Hardiyatmo, Hary Christady. 2019. *Perancangan Perkerasan Jalan dan Penyelidikan Tanah.* Yogyakarta: UGM Press