

Road Damage Detection Using Bina Marga Method on Raja Wadipalapa Road Section

Yuliyanti Kadir
Department of Civil Engineering
Universitas Negeri Gorontalo, Indonesia

Frice Desei
Department of Civil Engineering
Universitas Negeri Gorontalo, Indonesia

Bagastiar Imran
Department of Civil Engineering
Universitas Negeri Gorontalo, Indonesia

Abstract:- This study aims to identify road damage using the on the Raja Wadipala Road section. This study used quantitative descriptive analysis. For road damage analysis using the Bina Marga Method. The primary data taken consists of road geometry, vehicle volume and type of road damage. The traffic survey is carried out for 3 days (Monday, Wednesday and Saturday). Observation time for 12 hours. Based on the survey results, an ADT (Average Daily Traffic) value of 370.15 PCU/hour was obtained, which was included in the road class 3 category. The condition of the most road damage is surface texture. The top priority that must be addressed immediately is Sta 1 + 000 to Sta 2 + 000. Type of damage found on road sections street Raja Wadipala: surface texture 24,3%, cracking 4.6%, depression 0.8%, patching 0.3%, potholes 0,2% and rutting 0.2%. The repair method is by resurfacing (Overlay) or surface treatment using Chip Seal or Slurry Seal

Keywords: Road Damage, Bina Marga Method.

I. INTRODUCTION

Roads have an important role, especially regarding the development of an area. The district is said to be developed when the road infrastructure is good [1]. Damaged roads can result in accidents, increased travel time, and congestion [2]. According to [3] roads are very important transportation infrastructure because if the road is good, it facilitates economic activities and facilitates community mobility. In addition, it can increase productivity in work and other social activities. If there is road damage, it will cause disturbing influences on the community and road users [4]. Wadipalapa Street is one of the accesses that connects Gorontalo Regency and Gorontalo City. On some segments of the road, there is standing water because there are no drainage channels. This road is often passed by heavy vehicles transporting LPG, thus affecting the road pavement. Based on this, it is necessary to conduct research on the priority of handling Raja Wadipalapa Road, Gorontalo Regency.

II. LITERATURE REVIEW

The road pavement structure has decreased performance due to various causes including repetition of traffic loads, water, poor drainage systems, changes in temperature and rainfall intensity, environmental geological conditions, unstable basic soil conditions, and poor implementation processes. During the service life of the pavement structure experienced a decrease in performance from initial performance (IP0) to final performance (IPt) [3] The performance degradation time from IP0 to IPt is expected to be equal to the life of the plan. However, the quality of pavement structures, reps and traffic loads, surface coating conditions, and road drainage can accelerate performance degradation. If periodic maintenance is carried out, the decline from IP0 to IPt occurs over a longer time. Some of the causes of road damage are puddles on the road surface with poor drainage [6]

Road damage management programs include reconstruction, major rehabilitation, minor rehabilitation, preventive maintenance, routine maintenance, and gradual handling.[7] Road damage surveys are complications of various road damages, the extent of damage, and the extent of their spread [8]. According to [9] the type of pavement consists of surface texture, potholes, patching, cracking, rutting, and depression. The priority order is calculated using the following formula

Priority Order = 17- (ADT Class + Road condition Value)

Order Of Priority 0-3, indicating that the path should be included in the upgrade program

Order Of Priority 4-6, indicating that the path should be included in the periodic maintenance program

Order Of Priority >7, indicating that the path should be included in the routine maintenance program

III. METHODOLOGY

The stages of this research are identifying problems that occur at the research location, searching for related literature, preparing survey personnel, and processing and analyzing data so that results and conclusions are obtained. Traffic survey data is carried out for 3 days (Monday, Tuesday, and Saturday) within a period of 12 hours starting from 06.00-18.00. The length of the Raja Wadipala Road is approximately

5.1 km. For retrieval of damage, data is divided into 5 segments and each segment is 1 km apart. Each segment is divided into 100 m to observe the type of road damage. The data is analyzed using the Bina Marga Method so that priority handling is obtained.

IV. RESULT AND DISCUSSION

A. Research location overview

The Raja Wadipala Road has a length of 5.1 km with a width varying from 4.5 m to 4.7 m. The characteristics of the road are 2 lanes 2 directions undivided, a left and right shoulder road with a width of 1 m, and most of them do not have drainage channels, this road connects Telaga District, Telaga Jaya, Tinelo and Kota Barat District in Gorontalo City. The distance from the research location to the center of the region is approximately 5 km. This road has access to housing, schools, markets, and offices. Topographic conditions are flat and environmental conditions are residential areas. The population of Gorontalo Province is 1,171,681 [10]

B. Average Daily Traffic Calculation

Based on the results of the traffic volume survey for three days, namely Monday, Wednesday, and Saturday). The types of vehicles that cross the road are dominated by motorcycles, bendor (pedicab motorcycle), light vehicles (passenger cars), and heavy vehicles (Pertamina tanker trucks transporting LPG).

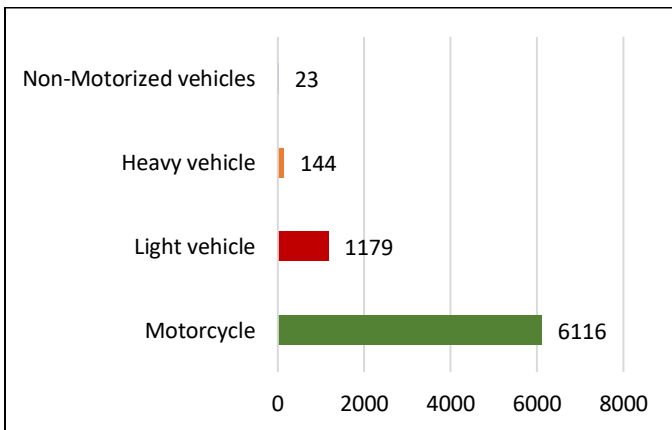


Fig 1. Number of vehicles by type

The survey results show peak hours occur in the afternoon from 17.00 to 18.00. The observation of daily traffic volume is almost equal to the amount of 370.15 PCU/hour. In accordance with the Traffic and ADT classes included in grade 3 PCU/hour. For more details on traffic, fluctuations can be seen in Figure 2.

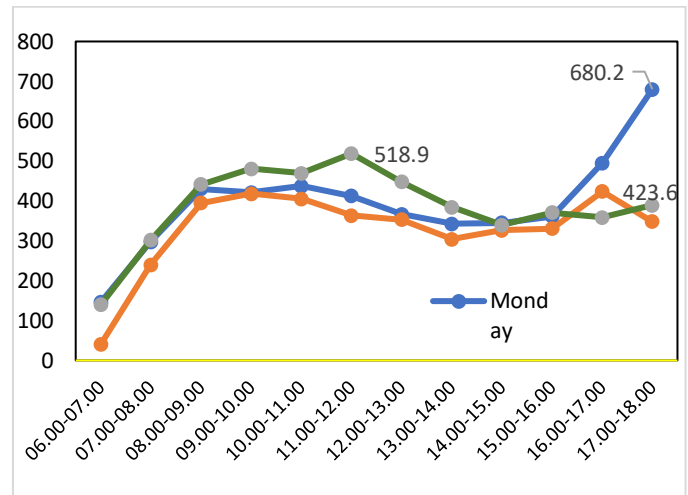


Fig 2. Traffic fluctuations during observation

C. Road Damage Calculation

Based on the results of the road damage condition survey, several types of damage were obtained among them surface texture, cracking, depression, patching, potholes and rutting. The damage to each segment is shown by the following Figure 3,4,5,6,7, respectively.

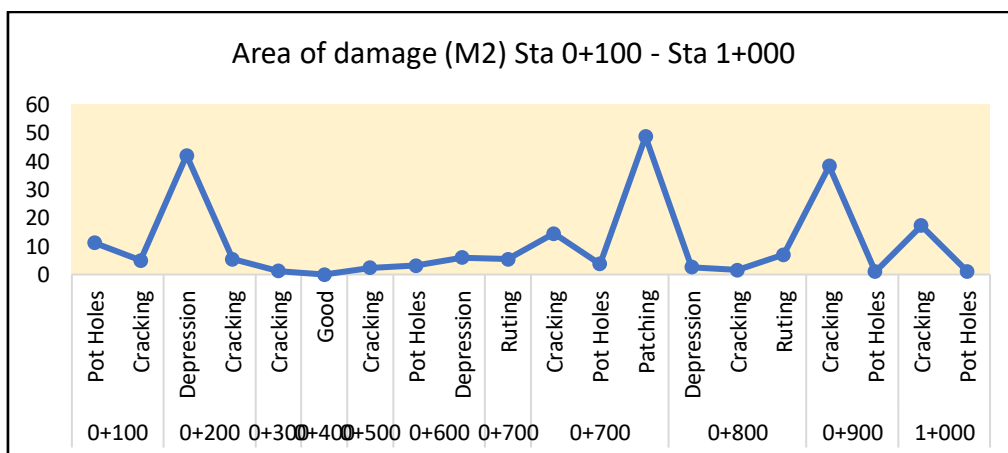


Fig 3. Types of damage to segments 1 Sta 0+000 sd Sta 1+000

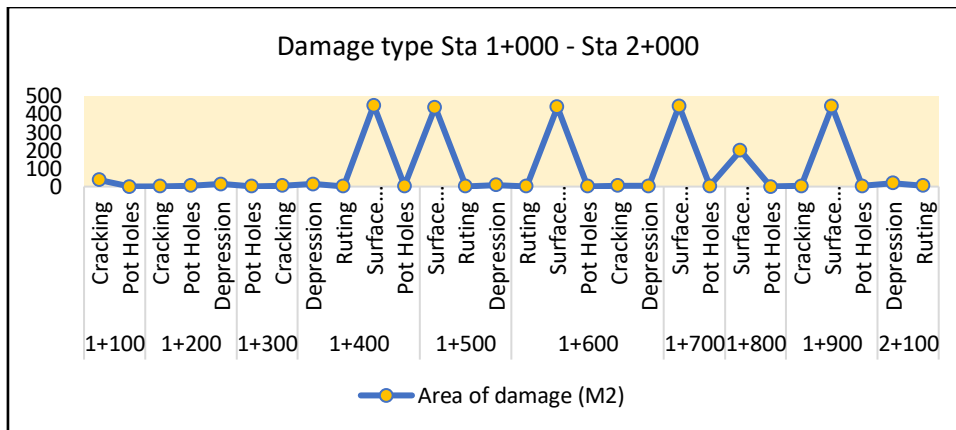


Fig 4 Types of damage to segments 2 Sta 1+000 sd Sta 2+000

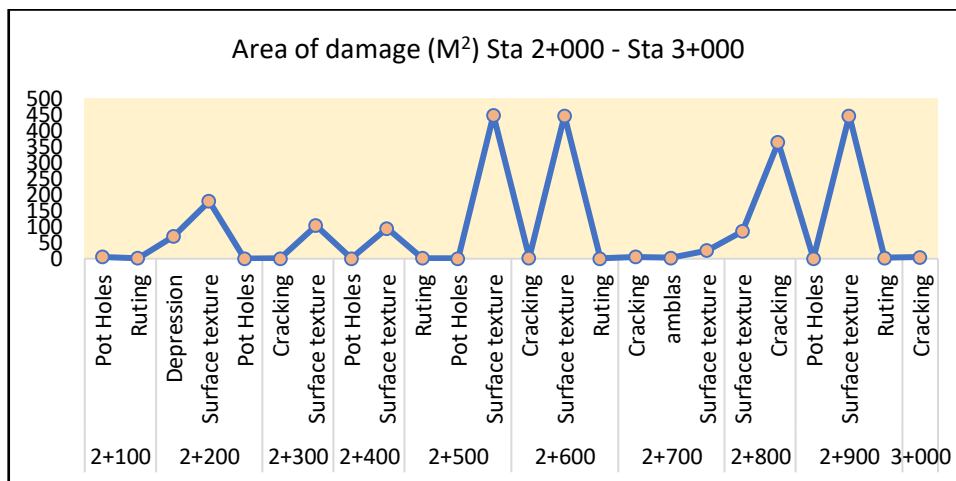


Fig 5. Types of damage to segments 3 Sta 2+000 sd Sta 3+000

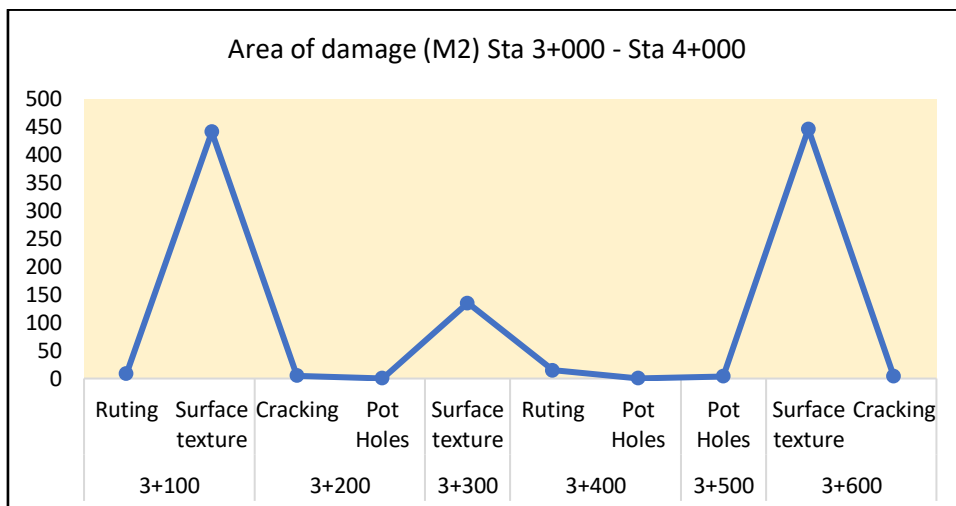


Fig 6. Types of damage to segments 4 Sta 3+000 sd Sta 4+000

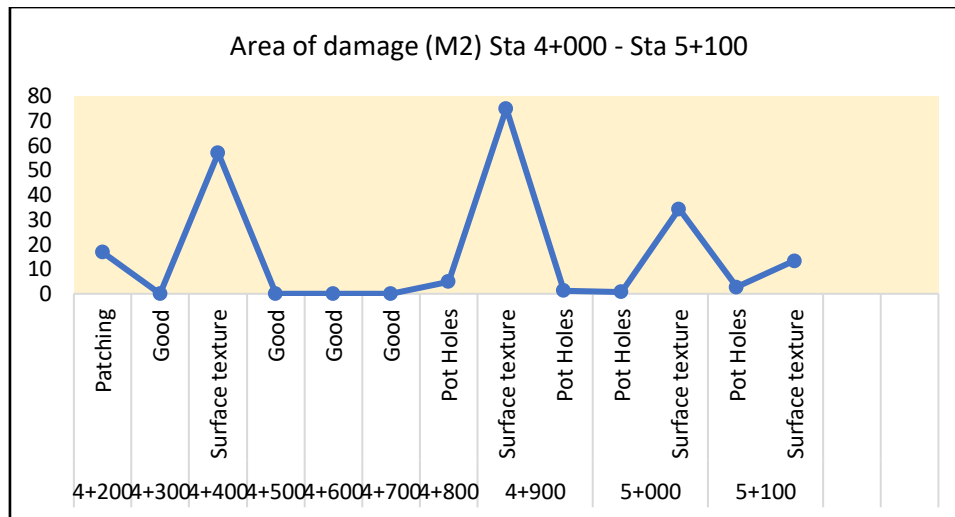


Fig 7. Types of damage to segments 5 Sta 4+000 sd Sta 5+100

The results of the road damage condition survey as shown in Figures 3,4,5,6,7 respectively show that the most damage is in segment 2 sta 1+000 to Sta 2+000. The total damage that occurred along the Raja Wadipalapa Road section was 22 loose grains with an area of 6017.07 m² or 24%. Furthermore, crack damage as many as 26 points with an area of 1062.92 m² or 5%, collapse as many as 11 points with an area of 184.76 m² or 1%, fillings as many as 2 points with an area of 65.60 m² or 0.28%, holes as many as 27 points with an area of 57.07 m² or 0.24%, and finally grooves as many as 12 points with an area of 52.02 m² or 0.22%. For more details shown in Figure 8.

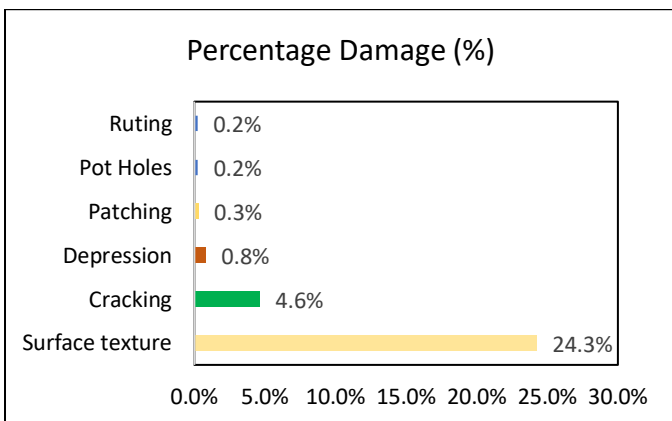


Fig 8. Prosentase Kerusakan

Based on the results of data analysis of field surveys on the Raja Wadipalapa Road, priority order values and maintenance recommendations were obtained, namely periodic maintenance. The repair method is by resurfacing (Overlay) or surface treatment using Chip Seal or Slurry Seal.

V. CONCLUSION

- Type of damage found on road sections street Raja Wadipala: surface texture 24,3%, cracking 4.6%, depression 0.8%, patching 0.3%, potholes 0,2% and ruting 0.2%.
- Based on the results of data analysis of field surveys on Jalan Raja Wadipalapa, priority order values and

maintenance recommendations were obtained, namely periodic maintenance. The repair method is by resurfacing (Overlay) or surface treatment using Chip Seal or Slurry Seal.

REFERENCES

- [1] Y. Kadir, Jaringan Jalan, Gorontalo: Ideas Publishing, 2016.
- [2] B. W. Widiyanto, Elkhasset and A. Rifky, "Kondisi dan Penanganan Perkerasan Jalan Berdasarkan Metode SDI, RCI dan IRU Dengan Menggunakan Aplikasi Roadlab Pro," *RekaRacana Jurnal Teknik Sipil*, vol. 08, no. 02, pp. 100-110, Juli 2022.
- [3] M. Isradi, H. Dwiatmoko, A. Subhana , J. Prasetyo and N. Hartatik, "Evaluation Of The Road Pavement Damage With Bina Marga Method And Pavement Condition Index Method," in *International Conference on Industrial Engineering and Operations Management*, Detroit, Michigan, USA, 2020.
- [4] F. Yudaningrum and Ikhwanudin, "Identifikasi Jenis Kerusakan Jalan," *Teknika*, vol. XII, no. 2, pp. 1-54, 2017.
- [5] S. Sukirman, Perencanaan Tebal Perkerasan lentur, Bandung: Nova, 2010.
- [6] H. JKOROMATH, F. L. DESEI and Y. Kadir, "Analisis Kondisi Kerusakan Jalan Menggunakan Metode Pavement Condition Index (PCI) Dan International Roughness Index (IRI) Beserta Alternatif Penanganannya (Studi Kasus: Jalan Samaun Pulubuhu-Jalan Boliohuto Huidu-Jalan A.K.Luneto)," *Fropil*, vol. Vol 10, no. No.1, pp. 1-9, Juni 2022.
- [7] Direktorat Jenderal Bina Marga, Perencanaan dan Pemrograman Pekerjaan Preservasi Jaringan Jalan (Bagian dari Manajemen Aset Prasarana Jalan), Jakarta, 2021
- [8] R. Faisal, M. Ahlan, C. Mutiawati, M. Rozi and Zulherri, "The comparison between the method of Bina Marga and the pavement condition index (PCI) in road damage condition evaluation (case study: Prof. Ali Hasyimi

Street, Banda Aceh)," in *IoP Conf. Series Material Science and Engineering*, 2020.

- [9] Direktorat Pembinaan Jalan Kota , Tata Cara Penyusunan Pemeliharaan Jalan Kota (No. 108/T/BNKT/1990), Jakarta: Direktorat Jenderal Bina Marga Departemen PU (In Bahasa Indonesia), 1990
- [10] Badan Pusat Statistik, "Jumlah Penduduk Provinsi Gorontalo," Gorontalo, 2020