

Factors Caused Road Damage Banda Aceh - Medan STA 481+000 - STA 483+000

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ABSTRACT – Roads are land transportation facilities that are very important in facilitating economic relations activities, both between one city and another. Good road conditions will facilitate the movement of people in relationships and other social activities. Meanwhile, if there is road damage, it will not only hinder economic and social activities, but accidents can occur. Many factors cause road damage, including weather, weather on the road surface when it rains, scorching heat in the dry season, average daily traffic volume (LHR), and vehicles that have a number of loads or overloads (Overloading). From the results of the study, the dominant type of damage on the Banda Aceh-Medan road STA 481+000-STA 483+000 sorted from the largest to the smallest percentage is Alligator Cracking, the second is Longitudinal Cracks, the third is Longitudinal Cracks. Edge (Cracked Edge).

Keywords: road, overloading, damage, maintenance

I. INTRODUCTION

Roads are land transportation infrastructure that is very important in facilitating economic relations activities, both between one city and another. Good road conditions will facilitate the mobility of the population in conducting economic relations and other social activities. Meanwhile, if there is road damage, it will not only hinder economic and social activities, but accidents can occur. Many factors cause damage to roads, including weather, puddles of water on the road surface when it rains, scorching heat in the dry season, average daily traffic volume (LHR), and vehicles that have a number of loads or overloading (overloading). The damage that occurs will certainly affect the safety and comfort of road users. Therefore, the handling of pavement construction whether it is maintenance, improvement or rehabilitation can be carried out optimally if the factors causing damage to the road segment are known. The Banda Aceh-Medan road is a Sumatran highway. This research was conducted at Km 481 to Km 483. Where on that road a lot of damage. Judging from the type and amount of damage that occurs on the road, the author is interested in conducting research on the road section. The road segment suffered a lot of damage such as crocodile cracking (Alligator cracking), groove cracks, edge cracks, holes, sinking, sungkur, peeling of the surface layer, and subsidence of the surface layer. Road damage that occurs is a complex problem and big losses for road users, such as the occurrence of long travel times, congestion, traffic accidents and others. Therefore, the road must receive handling and maintenance in order to maintain safety and comfort for road users.

II. LITERATURE REVIEW

The road network system is prepared with reference to the regional spatial plan and by taking into account the connectivity between regions and/or within urban areas. (Maftukin & Kartikasari, 2017). Road damage that occurred in several roads resulted in considerable losses, especially for road users. This happens due to the obstruction of the traffic lane, which should be smooth to be not smooth due to the number of potholes and damaged roads. Damage to this road often occurs in cross roads, such as the road that I studied, namely the Banda Aceh-Medan highway. This road damage is caused by several factors, namely, weather factors (climate), pavement quality that does not meet the requirements, the large number of motorists who pass through the road and vehicles carrying excess loads that are not in their capacity. The handling of damage to flexible pavement construction in the form of maintenance, improvement and rehabilitation has not been carried out optimally. This is likely to happen because maintenance is only carried out on physical damage without further evaluating the possibility other causal factors that must be anticipated so that the road pavement does not suffer serious damage same. This paper will describe the damage to roads and the various factors that cause the damage in several areas in Indonesia as well as the relationship between road damage and the costs that must be incurred. The analysis was carried out through library research methods/study of related research/earlier. Based on the results of the analysis, it is known that the dominant damage that occurs is damage in the form of surface defects and cracks. (Munggarani & Wibowo, 2017)

III. METHODS

Data collection in this study is divided into two, namely primary data and secondary data:

a. Primary data

Data were directly obtained from the research site, namely the Seumadam-Sungai Liput road by means of surveys and direct observations in the field so that there were no changes during the implementation of the research.

1. The recording of damage types 481+000 to STA 483+000 is divided into 10 STA, each STA is divided into 200 m per STA and the length of the road is 2 Km. The recording is carried out on a direct survey in the field by seeing what damage has occurred on the road.
2. Average daily traffic volume by means of a direct survey in the field starting from 16:00-18:00 WIB, at that time the road experiences the peak of the traffic flow of motorists at that hour. The recording is divided every 15 minutes, namely to private vehicles, small and large buses, 2-axis trucks, 3-axis trucks and others that cross the road.

b. Secondary Data

Data obtained by collecting data from the relevant agencies. In this case the relevant agency is the Directorate General of Land Transportation UPPKB Seumadam. Secondary data needed in this study is the number and weight of vehicles that pass the Seumadam-Sungai Liput road in unit time.

IV. RESULTS AND DISCUSSION

1. Type of Road Damage

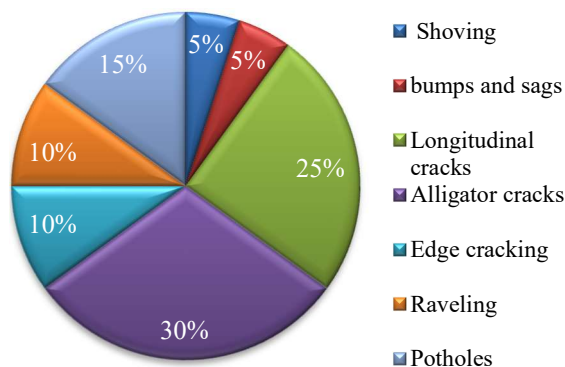


Figure 1. Percentage of Types of Damage to Roads

The types of road damage that occurred on the Banda Aceh – Medan road KM 481-483 were (4) Sungkur (Shoving), (6) Bump and Sags, (7) Longitudinal cracks, (11) Cracks Alligator cracks, (14) Edge cracking, (15) Ravelling, (19) Potholes.

a. Calculating Damage Density Value (Density)

In this study, the width of the road is 7 m, so the width is 200 m x 7 m = 1400 m² (As). as an example of

calculating STA 1 + 400: For Longitudinal Crack damage

$$\begin{aligned} \text{Densitas (\%)} &= \frac{Ad}{As} \times 100 \\ &= \frac{37}{1400} \times 100 \\ &= 2,64 \% \end{aligned}$$

b. Example of deduct value (DV) STA 1+400

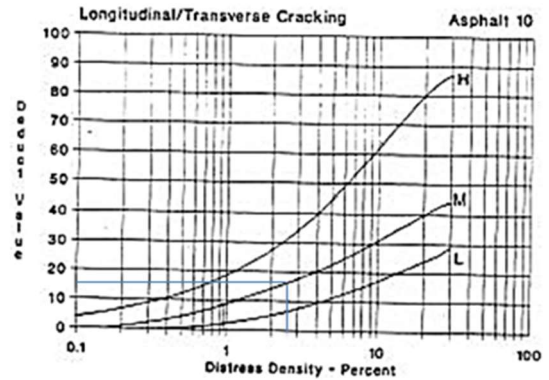


Figure 8-33. Longitudinal/Transverse Cracking.

Figure 2. Deduct Value (DV)

2. Average Daily Traffic Volume (LHR)

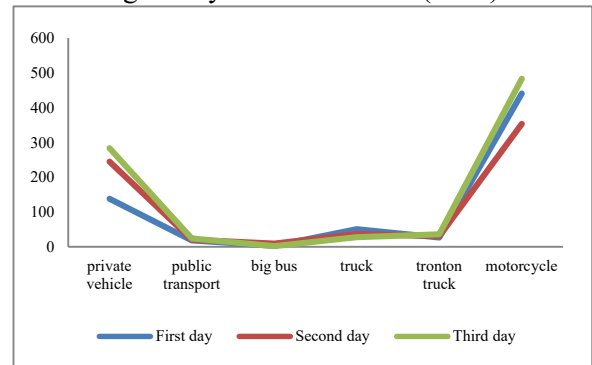


Figure 3. Traffic growth graph

Data collection was carried out at a time of high activity, that time was 16.00-18.00 WIB according to field observations. This data collection was carried out for three days at the same location, namely on 04-06 February 2022.

The calculation of the average daily traffic on the Banda Aceh-Medan road section is:

$$\text{LHR} = \frac{\text{Total Traffic During Observation}}{\text{Length of Observation}}$$

$$\begin{aligned} \text{LHR} &= \frac{(678 + 696 + 856) \text{ Vehicle}}{6 \text{ Hours}} \\ &= \frac{2230}{6} \text{ Vehicle} \\ &= 371.7 \text{ rounded up to } 371 \text{ vehicles per hour.} \end{aligned}$$

3. Calculation of Vehicle Weight

No	Month	Total Vehicle Weight	Total Overload 2020
1	January	0	0
2	February	0	0
3	March	166812269	133834361
4	April	25559356	9172441
5	May	17032860	6176462
6	June	74258641	26140465
7	July	128208891	45493657
8	August	123500735	44171932
9	September	140640948	52481582
10	October	144271710	54518904
11	November	65963619	22413335
12	December	62964106	18934644

Table 1. Total Vehicle Weight And Total Overload Weight 2020

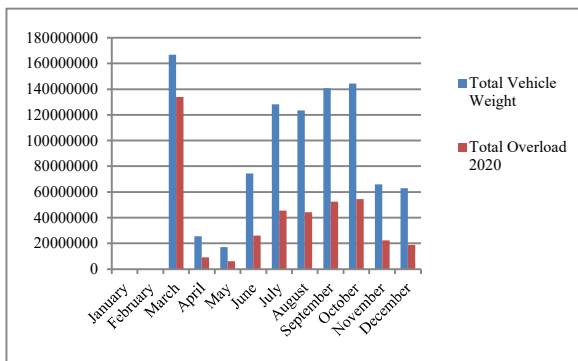


Figure 4. Graph of Vehicle Weight and Overloaded Year 2020

No	Month	Total Vehicle Weight	Total Overload 2021
1	January	38487414	10426326
2	February	37815100	10587630
3	March	49464732	13217499
4	April	60618205	16518338
5	May	7893506	2184660
6	June	67370108	18357723
7	July	23748769	6355357
8	August	51096635	13527836
9	September	51131285	13471529
10	October	51700886	12794363
11	November	46292859	9617018
12	December	42439189	8454606

Table 2. Total Vehicle Weight And Total Overload Weight 2021

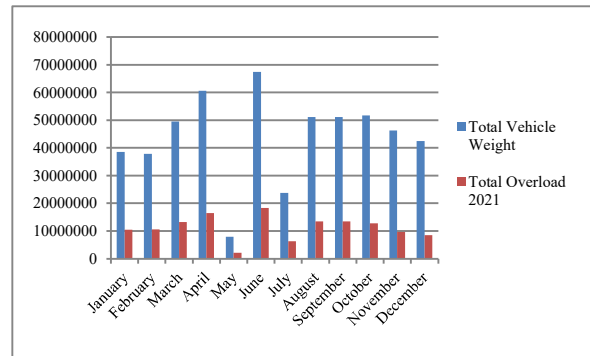


Figure 5. Graph of Vehicle Weight and Overloaded Year 2021

The weight of the vehicle is calculated based on data obtained from the UPPKB Seumadam. From the calculation results obtained the total weight of the vehicle and the total overload each month in the last 2 years.

From the results of the study, the dominant type of damage that occurred on the Banda Aceh-Medan road STA 481+000-STA 483+000 sorted from the largest to the smallest percentage was Alligator Cracking, the second Longitudinal Cracks, the third Holes (Potholes). According to Silvia Sukirman in her book entitled "Highway Flexible Pavement" Alligator Cracking Damage is caused by poor pavement material, surface weathering, subgrade or the pavement under the surface layer is less stable, or the foundation layer material is saturated. water (ground water rises). The large tonnage also contributes to the damage to the road, especially when the road is saturated with water. The largest tonnage or the largest load that crossed the Banda Aceh-Medan STA 481+000-STA 483+000 road was > 58,830 Kg or 58.83 Tons for the last 2 years. Vehicle loads can reduce the ability of the subgrade to support the load. Due to vehicle loads, the subgrade may decrease in volume due to compaction. This local volume reduction results in a non-uniform settlement of the subgrade. This happens when the subgrade is not compacted properly. Loss of subgrade support under the pavement, occurs when due to the load of passing vehicles, water is pumped out and carries fine soil particles causing cavities under rigid pavement. Based on the results of research and theories that support the factors of road damage, the factors that cause damage to the Banda Aceh-Medan STA 481+000-483+000 road are:

1. Roads that are saturated with water.
2. The absence of road supporting buildings (drainage channels)
3. Tonnage of vehicle load and overload with total vehicle weight exceeding the Permitted Weight Amount (JBI) = 21000 Kg.

V. CONCLUSION

Based on the survey of road conditions, the types of damage that occurred on the Banda Aceh-Medan road STA 481+000-STA 483+000 were Sungkur (Shoving), Benjol and Down (Bump and Sags) , Longitudinal cracks, Alligator cracks, Edge cracking, Ravelling, Potholes. One of the factors causing road damage is due to the absence of road supporting buildings such as drainage channels, low road surface elevation is also a factor in inundation of water above the road surface when it rains. Traffic volume also contributes to road damage, plus the tonnage of vehicle loads and overloads with the total weight of the vehicle exceeding the Total Permitted Weight (JBI) = 21000 Kg. Based on the type of damage that occurs in the field, maintenance actions can be carried out with maintenance or repair actions per segment. Where maintenance activities are divided into 2 (two) categories, namely routine maintenance and periodic maintenance, in accordance with road maintenance instructions according to the Directorate General of Highways.

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