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Bulungan-Lebak Road Service Period, Jepara Regency Post Repair

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A B S T R A C T

Traffic volume is one of the causes of road damage. With the increasing number of vehicles, it is possible that the road will be damaged in a relatively short time. The purpose of this study was to determine the service life of the road and the relationship between vehicle volume and the level of road damage on the Bulungan-Lebak road section. In this study, researchers used visual methods to see the type of damage and then measured the damaged road sections and counted the number of vehicles during peak hours and obtained road age data. In this way, 3 (three) data are obtained, namely road inventory data, damage value data and time data after the last road was repaired

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INTRODUCTION

The population of a city is a very important part of urban studies. This is because the development of the city's population concerning quality and quantity is the main factor of the existence of the city itself. The population growth of an urban area also increases the need for space. The higher the population, the higher the need for urban space. In addition to population factors, urban development is also influenced by socio-cultural factors and socio-economic factors. Socio-cultural factors are factors that include changes in patterns or procedures for people's lives. While socio-economic factors are factors related to economic growth in the city.

The increasing economic activity in Jepara has resulted in increasingly congested traffic activity. Therefore, it is necessary to provide infrastructure that can support community activities, one of which is the main road including complementary buildings intended for smooth traffic. The road is an infrastructure that is very helpful in achieving economic, social, tourism and cultural activities. The main function of a road is to provide safety and comfort for its users, especially for land transportation when traveling somewhere (Marsyanda et al., n.d.).

The Bulungan-Lebak road is included in the district road category and is also an alternative road between Suwawal Village and Bulungan Village. This road section is located in a densely populated area. This road is used by many employees of laborers or furniture factory workers and trucks carrying goods and many passenger cars going to the Jepara sub-district or to the city center and even out of town. As a result of the increasing traffic growth rate, the Bulungan-Lebak road section, which is a flexible pavement, has experienced a structural decline, so that many of these road sections have lots of bumps and potholes, especially during the rainy season.

In the maintenance process, road damage sometimes occurs earlier than the service period which is caused by several factors, including human factors and natural factors. Natural factors that can affect the quality of road pavement include water, temperature changes, weather and air temperature. In addition, there is also the human factor, which includes mutant heavy vehicles that exceed the capacity and volume of vehicles that are increasing. If these factors occur continuously, it can cause damage to the road being passed, and of course it will be detrimental to all parties involved (Ansusanto & Tanggu, 2016).

Seeing the problems with the condition of the Bulungan-Lebak road section, it is necessary to study again regarding the service life of the road. Starting from the beginning of repairs until damage occurs at this time, and it is also necessary to look for alternative pavements that have stronger structural resistance. Later, from the results of our research, it is hoped that we can provide information or data regarding the service life of district roads, especially the Bulungan-Lebak road. Prior to this research, a similar study had previously been conducted, but with different research locations and research objectives as done by (Service, 2014) (J.Dwijoko Ansusanto, 2016) (Arrang & Rangan, 2020) (Faisal et al., 2019) aboaut level of service.

In this study, researchers conducted research to obtain information about the service life of the road, to determine the traffic density of the Bulungan-Lebak road. as well as what factors cause the density of vehicle volume on the Bulungan-Lebak road. This research needs to be carried out and if there is no action like this it will cause problems that can interfere with the comfort, safety and safety of road users. This research is also a supporting infrastructure for the economy of the Jepara community.

METHODOLOGY

Overview

Field surveys were conducted to collect the necessary primary data. Primary data as a reference source of data obtained directly from the field (Marditama & Sufanir, 2017)(Saputro, 2022). The survey conducted includes:

a. Street Investor Survey (Saputro & Umam, 2021)

In conducting a road inventory survey, the things that must be considered are:

1. Survey equipment, including:
   Survey form.
   - Measuring instrument with a length of 50 meters and 5 meters.
   - Stationery.
   - Camera.
   - Pilox.
2. Time of survey implementation
   The road inventory survey was carried out at predetermined road locations starting on December 6, 2022. The implementation time was at 09.00 WIB - finished.
3. How to conduct the survey
   The stages in the process of carrying out an inventory survey are:
   - Determining the starting point of the STA survey.

Determination of the initial STA point starts at the STA point 0 ± 000, the determination of this STA point serves to facilitate the retrieval of road data to be reviewed, such as road dimension measurement data, road damage data. The determination of the distance to the STA points is carried out with varying distances depending on the length of the road being reviewed and the amount of road damage on the road section.

- Measurement of road dimensions.

The measurement of road dimensions aims to determine pavement width, lane width, shoulder width, and drainage width. Measurements using a meter with a length of 50 meters and 5 meters.

b. Road Damage Survey (Rachman & Sari, 2021)

When conducting a road damage survey, the following points should be considered:

1. Survey equipment, including
   - Survey form.
   - Measuring instrument
   - Stationery.
   - Camera.

• Pilox.

2. Time of survey implementation.
   The road damage survey was carried out at predetermined road locations starting on December 6, 2022. The implementation time was at 09.00 WIB - finished.
3. How to conduct the survey.
   The road damage survey is a survey in which this survey carries out the following process stages:
   • Preparation of the tools needed, such as stationery, measuring instruments and cameras.
   • Identify the type of road damage from the initial STA point by walking along the road under review up to the final STA.
   Identification of the type of damage is determined based on the STA points taken. The type of damage is adjusted according to the damage criteria.

Research Stages

The research stages cover the implementation steps from the beginning to the end of the research, each research stage is clearly described as follows (Sumina, 2015):

a. Formulation of the problem
   At this stage, the formulation of the problems that occurred at the research location was carried out as well as being used as a goal in the research conducted. In this study, the researcher formulated the problem to be studied, namely about the service life of the road.
b. Literature review
   The next step is to carry out literature studies and field studies. The literature study was carried out in order to study and theoretically study the basic analysis used in problem solving research, namely using the 1997 Directorate General of Highways Indonesia Road Capacity Manual (MKJI).
c. Data collection
   In the third stage of collecting the data needed for problem solving materials that have been stated in the second step. After the data is collected, data processing is carried out which will be used in the analysis and discussion stage.
d. Analysis and discussion
   At this stage, the analysis and discussion stage is carried out in accordance with the formulation of the research problem regarding the service life of the road. Each stage will be discussed optimally according to the steps based on the analysis reference. The results of data processing in the previous step will be used for more intensive analysis to obtain a solution. The results of solving this problem are expected to provide a better alternative calculation in determining the type of road service level.
e. Conclusion
   At this stage, the researcher draws conclusions about the results of the research that has been carried out based on the results of data processing

using the basic reference analysis. This conclusion is in the form of statements taken and calculations resulting from the analysis and discussion.

f. Suggestion

As a continuation of the conclusion statement, the researcher formulates suggestions related to the processes that are running at the research location so that they can provide better results in the future.

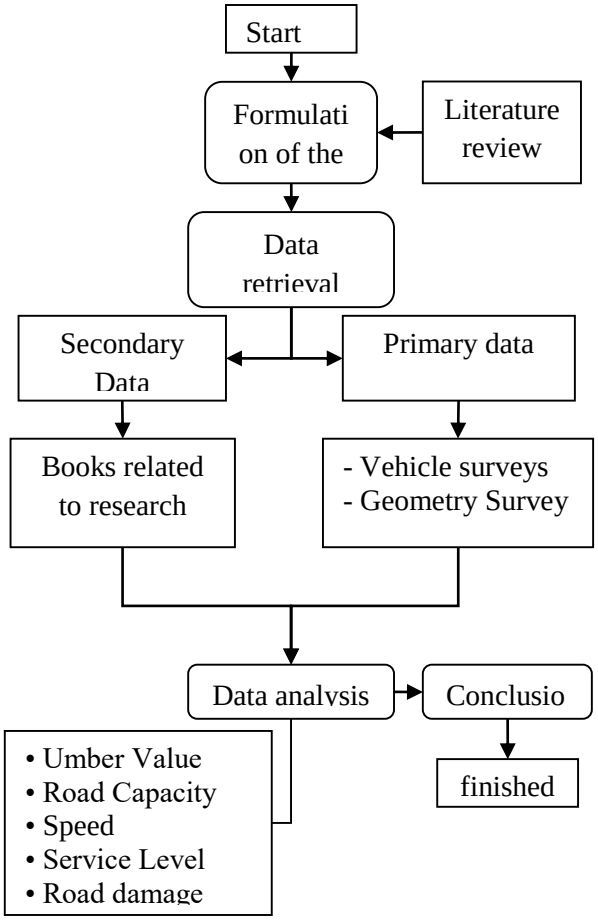

Figure 1. Research Flowchart

RESULTS AND DISCUSSION

Geometric Data

Geometric data is carried out with the aim of knowing the size and geometric shape of the road on the road segment. Such as road type, road width, pavement type, shoulder width, etc. As for knowing the general information of the road section, various existing problems can be identified.

The specifications on the Bulungan-Lebak road section, more precisely the connecting road for Bulungan-Suwawal village, can be seen as follows:

a. Road type: 2/2 UD (two lanes two directions)
b. Type of terrain: uphill / downhill
c. Road width: 6.7 m
d. Worker type: flexible pavement
e. Road shoulder width: 1 m
f. Road length: 200 m
g. Median: none
h. Total population: 1,184,947 people (BPS City of Jepara, 2020)

Figure 2. Road Type Bulungan-Suwawal

Population Data

Based on data from the Jepara Regency Central Bureau of Statistics for 2020, the current population of the city of Jepara is 1,184,947 people. This indicates that Jepara is included in the category of big cities, with 1-3 million people. This data will later be related to the city size adjustment factor in calculating road capacity.

Environmental Condition Data

Environmental conditions around the area of the road under review greatly influence the volume of existing traffic, in this case the environmental conditions under review are side barriers, road body conditions, and other factors. Following are the survey results obtained. On the road activities on the left and right of the road there are residents' gardens, some are used as residential areas, shops and repair shops for residents' vehicles. This road is an alternative

way to downtown Jepara. Not only to the city center, most of the furniture factory workers take this route because the distance will be shorter. The function of the road shoulder still functions as it should, no vehicles stop or park on the road shoulder.

Traffic Volume Data

Traffic performance aims to determine hourly traffic flow data in veh/hour. The survey was conducted for one day, namely Thursday, December 1, 2022 with an interval of 15 minutes and grouped each type of vehicle. Based on the survey results with a time interval of 15 minutes from the results of calculating the peak volume data for the total flow of vehicles that occur, after calculating it can be seen that the peak hours occur in the morning with a result of 1,860 vehicles/hour.

Service Level Analysis (LOS)

Analysis of road service LOS (Level of Service) or road service level is a method used to assess the performance of a road segment which is an indicator of vehicle congestion on a road. The service level value is related to the value of the degree of saturation, capacity according to MKJI 1997.

C = Co x Fsp x Fw x Fsf x Fcs
C = 2900 x 0.87 x 0.90 x 1.00
C = 2,270.7 smp/hour
Loss = V/C = 1,860/2270.7 = 0.81 Smp/hour (Level D)

a. the flow is nearly unstable with high traffic volume and the speed is still tolerable but highly affected by changes in flow conditions.
b. Moderate traffic density but fluctuations in traffic volume and temporary barriers can cause a large reduction in speed.
c. the driver has very limited freedom in running the vehicle, low comfort, but this condition can still be tolerated for a short time.

Road Service Period

Based on data from the Jepara Electronic Procurement Service (LPSE), the Bulungan-Pakis Aji road was last repaired on September 4 2015 with the tender name 'UPGRADING JALAN BULUNGAN LEBAK JALUR SELATAN' with the work unit of the Department of Highways, Irrigation and ESDM. So that the Bulungan-Lebak road has been 7 years old since the last time it was repaired. Now the damage has occurred and needs to be repaired immediately.

To find out the last road data, you can access the website address: https://lpse.jepara.go.id/epoc4/lelang?categoriId=&tahun=2015&instanceId=&resources=

Causes of Damage on the Road

The most dominant types of damage on the Bulungan-Lebak road section are longitudinal cracks, crocodile skin cracks, holes, shovels, grease, subsidence and several patches that occur in almost every road segment. The causal factors are generally caused by poor drainage, climate, unstable soil conditions, thin pavement layer planning, the process of implementing pavement construction work that is not in accordance with the provisions stated in the specifications, which are interrelated and greatly influence. As a result, if the road is not

repaired quickly, the damage to the road can become more and more widespread and will cause even worse damage.

Table 1. Type Road

No	Damage Type	Total Damage (m2)	Picture
1	perforated	11,7	
2	Skin Cracks Crocodile	22,76	
3	Free	15,03	
4	Obesity	3,75	
5	Longitudinal Cracks	12,49	

Data from the Calculation of the Percentage Value of Road Damage

The percentage value of road damage is obtained from the percentage of damaged road surface area to the total area of the road under review. The formula used to determine the percentage value of road damage (Np) is as follows:

Np : (Area of damaged roads)/(Area of total roads)×100 %
Np : 65.73/1340 ×100%
Np : 20.4 %

Based on the results of the survey we have conducted, there is a total road damage of 65.73 meters, and the total road we surveyed is 1,340 meters and then entered into the formula for the percentage value of road damage resulting in 20.4% road damage.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research and data analysis, the following conclusions can be drawn:

1. Based on passenger car units, traffic volume during peak hours on the Bulungan-Lebak road, Pakis Aji sub-district, Jepara Regency occurred at 07.00 - 08.00 at 1,860 pcu/hour. And has a capacity of 2,270.7 pcu/hour with a level D LOS value with unstable traffic flows and high traffic volumes and speeds are still tolerable but are highly affected by changes in traffic conditions.
2. According to data from the Jepara LPSE, the service life of the Bulungan-Pakis Aji road has been 7 years since it was last repaired. Now the damage has occurred and needs to be repaired immediately.
3. Factors causing damage in general are due to poor drainage systems, poor pavement construction material properties, unstable soil climate conditions, thin pavement layer planning, the process of implementing pavement construction work that is not in accordance with the provisions stated in the specifications, which interrelated and influence each other. With the level of road damage reaching 20.4%

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