PLANNING FOR IMPROVEMENT OF THE DISTRICT PEKARANGAN ROAD ROAD TOWARDS TITIGALAR IN TABANAN REGENCY

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ABSTRACT

Damage to the Pekarangan road to Titigalar in Baturiti Village along the 2.10 kilometers in the form of damage to the surface layer of asphalt (holes, collapsed, grain removal and pavement peeling). Damage occurred due to lack of drainage channels, weather, subgrade conditions and increased traffic volume. In expediting community activities, saving travel time and alternative paths for the Mengwitani-Singaraja road congestion, the improvement of the road must be carried out immediately. Design drawings are needed to get the cost of road improvement. This study aims to identify the condition of the road surface, plan the design of road drawings, calculate the cost of road repairs, get savings in the value of travel time between before and plan for road improvement and get people's perception of road improvement. Data collection methods are observation, interview, documentation, questionnaire and library study. The analysis method consists of quantitative descriptive analysis, SKBI-2.3.26.1987 component analysis, autocad, unit price analysis and travel time analysis. The results of the research are the condition of the road surface is heavily damaged, the design plan of the image is wear-resistant laston (AC-WC) as thick as 4 cm, intermediate laston layer (AC-BC) as thick as 6 cm, class A aggregate as thick as 15 cm and class B aggregate as thick as 25 cm. The amount of the fee is Rp. 7,784,038,000.00. The amount of savings in travel time is 4.05 minutes or 243 seconds. The community's perception of road improvement is that all agree.

Keywords: Planning, improvement, roads, Pekarangan, Titigalar

I. INTRODUCTION

The growth and development of cities or regions as well as the population has implications for the increasing needs of the population, the activity of movement of people and goods, thus requiring transportation facilities and infrastructure. In fact the rate of mobility cannot always be matched by the rate of supply of infrastructure networks and transportation facilities so that the impact on decreasing accessibility in reaching a destination point of travel, a place, location of activities and service centers (Aminah, 2018). Accessibility is a measure of comfort that is used to reach a place or location of activities by using a transportation network system. Good accessibility will provide value savings of travel time (value of travel time saving) which is an important part in the assessment of a transportation project (Azwanda, 2017).

One of the most basic types of transportation networks is the land transportation network, which in this case is road infrastructure. Road is a land transportation infrastructure
that covers all parts of the road, including complementary buildings and equipment intended for traffic that is on the surface of the land, above the surface of the land, below the surface of the land and / or water, as well as above the water surface except railroad, , lorries and cable roads (Law of the Republic of Indonesia number 38 of 2004, Government Regulation of the Republic of Indonesia number 34 of 2006 and Law of the Republic of Indonesia number 22 of 2009). Roads are land transportation infrastructure that play a very important role in the transportation sector, especially for the continued distribution of goods and services (Hendersin, 2000). The function of transportation itself is to serve the movement of people and / or goods from one place to another safely, comfortably and economically (Hidijah, 2017).

Various efforts have been made by the government in order to maintain the performance of the road so that it can continue to serve the transportation needs of the population which is increasingly increasing. These efforts can take the form of road network system improvements, improvements to traffic management, transportation and movement systems. However, if the road conditions that continue to be traversed by high and repetitive traffic volumes can certainly reduce the quality of the road surface, making it uncomfortable and unsafe to pass (Mubarak, 2016). Adding road infrastructure facilities, good pavement planning, improving road quality and maintaining roads so that road conditions remain safe and comfortable to provide services to vehicle traffic (Surandono, 2016). Roads with poor shoulder conditions will cause the speed of vehicles crossing the road to decrease, especially on mountain roads. The higher the speed of the vehicle on a road, the costs will be lower and if the speed is low, the costs will be greater (Usmana, 2019).

Tabanan Regency, which is located in the southern part of the island of Bali with an area of 839.33 km2, has 863,218 kilometers of regency roads. The condition of regency roads in 2019 is good conditions along 663.11 kilometers, moderate conditions of 13,726 kilometers, mildly damaged conditions of 50,175 kilometers and heavily damaged conditions of 136,207 kilometers. Road repairs must be adjusted to the road conditions and require a design plan to obtain the amount of costs required to repair the road. For road repairs in good and moderate road conditions are categorized as maintenance works, whereas in damaged and heavily damaged conditions are categorized as heavy works (Bina Marga Profile, Tabanan Regency, 2019).

One of the roads whose condition is still damaged today in Tabanan Regency is the Pekarangan road to Titigalar. This road is located in Baturiti Village, Baturiti District is a regency road status determined based on Regent Decree number 180/125/03 / Hk & HAM dated March 3, 2016 with a length of 2.10 kilometers and a width of 3.50 meters. This road is an alternative path to the Sila’s agrotourism attraction, there is a vegetable main market, an organic farming place, namely Bali island organics, a brother Bali adventure tourist attraction and is close to the Bedugul tourism object which is the main tourism destination in Tabanan Regency.

Damage that occurred in the yard to Titigalar in the form of damage to the asphalt surface layers such as holes (potholes), sinks (depressions), release of the grain (raveling) and peeling of the surface layer (stripping). This road damage is caused by the absence of drainage channels so that when it rains water flows on the road surface which results in damage to the road surface. Damage is also caused by weather factors such as rain, basic soil conditions and increasing volume of traffic passing through this road. Technically, road damage shows a condition where structural and functional roads are not able to provide optimal services for traffic that crosses the road. Traffic conditions and the type of vehicle that crosses a road is very influential in the design of construction planning and road pavement that is made.

In order to facilitate access in distributing agricultural and plantation products, an alternative route for breaking the congestion on the Mengwitani - Singaraja road, an alternative route to the tourism object, The Sila’s Agrotourism, provides comfort for tourists visiting the brother bali adventure tourist attraction, thus repairing the Pekarangan road to Titigalar is highly expected by the community members. Repairing the road can indirectly accelerate economic development in the Tabanan Regency. The purpose of this study is to identify the condition of the road surface, plan the design of road improvement drawings, calculate the amount of cost for road improvement, get a value savings of travel time (value of travel time saving) between before and plan after road improvement and get people's perception of road improvement Yard to Titigalar in Tabanan Regency. The results of this
study can be used as a basis for making proposals by the village government submitted to the Tabanan Regency PUPRPKP Office.

II. LITERATURE REVIEW

The difference between this study and previous research is the object under study and the analysis of the data used is different. As a comparison, research from Afrizal, Sofyan, Sugianto (2018) with the title analysis of saving time and vehicle operating costs in the Krueng Meusagop-Teupin Mane road construction plan. The results of the study are that the Krueng Meusagop-Teupin Mane road construction plan is feasible, a vehicle operational cost savings of Rp.458 / vehicle for passenger cars, Rp.1,723 / vehicle for buses and Rp. 1,416 / vehicle for trucks with vehicle operating costs in the 25th year of Rp. 1,009,412,291,578. Time savings of Rp. 21,877 / vehicle for passenger cars, Rp. 193,229 / vehicle for the bus and Rp. 24,048 / vehicles for trucks with savings in time value in the 25th year of Rp. 993,214,592,528. a study from Ningrum, et al (2015) with the title planning improvement on the Ambarawa-Soekarno-Hatta road, Bawen, Semarang. The results of the study are planning to carry out 1 stage of road widening in 2016 for the Rengas-bawen, Gembol-Doplang and Doplang-Doplang sections and widened to 7 m which was previously 5 m wide for Rengas-bawen and 3 m for the Gembol-Doplang and Doplang segments -Harjosari. Pavement used is flexible pavement and the existing pavement needs to be done with an additional 7 cm thick coating. For Widening, a 10 cm thick Surface layer is used, for the upper foundation layer it uses a class A crushed stone with a thickness of 20 cm while for the lower foundation layer it uses a class B 12 inch thick sirtu with a subgrade in the form of brownish red sandy clay. Research from Rahmalia et al (2016) with the title analysis feasibility of the construction of the Pemalang Batang toll road. The results of the study are the development of the Pemalang Batang toll road economically feasible. Savings in vehicle operating expenses for Goal I of Rp. 23,49, Gol IIA of Rp. 39,237.66 and Gol IIB of Rp. 52,518.90. The time saving for Goal I is 27.98 minutes, Goal IIA is 45,745 minutes and Goal IIB is 63.02 minutes. Accident costs can be saved as much as Rp. 43,363,019.00 / year / km. The Pemalang Batang toll road is also financially viable with an NPV value of Rp 4,301,297,387,339, a BCR value of 1.787, an IRR value of 23.226%, a payback period occurs at 8 years 7 months 16 days and NPV = 0 occurs at 13 years 7 months 23 days. The results of the sensitivity analysis are the limit of the percentage reduction in income by 44.032%, the initial limit of income income in the 21st year and the limit for the increase in investment costs by 78.673%.

Research from Allo (2017) entitled the economic and financial feasibility study of the Waru Sidoarjo toll road widening plan. The result of the research is that the Waru Sidoarjo toll road widening project is economically and financially feasible. This is shown in terms of economics obtaining NPV (Net Present Value) value of Rp. 16,281,034,118,129 and BCR (Benefit Cost Ratio) of 3. In financial terms, the Net Present Value (NPV) of Rp. 2,275,677,800,694, BCR (Benefit Cost Ratio) of 1.3. Payback Period for 4 years and 4 months and IRR value of 15.12%. Assuming i bank interest rate = 6.75%. Break-even point if the total toll tariff is determined for class I-V at the price of Rp. 21,030 and investment in the planned Waru Sidoarjo toll road widening project is risky (sensitive) to changes in the value of revenue provided that cash inflows have decreased to a minimum of 21%. Research from Syahrul, Nurjaman, Suryani (2016) with the title of technical analysis and evaluation of the feasibility of building a connecting road in Kaur Regency, Bengkulu Province, Tanjung Kemuning road section. The result of the research is that road construction is feasible to be carried out with (1) the results of the technical analysis of the road pavement structure, namely the type of road pavement construction consisting of 4 (four) layers, namely a 10 cm thick surface layer with material forming the Laston layer, a 21cm thick top layer foundation with material forming a broken gravel layer doused with liquid asphalt, 23 cm thick underfloor with local soil mixtures with lime or portland cement and 41 cm thick subsoil with local subsoil at the site of the compacted road construction project site . (2) The results of the evaluation of economic benefits include (a) cost analysis consisting of a project cost of Rp. 10,142,160,500, savings in operating costs of vehicles against three types of vehicles namely passenger cars, medium trucks / buses, and large trucks / buses of Rp. 953,814,502.55 which includes fixed costs of Rp. 878,980,000 and variable costs of Rp.74,834,502.55, savings in travel time of 0.6 hours or equivalent to Rp.572,288,701.53 and (b) economic feasibility evaluation including 1) economic
analysis of the BCR value with a 10% interest rate of 1,490, a 12% interest rate of 1,487 and a 15% interest rate of 1,482. All of the BCR values are greater than 1, the NPV value with an interest rate of 10% of Rp.5,068,189,644.36, 12% interest rate of Rp. 4,570,421,018,57 and 15% interest rate of Rp. 4,451,192,644.17 and an EIRR value of 15.41% and 2) sensitivity analysis obtained that the B-C (Benefit-Cost) value is of no value (0).

III. RESEARCH METHOD

This research was carried out on the district road of Pekarangan towards Titigalar located in Baturiti Village, Baturiti District, Tabanan Regency in the initial coordinates of the section 8o18'39.9" LS, 115o10'51.1" BT and the final coordinates of the sections 8o19'09.7" LS, 115o10'08.6" BT 2.10 kilometers long. The research location was chosen intentionally or purposively with the consideration that this road is an important road for the community in distributing agricultural products, plantations and tourism routes that connect the tourist attraction of brother Bali adventure and the sila, agrotourism. This study was conducted for 3 (three) months from August to October 2019. The study population was the number of residents who lived in Baturiti Village, Baturiti District, Tabanan Regency, which were 6,665 people with 1709 households (Profile of Baturiti Village, 2019). Sampling using a proportional random sampling technique with a level of significance of 10% was obtained by 99 people. Methods of data collection by observation, interviews, documentation, questionnaires and literature studies. The data obtained in the form of primary and secondary data. Primary data is data obtained through direct surveys in the field, namely road surface conditions, shooting data, traffic, vehicle speed, scoring questionnaires from the sampled population. Secondary data is additional data obtained by copying or quoting ready-made data, namely Baturiti village profile data, Tabanan Regency road map and Regency road SK from the Tabanan Regency PUPRPKP Office. The analysis method consisted of quantitative descriptive analysis, SKBI-2.3.26.1987 component analysis, autocad, Bina Marga Unit Price Analysis (AHSP) and travel time analysis.

IV. RESEARCH RESULT

Result
Surface conditions of the Pekarangan road to Titigalar

Identification of the condition of the Pekarangan road surface leading to Titigalar refers to the technical guidelines for planning and compiling the district road program SK No.77 / KTPS / Db / 1990 from the Directorate General of Highways of the Ministry of Public Works, which is using the road surface survey (S2) form and a summary photo form of the results S2 shooting. The results of the survey of the condition of the Pekarangan road to Titigalar in Table 1 show the type of road surface is gravel (100%), the road surface condition is heavily damaged (100%), the width of the pavement is 3.5 meters, the width of the pavement with the width of the shoulder is 5.5 meters, road slope is 1.15 km (54.55%) and hill is 0.95 km (45.45%), there is a bridge at STA 0 + 150 with a length of 14 meters and a width of 5 meters, land use on the left side of the road is 1.72 km (81.82%) and 0.38 km (18.18%) villages, land use on the right side of the road is 1.62 km (77.27%) and villages along 0.48 km (22.73%). Photograph of road surface conditions is carried out every 100 meters that aims to find a more detailed picture of road surface conditions. S2 shooting results can be seen in Figure 1.
Figure 1. Surface Condition of the Pekarangan Road to Titigalar at the Beginning of a Section

Road drawing design plan
The design of a road segment must always follow the design standards in accordance with the standards of the Department of Public Works. In determining the thickness of the road surface pavement reinforcement used the planning instructions for the road flexible pavement thickness using the component analysis method SKBI - 2.3.26.1987 from the Department of Public Works. The calculation results of the SKBI – 2.3.26.1987 component analysis method in Table 2 obtained the composition of the road surface pavement namely the surface layer in the form of AC-WC 4 cm thick, the base layer in the form of AC-BC 6 cm thick, the base layer (base) in the form of a 15 cm thick A class aggregate and a sub base layer in the form of a 25 cm thick class B aggregate. The design of the pavement surface arrangement of the Pekarangan to Titigalar road with the autocad application is shown in Figure 2.

Figure 2. Design of a Pavement Surface Surface Arrangement Plan towards Titigalar

Road improvement fee
Analysis of the estimated cost of upgrading the Pekarangan road to Titigalar refers to the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 28 / PRT / M / 2016 concerning Guidelines for Analysis of Unit Work Price in Public Works. Unit price analysis, hereinafter abbreviated as AHSP, is a calculation of the cost of labor, materials and equipment to get a unit price or one particular type of work. The results of the calculation of Job Unit Price Analysis in Table 3 obtained the magnitude of the cost of increasing the Pekarangan road to Titigalar of Rp. 7,784,038,000.00 or Rp. 3,706,684,761.90 per kilometer.

Value saving travel time (value of travel time saving)
Determination of the savings in the value of travel time carried out on the Pekarangan road to Titigalar by comparing the speed of four-wheeled vehicles in conditions before the road improvement with the speed of the plan on improving the Pekarangan road to Titigalar. The speed of the plan for upgrading the Pekarangan road to Titigalar is determined from the Geometric Planning Procedure for Inter-City Roads, Directorate General of Highways, Ministry of Public Works, 1997. For the Pekarangan road to Titigalar is included in the function of local roads with a flat slope of 1.15 km (54.55%) planned speed is 40-70 km / hr and for hills along 0.95 km (45.45%) the planned speed is 30-50 km / hr. From these data the average plan speed is 40 km / h, so the travel time of 2100 meters is 3.15 minutes or 189 seconds. To identify speed before upgrading the road, refer to the technical guidelines for planning and drafting the district road program SK No.77 / KTPS / Db / 1990 from the Directorate General of Highways of the Ministry of Public Works, which uses the speed survey form (S4). The results of the speed survey (S4) before the improvement of the Pekarangan road to Titigalar along 2100 meters was 17.5 km / h with a travel time of 7.2 minutes or 432 seconds. Difference in vehicle speed before increasing the road to the speed of the vehicle plan is a savings in the value of travel time obtained by 4.05 minutes or 243 seconds.
Public perception of the improvement of the Pekarangan road to Titigalar
Analysis of people's perceptions of the improvement of the Pekarangan road to Titigalar using quantitative descriptive analysis, validity and reliability testing with the SPSS program and questionnaires with a Likert point scale of 5. Questionnaires were 15 questions given to respondents / samples totaling 99 people. The results of the analysis of community perceptions of the improvement of the Pekarangan road to Titigalar in table 3 show that all the people agreed. This shows that the existence of the Pekarangan road to Titigalar is very beneficial for the community as a support for smooth activities in the economic, social, trade and tourism sectors. Improvement of the condition of the road surface is highly expected by the entire community of Baturiti Village, Baturiti District, Tabanan Regency.

Discussion

Roads are infrastructures to connect between one region and another. The length of the Pekarangan road to Titigalar reaches 2.10 km with the condition of the road surface being heavily damaged with the type of road surface in the form of gravel, so it needs to be done maintenance or asphalting. Slope of the road is dominant in the hills so that in the development of road widening it will be difficult. The solution to repair road surface conditions that are heavily damaged which is categorized as heavy work is in the form of upgrading roads with a planned age of at least 10 years. Road improvement works are work to improve service standards of existing roads, either by making the surface layers smoother such as asphalting unpaved roads, adding layers to roads, adding structural layers to strengthen pavement and widening existing pavement layers (Department of Work General, 1990).

Understanding the design is the process of planning or designing an object that aims to make the object created has a function, has a beauty value and is useful for humans. The planned design is in the form of a surface layer in the form of a 4 cm thick AC-WC, a base layer in the form of a 6 cm thick AC-BC, a base layer in the form of an aggregate kls. A 15 cm thick and sub base layer in the form of kls aggregate. B 25 cm thick. The total cost needed to increase the Pekarangan road to Titigalar is Rp.7,784,038,000.00 or Rp. 3,706,684,761.90 per kilometer.

Travel time is the length of time spent on a trip to cover a certain distance in the form of seconds, minutes, hours or days. Estimated travel time information is very useful for road users to choose travel routes that can make it easier to get to the destination. For this reason, a reliable travel time estimate is needed. According to the Director General of Highways in 1990 that speed is the level of movement of traffic or certain vehicles that are often expressed in kilometers per hour. The faster the speed that can be provided by a system, the shorter the time needed to reach the destination. For the Pekarangan road to Titigalar where the road surface is heavily damaged with a length of 2.1 kilometers, it can be reached in 17.5 km / h with a travel time of 7.2 minutes or 432 seconds. From planning the speed of the plan is determined based on road slope. For this road, road slope is identified in the form of flat and hilly so that the planned speed is taken at 40 km / hour. The difference between the planned time and the current travel time is the savings in travel time value obtained is 4.05 minutes or 243 seconds.

Public perception of the improvement of the Pekarangan road to Titigalar will determine the smoothness in the implementation of activities. With the support of the community, this road improvement activity can run optimally. From the results of the analysis that the entire community or respondents agreed and supported the implementation of the improvement of the yard road to Titigalar.

According to the Baturiti Village community, road infrastructure is one of the main factors in sustaining economic activities in the Baturiti Village. Particularly the Pekarangan road to Titigalar which is currently severely damaged surface conditions certainly must get the attention of all parties both from the government and the people of Baturiti Village itself. The improvement of the road is very much expected by all Baturiti residents, considering that the road is very important for the benefits of the agriculture / plantation sector, tourism, trade, providing a sense of security and comfort for road users. In the agriculture / plantation sector
where there is organic farming on the path, namely Island Organics Bali. Island Organics Bali is a garden with a variety of vegetables and fruits that can be ordered for hotels, lodging, restaurants and more. The villagers of Baturiti also work as farmers/planters, which of course with the improvement of the road will facilitate the distribution of agricultural/plantation products.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions
The conclusion that can be drawn from this research is:

1. The condition of the surface of the Pekarangan road to Titigalar along 2.10 kilometers is badly damaged.
2. The design plan for the image of the improvement of the Pekarangan road to Titigalar, namely on the surface layer using a 4 cm thick laston layer (AC-WC), the base layer using a 6 cm thick laston layer (AC-BC), the foundation layer (base) uses a class A aggregate 15 cm thick and a sub base layer (sub base) uses a class B aggregate as thick as 25 cm. The amount of funds needed to improve the road is Rp. 7,784,038,000.00 or Rp. 3,706,684,761.90 per kilometer.
3. The amount of savings in value of travel time between before and plan after the improvement of the Pekarangan road to Titigalar is 4.05 minutes or 243 seconds.
4. The public perception of the improvement of the Pekarangan road to Titigalar is entirely agreed.

Recommendations
Based on the results of research, discussion and conclusions, the writer can suggest the following:

1. The results of this research can be a guideline to the government of Baturiti Village to submit a proposal to the Government of Tabanan Regency, especially in the proposal to improve the infrastructure of the Pekarangan road to Titigalar.
2. The community should continue to work together and work together with village officials to guard and maintain especially the shoulder of the road so that it is well maintained.
3. In this study, it was found that the costs were quite large to increase the Pekarangan road to Titigalar, so that economic feasibility must be taken into account, namely Net Present Value (NPV), Benefit Cost Ratio (BCR) and sensitivity analysis. It is recommended for further research to calculate these factors.

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