International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 12 December 2024
DOI: 10.47191/ijcsrr/V7-i12-80, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Evaluation of Toll Rates with the Ability to Pay and Willingness to Pay Approach to Implementation on the Trans Sumatra Toll Road Pekanbaru Dumai Section

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ABSTRACT: The Pekanbaru-Dumai Trans Sumatra Toll Road project is an economically feasible project but not financially feasible. This study aims to assess the feasibility of toll roads that have low financial viability. Data analysis involves the relationship between the ability to pay (ATP) and willingness to pay (WTP), as well as financial evaluation using FIRR, NPV, and Payback Period. The results of the study show that the Trans Sumatra toll road Pekanbaru Dumai section needs a financial evaluation. The evaluation showed an average ability to pay (ATP) of IDR 237,461.00 and an average willingness to pay (WTP) of IDR 146,046.00. The research found that the optimal rate is IDR 115,500.00 that users can accept. The Financial Internal Rate of Return (FIRR) of the project based on ATP and WTP rates is 8.97%, indicating a relatively low rate of return compared to the Business Plan. Innovative strategies in operational management, including service efficiency and revenue diversification, can improve financial performance and ensure long-term investment continuity.

KEYWORDS: Ability to Pay (ATP), Financial Internal Rate of Return (FIRR), Pekanbaru Dumai, Toll Rates, Willingness to Pay (WTP).

1. INTRODUCTION

The government must accelerate the construction of toll roads in Sumatra that are economically feasible but not yet financially feasible. In an effort to support regional development and national economic growth in Sumatra and in connection with the implementation of the master plan for accelerating development and expansion of the Indonesian economy, the government gave an assignment to PT Hutama Karya (Persero). The assignment was given to PT Hutama Karya (Persero) including financing, design, construction, operation, and maintenance. The regulation states that the return on investment is made through the payment of tariffs by toll road users. Determining the required toll rates financially is relatively easy with a suitable financial model of the project's cash flow. Problems can arise if the socially acceptable toll rate is lower than the minimum financially required toll rate. The toll calculation is based on the ability to pay road users, the return of vehicle operating costs and the profitability of the investment.

In the previous study, to evaluate toll rates, the Ability to Pay (ATP) and Willingness to Pay (WTP) analysis approaches could be used with data obtained by conducting a survey of prospective toll road users. Jaya et al. (2022) conducted an analysis to determine the ideal toll tariff according to user characteristics using the ATP and WTP approaches on the Sigli Banda Aceh Toll Road. Ginting et al. (2023) conducted an analysis of the tariff of the Medan - Stabat Trans Sumatra Toll Road using the ATP and WTP approaches. Ability to Pay (ATP) (Tamin et al., 1999) is a person's ability to pay for services based on an ideal proportion of salary and income. Some of the factors that affect ATP are: salary income, transportation needs, transportation costs, travel intensity, results, and activities. Then Willingness to Pay (WTP) is a person's willingness to pay for the services they receive. Asking respondents directly to indicate an acceptable price is called a direct approach to measuring WTP. WTP is influenced by: transportation, productivity, quantity and quality, utility and salary income. Decision-making has a strong impact when considering WTP analysis (Quevedo et al., 2009).

There are three tariff conditions related to the ability to pay and willingness to pay, namely: (1) ATP is greater than WTP. This condition shows that salary income is high but utility for services is low, consumers in this zone are commonly called choiced riders. Consumers are free to choose the mode of transportation according to their ability. (2) ATP is smaller than WTP. Consumers in this condition have low income income but have high utility income for transportation services.

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Consumers who are in this zone are referred to as captive riders. Consumers cannot use modes of transportation and use the available options based on their capabilities. (3) ATP is the same as WTP. This condition is a condition of equilibrium where the utility of the means of transportation is as great as the ability. Consumers choose transportation modes according to their ability to use
Based on the explanation in the background above, the problem that is the focus of this study is the evaluation of toll rates on toll roads with low financial feasibility. The research was carried out on the Pekanbaru Dumai Section of the Trans Sumatra Toll Road operated by PT Hutama Karya (Persero). In this study, two types of data were collected, the data was separated by data source, that is, the primary data source was the first information provider. Data is obtained directly from sources using interview methods, surveys and company procedures. and Secondary data sources are data that has been processed by others from supporting documents in the form of financial statements, company study documents, business plans and data from the Central Statistics Agency.

2. RESEARCH METHODS

Based on the problem and research objectives, the research approach is applied in this study, which is qualitative with a case analysis method, with the main object being studied is the application of the Trans Sumatra Toll Road Pekanbaru Dumai Section with the problem studied being toll rates.

2.1 Data collection techniques

In this study, two types of data were collected, the data was separated based on the source from which the data was obtained, namely: The primary data source is the first information provider. Data is obtained directly from sources using interviews, surveys and company SOP methods. Secondary data sources are data that has been processed by others from supporting documents in the form of financial statements, company study documents, business plans, and data from the Central Statistics Agency. The determination of the sample was calculated using the slovin method, based on secondary data on the average daily traffic on the Pekanbaru – Dumai toll road of 8,912 by taking an error percentage of 6%.

$$n = \frac{8.912}{1+ (8.912 \times 0{,}06^2)}$$

So with an error rate of 6%, the highest number of samples was obtained 270 in an accuracy level of 94%.

2.2 Data analysis techniques

The research was conducted in several steps, starting with mapping to clarify management dilemmas and clarify research questions. In addition, the research literature on the research question was also examined in parallel. The research objectives are formulated from the results of the first phase and developed in the form of a research proposal. Starting from the research proposal, the researcher prepares a research plan, starting from determining the type of research, data requirements and collection methods to data processing and analysis. In addition, the research plan that has been prepared will be implemented, starting with data collection, after which the data obtained through qualitative methods will be processed and analyzed. The results of data analysis and interpretation are validated against sources using qualitative methods to attract attention to conclusions and recommendations. Finally, all stages of this research are presented in the form of a final report. The data that has been obtained will be analyzed using the Microsoft Excel application. Data analysis typically involves reducing the collected data into more manageable metrics, generating summaries, looking for patterns, and applying statistical techniques (Cooper & Schindler, 2014). In this study, data analysis after data collection was carried out by determining toll rates through the relationship between the ability to pay (ATP) and Willingness to pay (WTP) of prospective toll road users. Furthermore, the evaluation will be carried out using financial indicators, namely FIRR, NPV and Payback Period as constraints with the value set by the company.

3. RESULT & DISCUSSION

3.1 Profiles of the Respondents

The number of respondents studied in this study is as many as 270 people with various ages and occupations in the Pekanbaru area. The following are the profiles of the respondents:

3.1.1 Gender of Respondents

The proportion of respondent characteristics by gender is as follows:

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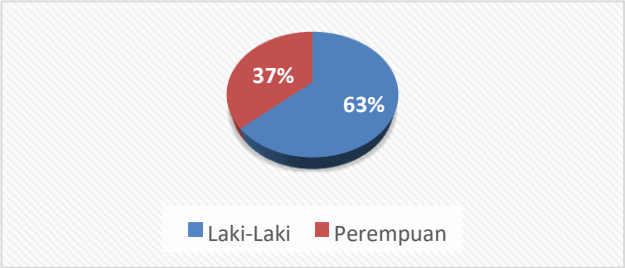

Figure 1 Gender of Respondents

The diagram above shows the gender distribution of respondents who are users of the Trans Sumatra Toll Road PekanbaruDumai Section. From the chart, it can be seen that the majority of respondents are men, which is 63%, while women account for 37% of the total respondents. This shows that in this study, toll road users are dominated by men, with a significant proportion compared to women. These findings can provide insight into the demographic profile of toll road users and can be considered in the development of more targeted services or policies.

3.1.2 Age of Respondents

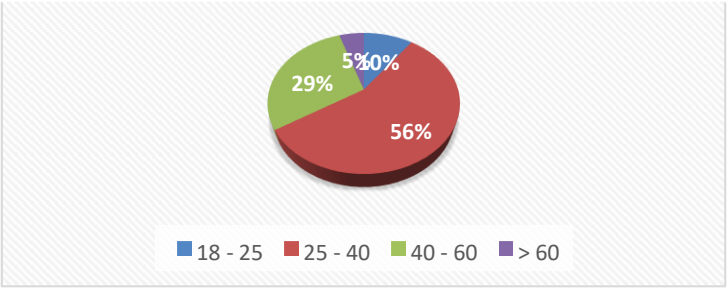

Figure 2 Age of Respondents

All respondents in this study, the age distribution showed a significant variation. A total of 27 people or 10% of respondents were between 18 and 25 years old, indicating that this young age group has little representation in the use of the Trans Sumatra Toll Road Pekanbaru-Dumai Section. The age group of 25 to 40 years dominated with a total of 151 people, which accounted for 56% of the total respondents. This shows that the majority of users of these toll roads are in the productive age range, which is likely to reflect active workers who travel frequently.

3.1.3 Respondent's Job

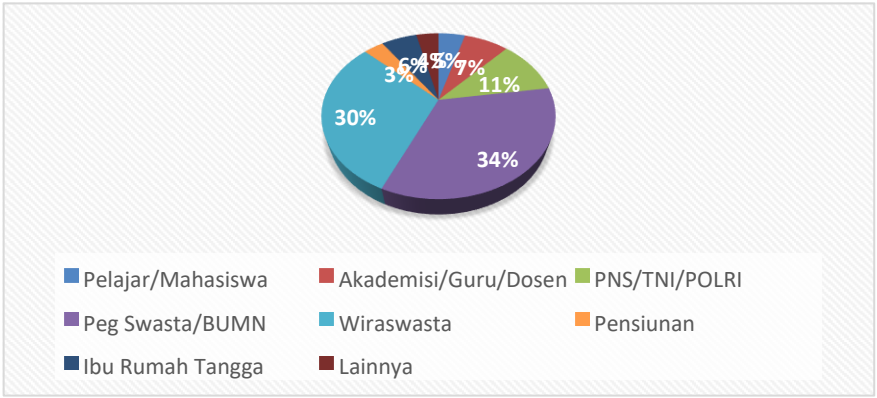

Figure 3 Respondent's Job

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Based on the results of the study, the work profiles of the respondents showed diverse variations. The most represented profession was Private Employees/SOEs, with 92 people or 34.1% of the total respondents. This shows that the majority of toll road users come from the private sector or State-Owned Enterprises. A total of 82 people or 30.4% of the respondents were self-employed, indicating that there are a large number of toll road users who come from business people or independent entrepreneurs. The Retired Group consisted of 9 people or 3.3%, showing that although small, there were toll road users from those who were no longer actively working.

3.1.4 Respondent's Monthly Income

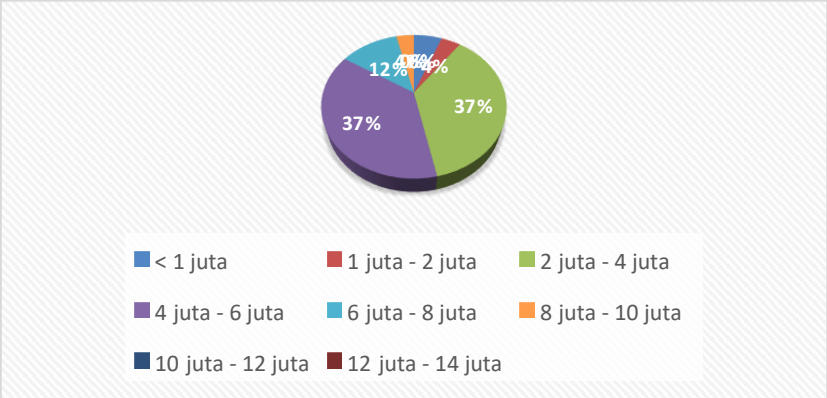

Figure 4 Respondents' monthly income

The results of the study showed the monthly income distribution of respondents using the Trans Sumatra Toll Road Pekanbaru-Dumai Section. From the data, it can be seen that 4% of respondents have an income of less than 1 million per month and another 4% have an income between 1 million to 2 million per month. The largest group is those with incomes between 2 million to 4 million per month and 4 million to 6 million per month, 37% each.

3.1.5 Monthly Transportation Cost Allocation

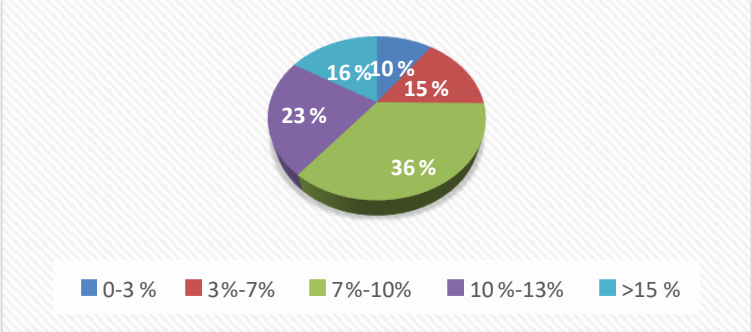

Figure 5 Allocation of Transportation Costs per Month of Respondents

The results of the study show the monthly allocation of transportation costs for respondents who use the Trans Sumatra Toll Road Pekanbaru-Dumai Section. Based on the chart, it can be interpreted that 10% of respondents allocate 0-3% of their income to transportation costs. As many as 15% of respondents allocate between 3-7% of their income for transportation. The largest group, which comprises 36% of respondents, allocates between 7-10% of their income to transportation costs.

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3.1.6 Length of Toll Travel Every Month

Figure 6 Length of Toll Road Trips per Month Respondents

The data presented in Figure 4.7 regarding the length of travel through tolls per month of respondents: As many as 25.2% of respondents travel through tolls with a distance of 0 to 150 km per month, which means that there are 68 respondents in this category. This category has the second highest percentage, indicating that quite a few respondents travel short or rarely use tolls. Meanwhile, 35.6% of respondents traveled through toll roads with a distance of 150 to 250 km per month, or as many as 96 respondents. This is the category with the highest percentage, indicating that most respondents travel medium distances via tolls each month.

3.1.7 Respondent Time Savings

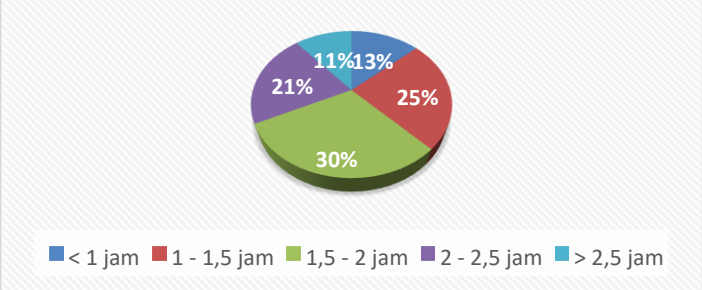

Figure 7 Respondent Time Savings

The following is the interpretation of the data presented in Figure 4.7 regarding the time savings of respondents A total of 13.3% of respondents experienced time savings of less than 1 hour, which means that there are 36 respondents in this category. This category has the second smallest percentage, indicating that only a small number of respondents save time in very small amounts. Furthermore, 24.4% of respondents saved between 1 to 1.5 hours, which means there were 66 respondents in this category. This category shows that almost a quarter of respondents get moderate time savings.

3.1.8 Toll Road Tariffs by Respondents

Figure 8 Toll Road Tariffs by Respondents

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Based on the results of a survey that has been conducted and classified, the Pekanbaru Dumai toll road tariff is in accordance with the level of willingness to pay the majority of respondents, as many as 59.6%, indicating that the toll tariff they pay is in the range of IDR 100,000 to IDR 120,000. The number of respondents in this category is 161 people. This shows that most respondents pay toll rates in this range. As many as 23.7% of respondents, or 64 people, paid toll rates between IDR 120,000 and IDR 150,000. This is the second highest percentage, showing that the number of respondents who pay toll rates in this range is also quite significant.

3.2 Toll Tariff Evaluation

In this study, to evaluate toll rates using *the Ability to Pay* (ATP) and *Willingness to Pay* (WTP) approaches processed from data obtained from respondents. Some of the factors that affect ATP are: salary income, allocation of transportation costs, and travel intensity. Meanwhile, WTP is a person's willingness to pay for the services they receive. This is measured by asking respondents directly to indicate an acceptable price. If the ATP is greater than the WTP, this condition indicates that the salary income is high but the utility for services is low, while if the ATP is smaller than the WTP, the consumer in this condition has a low income but has high utility for transportation services.

3.2.1 *Ability to Pay* (ATP) Analysis

To find out the ATP value, it is taken from the results of the questionnaire and then calculated the average value displayed in the following graph:

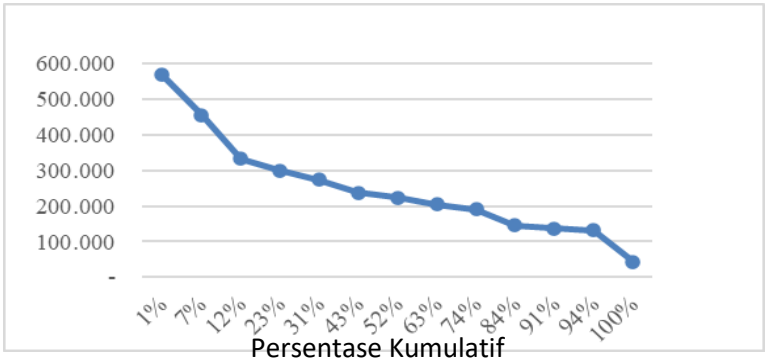

Figure 9 *Ability to Pay* (ATP)

From the graph above, the tariff that respondents can afford to pay ranges from IDR 45,000.00-IDR 570,000.00 with the average tariff that prospective toll road users can afford to pay is IDR 237,461.00 for every 131 km according to the length of the section studied, namely the Pekanbaru Dumai section or around IDR 1,813.00/km. And it can be seen that as many as 38% of respondents are able to afford fees above the ATP average. This shows that some respondents have better financial ability and can pay toll rates above average, which can be a consideration in determining more different toll rates.

3.2.2 *Willingness to Pay* (WTP) Analysis

The calculation of the average WTP value uses the average midpoint formula because the WTP value has been listed on the questionnaire form distributed and selected by the respondents according to the desired tariff. The choice of tariff listed on the questionnaire is determined based on previous research and adjusted to the nearest toll tariff. The following results from respondents are shown in the following graph:

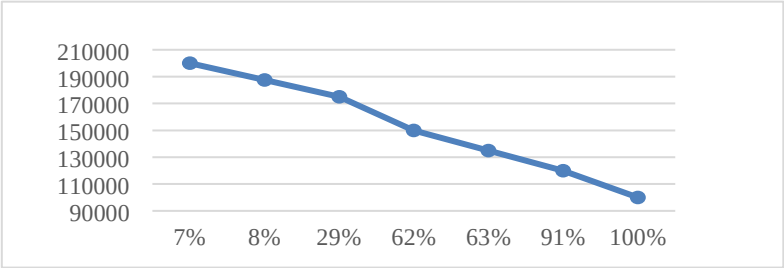

Figure 10 *Willingness to Pay* (WTP)

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From the data above, it can be seen that the tariff that respondents are willing to pay is IDR 100,000.00-IDR 200,000.00 for the 131 km toll road with an average WTP value of IDR 146,046.00 for the 131 km toll road according to the Pekanbaru section. to Dumai. The graph shows that around 62% of respondents can afford to pay rates above the WTP average. This interpretation shows that the majority of respondents have sufficient financial ability to pay toll rates above the specified average. This can be an important consideration in toll tariff determination policies, where excessive tariffs can burden heavy financial burdens for some respondents, while too low tariffs can reduce the potential revenue from tolls. Thus, the determination of the optimal toll tariff needs to consider the balance between the respondent's ability to pay and the sustainability of toll road operations.

3.2.3 ATP & WTP Relationship Analysis

Based on the results of ATP and WTP analysis, it can be seen that toll rates are high, where the ability and willingness to pay road users can be adjusted as shown in the graph below:

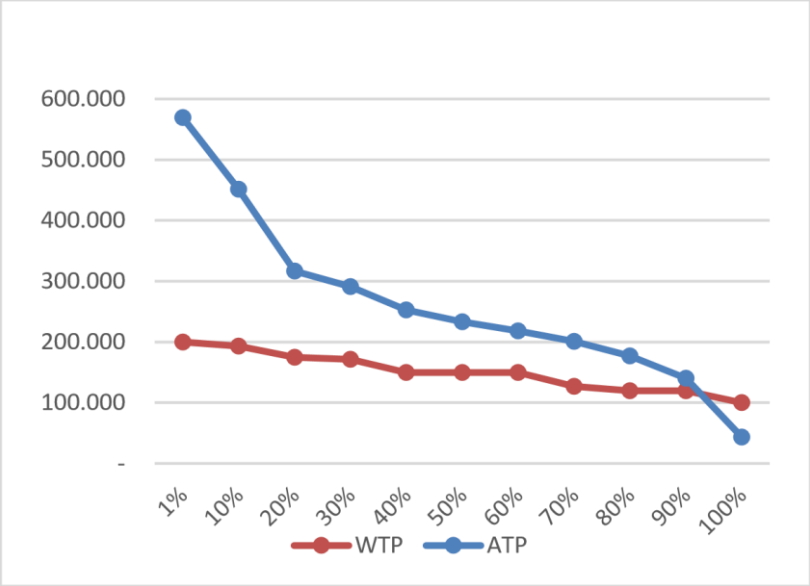

Figure 11 ATP & WTP Relationship

Based on the graph above, it can be seen that the ATP value is greater than the WTP value (ATP > WTP). This condition indicates that the ability to pay is greater than the desire to pay for the service. This can happen if the user has a relatively high income but the willingness to pay for the transportation services used is relatively low. These users can freely determine what utility they want to use and other factors related to the utility such as price and amenities also affect the choice they will make. The meeting of the two lines between ATP and WTP is at a tariff of Rp. 115,500.00 for the length of the 131 km toll road where the percentage is 93%. This meeting showed that there is a balance between ATP and WTP and it can be interpreted that as many as 93% of existing road users are able and willing to pay toll rates of Rp. 115,500.00 for 131 km of toll roads.

3.3 Financial Analysis

Financial Indicators are used to assess the financial viability of a project as well as alternative financial structures for its implementation. The indicators used are based on the financial parameters by the World Bank in the PPP scheme and adjusted to the financial parameters used in the Pekanbaru – Dumai Toll Road Business Plan, namely the Financial Internal Rate of Return (FIRR), Net Present Value (NPV), and Payback Period. Before calculating financial feasibility, it is necessary to calculate cash flow over 50 years by simulating rates based on ATP and WTP rates.

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Table 1. Financial Analysis

FCFF (IDR Miliar)	**2023**	**2040**	**2050**	**2060**	**2068**
EAT	(1.169)	14.440	66.216	169.910	301.609
Depreciation	252	5.601	9.923	15.187	20.054
Interest	1.871	6.921	6.921	6.921	6.921
Capex	(20.169)	(20.169)	(20.169)	(20.169)	(20.169)
Total	**(19.215)**	**6.793**	**62.891**	**171.850**	**308.415**
NPV	**(14.749)**	**(10.732)**	**(7.843)**	**(5.786)**	**(4.702)**
Pay Back Period		23 Tahun 2 Bula		n	
IRR		8,97%			

The results of the study provide information on ATP (*Ability to Pay*) and WTP *(Willingness to Pay*) rates in billions of Rupiah for 2023 to 2068. Earning After Tax (EAT) has increased from a negative value in 2023 to IDR 308,415 billion in 2068. *Depreciation* also shows an upward trend from year to year, albeit with a negative value at the beginning of the project.

Total *Interest and Capital Expenditure (Capex*) remained stable from year to year, with Total Interest ranging from IDR 1,871 billion to IDR 6,921 billion, and Capex remained at -IDR 20,169 billion annually. The total FCFF shows an upward trend from year to year, albeit with fluctuations in value. However, the Present Value (NPV) of this project showed negative figures throughout the project period, with the lowest value occurring in 2068 of -IDR 4,702 billion. The payback period of this project is projected to occur in the 23rd year of the 2nd month. The internal rate of return (IRR) of this project is 8.97%, indicating a relatively low rate of return compared to the previous project. Based on the results of the two previous projects, namely the Business Plan and the Current Toll Tariff, the value of ATP and WTP tariffs is the lowest. This is because the *pay back period* is longer than the previous project. Therefore, it is still biased to say that it is financially feasible.

The results of the evaluation show that the project based on the tariff under the Business Plan offers a higher rate of return (IRR 11.15%) compared to the project based on the ATP & WTP tariff (IRR 8.97%). This is in line with the findings of research by Fan and He (2019) which show that taking into account the willingness of toll road users to pay can increase the estimated rate of return on investment. However, both projects based on ATP and WTP tariffs generate negative NPV throughout the project period, indicating that the project does not generate added value in the long term.

The cause of this negative NPV can be explained by the complexity of the cost structure of toll road projects. In addition to operational and capital costs, additional elements such as interest and taxes in capital costs can have a significant impact, as observed in research by Zhang et al. (2020). In this context, the tariff structure chosen will affect the overall revenue and profit level of the project.

In addition, the evaluation also shows that the payback period for both alternatives is relatively long, indicating that the time required for the return on investment is quite long. This is in line with research by Wu et al. (2019) which found that infrastructure projects tend to have a longer payback period.

Overall, the study underscores the complexity of evaluating the financial viability of toll road projects, with an emphasis on the importance of taking into account user preferences and financial capabilities as key factors in determining optimal fares.

Along with the latest theoretical developments and research in this field, a holistic and detailed approach is needed to ensure the long-term success of significant infrastructure projects such as toll roads.

4. CONCLUSIONS

The Trans Sumatra toll road section between Pekanbaru and Dumai is a strategic project that highlights the importance of evaluating financial feasibility. The determination of toll tariff rates must consider the financial feasibility that can be accepted by all

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stakeholders, including toll road users. This research highlights the importance of considering the ability to pay and the willingness of users to pay in determining the optimal rate. The analysis shows that the current tariff is not optimal, from the results of the evaluation it was found that the majority of respondents have an average ability to pay (ATP) of IDR 237,461.00. Meanwhile, the respondents' average rate (WTP) was IDR 146,046.00. The results of the study found that the optimal rate that can be accepted by users is IDR 115,500.00. Thus, tariff adjustments are essential to ensure a balance between revenue and the financial viability of toll road sections. This conclusion emphasizes the need to adjust toll rates to the financial characteristics of users to ensure financial feasibility that is acceptable to all parties concerned. However, the complexity in evaluating the financial feasibility of toll road projects, with an emphasis on the importance of taking into account user preferences and financial capabilities as key factors in determining optimal rates. Along with the latest theoretical developments and research in this field, a holistic and detailed approach is needed to ensure the long-term success of significant infrastructure projects such as toll roads.

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Cite this Article: Anugerata N., Anas E.P. (2024). Evaluation of Toll Rates with the Ability to Pay and Willingness to Pay Approach to Implementation on the Trans Sumatra Toll Road Pekanbaru Dumai Section. International Journal of Current Science Research and Review, 7(12), 9383-9392, DOI: https://doi.org/10.47191/ijcsrr/V7-i12-80