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Analysis of the Impact of the Imposition of Existing Tariffs on the Average Daily Traffic of the Krian – Legundi - Bunder Toll Road

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ABSTRACT:
The imposition of toll tariffs on the Krian–Legundi–Bunder (KLB) Toll Road has resulted in suboptimal traffic volume, as the current rates do not align with the users' Ability to Pay (ATP) and Willingness to Pay (WTP). This research aims to analyze how existing toll tariffs affect Average Daily Traffic (ADT), particularly focusing on users in Gresik Regency. A quantitative descriptive method was employed, involving traffic count surveys and roadside interviews (RSI) at strategic toll gates and arterial roads. Data were analyzed through stated preference models and regression equations to measure the probability of route choice changes. The findings reveal that higher toll rates significantly deter users from toll roads, whereas reducing the tariff to Rp. 650/km could shift approximately 1,808 vehicles/day from arterial roads to the toll road. The implications highlight the need for toll policy revisions that consider socio-economic conditions to ensure infrastructure utilization and financial sustainability. Future studies are encouraged to incorporate broader behavioral and demographic variables with real-time modeling to refine toll pricing strategies further.
Keywords: Toll Tariff, Ability to Pay (ATP), Willingness to Pay (WTP), Krian – Legundi – Bunder Toll Road, Road User Preferences.

INTRODUCTION

East Java is one of Indonesia's regions experiencing rapid economic growth. To support this, various initiatives need to be carried out to improve access and connectivity between regions, including the construction of toll roads (Broughel & Thierer, 2019; Hess, 2016; Purwanto, 2023; Surya et al., 2021; Udeh et al., 2016). The construction plan of the Krian-Legundi-Bunder-Manyar Toll Road is one of the toll roads that will be developed and listed in East Java Regional Regulation Number 5 of 2012. Presidential Decree Number 56 of 2018 includes the 38.3 km Krian-Legundi-Bunder-Manyar Toll Road ("KLBM") in the national strategic program (Agustina & Widyastuti, 2020; Hartoyo & Utomo, 2021; Sungkono & Kurniawan, 2019; Trisaputra Zuna & Budi Astuti, 2019). Of course, the economic impact of infrastructure is widely recognized. For example, the economic changes that occurred on the Pantura route after the operation of the Trans Java Toll Road Prasetyo & Zuraida (2020). In

the Presidential Regulation of the Republic of Indonesia Number 80 of 2019 concerning *the Acceleration of Economic Development in the Gresik-Bangkalan-Mojokerto-Surabaya-Sidoarjo-Lamongan Area, the Bromo-Tengger-Semeru Area, the Selingkal Willis Area, and the South Lintas* Area, the KLBM toll road is included in the national strategic program. This is becoming increasingly important and needs to be accelerated. To support the Presidential Regulation Plan, the City of Surabaya and its surroundings will be designated as National Strategic Areas (KSN) (Deswati et al., 2023; Remus et al., 2023; Sasongko et al., 2019; Taali et al., 2024).

The Krian Legundi Bundar Manyar Toll Road (KLBM) is part of the non-Trans Java toll road included in the national strategic project. It was built to support the activities and economy of the people of Sidoarjo (Krian), Gresik Province, and its surroundings. Gresik Regency and Surrounding Areas.

Historically, in 2013, the process of initiating the Krian – Legundi – Bunder Toll Road ("KLB") began. Two companies have expressed interest in investing in the construction of the KLB Toll Road, namely PT. Waskita Karya (Persero), Tbk and PT. Earth Energy Mining. On 17 December 2013, the East Java Provincial Government, through the governor, made a letter with number 050/2709A/022.2/2013, which substantially contained an application to the Minister of Public Works and Public Housing to be able to consider PT. Waskita Karya (Persero), Tbk and PT. Energi Bumi Mining (Operational Cooperation) will become a business entity for the Initiator of the KLB Toll Road Section under the consortium name PT. Waskita Bumi Wira ("WBW").

On March 20, 2015, WBW sent a letter to the Minister of PUPR containing the letter's contents regarding the application for WBW's determination in initiating the KLB Toll Road. On April 23, 2015, the Minister of PUPR approved WBW as the initiator of the KLB Toll Road business according to his letter number JL.03.04-Mn/362 (Auction Document for the Krian—Legundi—Bunder Toll Road Business, 2016).

The auction process for the KLB Toll Road business officially began on June 22, 2016. The auction of the KLB Toll Road business was carried out in accordance with the provisions of Presidential Regulation Number 38 of 2015. Officially, the auction process for the KLB Toll Road business began with the announcement of the KLB Toll Road business auction through *the Jakarta Post* on June 22, 2016. At the time of the initiative process, the proposed toll road was only within the scope of the KLB Toll Road. However, in the midst of the prequalification process, the toll road plan will be extended to Manyar, considering the proposal for the development of the JIIPE area. The proposal was then followed up with a letter from the Minister of PUPR number Jl.03.04-Mn/667, which stated that the scope of the Krian-Legundi-Bunder Toll Road was added along ±9km, so that it became the Krian-Legundi-Bunder-Manyar Toll Road along ±39km. Based on the Minutes of the KLBM Toll Road Business Auction, the winning result of the KLBM Toll Road Business Auction is WBW with an investment calculation model, *business plan,* traffic conditions, toll revenue, and toll road pricing that will be stipulated in the KLBM Toll Road Business Agreement. Furthermore, the Toll Road Concession

Agreement was signed between WBW and the Toll Road Regulatory Agency ("BPJT") through Deed Number 05 dated December 5, 2016, with the scope of investment in KLBM Toll Road Construction and Construction Support on the 25 km Terbanggi Besar – Pematang Panggang – Kayu Agung Toll Road. Therefore, PT. Waskita Bumi Wira is entitled to the concessions given.

Krian (Mojokerto regency) and Bunder (Gresik regency) become connected because of this toll road; later, the toll road will be connected to the Surabaya – Mojokerto and Surabaya - Gresik toll roads. In addition to providing a shorter route alternative than the Krian–Bunder corridor, the construction of this toll road is expected to support industrial estates (JIIPEE) in this area. When the KLBM Toll Road KLB Section operates, the business plan has marginal investment realization conditions. This condition is due to the realization of Average Daily Traffic (LHR), which is very far from the target business plan and impacts investment mismatches in the calculation of toll revenue. Therefore, WBW needs to make efforts to increase the Company's valuation in reducing the difference in the *business plan*.

There is an evaluation of the *KLBM Toll Investment Business Plan* in 2023. In relation to the marginal investment realization condition for the *business plan*. WBW proposed to BPJT, a government representative, that the scope of investment in the KLBM Toll Road as a whole be evaluated. On March 16, 2023, BPJT issued a letter number BM.08-P/164 with recommendations for adjustments to the scope of investment on the KLBM Toll Road, namely WBW undertaking the KLB Toll Road (Krian – Legundi – Bunder) including *the* Wringinanom Junction as many as 8 ramps so that the KLB Toll Road can be connected *radially* with the Transjawa Toll Road through the Surabaya – Mojokerto Toll Road and connected to and *Junction* Kebomas so that the KLB Toll Road can be connected ringly with the Surabaya – Gresik Toll Road, where the construction can be carried out in stages. For Section 4, the Bunder – Manyar Section, its construction and operation of 9,399 km will be included in the Tuban – Gresik Toll Road business as *a solicited* project. With this scope adjustment, WBW only carries out the scope of the KLB Toll Road investment, Construction Support on the 25 km Terbanggi Besar – Pematang Panggang – Kayu Agung Toll Road, Sumo Junction, and Kebomas Junction. Currently, WBW has carried out construction on the KLB Toll Road and *the* Early Stage Wringinanom Junction (4 *ramps* to the north).

The construction *of the* Initial Phase of the Wringinanom Junction (4 *ramps* to the north) has not been able to boost the valuation of WBW. Although there is an increase in LHR and Toll Revenue due to the impact of the operation of *the* Early Stage Wringinanom Junction (4 *ramps* to the North), it has not been able to improve the feasibility conditions of WBW. Toll road users prefer other alternative routes that are cheaper, and most trips are not rushed – there is a reluctance for toll road users to enter the toll road. A review of the socio-economic aspects of the community needs to be conducted, including toll rates and effectiveness for toll road users and providers, which is very important to know the benefits. Therefore, the analysis of toll tariff adjustments in accordance with the wishes of the people of Gresik Regency is based on the perception of *Willingness to Pay* (WTP) and *Ability to Pay* (ATP). This study aims to analyze the toll rates charged to the people of Gresik Regency. The main reason for the need for this study is to find out the perception of the people of Gresik Regency in

interpreting *Willingness to Pay* (WTP) and *Ability to Pay* (ATP) in accordance with the facilities and infrastructure of the Krian – Legundi – Bunder Toll Road. This research was conducted on the Krian – Legundi – Bunder Toll Road with PT as a case study. Waskita Bumi Wira as a Business Entity for the Krian – Legundi – Bunder Toll Road.

The imposition of toll tariffs on the Krian–Legundi–Bunder (KLB) Toll Road has not yielded optimal traffic volumes, falling short of business plan targets and undermining investment feasibility. This shortfall is due to a mismatch between the existing tariffs and the public's ability and willingness to pay, especially among users in Gresik Regency who prefer alternative, more affordable routes. Understanding the socio-economic responses to toll rates is essential for devising effective pricing strategies that align with user preferences and regional mobility goals.

Toll roads are vital infrastructure for regional connectivity and economic growth, especially in East Java's industrial hubs like Gresik. However, the KLB Toll Road's intended benefits are hindered by low user adoption, raising concerns about the viability of public-private partnerships and long-term infrastructure financing. Without adequate user participation, the toll road cannot ease congestion and support economic development in the corridor.

The urgency is further heightened by the discrepancy between the designed financial models and actual road usage, which is heavily influenced by ATP (Ability to Pay) and WTP (Willingness to Pay). If toll rates remain unresponsive to these economic indicators, road users will continue to avoid the toll route, undermining investment returns and the goals of Indonesia's National Strategic Projects. Therefore, a reassessment grounded in socio-economic realities is critical to ensure the sustainability of toll road operations and infrastructure planning.

Cahyono & Wibowo (2021) examined ATP and WTP on the Kertosono-Kediri Toll Road and found that income levels and daily commuting costs significantly affect tariff acceptability, echoing challenges faced on the KLB Toll Road. Their work emphasized the need for context-based tariff modeling to improve policy responsiveness. Similarly, Hidayati et al. (2021) analyzed tariff determination on the Pandaan-Singosari Toll Road, demonstrating that user perception and income brackets must be central to pricing strategies for toll feasibility.

Rahmadyarto et al. (2018) conducted a financial feasibility analysis of the Medan-Binjai Toll Road and concluded that misaligned toll tariffs could lead to underutilization of infrastructure, a phenomenon evident in the KLBM corridor. This reinforces the significance of calibrating toll rates according to market and user capabilities. Meanwhile, Prasetyo & Zuraida (2020) investigated user sensitivity to WTP on the Semarang–Solo Toll Road, noting that even marginal fare adjustments influence switching behavior between toll and arterial roads.

Recent studies, such as Purboyo et al. (2023) and Syahrul et al. (2021), continued this discourse by applying ATP-WTP frameworks to the Becacayu and Sigli–Banda Aceh Toll Roads. Both studies validated the strong correlation between user affordability and toll road

utilization. However, while these studies focus on economic feasibility, few explicitly connect these metrics with actual behavioral preferences in different traffic scenarios. The current research on the KLB Toll Road adds further insight into this area.

While many previous studies have explored ATP and WTP models in various toll road contexts, limited research has incorporated stated preference methods alongside regression modeling to simulate road user behavior under varying tariff and road speed conditions. The lack of behavioral analysis linking tariff sensitivity to actual route choice in East Java, particularly for the KLB Toll Road, represents a significant research gap that this study aims to fill.

This research offers a novel integration of ATP-WTP metrics with a stated preference-based regression model to forecast user behavior under different toll rate and road condition scenarios. Unlike previous studies that treat ATP and WTP as static values, this study dynamically links these indicators to route-switching probabilities, offering policymakers a more actionable and predictive framework for toll pricing decisions in the KLB corridor.

The primary objective of this study is to analyze how the current toll tariff structure impacts average daily traffic on the Krian–Legundi–Bunder Toll Road by examining users' financial capacity and preferences. This uses ATP, WTP, and behavioral modeling to determine optimal pricing strategies that encourage higher toll road adoption.

This research provides strategic insights for infrastructure stakeholders, including the government and concessionaires, to make data-driven decisions on toll rate adjustments. The findings can help enhance policy formulation, ensure toll affordability, and improve toll road utilization, ultimately supporting more efficient regional transportation systems and sustainable investment returns.

METHOD

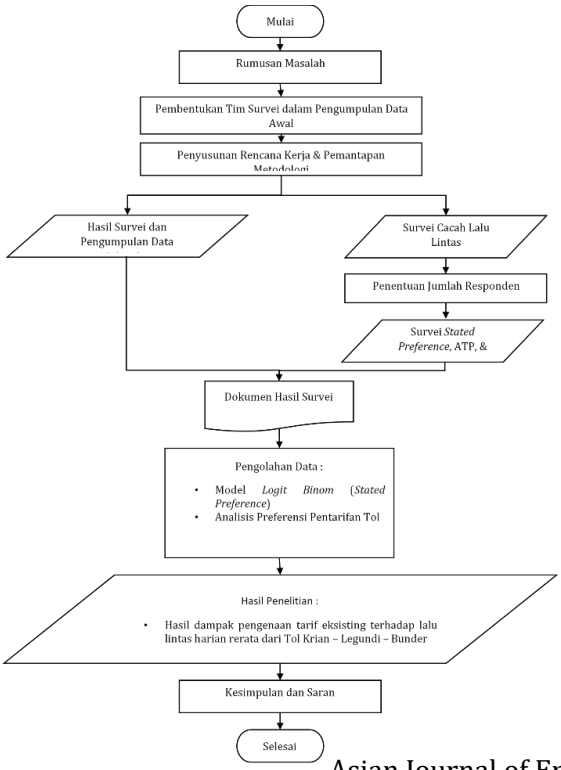

Figure 1. Research Flow Chart
Source: Processed Researcher, 2024

The research uses a quantitative descriptive method involving primary data collection through traffic count surveys and roadside interviews (RSI) at selected toll gates and arterial roads. These methods were used to obtain data on user income, travel behavior, and preferences related to the existing toll tariffs. The study then applied regression modeling and stated preference analysis to examine the impact of toll rates on route choices and the probability of road users switching to toll roads based on their Ability to Pay (ATP) and Willingness to Pay (WTP). This mixed approach enables a detailed assessment of economic capacity and behavioral intentions.

The research is entitled Analysis of the Impact of the Imposition of Existing Tariffs on Average Daily Traffic from the Krian—Legundi—Bunder Toll Road. This study discusses the public's ability and willingness to pay toll rates that affect road users' preferences. Data was collected through questionnaires and live surveys in a number of strategic locations to obtain primary data, including respondents' profiles, characteristics, and preferences.

This study involves a traffic count survey on Jalan Nasional Legundi – Simpang Empat Bunder to identify the characteristics of arterial road users and vehicles that switch to toll roads, by calculating the daily volume of cars based on the 2023 Indonesian Road Capacity Guidelines. In addition, the researcher also conducted *a roadside interview* (RSI) at three toll gates (Bunder Gresik, Cerme, and Belahanrejo) and two arterial road points (Karangandong and Cerme) to understand users' abilities and preferences for toll rates. The RSI includes information related to the respondent's profile, characteristics, and preferences. Sample data was obtained by considering the proportion of vehicles from toll transactions and *arterial road traffic counts*, while the sample number was calculated using an empirical formula to limit the scope of the study.

RESULTS AND DISCUSSION

A. Calculation Results

Data obtained from the researcher based on the condition of arterial roads can include several data, namely the characteristics of arterial road users, ATP values, WTP values, road user preferences, and Optimal Toll Rates.

1. Road User Characteristics

The researchers also described the type of work of arterial road users. This description aims to show the extent to which the characteristics of permanent and non-permanent employees are reflected in the profile of road users. Based on the survey, most road users are Drivers or passengers. This aligns with the characteristics of the

Gresik Regency area, which is dominated by industrial activities, ports, transportation, and large, medium, small, and office companies.

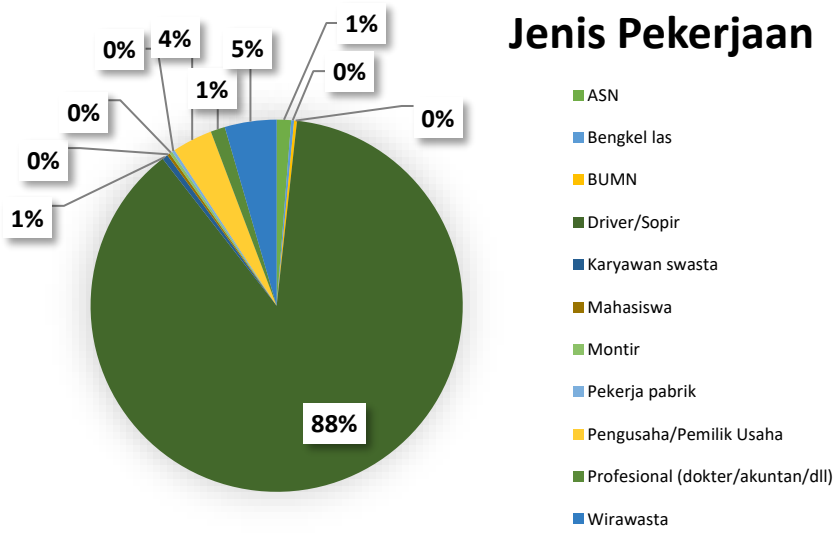

Figure 2. Types of Arterial Road User Jobs
Source: Processed Researcher, 2024

Income levels significantly influence the allocation of travel expenses. According to the survey results, most road users have incomes between Rp 3 million and Rp 4 million. This greatly affects the value of ATP (*Ability to Pay*) and WTP (*Willingness to Pay*), as they have a comparable relationship with income levels.

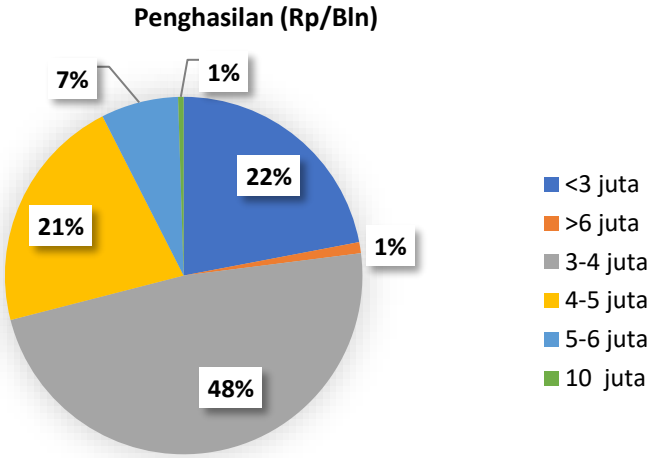

Figure 3: Income Value of Arterial Road Users
Source: Processed Researcher, 2024

2. Hasil Ability to Pay

Ability to Pay (ATP) describes road users' ability to pay toll rates based on the results of respondents' surveys. The ATP value is grouped according to vehicle classes

stipulated in PP 23/2024, which divides toll road vehicles into five groups. Group 1 includes passenger cars, sedans, jeeps, *pick-ups*, buses, private vehicles, and other transportation; Group 2 consists of trucks with two axles; Group 3 is a truck with three axles; Group 4 includes trucks with four axles; and Group 5 includes trucks with five or more axles. The calculation of the ATP value is carried out using the formula below.

The researcher aims to clarify the research results by providing an example of ATP calculation based on transportation income and expenses. As an illustration, a road user with the initials A who works as a self-employed person has a monthly income of IDR 4,500,000, a monthly expenditure of IDR 2,000,000, and a monthly transportation expenditure of IDR 2,430,000, using a Group 1 vehicle for travel. A travels about 1.920 km every month. Thus, the ATP value can be calculated using the formula 2.1 as follows:

$$\boldsymbol{ATP = \frac{Ix\ x\ Pp\ x\ Pt}{Tt} = \frac{4.500.000\ x\ \left(\frac{2.000.000}{2.430.000}\right)\ x\ \left(\frac{2.430.000}{4.500.000}\right)}{1920}}$$

$$\boldsymbol{ATP = Rp.1042/km}$$

Based on the analysis, the average ATP value for Group 1 was obtained with a tariff of IDR 1,477 per kilometer, while for Groups 2 and 3, the average value of ATP resulted in a tariff of IDR 2,144 per kilometer. In addition, for Groups 4 and 5, the average value of ATP was obtained with a tariff of Rp 2,865 per kilometer.

3. Hasil Willingness to Pay

Similar to *Ability to Pay*, *Willingness to Pay* has 3 types of values based on the classification of vehicle types in accordance with existing toll rates. This WTP value is determined based on the number of respondents previously surveyed by the Researcher. The WTP value was taken on average from the interview results with the ideal toll rate desired by the respondent. The results of the WTP certainly provide an overview of the willingness of road users to use toll roads by considering the export toll service and the selection of the route of the surrounding road network.

Based on the analysis, the average value of WTP for Group 1 resulted in a tariff of Rp 1,406 per kilometer, while the average value of ATP for Groups 2 and 3 resulted in a tariff of Rp 2,144 per kilometer. In addition, for Groups 4 and 5, the average value of WTP produces a tariff of IDR 2,855 per kilometer.

4. Road User Preferences

The probability of road users moving to toll roads is also influenced by the perception of each road user based on the toll rates charged to users. This probability is influenced by the desire to pay for the services they receive (toll roads) based on the personal perception of road users. The size of toll fare appropriateness varies from person to person; regression analysis of the stated preference survey results is used to form a model of the probability of switching modes. In this work, an analysis of the

displacement of vehicle routes that are still through existing roads will be carried out, using data from the results of *the stated preference analysis*. The data was obtained from interviews with respondents on existing roads. The magnitude of this displacement factor refers to the current toll rates and the average speed carried out on arterial roads.

The results of *the stated preference analysis* are based on a survey that has been carried out, which is differentiated by 3 graphs based on the existing toll rates of vehicle classes. From the results of these preferences, it can be estimated that if the toll tariff is adjusted, there will be a change in the movement pattern that originally used arterial roads, switched to using toll roads, and vice versa. Usually, if the toll tariff is increased, road users will switch to using arterial roads. On the other hand, if the toll tariff is lowered, road users will switch to using toll roads as an option. This result gives a scenario for the speed of 20 kph, 25 kph, 35 kph, 45 kph, and 60 kph.

The stage of *stated preference* analysis is the creation of a form based on the rating scale in accordance with the Research Method that the Researcher has submitted in Chapter 3. A total of 400 respondents were asked to state their level of preference for the available options using a numerical scale. For example, 1 = definitely choose A, 2 = maybe choose A, 3 = balanced choice, 4 = maybe choose B, and 5 = choose B. These five choices are then transformed into a form of probability with a transformation value of 1 = 0.1, 2 = 0.3, 3 = 0.5, 4 = 0.7, and 5 = 0.9. This analysis also identifies road users in the selection of road routes to be passed by entering it into Formula Number 2.3.

The respondents' choice of road depends on the road user's filling out the form at the time of the interview. According to the form the researcher has created, respondents will be asked a choice. The choice in question is based on the condition of the existing road and the toll rates charged. If the existing road condition is jammed and the toll rate per kilometer is based on the conditions asked by the researcher to the respondents, how do road users choose the response?

Table 1. Sample Filling Out Stated *Preference Survey Respondents*

Existing Road Conditions	Toll Rate (Rp/km)	Choice of path used				
		1	2	3	4	5
If the road conditions are JAMMED (Speed: < 20 km/h)	2800	☑	☐	☐	☐	☐
	2900	☑	☐	☐	☐	☐
	3000	☐	☑	☐	☐	☐
	3100	☐	☐	☑	☐	☐
	3200	☐	☐	☐	☑	☐

Source: Processed Researcher, 2024

Next is the process of recapitulation of preference results. The result of this preference describes the selected score under a predetermined state. These

circumstances are divided into 2 based on road conditions and toll rates. Points 1 to 5 will be recapitulated as a result of preference.

Table 2. Example of a Recapitulation of Filling in Respondent Preferences

Perception of the possibility of using toll roads (Gol. 4-5) [If Traffic Jams and Toll Tariff Rp. 2800/km]	Perception of the possibility of using toll roads (Gol. 4-5) [If Traffic Jams and Toll Tariff Rp.2900/km]	Perception of the possibility of using toll roads (Gol. 4-5) [If Traffic Jams and Toll Rates Rp. 3000/km]
1	2	3
1	1	1
1	1	1

Source: Processed Researcher, 2024

Furthermore, if the recapitulation of the results has been carried out, the transformation of respondents' choices to the probability scale is continued. This probability scale is taken based on a rating set, for example, 1 = choose A, 2 = probably choose A, 3 = balanced choice, 4 = probably choose B, and 5 = choose B. The five choices transform it into a form of probability with a transformation value of 1 = 0.1, 2 = 0.3, 3 = 0.5, 4 = 0.7, and 5 = 0.9.

Table 3. Example of Probability Scale Calculation

Scale	Responds	Probability Scale (P)	tilites Ln$(\frac{P}{1-P})$
1	Definitely choose A	0,9	2,1972
2	Most likely to choose A	0,7	0,8473
3	Maybe choose one of them	0,5	0
4	Most likely to choose B	0,3	-0,8473
5	Definitely choose B	0,1	-2,1972

Source: Processed Researcher, 2024

The probability scale results can be calculated using regression equations (*UJT – UJE)* obtained through SPSS. The following graph of toll road entry opportunities in Group 1 is based on the average speed of vehicles in the arteries, with the following regression equation results: *UJT – UJE = 8.233 – 0.05777 x speed – 0.00381 x* tariff. Therefore, the results of the regression equation are included in the calculation of the opportunity to enter the toll road for Group 1 as follows:

$$P_{Gol.1} = \frac{e^{(8{,}233 - 0{,}05777\ x\ kecepatan - 0{,}00381\ x\ tarif)}}{1 + e^{(8{,}233 - 0{,}05777\ x\ kecepatan - 0{,}00381\ x\ tarif)}}$$

Calculation tabulation can be used to facilitate the interpretation of the preference equation obtained. It is done by *trial and error* for each condition. The

condition of some of the results is due to the speed or road conditions and toll rates charged.

Table 4. Example of Road User Preference Calculation

Speed	20 kph		35 kph		60 kph	
Fare (Rp/km)	*P.tol*	*P.Existing*	*P.tol*	*P.Existing*	*P.tol*	*P.Existing*
250	0.998	0.002	0.995	0.005	0.978	0.022
300	0.997	0.003	0.994	0.006	0.974	0.026
350	0.997	0.003	0.992	0.008	0.968	0.032
400	0.996	0.004	0.991	0.009	0.962	0.038
450	0.995	0.005	0.989	0.011	0.954	0.046
500	0.994	0.006	0.987	0.013	0.945	0.055
550	0.993	0.007	0.984	0.016	0.935	0.065
600	0.992	0.008	0.980	0.020	0.922	0.078
650	0.990	0.010	0.976	0.024	0.907	0.093
700	0.988	0.012	0.972	0.028	0.890	0.110
750	0.985	0.015	0.966	0.034	0.870	0.130
800	0.982	0.018	0.959	0.041	0.847	0.153
850	0.979	0.021	0.951	0.049	0.820	0.180
900	0.974	0.026	0.941	0.059	0.790	0.210
950	0.969	0.031	0.930	0.070	0.757	0.243
1000	0.963	0.037	0.916	0.084	0.720	0.280

Source: Processed Researcher, 2024

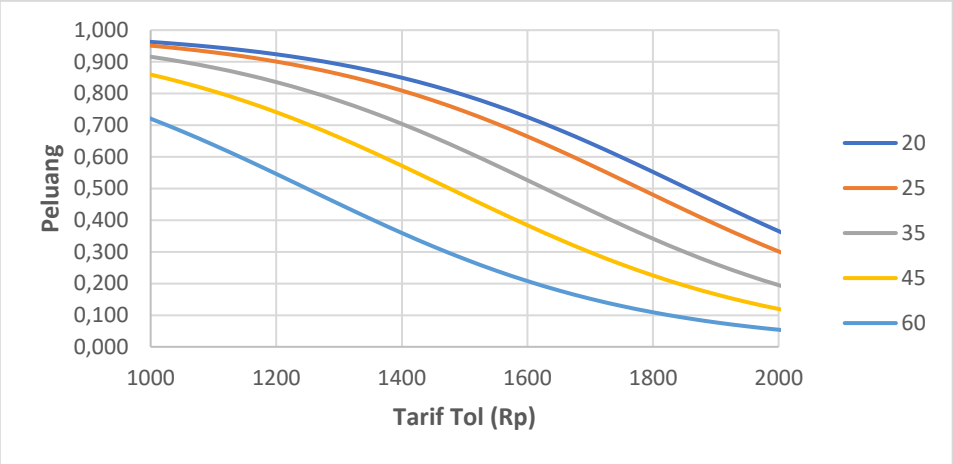

Figure 4. Road User Preferences Group 1

Source: Processed Researcher, 2024

For the graph of toll entry opportunities in Groups 2 and 3 based on the average speed of vehicles in the arteries, with the following regression equation results: UJT – UJE = 12.182 – 0.049043 x speed – 0.0045 x tariff. Therefore, from the results of the regression equation, it is included in the calculation of the opportunity to enter the toll road for Groups 2 and 3, so that the following equation is obtained:

$$P_{Gol.2\&3} = \frac{e^{(12{,}182 - 0{,}049043\ x\ kecepatan - 0{,}0045\ x\ tarif)}}{1 + e^{(12{,}182 - 0{,}049043\ x\ kecepatan - 0{,}0045\ x\ tarif)}}$$

In the same way, Group 1 preferences in each condition are calculated, resulting in the graph below.

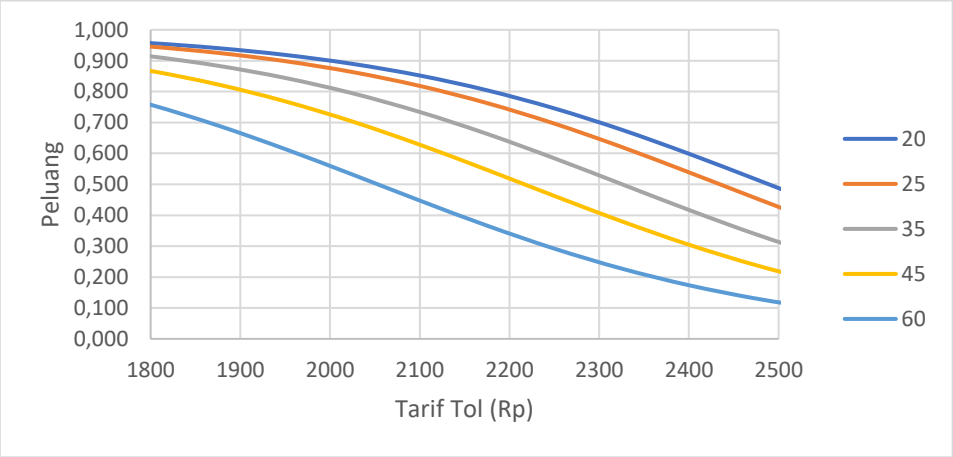

Figure 5. Road User Preferences Group 2 and 3
Source: Processed Researcher, 2024

For the graph of toll entry opportunities in Groups 4 and 5 based on the average speed of vehicles in arteries, with the following regression equation results: *UJT – UJE = 17.02 – 0.04476 x speed – 0.00493 x tariff.* Therefore, from the results of the regression equation, it is included in the calculation of the opportunity to enter the toll road for Groups 4 and 5, so that the following equation is obtained:

$$P_{Gol.4\&5} = \frac{e^{(17{,}02 - 0{,}04476\ x\ kecepatan - 0{,}00493\ x\ tarif)}}{1 + e^{(17{,}02 - 0{,}04476\ x\ kecepatan - 0{,}00493\ x\ tarif)}}$$

In the same way, Group 1 preferences as well as Groups 2 and 3 in each condition are calculated. Thus, the graph below is obtained.

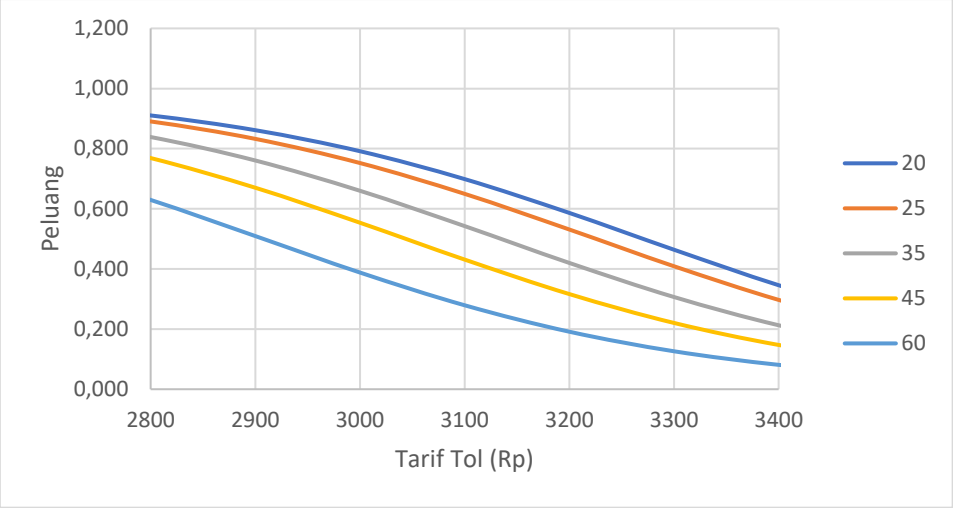

Figure 6. Road User Preferences Group 4 and 5
Source: Processed Researcher, 2024

CONCLUSION

Based on the analysis of road users' preferences, the imposition of existing toll tariffs significantly influences the choice of routes among road users. As toll rates increase, fewer users opt for the toll road, whereas lower rates encourage greater usage, such as reducing the tariff to Rp. 650/km could shift 1,808 vehicles per day from arterial roads to the toll road. The current tariff per kilometer on the Krian–Legundi–Bunder Toll Road exceeds most users' Willingness to Pay (WTP) and Ability to Pay (ATP), leading them to favor alternative, more affordable routes. Thus, the preference analysis confirms that road user movement is highly sensitive to toll pricing. For future research, it is recommended to incorporate real-time traffic simulation models and broader socio-demographic variables to more accurately forecast toll road usage and develop dynamic pricing strategies that align with evolving user behavior and economic conditions.

REFERENCES

Agustina, Y., & Widyastuti, H. (2020). Studi Karakteristik dan Pemilihan Rute Pengguna Jalan Tol Surabaya-Mojokerto terhadap Jalan Tol Krian-Legundi-Bunder-Manyar Menggunakan Metode Stated Preference. *Jurnal Aplikasi Teknik Sipil*, *18*(2).

Broughel, J., & Thierer, A. D. (2019). Technological innovation and economic growth: A brief report on the evidence. *Mercatus Research Paper*.

Cahyono, M. S. D., & Wibowo, L. S. B. (2021). ATP and WTP Analysis on the Kertosono-Kediri Toll Road Plan, East Java Province. *Aggregate*, *6*(1).

Deswati, D., Tetra, O. N., Syafrizayanti, Yusuf, Y., Putra, A., Fitri, W. E., Suparno, S., & Pardi, H. (2023). Application of water quality index (WQI) for surface water quality assessment in Maninjau Lake, Agam, West Sumatra, Indonesia. *AACL Bioflux*, *16*(5).

Hartoyo, Y., & Utomo, C. (2021). Sensitivity Analysis to Determine the Prospect of Tollroad Investment: Case Study Krian-Legundi-Bunder-Manyar Tollroad. *IPTEK Journal of Proceedings Series*, *0*(1). https://doi.org/10.12962/j23546026.y2020i1.8460

Hess, P. N. (2016). *Economic growth and sustainable development*. Routledge.

Hidayati, N., Waloejo, B. D., & Firdausiyah, N. (2021). The determination of the Pandaan-Singosari toll road tariff is based on socio-economic conditions using the ATP/WTP approach. *Planning for Urban and Environment*, *10*(1).

Prasetyo, L. B. B., & Zuraida, S. (2020). Analysis of Traffic Volume Sensitivity to Willingness to Pay (WTP)-Based Tariff Changes on the Semarang-Solo Toll Road. *Planners Insight*, *3*(1). https://doi.org/10.36870/insight.v3i1.189

Purboyo, W., Suryanto, D. A., Ramdan, T., & Tendy, J. (2023). ATP and WTP Analysis for Determination of Toll Rates on the Becacayu Toll Road. *Journal of Construction Engineering and Sustainable Development*, *6*(1). https://doi.org/10.25105/cesd.v6i1.17155

Purwanto, A. (2023). The Role of the Banking Sector in Economic Growth: An Analysis. *Economic Journal of Banking and Finance*, *12*(1), 45–60. https://doi.org/10.1234/ejbf.v12i1.23456

Rahmadyarto, G., Sandhyavitri, A., & Malik, A. (2018). Evaluation of Toll Tariff Prices Based on Financial Feasibility Analysis (Case Study: Medan - Binjai Toll Road). *Let's Move On*, *5*.

Remus, S. P., Tarmizi, H., Daulay, P., & Rujiman. (2023). Tourism Economic Effect Sustainability of the National Strategic Area of Lake Toba Against Community Economic Improvement. *Quality - Access to Success*, *24*(194). https://doi.org/10.47750/QAS/24.194.15

Sasongko, G., Huruta, A. D., & Wardani, A. (2019). Does the Wagner's Law exist in a strategic national area? An evidence from Kedungsepur - Indonesia. *Insights into Regional Development*, *1*(2). https://doi.org/10.9770/ird.2019.1.2(2)

Sungkono, P. A., & Kurniawan, H. F. (2019). Case Studies Of Private Government Cooperation: Procurement Of Land Development Projects Toll Road Krian – Legundi – Bunder – Manyar. *IJTI (International Journal of Transportation and Infrastructure)*, *2*(2). https://doi.org/10.29138/ijti.v2i2.788

Surya, B., Menne, F., Sabhan, H., Suriani, S., Abubakar, H., & Idris, M. (2021). Economic Growth, Increasing Productivity of SMEs, and Open Innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), 20. https://doi.org/https://doi.org/10.3390/joitmc7010020

Syahrul, F., Isya, M., & Suryani, F. M. (2021). Toll road tariff plans are analyzed based on the Ability To Pay (ATP) and Willingness to Pay (WTP) approaches in the Sigli - Banda Aceh toll road section plan. *Journal of The Civil Engineering Student*, *3*(2). https://doi.org/10.24815/journalces.v3i2.13369

Taali, M., Hucadinota Ainul Amri, L., Ayu Kunthi Puspitasari, D., & Anwar, R. (2024). Analysis of the Harmonious Development of the National Tourism Strategic Area and Tourism Master Plan. *KnE Engineering*. https://doi.org/10.18502/keg.v6i1.15348

Trisaputra Zuna, H., & Budi Astuti, Z. (2019). Composite girder to fulfill the needs of 60 up to 80 m span bridge for toll road projects in Indonesia. *MATEC Web of Conferences*, *270*. https://doi.org/10.1051/matecconf/201927006001

Udeh, S. N., UGWU, J. I., & Onwuka, I. O. (2016). External debt and economic growth: The Nigeria experience. *European Journal of Accounting Auditing and Finance Research*, *4*(2), 33–48.