Study on Environmental Attitudes and Passenger Preferences for Bali's Planned Urban Rail

Ni Komang Widyasanti[1*], Muhammad Zudhy Irawan[1], Danang Parikesit[1]
Department of Civil and Environmental Engineering Faculty of Engineering Universitas Gadjah Mada, Jl. Grafika Kampus No. 2 Yogyakarta, Indonesia[1]
[*]Corresponding author e-mail address: nikomangwidyasanti@mail.ugm.ac.id

ABSTRACT

Bali is experiencing increasing traffic congestion, growing travel demand, and rising environmental pressures, which highlight the need for more sustainable transport solutions. The planned urban rail system is expected to play a significant role in addressing these challenges as an alternative mode with lower environmental impacts. Understanding how environmental attitudes influence passenger behaviour is therefore important in assessing the potential acceptance of the system among different user groups. This study aims to examine how environmental influence passengers' willingness to pay (WTP) and their priority for using Bali's urban rail system. In particular, the research explores whether higher environmental awareness encourages a stronger preference and whether there are behavioural differences among residents, domestic tourists, and international tourists on the proposed service.A stated preference (SP) survey hence conducted both online and on-site between June and July 2025, bring in 1,186 valid responses. Ordered logit models were applied to analyse the determinants of urban rail priority and WTP, incorporating socio-demographic characteristics, trip attributes, travel costs, and levels of environmental awareness.The findings indicate that the factors shaping urban rail priority differ across groups. Residents are primarily influenced by trip-related characteristics, while domestic tourists are affected by a broader range of socio-demographic factors. International tourists exhibit similar sensitivities but with a stronger emphasis on environmental considerations. Higher environmental awareness generally increases the likelihood of prioritising urban rail, although this effect is statistically significant mainly for international tourists. WTP results show that approximately 75% of respondents are willing to pay more than the baseline fare suggested from previous feasibility study. While cost remains the dominant determinant of WTP, environmental attributes play more role for international tourists.

Keywords: Bali, Environmental Awareness, Stated Preference, Urban Rail, Willingness to Pay

1. INTRODUCTION

As one of the world's leading tourism destinations, Bali is increasingly challenged with severe transport-related problems. Persistent traffic congestion is particularly evident in the southern urban areas, where travel demand is concentrated. Daily mobility on the island is overwhelmingly reliant on private motorcycles and cars [1], while public transport services remain limited in coverage and usage. This heavy dependence on private vehicles has contributed not only to deteriorating traffic conditions but also to escalating carbon emissions and declining air quality. In response to these challenges, the local government has proposed the introduction of an urban rail system as part of a broader strategy to reduce reliance on

private vehicles and enhance urban mobility [2], The initial phase of the proposed system is planned to connect key activity centres, beginning with I Gusti Ngurah Rai International Airport.

Numerous studies have examined rail-related issues in Bali from various viewpoints, including economic feasibility [3], technological alternatives [4], passenger demand modelling [5], public transport mode choice [6], and geological feasibility [7]. However, despite this scale of research, limited attention has been given to the influence of environmental factors and to behavioural differences across distinct traveller groups. To close the gaps, this study aims to analyse passenger preferences regarding priority and willingness to pay (WTP) for Bali's planned urban rail system, with particular emphasis on the role of environmental awareness in shaping travel decisions. The analysis considers three user groups, local residents, domestic tourists, and international tourists who have visited, are currently visiting, or intend to visit Bali. The scope is on short urban trips of approximately 4 km, representative of typical commuting and tourist travel. The study is based on stated preference (SP) survey, where the data collected through online and on-site questionnaires between June and July 2025. Comparisons are made between urban rail and existing transport modes in Bali, with assumed operating characteristics and emission factors from relevant sources. Issues related to financing, engineering design, construction, and system operations are beyond the scope of this study.

2. THEORY AND METHODS

2.1 Stated Preference

Stated Preference (SP) techniques are frequently applied to explore travel behaviour by examining how individuals trade off different attributes when selecting transport modes. For example, Irawan [8] used SP surveys to analyse user preferences between public buses and motorcycle-based ride-hailing (MBRH) services in Yogyakarta, while their subsequent study in 2023[9] employed SP to investigate MBRH drivers' behavioural intentions and perceptions related to risky actions while driving. Despite its widespread use, SP has several shortcomings, including the possibility that estimated WTP may fall short of real implementation costs, vulnerability to external influences, and limited transferability across contexts due to differences in socio-demographic conditions and transport systems [10]. Within this research, SP is utilised to examine passenger preferences and WTP for Bali's proposed urban rail system, focusing on the role of environmental awareness, socio-demographic factors, and trip characteristics to produce context-specific evidence that can support sustainable transport policies and encourage higher rail ridership.

2.2 Discrete Choice Modelling

Discrete Choice Modelling (DCM) refers to a class of statistical methods used to examine and forecast individual choices among a limited number of discrete and mutually exclusive alternatives [11]. In transportation research, DCM is extensively applied to understand mode choice behaviour based on the attributes. The fundamental principle of DCM is derived from random utility theory, where the utility (U_{ni}) that individual (n) associates with alternative (i) (Eq. 1).

$$U_{ni} = V_{ni} + \varepsilon_{ni} \qquad (1)$$

where V_{ni} represents the systematic, observable component of utility determined by measurable factors, and ε_{ni} captures unobserved influences. Choice behaviour is modelled under the assumption that individuals select the alternative yielding the highest utility.

Previous transport studies have widely applied discrete choice models to analyse mode choice behaviour, with the multinomial logit (MNL) model commonly used for evaluating choices among multiple alternatives, such as Buehler's [12] cross-country study of mode choice determinants and Rizki et al.'s [13] analysis of electric vehicle adoption among tourists in Bali. In contrast, when behavioural outcomes are ordinal, ordered logit models have been shown to be more appropriate, as demonstrated by Waluyo et al. [14] in their study of electric motorcycle adoption among ride-hailing drivers. The ordered logit model, is commonly used to analyse ordinal dependent variables, where categories follow a natural order, but the intervals are not explicitly defined [15]. The model expresses the probability that the response variable (Y) falls within a specific category (j) or any lower category, using a cumulative logit function (Eq. 2).

$$P(Y_i > j) = \frac{exp(a_j + X_i\beta_j)}{1+[exp(a_j+X_i\beta_j)]}, j = 1,2,\dots,M-1 \qquad (2)$$

where α_j denotes threshold parameters (cut-points), X_i is a vector of explanatory variables, and β_j associated as coefficient vector.

These studies highlight the importance of selecting model structures that align with the nature of the dependent variable, providing methodological guidance for analysing ordered preferences and WTP in transport research.

2.3 Demand Curve Approaches

Demand theory explains the relationship between the price of a good or service and consumers purchasing behaviour. It suggests that a reduction in price generally leads to an increase in the quantity demanded, whereas a price rise tends to result in lower demand. This negative relationship between price and quantity is commonly illustrated by a demand curve that slopes downward from left to right. The demand curve represents the levels of consumption that buyers are both willing and able to achieve at various price points, under the assumption that other influencing factors remain constant (*ceteris paribus*) [16]. The standard demand curve is typically represented as a mathematical relationship between price and quantity demanded (Eq. 3).

$$Q_d = a - bP \qquad (3)$$

where Q_d is the quantity demanded, P for the price, a is intercept or maximum quantity demanded when price is zero, and b is slope of the demand curve or rate at which demand decreases as price increases.

2.4 Study Methods

This study adopts a stated preference (SP) approach to analyse passenger mode priority and willingness to pay (WTP) for Bali's planned urban rail system. It began with the development of a structured research plan and timeline, which incorporated the questionnaire design process. The survey instrument was structured into sections covering socio-demographic information, travel behaviour, environmental awareness, and SP choice scenarios. During preparation, risk assessment was also conducted to make sure the study run smoothly. The sample size was determined to achieve a 95% confidence level (required a minimum of 384 respondents for each category). Data were collected through a combination of online and on-site surveys at selected locations (airport and tourist attraction area), alongside appropriate ethical considerations. Secondary data on fares and emission factors were obtained from published sources and previous feasibility study from Korea Export-Import Bank [17].

Continuing with processing and analysing part, collinearity diagnostics were conducted prior to regression part to make sure no violation occurred. Ordered logit models were then estimated separately for residents, domestic tourists, and international tourists to capture group-specific behavioural differences. Finally, demand curve analysis was performed to examine fare sensitivity and the role of environmental valuation, with findings incorporated with existing literature and industry practice.

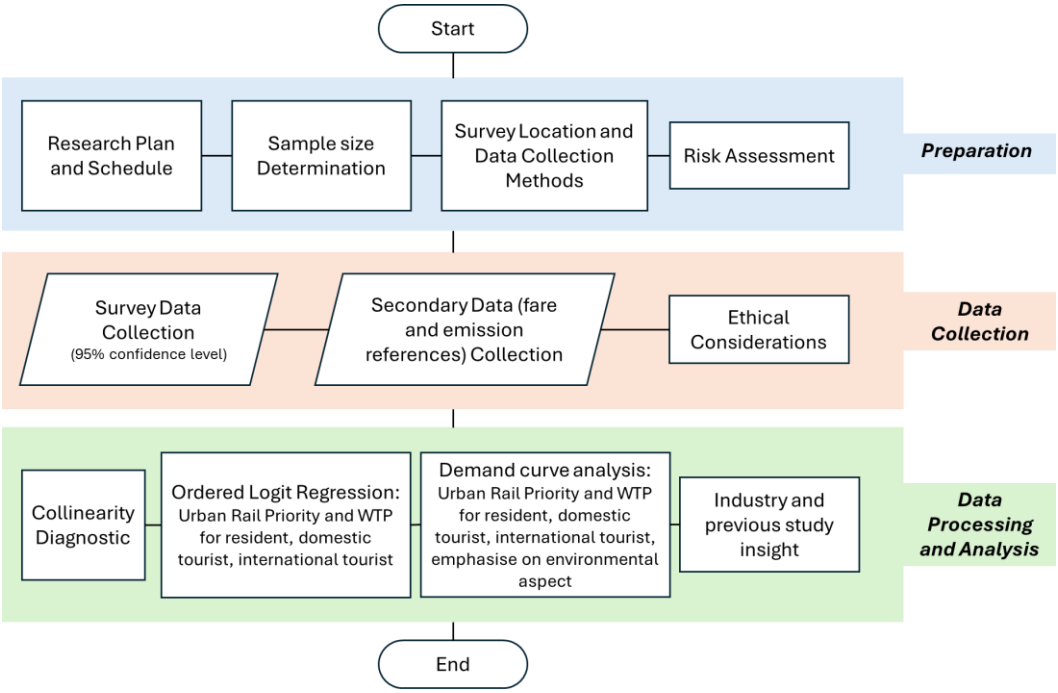


Figure 1. Study Methodology

3. RESULTS AND DISCUSSION

This analysis observes a total of 1,186 set responses, with resident total of 410, domestic 391, and international tourist 385 respondent. Before the analysis in specific began, collinearity diagnostics (Table 1) was done, and the result show all predictors have VIF values below 5, the commonly accepted threshold [18], and tolerance above 0.8, indicating no multicollinearity concerns and confirming that all predictors can be included reliably in the regression model.

Table 1. Collinearity Diagnostics

	Resident		Domestic		International	
Collinearity Statistics	**VIF**	**Tolerance**	**VIF**	**Tolerance**	**VIF**	**Tolerance**
age_group	1.22	0.817	1.14	0.876	1.10	0.909
income	1.15	0.870	1.17	0.851	1.11	0.899
employment	1.20	0.836	1.17	0.857	1.10	0.908
trip_companion	1.07	0.938	1.07	0.939	1.05	0.956
trip_duration	1.19	0.840	1.18	0.847	1.08	0.929
trip_purpose	1.10	0.908	1.07	0.931	1.05	0.952
first_prio	1.03	0.970	1.06	0.947	1.06	0.946
env_awareness	1.07	0.934	1.11	0.897	1.16	0.864
env_influence	1.10	0.911	1.15	0.873	1.23	0.813
wtp	1.05	0.956	1.05	0.950	1.08	0.924

3.1 Urban Rail Priority

The ordered logistic regression results indicate distinct behavioural patterns across user groups, despite generally modest explanatory power. For residents (Table 2a), the model is statistically significant overall but explains a relatively small share of variance (pseudo-$R^2_n \approx 0.05$), suggesting that urban rail priority among locals is influenced by factors beyond those captured in the model. Trip-related characteristics dominate, with routine travel purposes such as work, personal visits, and leisure being associated with higher urban rail priority, while preference for travelling specifically in a group or alone reduces the likelihood of prioritisation. This highlights the importance of contextual travel needs in shaping residents mode preferences. In contrast, the domestic tourist model (Table 2b) demonstrates stronger explanatory performance (pseudo-$R^2_n \approx 0.11$; $p<0.001$), indicating more consistent and structured preferences. Older age groups, higher income levels, and formal employment or student status are associated with a greater likelihood of prioritising urban rail, reflecting the role of socio-economic stability in shaping tourist travel behaviour.

For international tourists (Table 2c), the model also achieves a statistically significant fit with an acceptable explanatory level (pseudo-$R^2_n \approx 0.10$). While age, income, and employment status remain relevant, environmental awareness clearly emerges as the most influential factor, with environmentally concerned tourists being more than three times as likely to prioritise urban rail. This underlines the stronger role of sustainability considerations among international visitors, distinguishing them from residents and domestic tourists, for whom cost and trip-related factors remain more dominant.

Table 2. Significant Predictors for Urban Rail Priority on (a) Resident, (b) domestic tourist, (c) international tourist

(a)

Model Coefficients - prio_urbanrail (RESIDENT)			
Predictor	**Estimate**	**p**	**OR**
trip_companion:			
individual – no-preference	-0.797	0.014	0.451
group – no-preference	-0.512	0.088	0.599
trip_purpose1:			
personal-visit – events-other	1.237	0.005	3.444
work – events-other	0.837	0.006	2.310
leisure – events-other	0.615	0.041	1.849
Resident *n=410; R^2N=0.0475; χ^2=37.43; df=22; p=.021*			

(b)

Model Coefficients - prio_urbanrail (DOMESTIC)			
Predictor	**Estimate**	**p**	**OR**
age_group:			
older-adults – young-adults	1.587	0.011	4.889
midaged-adults – young-adults	0.473	0.054	1.606
income:			
high – low	0.736	0.022	2.088
mid – low	0.823	0.005	2.277
employment:			
retired-other – self-employed	1.351	0.004	3.863
gov-corp_employed – self-employed	1.231	0.001	3.423
student – self-employed	1.090	0.022	2.974
trip_purpose1:			
events-other – work	-1.018	0.025	0.361
Domestic *n=391; R^2N=0.1112; χ^2=66.8; df=22; p<.001*			

(c)

Model Coefficients - prio_urbanrail (INTERNATIONAL)			
Predictor	**Estimate**	**P**	**OR**
age_group:			
midaged-adults – older-adults	-1.236	0.002	0.291
young-adults – older-adults	-1.198	0.003	0.302
income:			
high – low	0.673	0.040	1.960
mid – low	0.501	0.044	1.651
employment:			
self-employed – retired-other	0.909	0.016	2.481
student – retired-other	0.929	0.033	2.532
employed – retired-other	0.782	0.020	2.185
env_awareness:			
very-concerned – not-concerned	1.770	< .001	5.870
moderately-concerned – not-concerned	1.895	< .001	6.655
slightly-concerned – not-concerned	1.105	0.023	3.020
International *n=385; R^2N=0.1046; χ^2=63.4; df=22; p<.001*			

While Table 2 shows that environmental attributes are statistically significant only for international tourists, indicating that this group is more sensitive to environmental considerations when prioritising urban rail, however, the behavioural implications of this significance are not immediately apparent from the table alone. Therefore, Figure 2 provides additional insight by presenting the proportion of respondents assigning urban rail as non-priority, second priority, and first priority across different levels of environmental awareness, where the results could help clarify the behavioural pattern underlying the statistical findings. The results in general (Figure 2) indicate a clear positive relationship between environmental awareness and the likelihood of selecting urban rail as a first-priority mode. However, this relationship is less consistent for secondary priority choices, where the distribution of responses appears more dispersed, suggesting that factors other than environmental awareness may play a more dominant role in shaping secondary priority decisions. In addition, a substantial proportion of residents classify urban rail as a non-priority option, which is likely justified to a strong dependence on private vehicles. Consequently, even among individuals with some degree of environmental awareness, habitual reliance on private transport may limit the perceived relevance of urban rail.

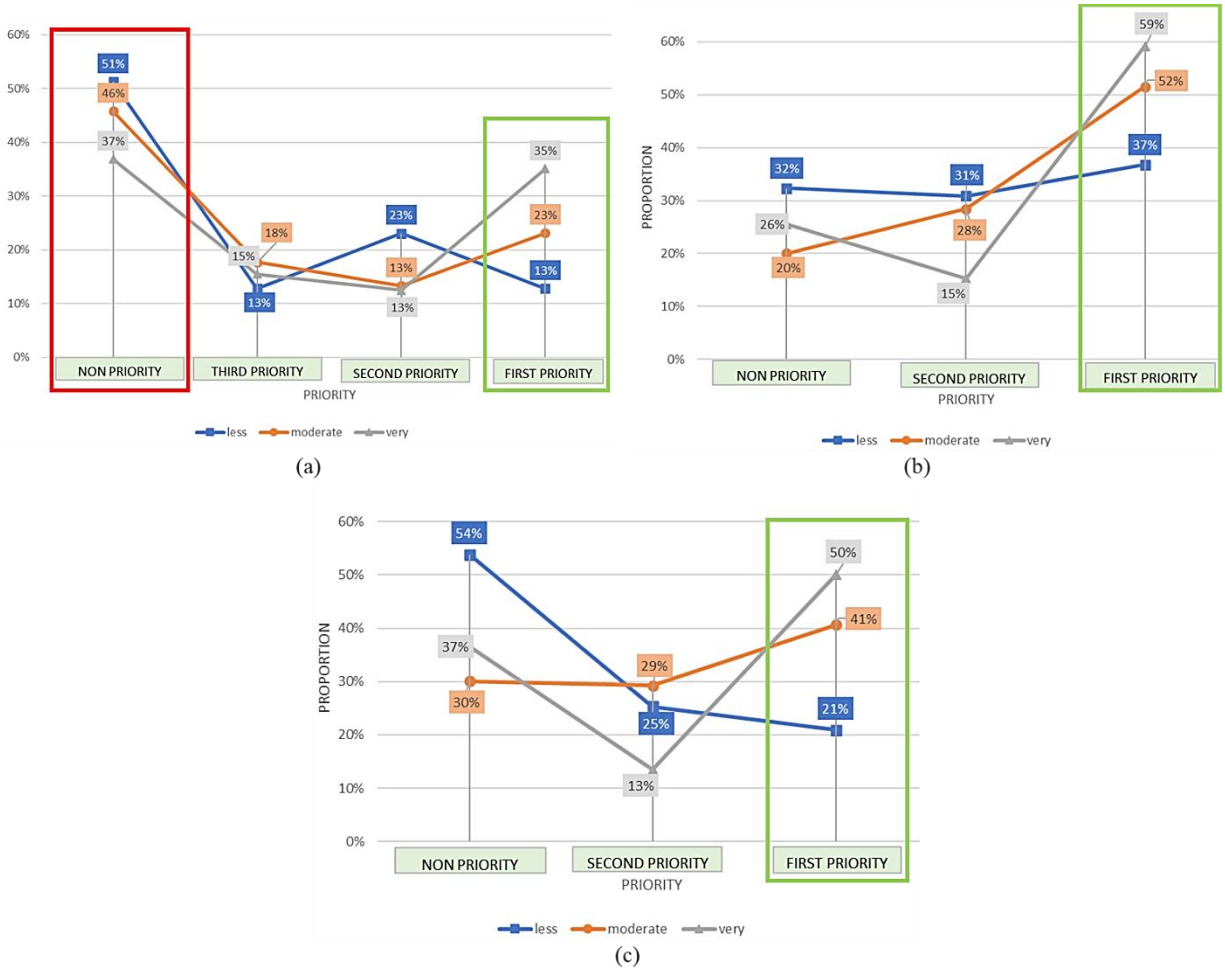
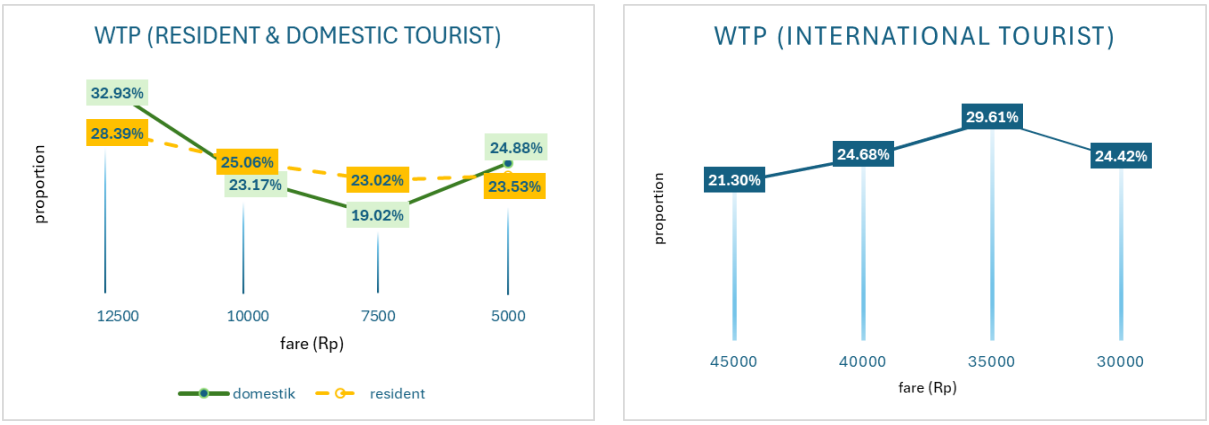


Figure 2. Urban Rail Priority Based on Environmental Awareness (a) Resident, (b) Domestic Tourist, (c) International Tourist

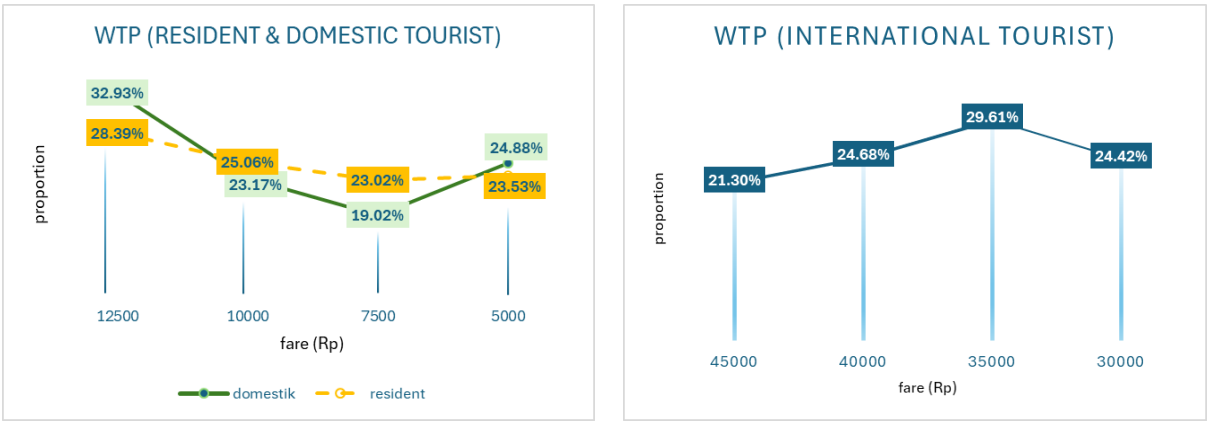
3.2 Willingness to Pay

For the average willingness to pay, a study from Korea Export-Import Bank [17] is used as the initial fare reference. The results indicate that residents are willing to pay an average fare of Rp9,104, while domestic tourists exhibit a slightly lower average WTP of Rp8,958. In contrast, international tourists, who were presented with a different proposed fare scheme, show a substantially higher average willingness to pay of Rp37,143. A more detailed distribution of these values is presented in



(a) (b)

Figure 3, where it can be seen that approximately 75% of respondents are willing to pay more than the baseline fare of Rp5,000 and Rp30,000.



(a) (b)

Figure 3. Willingness to Pay Chart for (a) Resident and Domestic Tourist, (b) International Tourist

To assess the influence of environmental attributes on willingness to pay, the analysis focuses on predictors related to environmental factors and cost as seen in Table 3. The results indicate that, overall, cost is a significant determinant across all respondent groups. Among residents, cost priority significantly affects WTP, with respondents placing no priority on travel cost, are more than twice likely to pay higher fares (OR=2.149, p=.001). Environmental awareness is also significant, as those slightly (OR=0.372, p=.008) or moderately concerned (OR=0.663, p=.046) about environmental issues are less willing to pay compared to highly concerned respondents, although the odds ratios are modest. The model itself is significant, although it explains limited variance (pseudo-R^2_n=4.74%). For domestic tourists, the model is also significant with better variance explained (p<.001; pseudo-R^2_n=7.67%), with income positively associated with WTP (≈1.6 times higher), while cost priority shows a significant relationship. Environmental influence is also as significant, as respondents, though with small

odds ratios, whereas environmental awareness is not significant despite a positive trend. For international tourists, the model remains significant with the highest explanatory power ($p<.001$; pseudo-R^2_n=9.69%), and both economic and environmental predictors are important, with environmental awareness emerging as the strongest factor; higher income increases WTP, while prioritising cost reduces the likelihood of paying more.

Table 3. Significant Predictors for WTP on (a) Resident, (b) domestic tourist, (c) international tourist

Model Coefficients - wtp (RESIDENT)

Predictor	Estimate	p	OR
income:			
high – low	0.0558	0.821	1.057
mid – low	0.3552	0.086	1.426
prio_cost:			
0 – 2	0.7651	0.001	2.149
1 – 2	0.3298	0.251	1.391
prio_environment:			
0 – 2	0.8867	0.245	2.427
1 – 2	0.9197	0.312	2.508
env_awareness:			
not-concerned – very-concerned	-0.3809	0.674	0.683
slightly-concerned – very-concerned	-0.9876	0.008	0.372
moderately-concerned – very-concerned	-0.4115	0.046	0.663
env_influence:			
no – yes	-0.7269	0.104	0.483
maybe – yes	-0.3683	0.067	0.692

Resident *n=410; R^2N=0.0474; χ^2=38.9; df=11; p=.<.001*

(a)

Model Coefficients - wtp (DOMESTIC)

Predictor	Estimate	p	OR
income:			
high – low	0.473	0.057	1.605
mid – low	0.475	0.032	1.608
prio_cost:			
1 – 0	-0.83	< .001	0.436
2 – 0	-0.966	< .001	0.38
prio_environment:			
1 – 0	0.54	0.374	1.716
2 – 0	0.932	0.444	2.539
env_influence:			
maybe – yes	-0.609	0.004	0.544
no – yes	-0.995	0.029	0.37
env_awareness:			
very-concerned – not-concerned	0.833	0.309	2.3
moderately-concerned – not-concerned	0.687	0.386	1.987
slightly-concerned – not-concerned	0.514	0.517	1.672

Resident *n=391; R^2N=0.0767; χ^2=61.1; df=11; p=.<.001*

(b)

Model Coefficients - wtp (INTERNATIONAL)

Predictor	Estimate	p	OR
income:			
high – low	0.903	0.002	2.467
mid – low	0.661	0.002	1.936
prio_cost:			
1 – 0	-0.549	0.023	0.577
2 – 0	-0.825	0.003	0.438
prio_environment:			
1 – 0	0.306	0.453	1.358
2 – 0	1.094	0.026	2.988
env_influence:			
yes – no	0.139	0.763	1.149
maybe – no	-0.413	0.331	0.662
env_awareness:			
very-concerned – not-concerned	1.235	0.007	3.439
moderately-concerned – not-concerned	1.445	< .001	4.244
slightly-concerned – not-concerned	0.895	0.032	2.448

Resident *n=385; R^2N=0.0969; χ^2=76.2; df=11; p=.<.001*

(c)

To illustrate the relationship specifically between WTP and environmental attributes, Figure 4 is presented as follows. Across all respondent groups, a broadly consistent pattern emerges, where higher environmental awareness is associated with greater willingness to pay for urban rail, although the magnitude of this effect differs between groups. Notably, for international tourists, despite the relationship being statistically significant, the moderately aware and highly aware categories exhibit some fluctuations, suggesting that additional factors may also influence their WTP behaviour at those rates of environmental awareness.

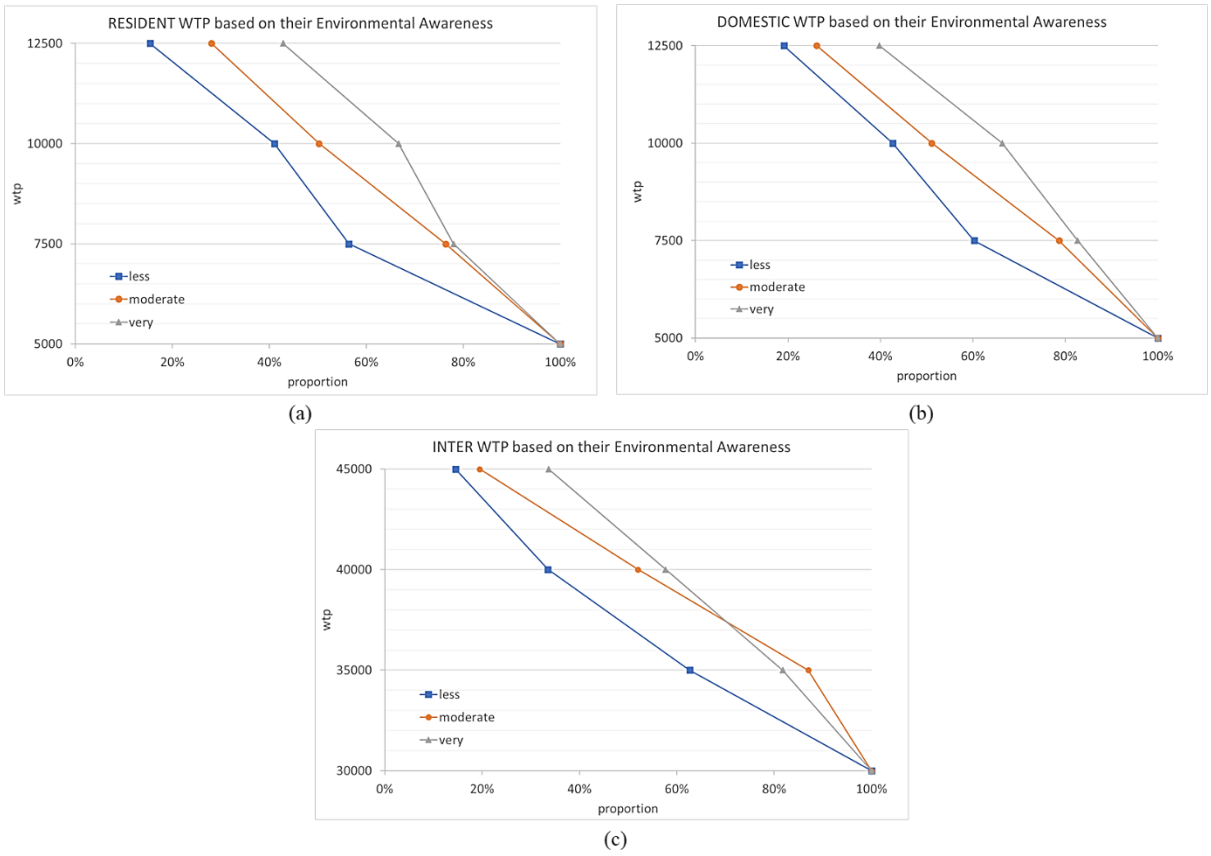


Figure 4. WTP in Relation with Environmental Awareness on (a) Resident, (b) Domestic Tourist, (c) International Tourist

3.3 Discussion

Based on findings at section **Error! Reference source not found.** and **Error! Reference source not found.**, it could be imply that fare policy will be critical in shaping demand, either with segregated pricing, simplified ticketing, or targeted fare strategies, offering a potential enhance to ridership particularly when complemented by environmental messaging, as proven by previous studies [19, 20, 21, 22]. However, environmental awareness alone is insufficient to explain mode priority and WTP, as secondary priorities and non-linear patterns suggest the influence of additional factors. As this study is subject to limitations related to survey duration, sample representativeness, and model explanatory power, indicating the need for future research incorporating longer data collection periods, additional predictors, and alternative modelling approaches. Furthermore, emerging transport alternatives in Bali, such as new airport developments and water-based services, may influence future demand and should be integrated into subsequent analyses to better inform urban rail planning and policy.

4. CONCLUSIONS

In conclusion, the findings show that environmental awareness does influence both prioritisation and willingness to pay for Bali's planned urban rail, although the extent differs across user groups. From 1,186 responses, ordered logit results show relatively low but could be accepted explanatory power with clear behavioural distinctions, where environmental awareness emerging as the strongest predictor for international tourists. Demand patterns further indicate that higher environmental awareness generally increases first-priority selection, while residents remain constrained by private vehicle dependence. In terms of willingness to

pay, approximately 75% of respondents are willing to pay above the baseline fares, with average WTP reaching Rp9,104 for residents, Rp8,958 for domestic tourists, and Rp37,143 for international tourists. Overall, cost attribute remains a dominant determinant, yet environmental factors also contribute, especially for international tourists. These results suggest that while pricing strategies must remain cost-sensitive, integrating environmental awareness could enhance acceptance and support segregated fare policies to maximise ridership and revenue potential for Bali's urban rail system.

5. ACKNOWLEDGEMENTS

The correspondent author would like to express their appreciation to Postgraduate Railway Engineering course at the University of Birmingham and MSTT Universitas Gadjah Mada for their institutional support, along with other parties involved in the development of Bali's planned urban rail project who contributed insights and assistance to this study.

REFERENCES

[1] Badan Pusat Statistik Provinsi Bali, 'Number of Vehicles by Type in Bali Province (Unit), 2024', BPS-Statistic Indonesia Bali Province. Accessed: Jul. 01, 2025. [Online]. Available: https://bali.bps.go.id/en/statistics-table/2/MjUwIzI=/jumlah-kendaraan-menurut-jenis.html

[2] Tempo, 'Bali Inks Deal with Jakarta for MRT Development', Tempo English. Accessed: Jul. 01, 2025. [Online]. Available: https://en.tempo.co/read/2017606/bali-inks-deal-with-jakarta-for-mrt-development

[3] D. K. Sudarsana, 'An Economic Analysis of the South-North Bali Connection Railway Plan in The Acceleration of Economic Equality Development in Bali, Indonesia', *European Journal of Engineering Research and Science*, vol. 4, no. 3, pp. 208–211, 2019, doi: 10.24018/ejers.2019.4.3.1201.

[4] I Made Yogi Pramana, 'A Battery-Powered Tram ready to Operate in Bali; an Answer to Green Energy Public Transportation', *Bali Tourism Journal*, vol. 5, no. 1, pp. 19–22, 2021, doi: 10.36675/btj.v5i1.54.

[5] H. P and B. Bahtiar, 'A Model of Passenger Demand on the Operation of LRT at Ngurah Rai Airport Corridor in Bali', *Scholars Journal of Engineering and Technology*, vol. 9, no. 9, pp. 127–135, 2021, doi: 10.36347/sjet.2021.v09i09.002.

[6] A. B. Putri *et al.*, 'Study of Public Transport Development in South Bali Districts: Potential Public Transport Mode', *International Journal of Sustainable Transportation Technology*, vol. 4, no. 1, pp. 9–21, 2021, doi: 10.31427/ijstt.2021.4.1.2.

[7] J. Setiawan, A. P. Prasetyo, and N. Hapsari, 'Geological Assessment for The Construction of an Underground Railway in Bali', *The Journal of Academic Science*, vol. 2, no. 3, pp. 902–919, 2025, doi: 10.59613/0nxn9512.

[8] M. Z. Irawan, P. F. Belgiawan, T. B. Joewono, and N. I. M. Simanjuntak, 'Do motorcycle-based ride-hailing apps threaten bus ridership? A hybrid choice modeling approach with latent variables', *Public Transport*, vol. 12, no. 1, pp. 207–231, Mar. 2020, doi: 10.1007/s12469-019-00217-w.

[9] M. Z. Irawan, D. B. E. Dharmowijoyo, T. A. Waluyo, and N. O. Widiastuti, 'Responding to customers while driving: Predictors of intention to text among motorcycle-based ride-hailing drivers', *Transp Res Interdiscip Perspect*, vol. 21, Sep. 2023, doi: 10.1016/j.trip.2023.100869.

[10] A. A. Israel Schwarzlose, J. W. Mjelde, R. M. Dudensing, Y. Jin, L. K. Cherrington, and J. Chen, 'Willingness to pay for public transportation options for improving the quality of life of the rural elderly', *Transp Res Part A Policy Pract*, vol. 61, pp. 1–14, 2014, doi: 10.1016/j.tra.2013.12.009.

[11] D. McFadden, 'Conditional Logit Analysis of Qualitative Choice Behavior', 1972, [Online]. Available: https://escholarship.org/uc/item/61s3q2xr

[12] R. Buehler, 'Determinants of transport mode choice: a comparison of Germany and the USA', *J Transp Geogr*, vol. 19, no. 4, pp. 644–657, Jul. 2011, doi: 10.1016/j.jtrangeo.2010.07.005.

[13] M. Rizki, J. Syahputri, P. F. Belgiawan, and M. Z. Irawan, 'Electrifying tourist mobility in bali, indonesia: Setting the target and estimating the co2 reduction based on stated choice experiment', *Sustainability (Switzerland)*, vol. 13, no. 21, Nov. 2021, doi: 10.3390/su132111656.

[14] T. A. Waluyo, M. Z. Irawan, and Dewanti, 'Adopting Electric Motorcycles for Ride-Hailing Services: Influential Factors from Driver's Perspective', *Sustainability (Switzerland)*, vol. 14, no. 19, Oct. 2022, doi: 10.3390/su141911891.

[15] R. Williams, 'Understanding and interpreting generalized ordered logit models', *J Math Sociol*, vol. 40, no. 1, pp. 7–20, 2016, doi: 10.1080/0022250X.2015.1112384.

[16] J. ; I. S. ; R. T. ; & R. G. Cowie, 'The economics of transport : a theoretical and applied perspective', *Routledge eBooks*, 2009, Accessed: Oct. 28, 2025. [Online]. Available: https://doi.org/10.4324/9780203874103

[17] Korea Export-Import Bank, 'Feasibility Study for the Bali LRT Construction Project 1A section Final Report', Apr. 2024.

[18] A. Kalnins and K. Praitis Hill, 'The VIF Score. What is it Good For? Absolutely Nothing', *Organ Res Methods*, vol. 28, no. 1, pp. 58–75, 2025, doi: 10.1177/10944281231216381.

[19] J. Carroll, W. Brazil, M. Howard, and E. Denny, 'Imperfect emissions information during flight choices and the role of CO2 labelling', *Renewable and Sustainable Energy Reviews*, vol. 165, no. April, p. 112508, 2022, doi: 10.1016/j.rser.2022.112508.

[20] Railfuture and The Railway Consultancy Ltd, 'National Railcard Economic Research', 2003, [Online]. Available: www.railfuture.org.ukwww.railfuturewales.org.ukwww.railfuturescotland.org.uk

[21] P. C. Sianturi, R. Nasrudin, and M. H. Yudhistira, 'Estimating the price elasticity of demand for urban mass rapid transit ridership: A quasi-experimental evidence from Jakarta, Indonesia', *Case Stud Transp Policy*, vol. 10, no. 1, pp. 354–364, Mar. 2022, doi: 10.1016/j.cstp.2021.12.015.

[22] H. Wallimann, K. Blättler, and W. von Arx, 'Do price reductions attract customers in urban public transport? A synthetic control approach', *Transp Res Part A Policy Pract*, vol. 173, Jul. 2023, doi: 10.1016/j.tra.2023.103700.