



Understanding Non-User Resistance toward Electric Motorcycle Adoption in Indonesia: The Role of Environmental Concern and Incentive Policy

Risdayanti ¹⁾; Arif Harton ²⁾

¹⁾ Master of Management, Faculty of Business and Economics, Islamic University of Indonesia, Indonesia

²⁾ Departemen of Management, Faculty of Business and Economics, Islamic University of Indonesia, Indonesia

Email: ¹⁾ Risdayanti799@gmail.com

How to Cite :

Risdayanti., Harton A . (2026). Understanding Non-User Resistance toward Electric Motorcycle Adoption in Indonesia: The Role of Environmental Concern and Incentive Policy . EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi Dan Bisnis, 14(4). doi: <https://doi.org/10.37676/ekombis.v14i4>

ARTICLE HISTORY

Received [25 July 2026]

Revised [15 October 2026]

Accepted [19 October 2026]

KEYWORDS

Electric Motorcycle; Innovation Resistance Theory; Environmental Concern; Incentive Policy; Non-User Adoption.

This is an open access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license



ABSTRACT

Indonesia has the largest motorcycle population in Southeast Asia, yet electric motorcycle adoption remains below 1% of total national motorcycles. This study analyzes non-user resistance to electric motorcycle adoption using the Innovation Resistance Theory (IRT) framework, examining the moderating roles of environmental concern and incentive policy. A quantitative approach was employed with a survey of 166 non-user respondents across Indonesia. Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The findings reveal that usage barriers, value barriers, and risk barriers significantly and negatively influence behavioral intention. Environmental concern and incentive policy positively affect behavioral intention. Notably, environmental concern moderates the relationships between all three barriers and behavioral intention—positively for usage and value barriers but negatively for risk barriers, indicating that environmentally conscious consumers have higher expectations for technological reliability. Conversely, incentive policy does not moderate the relationship between functional barriers and behavioral intention. These findings enrich the IRT literature within developing country contexts and imply that incentive policies must be complemented by non-financial approaches such as infrastructure development, product quality assurance, and public education to effectively address non-user barriers.

INTRODUCTION

Indonesia possesses the largest motorcycle population in Southeast Asia, with over 125 million two-wheeled vehicles dominating more than 80% of the national vehicle fleet (Ministry of Transportation RI, 2023). This dominance reflects public preference for affordable and agile transportation while simultaneously indicating heavy dependence on fossil fuels, contributing significantly to greenhouse gas emissions, urban air pollution, and national economic burden from fuel imports. In response, the Indonesian government has accelerated the transition toward electric vehicles, including electric motorcycles, through strategic policies such as Presidential Regulation No. 55/2019 on the Acceleration of Battery-Based Electric Vehicle Programs, purchase subsidies up to Rp 7 million, expansion of charging infrastructure, and motorcycle conversion programs (Santoso et al., 2024).

Despite these government initiatives, electric motorcycle adoption remains far below expectations. Industry reports indicate that total electric motorcycle population remains under 200,000 units less than 1% of conventional motorcycles. This significant gap between potential and actual adoption suggests persistent consumer resistance requiring comprehensive investigation.

Previous research demonstrates that electric motorcycles offer substantial economic, environmental, and operational benefits. Suwignjo et al. (2023) found that online ride-hailing drivers using electric motorcycles reduced daily operational costs by over 50% compared to conventional motorcycles, primarily through eliminated fuel costs and reduced maintenance expenses. Balijepalli et al. (2023) revealed positive consumer preferences in Bandung regarding riding ease, comfort, and environmental sustainability. Globally, electric motorcycle adoption shows positive trends alongside increasing environmental awareness and improving battery technology (Zhang & Chang, 2023).

However, the most critical yet underexplored segment in this context is the non-user population individuals who have never used electric motorcycles. This group constitutes the largest market segment and determines national adoption success. As Liu et al. (2020) emphasize, public perception of new technology significantly influences initial acceptance, particularly in developing countries. The absence of direct experience makes non-user perceptions more susceptible to misconceptions, distrust, and psychological factors that shape resistance (Khan et al., 2022; Nguyen-phuoc et al., 2023).

Understanding this resistance phenomenon is best achieved through Innovation Resistance Theory (IRT), which explains that consumers often reject innovations due to perceived barriers, especially when innovations demand behavioral changes or present uncertain risks (Ram & Sheth, 1989; Xue et al., 2024). Three functional barriers are particularly relevant in electric motorcycle adoption: usage barriers related to perceived complexity and incompatibility with daily routines, value barriers concerning imbalance between costs and benefits, and risk barriers involving uncertainty about performance, safety, and long-term costs.

However, resistance is not determined solely by these barriers. Environmental concern and incentive policy play important moderating roles. Bonisoli et al. (2024) found that environmentally conscious consumers are more willing to accept electric motorcycles despite technological barriers. Liu & Madni (2024) demonstrated that government incentives can significantly reduce initial consumer resistance.

Existing research on electric motorcycles in Indonesia predominantly focuses on users or general potential buyers, with limited comprehensive studies specifically examining non-user resistance. Agustina et al. (2025) emphasized that understanding non-user psychological factors is crucial for effective policy and marketing strategies.

This study addresses this gap by analyzing non-user resistance to electric motorcycle adoption through the IRT framework, examining how environmental concern and incentive policy moderate the influence of functional barriers on behavioral intention. Specifically, this

research investigates: (1) the influence of usage, value, and risk barriers on behavioral intention; (2) the moderating roles of environmental concern and incentive policy on these relationships; and (3) the direct effects of environmental concern and incentive policy on behavioral intention

LITERATURE REVIEW

Innovation Resistance Theory (IRT)

Innovation Resistance Theory, developed by Ram and Sheth (1989), explains that consumers can reject innovations despite technological superiority when innovations are perceived to disrupt established behavioral equilibrium. IRT categorizes innovation barriers into two types: functional barriers (usage, value, and risk barriers) and psychological barriers (tradition and image barriers). This study focuses on functional barriers as these are most dominant in electric motorcycle technology contexts. IRT has been applied in various electric motorcycle adoption studies, including Xue et al. (2024), confirming that usage, value, and risk barriers constitute primary sources of consumer resistance.

Usage Barrier

Usage barrier refers to obstacles arising when consumers perceive an innovation as difficult to use or incompatible with their daily habits and routines (Ooi et al., 2011; Talwar et al., 2025). This barrier relates to perceived complexity, operational difficulties, and ease of use (Lee & Kim, 2022). In electric motorcycle contexts, usage barriers manifest through concerns about limited range, lengthy charging times, inadequate charging infrastructure, and required behavioral adjustments (Balijepalli et al., 2023; Lazuardy et al., 2024). Non-users, lacking direct experience, develop perceptions based on assumptions and limited information, potentially intensifying usage barriers. Studies by Shaikh et al. (2023) and Zhang & Chang (2023) confirm that perceived ease of use significantly influences consumer intentions to switch to electric motorcycles.

Value Barrier

Value barrier emerges when consumers perceive that innovation benefits do not justify the costs, efforts, or sacrifices required for adoption. In electric vehicle contexts, this barrier relates to high purchase prices, limited range, operational costs, and perceived lack of relative advantage over conventional motorcycles (Xue et al., 2024; Lazuardy et al., 2024). Dimensions include perceived performance risk, economic value, and relative advantage. Guerra (2019) and Bonisoli et al. (2024) emphasize that perceived value is critical in shaping consumer willingness to adopt electric motorcycles. Non-users often assess that initial purchase costs, battery replacement expenses, and uncertain long-term economic benefits do not justify switching.

Risk Barrier

Risk barrier describes obstacles arising when consumers perceive potential risks or uncertainty regarding innovation adoption. For electric motorcycles, uncertainties relate to vehicle performance, safety, battery durability, and potential additional costs (Xue et al., 2024). Dimensions include performance risk, safety risk, financial risk, and psychological or social risk (Lazuardy et al., 2024; Nguyen-phuoc et al., 2023). Non-users exhibit stronger risk perceptions due to reliance on indirect information and personal assumptions. Studies confirm that concerns about technical reliability, safety, and maintenance costs significantly reduce adoption intentions (Shaikh et al., 2023; Aditya et al., 2024).

Environmental Concern

Environmental concern reflects individual awareness of environmental issues and perceived responsibility for ecosystem preservation (Bonisoli et al., 2024; Flores, 2024).

Dimensions include awareness of environmental issues, personal responsibility for environmental preservation, and willingness to act pro-environmentally (Esposito & Jalal, 2025). Research demonstrates that environmental concern positively influences green behavior intentions (Andreica Mihaș et al., 2025; Agustina et al., 2025). In electric motorcycle contexts, environmental concern serves as psychological motivation that can overcome functional barriers, as consumers prioritize ecological benefits over immediate practical inconveniences.

Incentive Policy

Incentive policy refers to government support encouraging innovation adoption, typically through financial incentives (subsidies, tax reductions, financing facilities) or non-financial support (regulations, infrastructure development) (Purwanto et al., 2021). In IRT frameworks, incentive policy functions as external factors reducing perceived barriers (Ooi et al., 2011). Dimensions include financial incentives, regulatory support, and non-financial incentives. Studies confirm that government incentives significantly reduce adoption barriers and strengthen purchase intentions (Liao & Wu, 2024; Santoso et al., 2024; Liu & Madni, 2024).

Behavioral Intention

Behavioral intention refers to individuals' tendency or intention to perform future actions in response to innovation or products (Aditya et al., 2024; Agustina et al., 2025). Dimensions include willingness to adopt, likelihood to use, continuance intention, and recommendation intention (Nguyen-phuoc et al., 2023; Shaikh et al., 2023). In technology adoption contexts, behavioral intention represents consumer readiness to purchase, try, and sustainably use innovations. Prior research confirms that behavioral intention is influenced by psychological, technical, and situational factors including technology attitudes, perceived ease of use, environmental concern, and policy support (Aditya et al., 2024; Agustina et al., 2025; Suwignjo et al., 2023).

Hypothesis Development

Based on theoretical foundations and empirical evidence, this study proposes the following hypotheses:

- H1: Usage barrier negatively influences behavioral intention of non-users to adopt electric motorcycles.
- H2: Value barrier negatively influences behavioral intention of non-users to adopt electric motorcycles.
- H3: Risk barrier negatively influences behavioral intention of non-users to adopt electric motorcycles.
- H4: Environmental concern positively influences behavioral intention of non-users to adopt electric motorcycles.
- H5: Incentive policy positively influences behavioral intention of non-users to adopt electric motorcycles.
- H6: Environmental concern moderates the relationship between usage barrier and behavioral intention.
- H7: Environmental concern moderates the relationship between value barrier and behavioral intention.
- H8: Environmental concern moderates the relationship between risk barrier and behavioral intention.
- H9: Incentive policy moderates the relationship between usage barrier and behavioral intention.
- H10: Incentive policy moderates the relationship between value barrier and behavioral intention.

- H11: Incentive policy moderates the relationship between risk barrier and behavioral intention.

METHODS

Research Design

This study employed a quantitative approach with causal relationship design to examine the effects of independent variables (usage barrier, value barrier, risk barrier), moderating variables (environmental concern and incentive policy), and dependent variable (behavioral intention) through empirical hypothesis testing. Primary data were collected directly from electric motorcycle non-user respondents through online questionnaires distributed via Google Forms. This method enabled efficient reach of large respondent numbers across diverse geographic locations.

Population and Sample

The population comprised Indonesian citizens who have never used electric motorcycles but know and consider potential future use. This population was selected because Indonesia possesses the largest motorcycle population in Southeast Asia, with two-wheeled vehicles exceeding 80% of national vehicle fleet (over 125 million units in 2023), while electric motorcycle adoption remains below 1%. Sample selection used non-probability purposive sampling with criteria: (1) minimum age 17 years, (2) residing in Indonesia, and (3) never owned or used electric motorcycles. Based on Hair et al. (2019) recommendations for PLS-SEM analysis with 10-times rule, the sample comprised 166 respondents, exceeding minimum requirements and enabling valid and reliable model estimation.

Operational Definition and Measurement

All variables were measured using five-point Likert scales (1 = Strongly Disagree to 5 = Strongly Agree), following established scales from prior research.

Usage Barrier (UB): Perceived impracticality and functional limitations of electric motorcycles, measured through three indicators adapted from Xue et al. (2024): (UB1) perceived inconvenience for daily activities, (UB2) perceived operational complexity compared to conventional motorcycles, and (UB3) required difficult behavioral adjustments.

Value Barrier (VB): Perceived imbalance between costs and benefits, measured through three indicators (Xue et al., 2024): (VB1) price disproportionate to offered benefits, (VB2) fewer benefits compared to conventional motorcycles, and (VB3) purchase costs not justified by advantages.

Risk Barrier (RB): Perceived risks and uncertainties, measured through three indicators (Xue et al., 2024): (RB1) perceived safety inferiority, (RB2) doubts about long-term reliability and durability, and (RB3) concerns about technological stability.

Environmental Concern (EC): Level of environmental awareness and concern, measured through three indicators (Xue et al., 2024): (EC1) worry about current environmental problems, (EC2) personal responsibility for environmental preservation, and (EC3) importance of reducing air pollution through environmentally friendly transportation.

Incentive Policy (IP): Perception of government incentive policies, measured through three indicators (Xue et al., 2024): (IP1) subsidies encouraging purchase consideration, (IP2) tax relief or financial incentives increasing attractiveness, and (IP3) policy support increasing purchase confidence.

Behavioral Intention (BI): Intention to consider, try, or adopt electric motorcycles, measured through four indicators (Xue et al., 2024): (BI1) intention to consider purchasing/using in the future, (BI2) interest in trying if affordably priced, (BI3) willingness to recommend if proven beneficial, and (BI4) no intention to switch (reverse-coded).

Data Analysis Technique

Data analysis employed descriptive statistics and inferential statistics using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS software. PLS-SEM was selected for its predictive orientation and ability to analyze complex models with multiple indicators and moderate sample sizes (Hair et al., 2021). Analysis proceeded through two stages: (1) evaluation of measurement model (outer model) assessing validity (convergent and discriminant validity) and reliability (Cronbach's Alpha and Composite Reliability), and (2) evaluation of structural model (inner model) assessing collinearity (VIF), coefficient of determination (R^2), effect size (f^2), and hypothesis testing through bootstrapping procedures with 5,000 subsamples at 5% significance level (t -statistic > 1.96).

RESULTS

Respondent Characteristics

Table 1. Respondent Characteristics (n = 166)

Characteristic	Category	n	%
Age	17 – 25 years	79	47.6
	26 – 35 years	63	38.0
	≥ 36 years	24	14.4
Gender	Male	76	45.8
	Female	90	54.2
Education	Bachelor's degree (S1)	86	51.8
	Senior high school	61	36.7
	Others (Diploma, S2/S3, etc.)	19	11.5
Occupation	Student	67	40.4
	Private employee	45	27.1
	Others (Entrepreneur, civil servant, etc.)	54	32.5
Domicile	Nusa Tenggara	71	42.8
	Java	60	36.1
	Others (Sumatera, Sulawesi, Kalimantan, Bali, Maluku)	35	21.1

Source: Primary Data Processed, 2026

Respondents were predominantly young, aged 17–25 (47.6%) and 26–35 (38.0%). The proportion of female respondents (54.2%) was slightly higher than that of male respondents (45.8%). The majority of respondents had a bachelor's degree (51.8%) or a high school/equivalent (36.7%). A total of 40.4% of respondents were students, followed by private sector employees (27.1%). Based on domicile, respondents came from Nusa Tenggara (42.8%), Java (36.1%), and other regions (21.1%). This profile reflects that the research sample consists of a productive age group and has an adequate educational background to understand technological and environmental issues.

Measurement Model Evaluation (Outer Model)**Table 2. Convergent Validity: Outer Loadings and AVE**

Construct	Item	Loading	AVE
Usage Barrier	UB1	0.930	0.855
	UB2	0.918	
	UB3	0.926	
Value Barrier	VB1	0.928	0.839
	VB2	0.894	
	VB3	0.925	
Risk Barrier	RB1	0.909	0.851
	RB2	0.919	
	RB3	0.939	
Environmental Concern	EC1	0.842	0.814
	EC2	0.947	
	EC3	0.914	
Incentive Policy	IP1	0.896	0.801
	IP2	0.895	
	IP3	0.894	
Behavior Intention	BI1	0.874	0.739
	BI2	0.925	
	BI3	0.885	
	BI4	0.743	

Source: Primary Data Processed, 2026

Table 2 presents the convergent validity results for all constructs in the study. Convergent validity assesses the extent to which indicators of a specific construct share a high proportion of variance (Hair et al., 2021). It is evaluated using two criteria: (1) outer loadings of each indicator should be ≥ 0.70 , and (2) the Average Variance Extracted (AVE) for each construct should be ≥ 0.50 . As shown in Table 2, all outer loadings exceed 0.70, ranging from 0.743 to 0.947. The highest loading is for EC2 (0.947), while the lowest is for BI4 (0.743). This indicates that each indicator explains more than 70% of the variance in its respective construct, satisfying the first criterion. Additionally, all AVE values are above 0.50, ranging from 0.739 to 0.855. Usage barrier has the highest AVE (0.855), followed by risk barrier (0.851), value barrier (0.839), environmental concern (0.814), incentive policy (0.801), and behavior intention (0.739). These values confirm that each construct explains more than half of the variance of its indicators, implying minimal measurement error.

Table 3. Discriminant Validity – Fornell-Larcker Criterion

Construct	BI	EC	IP	RB	UB	VB
Behavior Intention (BI)	0.860					
Environmental Concern (EC)	0.136	0.902				
Incentive Policy (IP)	0.090	0.347	0.895			
Risk Barrier (RB)	-0.399	0.118	0.185	0.922		
Usage Barrier (UB)	-0.289	0.205	0.335	0.445	0.925	
Value Barrier (VB)	-0.409	0.112	0.130	0.537	0.435	0.916

Source: Primary Data Processed, 2026

Table 3 presents the Fornell-Larcker criterion for assessing discriminant validity. Discriminant validity ensures that each construct is empirically distinct from other constructs (Hair et al., 2021). It is established when the square root of the Average Variance Extracted (AVE)

for each construct (diagonal values in bold) is greater than its correlations with all other constructs (off-diagonal values). As shown in Table 3, the diagonal values range from 0.860 to 0.925, while the off-diagonal correlations range from -0.409 to 0.537. For every construct, the square root of AVE is higher than any correlation with other constructs. For example, Behavior Intention ($\sqrt{\text{AVE}} = 0.860$) has correlations of 0.136, 0.090, -0.399, -0.289, and -0.409 with other constructs – all lower than 0.860. The same pattern holds for all constructs.

Table 4. Reliability Coefficients

Construct	Cronbach's Alpha	Composite Reliability
Behavior Intention	0.882	0.918
Environmental Concern	0.887	0.929
Incentive Policy	0.877	0.923
Risk Barrier	0.912	0.945
Usage Barrier	0.915	0.946
Value Barrier	0.904	0.940

Source: Primary Data Processed, 2026

Table 4 presents the internal consistency reliability of each construct, assessed using Cronbach's Alpha and Composite Reliability (ρ_c). Reliability indicates the extent to which a set of indicators consistently measures the same underlying construct (Hair et al., 2021). As shown in Table 4, all Cronbach's Alpha values range from 0.877 to 0.915, and all Composite Reliability values range from 0.918 to 0.946. These values are well above the recommended threshold of 0.70. The highest reliability is observed for Usage Barrier (Cronbach's Alpha = 0.915; CR = 0.946), followed by Risk Barrier (0.912; 0.945) and Value Barrier (0.904; 0.940). Even the lowest values (Incentive Policy: 0.877; 0.923) substantially exceed the acceptable limit.

Structural Model Evaluation (Inner Model)

Table 5. Coefficient of Determination (R^2) and Effect Sizes (f^2)

Variable / Relationship	R^2	R^2 Adjusted	f^2	Effect Size
Behavior Intention	0.375	0.331	–	Moderate
Direct Effects				
Usage Barrier → Behavior Intention			0.054	Small
Value Barrier → Behavior Intention			0.057	Small
Risk Barrier → Behavior Intention			0.028	Small
Environmental Concern → Behavior Intention			0.053	Small
Incentive Policy → Behavior Intention			0.058	Small
Moderation Effects (Environmental Concern)				
EC × Usage Barrier → Behavior Intention			0.047	Small
EC × Value Barrier → Behavior Intention			0.046	Small
EC × Risk Barrier → Behavior Intention			0.060	Small
Moderation Effects (Incentive Policy)				
IP × Usage Barrier → Behavior Intention			0.017	Negligible
IP × Value Barrier → Behavior Intention			0.000	Negligible
IP × Risk Barrier → Behavior Intention			0.001	Negligible

Source: Primary Data Processed, 2026

Table 5 presents the coefficient of determination (R^2) and effect sizes (f^2) for the structural model. R^2 measures the proportion of variance in the endogenous construct (behavior intention) explained by all exogenous constructs. The R^2 value of 0.375 (adjusted $R^2 = 0.331$) indicates a moderate explanatory power, meaning that the model explains 37.5% of the variance

in non-users' adoption intention (Chin, 1998). Effect sizes (f^2) assess the practical contribution of each predictor or interaction term. According to Cohen's (1988) guidelines, values between 0.02–0.15 indicate small effects, 0.15–0.35 medium, and ≥ 0.35 large. All direct effects (usage, value, risk barriers, environmental concern, incentive policy) show small f^2 values ranging from 0.028 to 0.058. The moderation effects of environmental concern also exhibit small effects (0.046–0.060). However, the moderation effects of incentive policy on all three barriers are negligible ($f^2 = 0.017, 0.000, 0.001$), indicating that incentive policy does not meaningfully alter the relationships between barriers and intention.

Hypothesis Testing

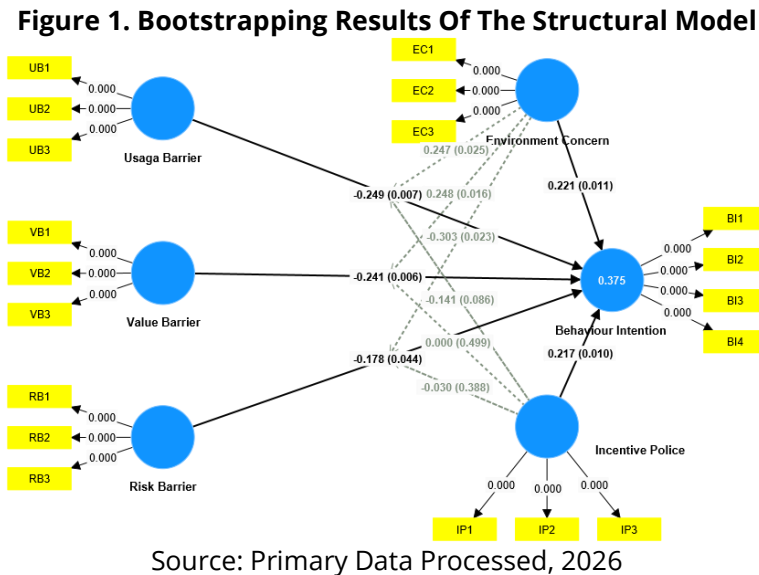


Figure 1 displays the bootstrapping results of the structural model, showing the standardized path coefficients (β), t-statistics (in parentheses), and the coefficient of determination ($R^2 = 0.375$) for behavior intention. Bootstrapping with 5,000 subsamples was used to assess the significance of each hypothesized relationship (Hair et al., 2021). As illustrated, usage barrier ($\beta = -0.249$, $t = 2.478$) and value barrier ($\beta = -0.241$, $t = 2.528$) have significant negative effects on behavior intention, while risk barrier ($\beta = -0.178$, $t = 1.706$) is not significant. Environmental concern ($\beta = 0.221$, $t = 2.298$) and incentive policy ($\beta = 0.217$, $t = 2.328$) have significant positive direct effects. For moderation effects, environmental concern positively moderates usage barrier ($\beta = 0.247$, $t = 1.955$) and value barrier ($\beta = 0.248$, $t = 2.153$), but negatively moderates risk barrier ($\beta = -0.303$, $t = 1.994$). In contrast, all moderation effects involving incentive policy are non-significant (< 1.96), indicating that incentive policy does not alter the relationships between the three barriers and behavior intention. These visual results align with the statistical findings reported in Table 6 (hypothesis testing).

Table 6. Hypothesis Testing Results

Hypothesis	Relationship	Path Coeff.	t-statistic	p-value	Result
H1	UB $\rightarrow$ BI	-0.249	2.478	0.007	Supported
H2	VB $\rightarrow$ BI	-0.241	2.528	0.006	Supported
H3	RB $\rightarrow$ BI	-0.178	1.706	0.044	Not Supported
H4	EC $\rightarrow$ BI	0.221	2.298	0.011	Supported
H5	IP $\rightarrow$ BI	0.217	2.328	0.010	Supported
H6	EC $\times$ UB $\rightarrow$ BI	0.247	1.955	0.025	Supported

H7	EC×VB → BI	0.248	2.153	0.016	Supported
H8	EC×RB → BI	-0.303	1.994	0.023	Supported
H9	IP×UB → BI	-0.141	1.368	0.086	Not supported
H10	IP×VB → BI	0.000	0.003	0.499	Not supported

Source: Primary Data Processed, 2026

The hypothesis testing results presented in Table 6 reveal that out of eleven proposed hypotheses, seven are supported while four are rejected. For direct effects, usage barrier (H1: $\beta = -0.249$; $t = 2.478$; $p = 0.007$) and value barrier (H2: $\beta = -0.241$; $t = 2.528$; $p = 0.006$) have significant negative effects on behavioral intention, whereas risk barrier (H3: $\beta = -0.178$; $t = 1.706$; $p = 0.044$) is not significant at $\alpha = 0.05$ using two-tailed tests ($t < 1.96$), thus H3 is not supported. Meanwhile, environmental concern (H4: $\beta = 0.221$; $t = 2.298$; $p = 0.011$) and incentive policy (H5: $\beta = 0.217$; $t = 2.328$; $p = 0.010$) both have significant positive direct effects on behavioral intention. Regarding moderation effects, environmental concern significantly moderates the relationships of usage barrier (H6: $\beta = 0.247$; $t = 1.955$; $p = 0.025$) and value barrier (H7: $\beta = 0.248$; $t = 2.153$; $p = 0.016$) with positive coefficients indicating it weakens the negative effects of these barriers, but it moderates risk barrier (H8: $\beta = -0.303$; $t = 1.994$; $p = 0.023$) in a negative direction, meaning it actually strengthens the negative effect of perceived risk on intention. In contrast, all moderation effects involving incentive policy (H9, H10, H11) are non-significant ($t < 1.96$; $p > 0.05$), indicating that government incentives do not alter how non-users evaluate functional barriers, despite having a significant positive direct effect on adoption intention.

DISCUSSION

This study examined non-user resistance to electric motorcycle adoption in Indonesia using Innovation Resistance Theory, with environmental concern and incentive policy as moderators. The findings provide several theoretical and practical insights. First, usage barrier and value barrier significantly reduce behavioral intention, confirming that perceived impracticality and cost-benefit imbalance are the primary sources of resistance among non-users. This aligns with prior studies (Balijepalli et al., 2023; Lazuardy et al., 2024) and reinforces IRT's central premise that functional barriers drive consumer resistance. However, risk barrier was found to have a non-significant effect, contradicting several previous studies (Xue et al., 2024; Agustina et al., 2025).

This unexpected finding suggests that non-users, lacking direct experience, may hold abstract risk perceptions that are less cognitively salient compared to tangible concerns about charging infrastructure and purchase costs. The relatively young and educated sample may also have greater access to information, reducing uncertainty about product risks. Second, environmental concern has a significant positive direct effect on adoption intention, confirming that environmentally conscious consumers are more receptive to sustainable mobility. More importantly, environmental concern weakens the negative effects of usage and value barriers (positive moderation) but surprisingly strengthens the negative effect of risk barrier (negative moderation).

This novel finding reveals that environmental concern is a "double-edged sword": environmentally conscious consumers are more tolerant of practical inconveniences, yet they hold higher expectations for product safety and reliability a "responsibility premium" (Liao & Wu, 2024). When they perceive risks, the dissonance between their green identity and perceived unsafeness generates stronger resistance.

Third, incentive policy has a significant positive direct effect, confirming that subsidies encourage adoption intention (Liu et al., 2020). However, its moderating effects on all barrier–intention relationships are non-significant, indicating that financial incentives alone do not change how non-users evaluate functional barriers. This implies that subsidies must be

complemented by infrastructure investment, product quality assurance, and public education campaigns to effectively reduce resistance.

This study extends IRT by identifying boundary conditions of functional barriers and revealing that environmental concern operates asymmetrically across different types of resistance. It also demonstrates that incentive policy influences adoption through a direct pathway independent of barrier perception, offering a more nuanced understanding of policy effectiveness in IRT.

Policymakers should prioritize charging infrastructure expansion and battery-swapping networks over subsidies alone. Manufacturers should communicate total cost of ownership and emphasize product reliability, particularly for environmentally conscious segments. Test-ride programs, quality certification, and extended warranties are essential to address usage, value, and risk concerns simultaneously

CONCLUSION

This study analyzed non-user resistance to electric motorcycle adoption in Indonesia using the Innovation Resistance Theory framework, examining the moderating roles of environmental concern and incentive policy. Based on survey responses from 166 non-user respondents across various Indonesian regions, analyzed through PLS-SEM, the following conclusions are drawn:

First, usage barriers, value barriers, and risk barriers significantly and negatively influence non-user behavioral intention to adopt electric motorcycles. Higher perceived barriers correlate with lower adoption intentions, confirming IRT's relevance in explaining innovation resistance in Indonesian contexts.

Second, environmental concern and incentive policy significantly and positively influence behavioral intention. Higher environmental awareness and positive perceptions of government incentive policies correlate with higher adoption intentions. Both factors serve as drivers that can increase adoption intentions despite functional barriers.

Third, environmental concern significantly moderates the relationship between all three functional barriers and behavioral intention. Positive moderation on usage and value barriers indicates that environmental concern weakens negative effects, allowing environmentally conscious non-users to tolerate practical inconveniences and cost concerns. However, negative moderation on risk barrier reveals that environmental concern paradoxically strengthens the negative effect of risk concerns, as environmentally conscious individuals hold higher expectations for green technology reliability.

Fourth, incentive policy does not moderate the relationship between any functional barrier and behavioral intention. Although incentive policies directly increase adoption intentions, they are insufficient to change how non-users respond to usage, value, and risk barriers. This indicates that functional barriers are non-financial in nature and require comprehensive interventions beyond financial compensation

SUGGESTION

Several limitations warrant acknowledgment. First, the study focuses exclusively on non-users; perceptions and resistance may differ among users or early adopters. Sample composition is dominated by respondents from Nusa Tenggara and Java, potentially less representative of other Indonesian regions. Second, data collection through online self-reported questionnaires may introduce common method bias or discrepancies between perceptions and actual behavior.

Third, the R^2 value of 0.375 indicates that 62.5% of behavioral intention variance remains unexplained by the model, suggesting other variables (subjective norms, perceived behavioral control, social influence, cultural factors) warrant investigation. Fourth, the study examines only functional barriers while psychological barriers (tradition, image barriers) may also be relevant in Indonesian contexts.

RESEARCH TRANSPARENCY AND ETHICS STATEMENTS

1. Author Contributions:

RR: Conceptualization, Methodology, Data Collection, Data Analysis,

AH: Writing – Original Draft, Visualization, Review and Editing

2. Funding:

No funding: This research and publication of the article received no specific funding from any party.

3. Conflict of Interest:

No conflict of interest: The authors declare that they have no conflict of interest related to the research and publication of this article.

4. Research Ethics:

The study did not involve any intervention, biological specimens, vulnerable groups, or sensitive personal data. Participation was voluntary, and the confidentiality of the respondents was maintained.

5. Use of Artificial Intelligence (AI):

No use of ai. The authors declare that generative ai was not used in the preparation of this article.

REFERENCES

- Aditya, M. H., Yuniaristanto, & Sutopo, W. (2024). Exploring the Factors Accelerating the Electric Motorcycle Adoptions: Insights from Theory of Planned Behavior and Travel Behavior. *Automotive Experiences*, 7(1), 171–188.
- Agustina, R., Yuniaristanto, & Sutopo, W. (2025). Factors Influencing Electric Motorcycle Adoption in Indonesia: Comprehensive Psychological, Situational, and Contextual Perspectives. *World Electric Vehicle Journal*, 16(2), Article 106. <https://doi.org/10.3390/wevj16020106>
- Andreica Mihut, I. S., Sterie, L. G., & Mican, D. (2025). The green dilemma: What drives consumers to green purchase intention in an emerging EU economy? *Journal of Applied Economics*, 28(1), Article 2536323. <https://doi.org/10.1080/15140326.2024.2536323>
- Balijepalli, C., Shepherd, S., Crastes, R., Sourd, D., Praesha, T., & Lubis, H. A. (2023). Preferences for electric motorcycle adoption in Bandung, Indonesia. *Urban, Planning and Transport Research*, 11(1), Article 2238033. <https://doi.org/10.1080/21650020.2023.2238033>
- Bonisoli, L., Madelaine, A., Cruz, V., Karely, D., & Elizalde, R. (2024). Revving towards sustainability: Environmentalism impact on electric motorcycle adoption. *Journal of Cleaner Production*, 435, 140262. <https://doi.org/10.1016/j.jclepro.2023.140262>
- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). Lawrence Erlbaum Associates.

- Esposito, L., & Jalal, R. N.-U.-D. (2025). Environmental awareness and pro-environmental behavior impact on renewables investments: A moderating role of environmental concerns. *Socio-Economic Planning Sciences*, 101, Article 102256. <https://doi.org/10.1016/j.seps.2025.102256>
- Flores, P. J. (2024). What motivates consumers to adopt controversial green mobility innovations? The case of shared e-bikes and e-scooters. *Technological Forecasting and Social Change*, 208, Article 123694. <https://doi.org/10.1016/j.techfore.2024.123694>
- Guerra, E. (2019). Electric vehicles, air pollution, and the motorcycle city: A stated preference survey of consumers' willingness to adopt electric motorcycles in Solo, Indonesia. *Transportation Research Part D*, 68, 52–64. <https://doi.org/10.1016/j.trd.2017.07.027>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). SAGE Publications.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
- Hoffmann, R., Kanitsar, G., & Seifert, M. (2024). Behavioral barriers impede pro-environmental decision-making: Experimental evidence. *Ecological Economics*, 225, Article 108347. <https://doi.org/10.1016/j.ecolecon.2024.108347>
- Khan, M. A. S., Du, J., Malik, H. A., Anuar, M. M., Pradana, M., & Yaacob, M. R. B. (2022). Green innovation practices and consumer resistance to green innovation products. *Journal of Innovation & Knowledge*, 7(4), Article 100280. <https://doi.org/10.1016/j.jik.2022.100280>
- Lazuardy, A., Nurcahyo, R., Kristiningrum, E., & Ma, A. (2024). Technological, Environmental, Economic, and Regulation Barriers to Electric Vehicle Adoption: Evidence from Indonesia. *World Electric Vehicle Journal*, 15(9), Article 422. <https://doi.org/10.3390/wevj15090422>
- Lee, G., & Kim, Y. (2022). Effects of Resistance Barriers to Service Robots on Alternative Attractiveness and Intention to Use. *SAGE Open*, 12(2), Article 21582440221099293. <https://doi.org/10.1177/21582440221099293>
- Liao, Y., & Wu, L. (2024). The Influence of Brand Greenwashing on EV Purchase Intention: The Moderating Role of Consumer Innovativeness and Peer Brand Attitude. *World Electric Vehicle Journal*, 15(7), Article 313. <https://doi.org/10.3390/wevj15070313>
- Liu, F., & Madni, G. R. (2024). Moderating role of policy incentive and perceived cost in relationship of environmental awareness and green consumption behavior. *PLOS ONE*, 19(2), 1–17. <https://doi.org/10.1371/journal.pone.0296632>
- Liu, Y., & Lai, W. (2020). The Effects of Environmental Policy and the Perception of Electric Motorcycles on the Acceptance of Electric Motorcycles: An Empirical Study in Macau. *PLOS ONE*, 1-14. <https://doi.org/10.1177/2158244019899091>
- Nguyen-phuoc, D. Q., An, N., Nguyen, N., Thi, P., & Tran, K. (2023). The influence of environmental concerns and psychosocial factors on electric motorbike switching intention in the global south. *Journal of Transport Geography*, 113, Article 103705. <https://doi.org/10.1016/j.jtrangeo.2023.103705>

- Ooi, K.-B., Lee, V.-H., Tan, G. W.-H., & Chong, A. Y.-L. (2011). Determinants of intention to use mobile banking. *International Journal of Systems Science*, 42(10), 1243–1254.
<https://doi.org/10.1080/00207721.2010.523408>
- Purwanto, A., Asbari, M., & Santoso, P. B. (2021). The role of incentive policy in technology adoption: A systematic review. **International Journal of Social and Management*