

AN EXTENSION OF THE THEORY OF PLANNED BEHAVIOR: THE ROLE OF ENVIRONMENTAL AND ECONOMIC BENEFIT IN SHAPING PURCHASE INTENTIONS OF ELECTRIC MOTORCYCLES IN WEST JAVA

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Abstract:

Background: The transportation sector is a major contributor to carbon emissions, and the adoption of electric motorcycles could offer a solution for sustainable mobility in Indonesia. However, despite government incentives and increasing environmental awareness, purchase intention for electric motorcycles remains low, particularly in West Java.

Purpose: Although the Theory of Planned Behavior (TPB) is widely applied to explain pro-environmental behavior, limited studies have integrated perceived environmental and economic benefit, as well as perceived incentive policies, into the model. This study addresses the gap by extending TPB to examine their roles in shaping purchase intentions for electric motorcycles, particularly in West Java.

Methodology: This study employs a cross-sectional survey using convenience sampling of 222 respondents in West Java, a relevant context and emerging market for electric motorcycles. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test both direct and mediating effects, although the non-probability sampling approach may limit generalizability.

Findings: The results indicate that perceived environmental and economic benefits are the strongest predictors of purchase intention, with attitude playing a key mediating role. In contrast, incentive policies show a more limited effect, highlighting that consumers are more driven by perceived value than external policy support. In addition, the model explains 70.2% of the variance in purchase intention, indicating strong predictive relevance.

Conclusion: The study contributes to the literature by extending the TPB to incorporate perceived benefits and policy incentives in the context of electric motorcycle adoption. From a managerial perspective in Indonesia, the findings suggest the importance of emphasizing concrete environmental and economic value propositions, as consumer decisions appear to be driven more by perceived benefits than by external policy support.

Originality/Value: This study extends the Theory of Planned Behavior (TPB) by integrating environmental, economic, and policy perception variables in the context of electric motorcycle adoption in a developing country. The findings provide empirical evidence and practical insights for policymakers and marketers to design effective strategies that bridge the gap between positive perceptions and actual purchasing behavior.

Keywords: perceived environmental benefit, perceived economic benefit, attitude, purchase intention, electric motorcycles

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INTRODUCTION

Climate change and air pollution caused by fossil-fueled vehicles have become pressing global concerns. The transportation sector is a major contributor to carbon dioxide (CO₂) emissions, with internal combustion engine vehicles being a primary source of air pollution (Krishnan & Koshy, 2021). To mitigate these environmental challenges, many countries have promoted the adoption of electric vehicles (EVs) as a sustainable transportation alternative (Rahman & Sharif, 2023). In recent years, the EV market has expanded rapidly in regions such as China, the United States, and Europe (Parmar & Machhar, 2024).

However, in developing countries like Indonesia, EV adoption remains limited due to several barriers, including high costs, limited charging infrastructure, and low public awareness (Samarasinghe et al. 2024). Indonesia ranks among the countries with the most significant motorcycle populations globally, with more than 132 million units recorded in 2023 (Agustina et al. 2025). The rapid growth significantly contributes to transportation-related carbon emissions, which totaled 674.54 million tons of CO₂ in same year. To address these issues, the Indonesian government has introduced several policies such as purchase subsidies and infrastructure development to accelerate EV adoption (*Perubahan Atas Peraturan Presiden Nomor 55 Tahun 2019 Tentang Percepatan Program Kendaraan Bermotor Listrik Berbasis Baterai* (Battery Electric Vehicle) *Untuk Transportasi Listrik*, 2023).

Despite strong policy support, the adoption rate of EVs in Indonesia remains relatively low. Recent data from the Ministry of Industry indicate that EVs account for only approximately 1.1% of total registered vehicles (Rahman & Sharif, 2023). Although the government has provided subsidies of IDR 7 million per unit to encourage the purchase of electric motorcycles, sales remain far below expectations. Of the remaining 197,097 subsidized units, only 836 have been distributed to industries, and 431 have been verified for public use (Putri, 2023). In comparison, the average annual sales of conventional motorcycles over the past decade (2014–2024) have ranged from five to six million units per year (Anshori, 2024).

Previous studies have identified several barriers to EV adoption, including concerns about performance, limited infrastructure, and low consumer awareness (Degirmenci & Breitner, 2017; He et al. 2023; Murtiningrum et al. 2022). While these studies provide valuable insights, they predominantly focus on general adoption factors

and often overlook how multiple perceived benefits and incentive policies interact within comprehensive behavioral framework. Moreover, limited research has examined these factors specifically in the context of electric motorcycle adoption in Indonesia, particularly in regions such as West Java, where vehicle ownership is high but adoption remains low (Suartika, 2023).

To address this gap, this study adopts the Theory of Planned Behavior (TPB), which posits that behavioral intention is shaped by attitude, subjective norms, and perceived behavioral control (Ajzen, 1985). Prior studies have consistently shown that attitude significantly influences consumers' purchase intention (Khan et al. 2023; Shastry & Anupama, 2021). While TPB provides a robust framework for predicting behavioral intention, it does not explicitly specify the underlying belief-based factors that shape attitude in specific contexts. In the case of electric motorcycle adoption, perceived environmental benefits (e.g. reducing emissions) and perceived economic benefits (e.g. cost efficiency), play a crucial role in shaping consumer attitudes (Alberto & Riza, 2023; Rachmawati & Rahardi, 2023; Rahman & Sharif, 2023). In addition, government incentive policies may reinforce positive public perceptions, although their effectiveness in stimulating purchase decisions remains debatable (Şenyapar & Akil, 2023). Therefore, integrating these perceived-based variables extends TPB by providing a more context-specific explanation of how attitudes toward electric motorcycles are formed. Other factors, social influence from peers, family members, or community groups, reflected in subjective norms, further contributes to shaping individual decision making (Bernando & Ray, 2024), while perceived behavioral control reflects individuals' perceived ability to access and use electric motorcycles under constraints such as limited information and infrastructure.

Therefore, this study aims to extend the Theory of Planned Behavior by incorporating perceived environmental benefits, perceived economic benefits, and perceived incentive policies as context-specific antecedents of attitude. It further examines how these factors, together with subjective norms and perceived behavioral control, providing a more comprehensive explanation of electric motorcycle purchase intention in the context of West Java.

METHODS

This study aims to identify the drivers of purchase intention for electric motorcycles in West Java. A quantitative,

cross-sectional survey was conducted using a structured questionnaire with five-point Likert scales (1–5). Data were collected on July to September 2025 from 222 Indonesian consumers through Kudata, an online survey panel. The sampling frame consisted of individuals residing in West

Java who are potential or current motorcycle users. Measurement indicators were adapted from previous studies and modified to fit with the current context of the object (Table 1).

Table 1. Indicator of All Variables

Variable	Indicator	Source
Perceived Environmental Benefit (PenvB)	Reduce carbon emissions	(Hu et al. 2023; Samarasinghe et al. 2024)
	Decrease air pollution.	
	Support environmental conservation.	
	More eco-friendly than gasoline motorcycles.	
	Lower fossil fuel consumption.	
Perceived Economic Benefit (PEB)	Sustainable transportation development	(Hu et al. 2023; Krishnan & Koshy, 2021)
	Charging costs are lower than buying fuel.	
	Maintenance is more affordable than for gasoline motorcycles.	
	Using an electric motorcycle reduces monthly expenses.	
	It is affordable for daily travel.	
Perceived Incentive Policies (PIP)	It offers long-term cost savings.	(Samarasinghe et al. 2024; Tu & Yang, 2019)
	Maintenance is simple and convenient.	
	Government subsidies make electric motorcycles more affordable.	
	Tax exemptions increase interest in owning electric motorcycles.	
	Electricity tariff discounts encourage the use of electric motorcycles.	
Subjective Norm (SN)	Down payment reductions make purchasing easier.	(Agustina et al. 2025; Bernando & Ray, 2024; Murtiningrum et al. 2022)
	Government policies actively support the adoption of electric motorcycles.	
	Additional incentives, such as low-interest loans, would boost purchase interest.	
	Friends or colleagues encourage me to buy an electric motorcycle.	
	People around me influence my decision to choose an electric motorcycle.	
Attitude (ATT)	My family supports the use of electric motorcycles.	(Bernando & Ray, 2024)
	I feel social pressure to start using an electric motorcycle.	
	Using an electric motorcycle gives me a sense of social acceptance.	
	Positive attitude toward using electric motorcycles.	
	Choosing an electric motorcycle is a wise decision.	
Perceived Behavioral Control (PBC)	Using an electric motorcycle is the best choice for me.	(Bernando & Ray, 2024)
	Electric motorcycles are a good transportation solution.	
	I have a favorable perception of electric motorcycles.	
	I feel proud to use an electric motorcycle.	
	I have the financial ability to buy an electric motorcycle.	
Purchase Intention (PI)	I am confident in my ability to purchase an electric motorcycle.	(Agustina et al. 2025; Bernando & Ray, 2024; Murtiningrum et al. 2022)
	I have control over my decision to buy an electric motorcycle.	
	I do not face significant obstacles in purchasing an electric motorcycle.	
	I have sufficient access to information about electric motorcycles.	
	The purchase process is easy for me to understand and follow.	
	I intend to buy an electric motorcycle within the following year.	
	I will consider buying an electric motorcycle when purchasing a new vehicle.	
	I have a plan to replace my conventional motorcycle with an electric one.	
	I am confident that I will buy an electric motorcycle soon.	
	I intend to buy an electric motorcycle within my means.	

A non-probability convenience sampling approach was employed to accommodate the complexity of the model with multiple interrelationships among latent variables. The recommended minimum sample size for PLS-SEM is 200–250 respondents to ensure stable bootstrapping results (Hair et al. 2017; Kock & Hadaya, 2018). Respondents were screened based on the following criteria: (1) at least 17 years old, (2) possession of a valid motorcycle driving license, and (3) residency in West Java. Screening questions were included at the beginning of the questionnaire to ensure eligibility. Responses that did not meet these criteria or were incomplete were excluded from the analysis.

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.2 software (Hair et al. 2019). The measurement model was assessed based on convergent validity (indicator loadings > 0.70), discriminant validity (cross-loadings), Average Variance Extracted (AVE > 0.50), composite reliability (> 0.70), and Cronbach's alpha (> 0.70). The structural model was evaluated using R^2 (thresholds: > 0.67 substantial; 0.33 – 0.67 moderate; 0.19 – 0.33 weak) and Q^2 for predictive relevance. Hypotheses were tested via bootstrapping to derive path coefficients and t-statistics, with significance set at $p < 0.05$. Total effects, including direct and indirect effects, were computed to examine mediation and moderation. To address potential common bias, procedural remedies were applied, including assuring respondents anonymity and varying item wording. In addition, Variance Inflation Factor (VIF) was used as a statistical check for common method bias following (Kock, 2015).

Hypotheses

Perceived environmental benefits shape consumers' evaluation of electric motorcycles by highlighting their role in reducing pollution and emissions. When individuals recognize these environmental advantages, they are more likely to develop favorable attitudes toward adoption. Prior studies support the positive link between perceived environmental benefits and attitude (Krishnan and Koshy, 2021; Parmar and Machhar, 2024; Tu & Yang, 2019; Hu et al. 2022; Alberto & Riza, 2023). Therefore, the following hypothesis is proposed: H1: Perceived environmental benefit has a positive effect on attitude.

Perceived economic benefits influence consumers' evaluations by emphasizing cost savings, such as reduce fuel and maintenance expenses. Previous studies show

that these financial advantages enhance the perceived value of electric motorcycles, leading to more positive attitudes toward adoption (Tu and Yang, 2019; Alberto & Riza, 2019; Krishnan & Koshy, 2021; Hu et al. 2022; Parmar & Machhar, 2024). Therefore, the following hypothesis is proposed: H2: Perceived economic benefit has a positive effect on attitude.

Government incentive policies, such as subsidies and tax reductions, serve as external motivators that enhance the attractiveness of electric motorcycles. Studies suggest that these incentives can strengthen positive evaluations by reducing perceived financial barriers (Samarasinghe et al. 2024; Permana, 2023; Rachmawati & Rahardi, 2023). Therefore, the following hypothesis is proposed: H3: Perceived incentive policies have a positive effect on attitude.

Subjective norms reflect perceived social pressure from important others. When individuals perceive strong social influence from people close to them, such as family, friends, or colleagues, they are more likely to form favorable attitudes toward adopting electric motorcycles (Agustina et al. 2025; Murtiningrum, 2022; Rachmawati & Rahardi, 2023; Krishnan & Koshy, 2021; Samarasinghe, 2024). Therefore, the following hypothesis is proposed: H4: Subjective norm has a positive effect on attitude.

According to the Theory of Planned Behavior, attitude represents an individual's overall evaluation of a behavior and is a key determinant of intention (Ajzen, 1985). A more favorable attitude toward electric motorcycles increases the likelihood of purchase intention. Previous research has confirmed that ATT significantly affects consumers' PI (Khan et al. 2023; Shastry & Anupama, 2021a). Therefore, the following hypothesis is proposed: H5: Attitude has a positive effect on purchase intention.

Perceived environmental benefits influence purchase intention indirectly by shaping attitudes (Alberto & Riza, 2023; Rachmawati & Rahardi, 2023). As positive attitudes develop, it acts as a psychological mechanism that translates environmental perceptions into behavioral intention (Tu & Yang, 2019; Rachmawati & Rahardi, 2023). Therefore, the following hypothesis is proposed: H6: Attitude mediates the relationship between perceived environmental benefit and purchase intention.

Similarly, perceived economic benefits affect purchase intention through attitude (Alberto & Riza, 2023; Rachmawati & Rahardi, 2023; Krishnan & Koshy, 2021).

Favorable evaluations driven by cost advantages increase the likelihood of forming purchase intention (Tu & Yang, 2019; Rachmawati & Rahardi, 2023; Şenyapar and Akil, 2023; Agustina et al. 2025; Murtiningrum et al. 2022). Therefore, the following hypothesis is proposed: H7: Attitude mediates the relationship between perceived economic benefit and purchase intention.

The influence of incentive policies on purchase intention is primarily indirect. Information about incentives, such as subsidies or tax reductions, fosters positive attitude, which subsequently drive purchase intention (Alberto & Riza, 2023). Hence, attitude serves as a key mediating variable linking perceived incentive policies to consumers' willingness to purchase electric motorcycles (Permana et al. 2023; Rachmawati & Rahardi, 2023). Therefore, the following hypothesis is proposed: H8: Attitude mediates the relationship between perceived incentive policies and purchase intention.

Subjective norms, which reflect social influence, affects purchase intention through attitude formation (Agustina et al. 2025). In developing-country contexts, attitude mediate the relationship between social influence and EV purchase decisions (Bernando & Ray, 2024). Consumer attitudes are shaped by the interplay between social pressure and personal perceptions of benefits, jointly motivating the desire to purchase (Harno, 2023; Murtiningrum et al. 2022). Therefore, the following hypothesis is proposed: H9: Attitude mediates the relationship between subjective norm and purchase intention.

A positive attitude does not always lead to purchase intention unless accompanied by a strong sense of self-efficacy. Perceived behavioral control is defined as the perceived ease or difficulty of performing a behavior, which can strengthen or weaken the influence of attitude on purchase intention. Individuals who believe they can purchase and use electric motorcycles are more likely to translate positive attitudes into actual purchase intentions (Rachmawati & Rahardi, 2023; He et al. 2023; Permana, 2023; Murtiningrum et al. 2022). Accordingly, the following hypothesis is proposed: H10: perceived behavioral control moderates the relationship between attitude and purchase intention.

This study contributes to the existing body of research on environmental issues, particularly within business and marketing contexts. It is expected to serve as a foundation for future studies aimed at expanding the understanding of green purchase behavior in marketing literature.

The conceptual framework in Figure 1. illustrates that perceived environmental benefits (PEnvB), perceived economic benefits (PEB), perceived incentive policies (PIP), and subjective norms (SN), function as antecedent variables that influence attitude (ATT) toward electric motorcycles. Furthermore, ATT is hypothesized to have a direct effect on purchase intention and mediating variable that translates cognitive and social evaluations into behavioral intention. In addition, perceived behavioral control (PBC) is incorporated as a moderating variable that strengthens or weakens the effect of attitude (ATT) on purchase intention (PI). This framework enables a holistic perspective for examining psychological and contextual factors in the adoption process, thereby providing a strong basis for analyzing consumer behavior toward EVs adoption in West Java.

RESULTS

Demography Characteristic

During the questionnaire distribution period from July to September, a total of 525 responses were collected; however, only 222 respondents met the research criteria. The demographic profile indicates that most participants are female (66%), while males account for 34%. The majority are young adults aged 17–25 years (69%), followed by those aged 26–40 years (28%), with only a small proportion (2%) aged 40 or older. The predominance of younger respondents suggests that this group may play an essential role in influencing purchasing decisions and the adoption of new technologies such as electric motorcycles. Regarding education, most respondents have completed a diploma or a bachelor's degree (59.5%). In comparison, 39.6% hold high school qualifications, reflecting a generally well-educated group that may be more receptive to innovation and sustainability. Occupationally, the largest groups are students (39%) and private-sector employees (38%), followed by entrepreneurs (8%), indicating that many respondents belong to active, productive age segments with dynamic lifestyle patterns. Regarding income, 39% earn between IDR 1–3 million per month, and 27% earn below IDR 1 million, suggesting that most respondents fall within the lower-middle income group, where price remains a key consideration in purchasing decisions. Geographically, 37% reside in Bandung, followed by smaller shares from Bandung Barat (8%), Bekasi (5%), and other parts of West Java, confirming that respondents primarily come from urban and semi-

urban areas where awareness of electric motorcycles is relatively higher. Overall, the demographic profile portrays a young, educated, and price-sensitive group that values practicality and affordability, characteristics that companies and policymakers must consider when promoting the adoption of electric motorcycles.

Measurement Model

Convergent Validity

Convergent validity assesses how well a set of indicators represents its latent construct. It is established when two different instruments measuring the same construct exhibit a high correlation. In practice, an indicator is considered valid when its outer loading exceeds 0.70 on the intended construct (Hair et al. 2021). Testing for convergent validity, therefore, examines the accuracy with which each item or set of items captures the target construct. The analysis revealed two invalid indicators for the perceived incentives policies variable, which were subsequently excluded before recalculating the model.

After removing the invalid indicators, the remaining valid indicators were reprocessed. Figure 2 shows that each indicator for its respective construct exceeds 0.700, confirming that all indicators are valid and suitable for further analysis.

Discriminant Validity (Cross Loading)

The discriminant validity test presented in Table 2, using the cross-loading approach, shows that each indicator loads highest on its intended construct rather than on other constructs (Hair et al. 2017; Mohd Dzin & Lay, 2021). These findings confirm that the indicators used in the study demonstrate satisfactory discriminant validity.

Reliability Test

Reliability refers to the extent to which a measure is consistent and dependable, producing stable results across repeated administrations. In PLS-SEM, composite reliability and Cronbach's alpha are considered acceptable at values above 0.70, while average variance extracted (AVE) indicates adequate convergent validity when coefficients exceed 0.50 (Hair et al. 2017). Table 3 shows that Cronbach's alpha and composite reliability values exceed 0.70, indicating strong internal reliability. Convergent validity is confirmed, as all AVE values are above 0.50. The inner (structural) model examines the hypothesized relationships among latent variables. Its evaluation focuses on the coefficient of determination (R^2) and path coefficients to assess explanatory power and hypothesis support. Changes in R^2 indicate the contribution of exogenous variables, while bootstrapped path coefficients (β , t-values, p-values, and confidence intervals) determine the significance of each relationship (Hair et al. 2021).

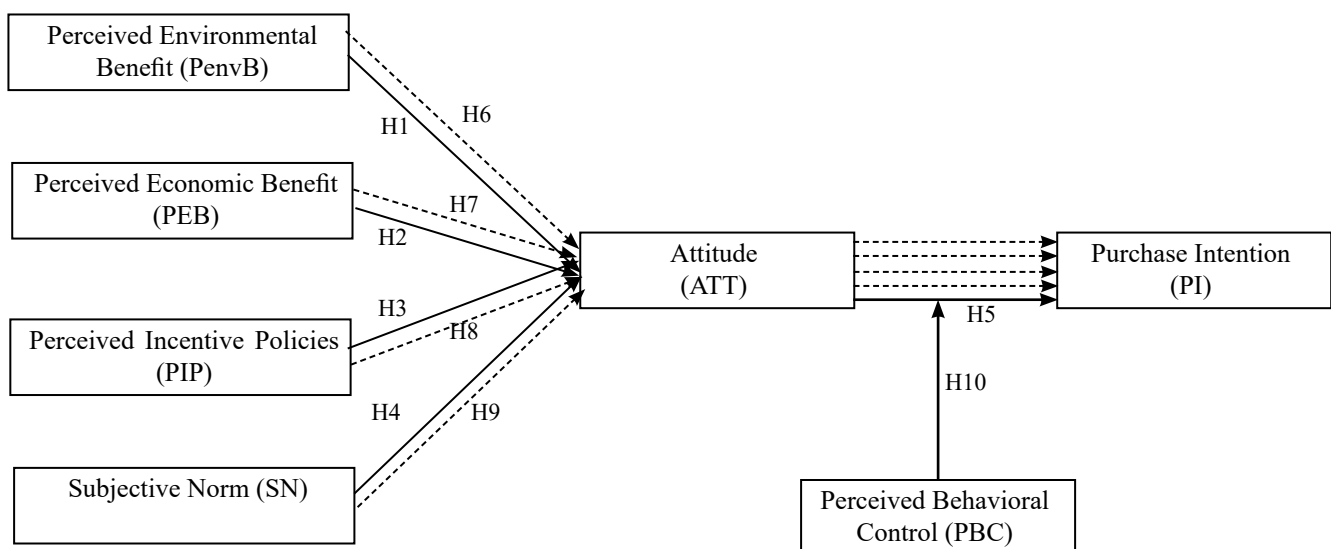


Figure1. Conceptual framework of the study and hypotheses, solid arrows indicate direct effect, dotted arrows indicate indirect effect on purchase intention via attitude (H6, H7, H8, H9), one solid arrow directed into other arrows indicate moderating effect of perceived behavioral control between attitude and purchase intention.

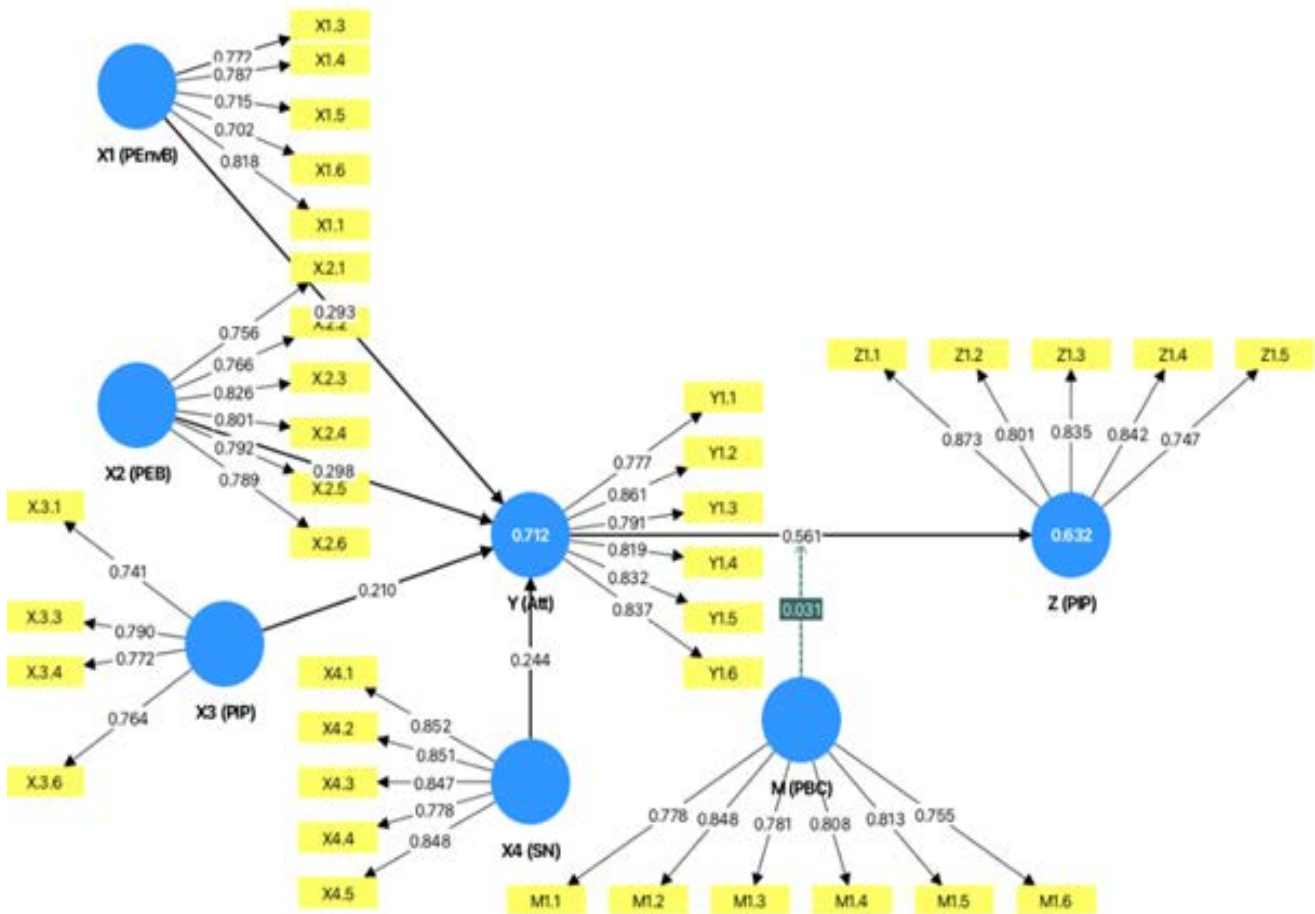


Figure 2. Convergent validity test

Collinearity Assessment

The assessment of collinearity was conducted by examining the Variance Inflation Factor (VIF) values in the structural model. As proposed by (Kock, 2015), VIF values lower than 3.3 confirm the absence of critical multicollinearity and potential common method bias. Table 4 shows that the VIF values are all below 3.3, which means no indication of potential common method bias.

Using bootstrapping, the structural model is commonly evaluated based on three criteria:

1. R Square

R-square indicates the extent to which other variables influence endogenous variables. According to Hair et al. (2021), an R^2 value greater than 0.75 indicates a strong effect of exogenous variables on endogenous variables, a value between 0.25 and 0.74 indicates a moderate

effect, and a value below 0.25 indicates a weak effect. The R-square values in Table 5 for ATT and PI range from 0.25 to 0.74, indicating that the effects of these variables are moderate (Hair et al. 2021).

2. Q - Square

Q-square is conceptually similar to the coefficient of determination (R-square) in regression analysis, with higher Q-square values indicating a better fit of the model to the data (Hair, 2021). The formula for calculating Q-square is as follows:

$$\begin{aligned} Q^2 &= 1 - (1 - R_1^2) \times (1 - R_2^2) \dots (1 - R_p^2) \\ &= 1 - (1 - 0.712^2) \times (1 - 0.632^2) \\ &= 1 - (0.493) \times (0.600) \\ &= 1 - 0.298 = 0.702 \\ &= 70.2\% \end{aligned}$$

Thus, the Q-square value is 0.702 (or 70.2%), indicating that the included variables explain 70.2% of the model's variance, while factors outside the model explain 29%.

Table 2. Discriminant Validity (Cross Loading) of All Indicators

	PEnvB	PEB	PIP	SN	ATT	PI	PBC
PEnvB 1	0.818	0.305	0.364	0.298	0.462	0.373	0.206
PEnvB 2	0.773	0.255	0.417	0.239	0.438	0.301	0.164
PEnvB 3	0.772	0.335	0.464	0.417	0.548	0.451	0.314
PEnvB 4	0.787	0.326	0.383	0.256	0.445	0.363	0.211
PEnvB 5	0.715	0.273	0.380	0.247	0.396	0.323	0.187
PEnvB 6	0.702	0.383	0.462	0.334	0.546	0.397	0.317
PEB 1	0.273	0.756	0.506	0.457	0.489	0.343	0.449
PEB 2	0.334	0.766	0.440	0.539	0.506	0.439	0.524
PEB 3	0.217	0.826	0.521	0.503	0.529	0.387	0.472
PEB 4	0.405	0.801	0.535	0.476	0.576	0.550	0.435
PEB 5	0.402	0.792	0.571	0.518	0.653	0.562	0.486
PEB 6	0.315	0.789	0.478	0.592	0.602	0.506	0.523
PIP 1	0.360	0.527	0.741	0.478	0.541	0.402	0.455
PIP 3	0.419	0.467	0.790	0.437	0.567	0.458	0.388
PIP 4	0.441	0.510	0.772	0.428	0.537	0.495	0.458
PIP 6	0.458	0.483	0.764	0.442	0.515	0.444	0.458
SN 1	0.378	0.551	0.543	0.852	0.605	0.631	0.516
SN 2	0.316	0.556	0.541	0.851	0.575	0.602	0.524
SN 3	0.351	0.604	0.497	0.847	0.613	0.600	0.528
SN 4	0.275	0.408	0.383	0.778	0.454	0.478	0.429
SN 5	0.343	0.589	0.447	0.848	0.567	0.573	0.548
ATT 1	0.427	0.592	0.601	0.478	0.777	0.533	0.510
ATT 2	0.517	0.634	0.617	0.648	0.861	0.681	0.590
ATT 3	0.440	0.623	0.581	0.624	0.791	0.657	0.565
ATT 4	0.595	0.540	0.575	0.517	0.819	0.567	0.422
ATT 5	0.567	0.563	0.569	0.474	0.832	0.605	0.467
ATT 6	0.553	0.567	0.528	0.579	0.837	0.651	0.518
PI 1	0.403	0.511	0.537	0.604	0.658	0.873	0.636
PI 2	0.405	0.466	0.493	0.514	0.614	0.801	0.472
PI 3	0.428	0.529	0.461	0.624	0.655	0.835	0.519
PI 4	0.355	0.529	0.468	0.625	0.624	0.842	0.625
PI 5	0.433	0.406	0.446	0.465	0.535	0.747	0.464
PBC 1	0.229	0.456	0.435	0.455	0.466	0.520	0.778
PBC 2	0.216	0.498	0.446	0.520	0.497	0.525	0.848
PBC 3	0.223	0.507	0.447	0.481	0.509	0.553	0.781
PBC 4	0.207	0.494	0.439	0.515	0.474	0.504	0.808
PBC 5	0.302	0.535	0.506	0.477	0.548	0.547	0.813
PBC 6	0.326	0.430	0.461	0.480	0.497	0.538	0.755

Note: Perceived Environmental Benefit (PEnvB); Perceived Economic Benefit (PEB); Perceived Incentive Policies (PIP); Subjective Norm (SN); Attitude (ATT); Perceived Behavioral Control (PBC); Purchase Intention (PI); Yellow color block = higher correlation than the other constructs

Table 3. Reliability test of all variables

Variable	Cronbach's Alpha	Composite Reliability	AVE
Perceived Environmental Benefit (PenvB)	0.856	0.860	0.581
Perceived Economic Benefit (PEB)	0.879	0.883	0.622
Perceived Incentive Policies (PIP)	0.767	0.767	0.588
Subjective Norm (SN)	0.892	0.898	0.698
Attitude (ATT)	0.902	0.905	0.672
Purchase Intention (PI)	0.878	0.884	0.673
Perceived Behavioral Control (PBC)	0.885	0.886	0.637

Table 4. Variance inflation factor of all variables

	VIF
Perceived Environmental Benefit (PenvB) → Attitude (ATT)	1.484
Perceived Economic Benefit (PEB) → Attitude (ATT)	2.138
Perceived Incentive Policies (PIP) → Attitude (ATT)	2.309
Subjective Norm (SN) → Attitude (ATT)	1.954
Perceived Behavioral Control (PBC) → Purchase Intention (PI)	1.647
Attitude (ATT) → Purchase Intention (PI)	1.700
Perceived Behavioral Control (PBC) → Attitude (ATT) → Purchase Intention (PI)	1.066

Hypothesis Testing

Path coefficients summarize the hypothesized effects among the latent constructs. We assessed their significance using bootstrapping, which provides t-statistics (and p-values) for each path. At the 5% level ($\alpha = 0.05$), a hypothesis is supported when the absolute t-value exceeds 1.96 and the p-value is below 0.05. The estimated path coefficients, together with their test statistics, are reported in Table 5 and Table 6.

Direct Effect Test

Hypothesis 1 result: PEnvB to ATT testing shows a positive, significant effect. Stronger PEnvB are associated with a more favorable ATT toward EVs. This finding is consistent across prior studies (Agustina et al. 2025), which shows that recognizing PEnvB strengthens pro-adoption ATT (Bonisoli et al. 2024). Identify environmental benefits and trust in green technology as key predictors of ATT; evidence from Indonesia (Agustina et al. 2025) and (Nyoman et al. 2024; Wang et al. 2021) indicates that the more consumers believe EVs reduce pollution and fossil-fuel dependence, the more positive their ATT become. Overall, the results position PEnvB as a central determinant of supportive ATT, making consumers more willing and ready to adopt electric motorcycle.

Hypothesis 2 result: PEB to ATT testing result shows a positive and significant effect. Stronger PEB are associated with a more favorable ATT toward electric motorcycle. This pattern aligns with prior research showing that beliefs about cost efficiency and long-term savings foster positive ATT and, in turn, stronger PI (Bonisoli et al. 2024; Tu & Yang, 2019; Alberto & Riza, 2023).

Hypothesis 3 result: PIP to ATT testing result shows positive and significant effect. This finding is consistent with prior research showing that PIP shape not only behavior but also consumers' psychological evaluations. Wang et al. (2021) report that PIP influence ATT, not merely as external stimuli. Similar evidence appears in large-city contexts where government incentives significantly strengthen ATT toward electric motorcycles (Sonhaji, 2024; Samarasinghe et al. 2024; Permana et al. 2023; Rachmawati and Rahardi, 2023)

Hypothesis 4 result: SN to ATT testing result shows a positive and significant effect. Stronger SN are associated with a more favorable ATT toward electric motorcycles. This result aligns with prior evidence showing that SN helps shape pro-adoption ATT. Studies from Krishnan and Koshy (2021), Samarasinghe et al. (2024), and Tu and Yang (2019) consistently report that when important others approve of electric motorcycle use, individuals form more positive evaluations. Our

findings follow the same pattern, indicating that SN operate through ATT formation, thereby supporting the adoption of electric motorcycles.

Hypothesis 5 result: ATT to PI testing result shows a positive and significant effect. Previous research confirm a significant link between ATT and PI, noting that environmental awareness helps form favorable ATT. Consistent with the TPB, ATT reliably predicts intention in the context of electric motorcycles. ATT is a primary driver of electric motorcycle PI (Shastry & Anupama, 2021; Naufal et al. 2024; Gunawan et al. 2022; Chen et al. 2024).

Hypothesis 10 result: moderation effect of PBC on ATT to PI testing result shows positive but not significant effect. PBC does not moderate the effect of ATT on PI. Empirically, the non-significant ATT and PBC coefficient indicates that a main-effects model fits the data better than a moderation model. This pattern aligns with recent studies on EVs that position PBC as a direct antecedent of PI rather than a strengthener of the ATT toward PI (Buhmann et al. 2024; Gunawan et al. 2022). Consistent with this stream of findings, PBC appears to operate on its own direct path, not as a moderator of the ATT–PI relationship (Ruslim et al. 2022).

Indirect Effect Test

Hypothesis 6 result: the mediation effect of ATT on PEnvB to PI testing result shows a positive and significant effect. PEnvB first fosters a more favorable ATT toward electric motorcycles, and that ATT strengthens effect into a stronger PI (Table 7). This result is consistent with

a recent study showing that PEnvB shapes supportive ATT, which in turn raises electric motorcycle PI (Gunawan et al. 2022). Related work also indicates that PEnvB strengthens green PI (Zhao et al. 2024). Overall, the results showed that ATT is the key psychological mechanism that channels environmental benefits into purchase intention, implying that communications emphasizing the environmental advantages of electric motorcycles/vehicles are likely to improve attitudes and, ultimately, boost purchase intentions.

Hypothesis 7 result: the mediation effect of ATT on PEB to PI testing result shows a positive and significant effect. PEB first improves ATT toward electric motorcycles, and more favorable ATT translate into higher PI (Table 7). Substantively, lower perceived costs and higher perceived efficiency appear to reframe consumers' evaluations, thereby converting economic considerations into behavioral intention. PEB strengthens positive ATT and ultimately increases PI, underscoring the central mediating role of attitude (Permana et al. 2023). Communicating economic attributes (cost savings, efficiency) alongside environmental education fosters pro-environmental ATT and PI, reinforcing the mechanism we observe (Sasongko et al. 2024). The primacy of ATT in PI; thus, when PEB enhances ATT and PI rises, the exact mediation pattern is confirmed in our model (Zhao et al. 2024). PEB such as lower operating costs, energy efficiency, and a more competitive total cost of ownership, are most effective when designed to build positive ATT toward electric motorcycles. In this sense, economic messaging is not only a cost argument; it is a psychological lever that strengthens intention via ATT.

Table 5. R-Square test result of attitude and purchase intention

	R-square
Attitude (ATT)	0.712
Purchase Intention (PI)	0.632

Table 6. Hypothesis testing (path coefficient) of direct effect test

Hypothesis	Path Coefficient	t statistics	P values	Result
H1: PEnvB → ATT	0.293	4.692	0.000	Supported
H2: PEB → ATT	0.298	3.906	0.000	Supported
H3: PIP → ATT	0.210	3.154	0.002	Supported
H4: SN → ATT	0.244	4.131	0.000	Supported
H5: ATT → PI	0.561	7.230	0.000	Supported
H10: PBC x ATT → PI	0.031	0.588	0.556	Not supported

Note: Perceived Environmental Benefit (PenvB); Perceived Economic Benefit (PEB); Perceived Incentive Policies (PIP); Subjective Norm (SN); Attitude (ATT); Perceived Behavioral Control (PBC); Purchase Intention (PI)

Table 7. Hypothesis testing (path coefficient) of indirect effect test

Hypothesis	Path Coefficient	t statistics	P values	Result
H6: PEnvB → ATT → PI	0.165	3.822	0.000	Supported
H7: PEB → ATT → PI	0.167	3.514	0.000	Supported
H8: PIP → ATT → PI	0.118	2.932	0.003	Supported
H9: SN → ATT → PI	0.137	3.456	0.001	Supported

Note: Perceived Environmental Benefit (PenvB); Perceived Economic Benefit (PEB); Perceived Incentive Policies (PIP); Subjective Norm (SN); Attitude (ATT); Perceived Behavioral Control (PBC); Purchase Intention (PI)

Hypothesis 8 result: the mediation effect of ATT on PIP to PI testing result shows a positive and significant effect (Table 7). PIP improves ATT, and these more favorable ATT translate into higher PI for electric motorcycle. This result aligns with recent research showing that PIP first raise psychosocial value and pro-environmental ATT, which then drive PI (Gunawan et al. 2022). Related work likewise reports that PIP are effective because they shape the behavioral constructs that predict PI (Chen et al. 2025), while ATT often emerges as the strongest direct predictor of electric motorcycle PI in the Indonesian market positioning policy incentives as an important context that builds ATT and enables the mediation path (Bernando & Ray, 2024).

Hypothesis 9 result: the mediation effect of ATT on SN to PI testing result shows a positive and significant effect (Table 7). SN first motivates a more favorable ATT, and that ATT, in turn, translates into higher PI for electric motorcycles. This pattern is consistent with recent evidence showing that SN and ATT both relate positively to electric motorcycle adoption, with attitude as the key mediator (Gunawan et al. 2022; Pramono et al. 2025; Rachmawati & Rahardi, 2023; Ramadhan et al. 2024). Practical takeaway, SN, such as peer testimonials, pro-environmental norms in communities, or endorsements by opinion leaders, are most effective when they simultaneously build positive ATT, thereby boosting consumers' PI for electric motorcycles.

The findings can be theoretically explained through the cognitive-affective mechanism proposed in the Theory of Planned Behavior (TPB). Specifically, perceived environmental and economic benefits, as well as policy incentives and social influence, function as cognitive evaluations that shape individuals' attitudes toward electric motorcycles. These results occur because consumers do not directly translate external stimuli into behavioral intentions; instead, they process these stimuli through internal attitudinal evaluations. In the context of West Java, where electric motorcycle adoption remains relatively low, consumers tend to rely more on perceived value (environmental and economic) to justify their

decisions, rather than acting solely based on external encouragement or policy incentives.

Furthermore, the non-significant moderating role of perceived behavioral control suggests that, despite positive attitudes, consumers may still face structural or contextual constraints (e.g., infrastructure limitations and perceived risk), which weaken the expected strengthening effect. This indicates that perceived control operates more as a direct determinant rather than as a moderator, particularly in emerging markets where access and readiness are uneven.

Managerial Implication

The results suggest that strengthening consumers' purchase intentions for electric motorcycles requires an integrated strategy that combines environmental communication, economic incentives, and infrastructure support. Managers and policymakers should emphasize the environmental benefits of electric motorcycles through persuasive campaigns highlighting their role in reducing emissions and promoting sustainable mobility. At the same time, economic messaging must be clearer and more transparent, emphasizing long-term savings, low maintenance costs, and total cost efficiency to build favorable attitudes that translate into purchase intention.

Government incentives, such as subsidies and tax exemptions, should be simplified and clearly communicated to enhance public trust and perceived accessibility. Furthermore, social influence should be leveraged through community engagement, testimonials, and peer endorsements to normalize the adoption of electric motorcycles. Finally, improving perceived behavioral control by expanding charging infrastructure, ensuring service availability, and offering reliable after-sales support will increase consumer confidence and facilitate purchase decisions. Collectively, these strategies can bridge the gap between positive attitudes and actual purchasing behavior, accelerating the transition toward sustainable transportation in West Java's emerging markets.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study suggests that perceived environmental benefits, perceived economic benefits, perceived incentive policies, and subjective norms significantly shape consumers' attitudes toward electric motorcycles, which in turn strongly influence purchase intention. These findings confirm that attitude plays a central mediating role in translating cognitive and social evaluations into behavioral intention.

Consistent with prior studies this study confirms that both environmental and economic benefits positively influence attitudes toward electric vehicles. Similarly, the significant role of subjective norms and policy incentives aligns with previous research highlighting the importance of social influence and institutional support in shaping pro-environmental behavior. However, in contrast to several studies that emphasize the moderating role of perceived behavioral control, this study finds no significant moderating effect, suggesting that its role may vary depending on contextual factors in developing markets such as Indonesia.

Theoretically, this study extends the Theory of Planned Behavior (TPB) by demonstrating that attitude remains the dominant mechanism through which external perceptions environmental, economic, and policy related are translated into purchase intention. Unlike the traditional TPB framework, where perceived behavioral control is expected to strengthen the attitude intention relationship, the findings suggest that, in emerging market contexts, cognitive evaluations and attitudinal formation play a more decisive role than control perceptions. This highlights a contextual refinement of TPB, particularly in sustainability-driven adoption behavior, where structural limitations may weaken the influence of perceived control.

Overall, the most critical insight of this study is that strengthening positive attitudes is key to increasing purchase intention for electric motorcycles. This can be achieved by emphasizing environmental and economic value, supported by clear policy communication and social influence.

Importantly, these conclusions are derived directly from the empirical findings and do not generalize beyond the scope of the study, which focuses on consumers in West

Java. Therefore, while the results provide meaningful insights, they should be interpreted within the specific context of emerging markets with similar structural and behavioral characteristics.

Recommendations

Future research could broaden the scope to include more diverse market segments, such as older age groups or economically diverse populations, and examine how these segments respond to incentive policies and electric vehicle products. Experimental studies could also investigate changes in perceived economic benefits through information campaigns or incentive programs, assessing their short-term impact on attitudes and purchase intentions toward electric motorcycles. Finally, there is a need to develop a more comprehensive theoretical model that incorporates external factors, such as technological innovation and social change, which significantly influence consumer decision-making during the transition to electric vehicles.

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