Research Article

Riding Green: Electric Two-Wheeler Purchase Intention Based on the Extended Theory of Planned Behaviour

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ABSTRACT

The transition to sustainable mobility has become a global priority as nations seek effective solutions to address climate change, environmental degradation, and rising energy demand. Among emerging transportation alternatives, electric vehicles, particularly electric two-wheelers (ETWs), have gained considerable attention for their potential to support environmentally sustainable urban mobility, especially in developing economies such as India. This study examines the behavioural, attitudinal, and psychological determinants of ETW purchase intention among young and educated consumers in Kerala, who represent a strategically important segment for the diffusion of sustainable transportation technologies. Data were collected from 585 university students enrolled at the University of Kerala, Mahatma Gandhi University, and the University of Calicut. SPSS (Version 25) and PLS-SEM were used to analyze the data. The findings indicate that Attitude, Perceived Behavioural Control, Environmental Concern, Subjective Norm, and Green Trust each exert a positive and statistically significant influence on ETW purchase intention, with Perceived Behavioural Control emerging as the strongest predictor. The results suggest that although young consumers demonstrate substantial environmental awareness and favourable attitudes toward sustainable mobility, their perceived ability to access, afford, and effectively use ETWs plays a pivotal role in transforming positive perceptions into purchase intention. By providing empirical evidence on the key drivers of ETWs adoption among Kerala's future consumer base, this study contributes to the growing literature on sustainable transportation and offers practical implications for policymakers, manufacturers, and other stakeholders seeking to accelerate the adoption of clean, accessible, and consumer-driven mobility solutions.

Keywords: Electric Two-Wheeler; Environmental Concern; Extended Theory of Planned Behaviour; Green Trust; Purchase Intention; SEM; Theory of Planned Behaviour

INTRODUCTION

The development of new technologies increasingly depends on sustainable development frameworks that integrate social, economic, environmental, and technological dimensions. In the transportation sector, the effectiveness of future electric vehicles (EVs) will depend on universal charging infrastructure, standardised technological platforms, and user-friendly digital interfaces (Arancibia & Strunz, 2012). Despite progress in fuel-efficient mobility, climate-related challenges persist, with the global transport sector contributing nearly 24%

of greenhouse gas emissions, 72% of which originate from ground transport (Graham, 2021; Liu et al., 2020). For a rapidly modernizing economy like India, energy demand is rising at 3% annually, with fossil fuels meeting roughly 80% of current needs (IEA, 2021). The Indian transportation sector, which consumes nearly half of the nation's petroleum and contributes 11-14% of energy-related emissions (Kamboj et al., 2022), stands at the centre of discussions on clean mobility transitions.

These challenges are especially concerning for young Keralites, who face the environmental consequences of rapid urbanisation and deteriorating air quality. According to IQAir (2021), 11 of the 15 most polluted cities in Central and South Asia are located in India, highlighting the urgent need for sustainable mobility solutions. EV adoption in India has been positioned as a pathway to address pollution, reduce fossil fuel dependency, and support national climate commitments (Dai et al., 2022). With estimated annual crude oil savings across two-, three-, and four-wheeler segments (e-AMRIT Portal, NITI Aayog, 2023), EVs represent a long-term investment in environmental and economic stability. India's ambitious 2030 targets of 80% electrification of two- and three-wheelers and nearly 80 million EVs on the road signal a strong national vision (Indian Electric Vehicle Industry Report, 2024). Yet despite incentives and policy support, EV adoption remains far below expectations (Gönül et al., 2021; Iwan et al., 2019), underscoring the need to analyse consumer behaviour more deeply.

Given that young, educated Keralites constitute the largest potential consumer segment for electric two-wheelers (Sreeja OK et al., 2024), understanding their behavioural intentions is critical. University students, in particular, represent a unique demographic: they are technologically informed, environmentally aware, and regularly exposed to sustainability concepts through academic curricula, seminars, conferences, and professional training. However, whether this exposure to knowledge, especially regarding climate change, green mobility, and responsible consumption, translates into actual intention to adopt electric two-wheelers remains uncertain. Therefore, this study focuses its scope specifically on young, educated Kerala electric two-wheeler consumers, aiming to examine the behavioural, attitudinal, and psychological factors that shape their purchase intention for electric two-wheelers. Insights from this analysis can inform policymakers, manufacturers, and sustainability advocates seeking to accelerate India's transition toward cleaner transportation.

LITERATURE REVIEW

Theory of Planned Behaviour (TPB)

As per TPB, behavioural intentions of individuals are mostly determined by the conceptions of Perceived Behavioural Control (PBC), Subjective Norm (SuNo), and Attitude (Att). Customers' intentions to buy products or services and the factors that influence their preference for one brand over another can be ascertained using the TPB (Ajzen, I., 1991). Among these concepts, an "attitude is a person's approval of a particular behaviour" (Ajzen, I., 1991; Zhang, K., 2018). Subjective norm is the "social pressure that results from engaging in or abstaining from a certain behaviour" (Ajzen, I., 1991). "Asking oneself how easy or

difficult a particular behaviour is to execute is a component of perceived behavioural control" (Ajzen, I 1991; Jain, N.K., 2022).

The potential of electric vehicles (EVs) to further the UN SDGs has been the subject of recent research. By lowering energy consumption and carbon emissions, EV adoption supports SDGs 7 "Affordable and Clean Energy" and SDGs 13 "Climate Action", according to Lu et al.'s (2024) analysis of China's EV market. Similar to this, Tilly et al. (2024) examined EV policies in the US, UK, Canada, Australia, and Germany and came to the conclusion that EVs cannot significantly affect SDGs, particularly SDG 11 "Sustainable Cities and Communities" and SDG 13, without efficient multi-level governance. Singh et al. (2022) examined the state of EV adoption in India and emphasized the necessity of better policy support and infrastructure in order to meet SDG targets. According to these studies, EVs have the potential to help achieve a number of SDGs, but doing so will need the creation of extensive legislative frameworks and infrastructure. To overcome these obstacles, EV research examines consumer behavior. TPB, a widely sought-after model, is one of the theories that are used in these behavioral investigations. By adding the behavioural factor of perceived behavioural control to rational choice theory, the TPB was developed, contending that people only behave or have intentions that serve their own interests. The TPB has been utilized in many behavioural studies since it was created to look at the reasons behind people's actions (Wang, S. et al., 2018; Jain, N.K. et al., 2022).

Extended Theory of Planned Behavior (ETPB)

The TPB has been extensively implemented in studies related to environmentally friendly behaviours but benefits from additional behavioural constructs for predicting consumer intentions toward the environment. Studies on Electric Two-Wheeler Purchase Intentions (ETWPI) have extended TPB with factors like moral norm, environmental concern, price sensitivity, green trust, and readiness to pay extra. These extensions enhance predictions of behavioural factors influencing the acceptance of EVs and other environmentally friendly modes of transportation. Studies have shown that TPB and Extended TPB (ETPB) effectively measure Electric Two-Wheeler Purchase Intentions (ETWPI) (Shalender et al., 2021; Wang et al., 2016). In this research, a statistical viewpoint on key behavioural constructs influencing ETW adoption among university students in Kerala, India, based on prior research is provided (Table 1). Accordingly, we extend TPB by integrating Environmental Concern (EC) and Green Trust (GT), assuming they significantly impact ETWPI.

Proposed Model and Hypotheses

Here, the impact of key behavioural factors on electric two-wheeler purchase intention (ETWPI) is empirically investigated. These constructs include Att, EnCo, SuNo, PBC, and GrTr. First, the research hypotheses were developed based on prior studies. Then, we analysed the relationships between these constructs and ETWPI.

Table 1: *Prior Studies on ETPB*

Author	Factor	Finding
Chen and Tung (2014)	Subjective Norm, Attitude, Environmental Concern, Perceived Behavioural Control	EC enhances ATT toward electric motorcycles, leading to higher adoption intentions. SN and PBC are also significant factors of purchase intention.
Rezvani et al. (2015)	Perceived Behavioural Control, Subjective Norm, Attitude, Symbolic and Affective Motives(SAM)	SAM impacts ATT toward electric motorcycles, influencing adoption intentions. PBC and SN are also significant determinants of behavioural intention.
Javid and Nejat (2017)	PBC, Subjective Norm, Environmental Knowledge (EK), Attitude	EK enhances attitudes toward electric motorcycles, which subsequently influence adoption intentions. SN and PBC are also significant predictors of PI.
Wang et al. (2020)	Environmental Concern(EC), Perceived Behavioural Control(PBC), Attitude, and Subjective Norm(SN)	EC significantly influences ATT toward electric motorcycles, which subsequently influence the desire to adopt them. SN and PBC also positively impact adoption intentions.
Kumar et al. (2021)	Perceived Economic Benefits(PEB), Charging Infrastructure(CI), Environmental Concern (EC), Attitude(ATT), and Social Influence(SI)	PEB, CI, EC, and SI have an influence on consumers' attitudes to EVs.
Zhang and Bai (2021)	SN, Att, PBC, Perceived Value(PV)	PV moderates the association between ATT and adoption intention.
Li et al. (2021)	SN, Att, Environmental Awareness(EA), PBC	EA positively affects ATT toward electric scooters, which subsequently influences the intention to use them. PBC and SN also play important roles in shaping usage intentions.

Source: *Secondary Data*

Attitude (Att)

"Attitude refers to individuals' positive and negative evaluations regarding certain behaviour through observation, experience, research, etc., and their tendency to perform that behaviour" (Bianchi, C. 2017). Studies shows that a person having a positive attitude for a certain product have a higher chance to end up making a purchase decision (Wang et al. 2020 and Kumar et al. 2021). To the contrary, customers shows negative attitudes for EVs (Skippon, S.M., 2016 and Haustein, S., 2018). Some studies compared peoples who had favourable and unfavourable opinions for EVs and discovered that the former once are more likely to buy EVs than conventional one (Hidrue, M.K., 2011). Depending on, the prior data, attitude defined as one factor that determines consumers' ETWPI

(Semeijn, J., 2019 and Shalender, K., 2018).

H1: *"Attitude has a significant and positive influence on Electric Two-Wheeler Purchase Intentions."*

Subjective Norms (SuNo)

Subjective norms indicate that people consider the prospects of their surroundings prior to acting in certain ways, which puts them under social pressure. It is one of the key elements of the TPB that has been shown in numerous studies to be essential for assessing behavioural intentions. According to Shalender (2021, Subjective Norm is a determinant of EV adoption. Likewise, subjective norm is considered crucial for measuring behavioural intention (Rezvani et al., 2015). Peters, A. (2014) asserted, however, that despite social pressure over their EVPI, drivers in Germany would not bear it. The impact of SuNo on ETWs is still unknown due to these conflicting findings about the influence of SuNo on behavioural intention. We are therefore interested in the effect of SuNo as one of the determinants of consumers' ETWPI based on the results of earlier studies that demonstrated a beneficial influence.

H2: *Subjective Norm significantly and positively influences Electric Two-Wheeler Purchase Intentions.*

Perceived Behavioural Control (PBC)

The impact of outside forces and enablers on a person's choice of behaviour is reflected in perceived behavioural control. It represents their overall perception of how simple or tough performing the behaviour would be (Lai, I. et al., 2015; Dutta, B. et. al., 2021). Chen and Tung (2014) identified PBC as a significant determinant of behavioural intention, while Wang et al., (2020) highlighted its positive impact on the adoption process. Thus, in this investigation, we offer the following hypothesis and presented PBC as a significant influencer of ETWPI.

H3: *"Perceived Behavioural Control has a significant and positive influence on Electric Two-Wheeler Purchase Intentions."*

Environmental Concern (EnCo)

EnCo, which reflects consumers' emotional reactions to environmental challenges, has been acknowledged as a significant indicator of environmental behavioural intentions (Chen, S.-C., 2016; Ikram, M., 2022). Asadi, S., (2021) identified EnCo as a dominant factor influencing green purchase intentions. However, no research has explored this relationship in India, particularly Kerala. Given prior findings that EnCo directly influences green product adoption, we anticipate its significant impact on ETWPI. We put forward the following hypothesis to test this.

H4: *"Environmental Concern has a significant and positive influence on ETWPI."*

Green Trust (GrTr)

People's propensity to believe in and stick with items due to their environmental performance is reflected in Green Trust (Moon, S.-J, 2021). According to Chen, Y., (2012), GrTr found to be a vital factor for green purchase intention, a finding supported by other studies (Cheung, R., 2015 and Guerreiro, J. 2021). We raise concerns about the effect of GrTr on ETWPI among college students in Kerala, India, based on the available literature.

Then after, we put out the following hypothesis to test this.

H5: *"Green Trust has a significantly and positively influences ETWPI."*

Proposed Model

After intensive theoretical background and literature review, this study adopted this extended TPB (Ajzen, 1991) by integrating Environmental Concern and Green Trust (GrTr) into its core constructs (Att, SuNo, PBC). Therefore, in order to measure ETWPI, we proposed using the ETPB model shown in figure 1.

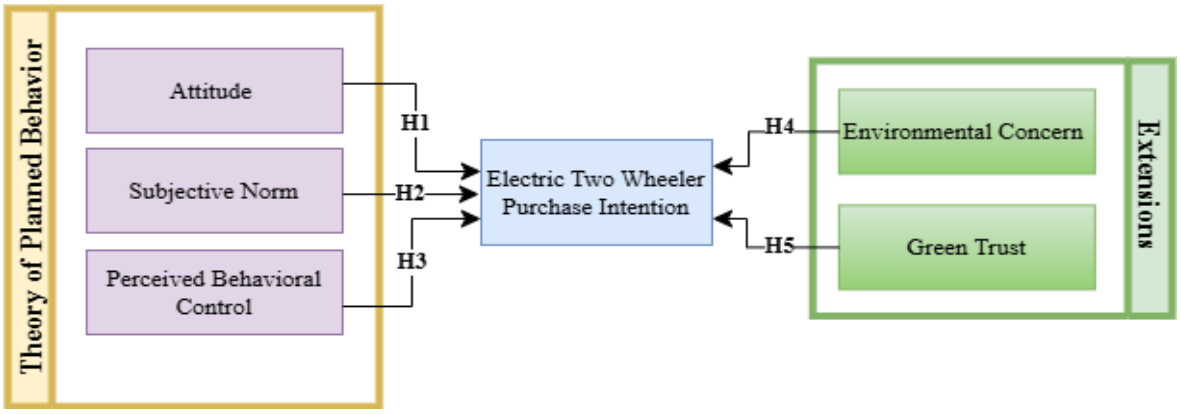


Figure 1: *Proposed Research Model*

METHODS

Study Design and Questionnaire Development

The research is descriptive in nature. It examines the behavioural factors influencing Electric Two-Wheeler Purchase Intentions (ETWPI) among university students in Kerala state, India. A structured questionnaire was used to gather primary data from 585 students at Calicut University, Mahatma Gandhi University, and the University of Kerala.

There were two sections in the data collection instrument. The participants' demographic information was gathered in the first segment, while the second section included measurement scales adapted from previous studies. The TPB constructs, including Att with 5 items, SuNo with 5 items, and PBC with 6 items, were adapted from Hamzah (2021) with a total of 16 items. The Environmental Concern (EnCo) scale was also sourced from Hamzah (2021) with four items. The Green Trust (GrTr) scale, with four items, was taken from Yadav (2019), while the ETWPI scale was derived from Shalender (2021), with three items. A 5-point Likert Scale, with 1 denoting "Strongly Disagree" to 5 denoting "Strongly Agree," was used as a measurement in the entire questionnaire. To guarantee content validity, management professors reviewed the scale, resulting in modest revisions to enhance clarity. A pilot test was conducted with 30 students consisting of 10 from Mahatma Gandhi University, 10 from University of Kerala, and 10 from Calicut University, and necessary refinements were made based on participants' feedback. Reliability results met the required thresholds in the literature, confirming the suitability of the scale (Appendix A).

Data Collection and Sampling

Data collection took place between October 2024 and November 2024. The population of this study included university students who are electric two-wheeler consumers in Kerala. Data collection was conducted from three major universities: University of Kerala, Mahatma Gandhi University, and University of Calicut. These institutions were purposively selected due to their prominent academic status and high student enrolment numbers. Though total student enrolment size was used to select Universities, it is not a core variable of interest regarding ETWPI; therefore, using a disproportionate stratified sampling method, an equal sample size of 200 students was drawn from each selected university (strata), resulting in a total sample of 600 respondents, of which 585 valid responses were retained after data cleaning. In addition, since the scope of the study is not interested in seeing the effect of gender on the ETWPI, it purposively avoids bias by keeping the proportion of gender disparity based on the data from the Kerala State Higher Education Council, 2024, which is on average the proportion of female and male higher education students consisted of 65%-68% female and 35-32% male. Since the minimum sample size for SEM is ten respondents per survey item, this study's sample size exceeded the requirement (Etikan, 2016). The response rate was 97.5 %, ensuring a robust dataset for further

Table 2: *Study Parameters and Sample Characteristics*

Study Parameters	Value
Time	October 2024 – November 2024
Location	Kerala, India
Sample Size	600
Valid responses	585
Response rate	97.5%

Source: *Authors' Own Compilation*

Data Analysis

To test the hypotheses and examine correlations between variables, a two-stage SEM approach was implemented following the methodology of Hair et al. (2021). In the first stage, the measurement model was evaluated by assessing indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. In the second stage, the structural model was assessed to examine the hypothesised relationships and evaluate the predictive capability of the proposed model. This methodological framework ensures a rigorous examination of the factors influencing ETWPI among university students in Kerala.

PLS-SEM was considered appropriate because the study sought to explain consumers' purchase intentions toward ETW while simultaneously examining multiple direct relationships among constructs. Moreover, the technique is well-suited for consumer behaviour research involving complex models and data that may not fully satisfy multivariate normality assumptions (Hair et al., 2019). The significance of path coefficients was assessed using a bootstrapping procedure with 10,000 resamples.

RESULTS

Participant Profile

The majority (65.8%) were female; this result accurately reflects the macro-

demographic framework of higher education in Kerala, which features a State Gender Parity Index (GPI) of 1.44 (Kerala State Higher Education Council [KSHEC], 2024), and 53.8% fell within the 20-25 age group. In terms of monthly income, 58.5% earned less than 20, 000 rupees. Regarding academic disciplines, 19.8% were from pure science, 25.3% from Applied Science, 20.7% from Arts, and 34.2% from Social Science. The participants were evenly distributed across the three universities, with 33.7% from the University of Kerala, 33.3 % were from the University of Calicut, and 33% from Mahatma Gandhi University.

Table 3: *Respondents' Demographic Results*

Participants Profile	Category	Frequency	Percentage (%)
Gender	Female	385	65.8
	Male	200	34.2
	Total	585	100
Age	20-25	315	53.8
	26-30	196	33.5
	Above 30	74	12.6
	Total	585	100
Income	<20000	342	58.5
	20001-50000	146	25
	50001-100000	72	12.3
	Above 100000	25	4.3
	Total	585	100
Stream	Pure Science	116	19.8
	Applied Science	148	25.3
	Arts	121	20.7
	Social Science	200	34.2
	Total	585	100
University	University of Kerala	197	33.7
	University of Calicut	195	33.3
	Mahatma Gandhi University	193	33
	Total	585	100

Source: *Primary Data*

Measurement Model Assessment

Using information gathered from the participants, first, we looked at the study's scale's validity and reliability. Adhering to the PLS-SEM evaluation framework (Hair et al., 2021), the measurement model was examined to verify indicator reliability, internal consistency reliability, convergent validity, and discriminant validity prior to structural model testing. As detailed in Table 4, all evaluation criteria were met, establishing robust reliability and validity across all constructs. Specifically, Attitude (ATT) yielded factor loadings between 0.82 and 0.86, a Cronbach's Alpha of 0.88, a Composite Reliability (CR) of 0.91, and an Average Variance Extracted (AVE) of 0.69, confirming high internal consistency and convergent validity. Subjective Norm (SuNo) reflected strong construct validity, with item loadings ranging from 0.84 to 0.86, Cronbach's Alpha of 0.90, CR of 0.93, and AVE of 0.73. Perceived Behavioral Control (PBC) similarly

Table 4: *Validity and Reliability Results*

Construct	Items	Factor Loading	Cronbach's Alpha	CR	AVE
Attitude (ATT)	ATT1	0.83	0.88	0.91	0.69
	ATT2	0.83			
	ATT3	0.82			
	ATT4	0.83			
	ATT5	0.86			
Subjective Norm (SuNo)	SuNo1	0.86	0.90	0.93	0.73
	SuNo2	0.86			
	SuNo3	0.86			
	SuNo4	0.85			
	SuNo5	0.84			
Perceived Behavioral Control (PBC)	PBC1	0.86	0.91	0.93	0.71
	PBC2	0.84			
	PBC3	0.84			
	PBC4	0.83			
	PBC5	0.83			
	PBC6	0.88			
Green Trust (GrTr)	GrTr1	0.86	0.88	0.92	0.75
	GrTr2	0.88			
	GrTr3	0.85			
	GrTr4	0.87			
Environmental Concern (EnCo)	EnCo1	0.85	0.88	0.91	0.74
	EnCo2	0.86			
	EnCo3	0.86			
	EnCo4	0.86			
ETWPI	ETWPI1	0.89	0.87	0.92	0.80
	ETWPI2	0.89			
	ETWPI3	0.90			

Note. CR = Composite Reliability; AVE = Average Variance Extracted. All constructs meet established reliability ($\alpha > 0.70$, CR > 0.70) and convergent validity (AVE > 0.50) thresholds (Hair et al., 2021).
Source: *Primary Data*

demonstrated sound measurement properties (loadings: 0.83–0.88, Cronbach's Alpha: 0.91, CR: 0.93, AVE: 0.71). Furthermore, Green Trust (GrTr) displayed loadings from 0.85 to 0.88, Cronbach's Alpha of 0.88, CR of 0.92, and AVE of 0.75, while Environmental Concern (EnCo) showed loadings between 0.85 and 0.86, Cronbach's Alpha of 0.88, CR of 0.91, and AVE of 0.74. Lastly, ETWPI exhibited factor loadings of 0.89–0.90, with a Cronbach's Alpha of 0.78, CR of 0.92, and AVE of 0.80, affirming solid reliability and validity. Across all constructs, factor loadings surpassed the 0.70 benchmark and AVE values exceeded 0.50, satisfying the requirements for convergent validity (Hair et al., 2019). Additionally, all Cronbach's Alpha and Composite Reliability estimates exceeded the 0.70 threshold, verifying internal consistency and providing a sound basis for hypothesis testing.

To evaluate the relationships between constructs and ascertain if they sufficiently differ from one another,

discriminant validity analysis was performed. Fornell-Larcker Criterion (FLC) applied to evaluate the discriminate validity of the scale (Fornell & Larcker, 1981). The findings demonstrated discriminant validity by showing that the square root of the AVE for each construct was greater than the correlations between the constructs (Fornell & Larcker, 1981; Hair, 2010). As presented in Table 5, all values highlighted were higher than the matching correlation values, demonstrating that the constructs were well-differentiated and that the scale met the required discriminant validity criteria.

Table 5: *Discriminant Validity and Correlation Matrix Results*

	ATT	ETWPI	EnCo	GrTr	PBC	SuNo
ATT	**0.832**					
ETWPI	0.458	**0.893**				
EnCo	0.033	0.177	**0.859**			
GrTr	0.077	0.149	0.013	**0.863**		
PBC	0.198	0.512	0.047	0.051	**0.845**	
SuNo	0.222	0.410	0.001	0.056	0.167	**0.854**

Note. Bold values along the diagonal represent the square root of the Average Variance Extracted (AVE) for each construct; off-diagonal values represent the inter-construct correlations. Att = Attitude; ETWPI = Electric Two-Wheeler Purchase Intention; EnCo = Environmental Concern; GrTr = Green Trust; PBC = Perceived Behavioural Control; SuNo = Subjective Norm.
Source: *Primary Data*

Structural Model Assessment and Hypothesis Testing

Lateral Collinearity and Model Fit

Following the established guidelines of Hair et al. (2021), lateral collinearity was established using the Variance Inflation Factor (VIF) derived from the inner model. A VIF value equal to or greater than 3.0 indicates potential multicollinearity issues that warrant structural adjustments. As detailed in Table 6, the inner VIF values for all predictor pathways ranged from 1.003 to 1.087 (specifically: 1.087 for ATT → ETWPI, 1.072 for SuNo → ETWPI, 1.061 for PBC → ETWPI, 1.003 for EnCo → ETWPI, and 1.008 for GrTr → ETWPI).

Because all estimated inner VIF values are well below the conservative threshold of 3.0, it is concluded that lateral multicollinearity does not pose a threat to the structural model estimation, ensuring that the subsequently calculated path coefficients are stable and reliable.

To evaluate overall structural model adequacy prior to path estimation, global goodness-of-fit was assessed alongside collinearity diagnostics. Within Partial Least Squares Structural Equation Modeling (PLS-SEM), the standardized root mean square residual (SRMR) serves as the primary metric for global fit, quantifying the discrepancy between empirical and model-implied covariance matrices (Henseler et al., 2016). Values below the 0.08 benchmark denote satisfactory model specification. The structural model yielded an SRMR of 0.038, comfortably below the standard threshold. This demonstrates excellent model-data fit, providing a statistically sound foundation to examine path coefficients, significance levels, and explanatory power (R2).

Assessment of Path Coefficient and Hypothesis Testing

Having established acceptable global model fit and the absence of lateral collinearity, the hypothesized structural relationships were evaluated. Following standard PLS-SEM procedures, a non-parametric bootstrapping routine with 10, 000 resamples was performed to generate standard errors, t-statistics, p-values, and 95% percentile confidence intervals for all paths estimated (Hair et al., 2021). The structural model assessment results are summarized in Table 6. The structural path analysis revealed that all five hypothesized direct relationships were positive and statistically significant, yielding empirical support for all hypotheses.

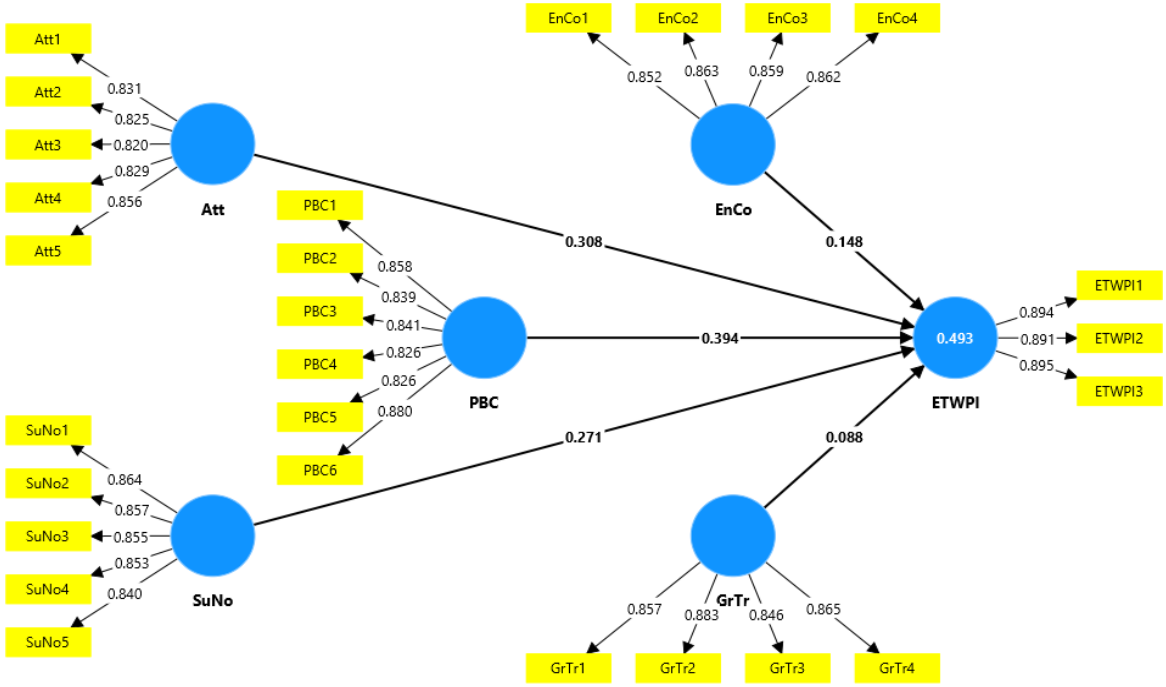


Figure 2: *Structural Model Evaluation (Item Loading, Path Coefficient, Construct R^2value)*

Note. Values on the arrows connecting the latent constructs (Blue Circles) represent standardized path coefficients (β). Values on the arrows pointing from constructs to the rectangular yellow boxes represent outer indicator loadings. Numbers inside the endogenous construct circle represent the coefficient of determination (R^2). EnCo = Environmental Concern; Att = Attitude; PBC = Perceived Behavioural Control; SuNo = Subjective Norm; GrTr = Green Trust; ETWPI = Electric Two Wheeler Purchase Intention. Significance was determined via a two-tailed bootstrapping procedure with 10,000 resamples ($P < .05$)

The direct path from Attitude (ATT) to Electric Two-Wheeler Purchase Intention (ETWPI) was found to be positive and statistically significant ($\beta = .30$, t = 8.956, $p < .001$, 95% CI [.238, .373]), thereby providing strong empirical support for H1. This suggests that positive consumer attitudes toward electric mobility directly translate into a higher intention to purchase electric two-wheelers. Similarly, the direct relationship hypothesized between Subjective Norm (SuNo) and ETWPI demonstrated a positive and statistically significant effect ($\beta = .27$, t = 7.798, $p < .001$, 95% CI [.201, .337]); hence, H2 was supported by the data, underscoring the role of social influence and subjective norms in shaping adoption

intentions. With respect to Perceived Behavioral Control (PBC), the structural analysis revealed a powerful direct effect on the primary target construct. Specifically, PBC exerted the strongest direct influence on ETWPI (β = .39, t = 11.954, p < .001, 95% CI [.331, .459]), strongly validating H3 and highlighting personal capability and resource availability as pivotal drivers in electric two-wheeler adoption decisions. Furthermore, Environmental Concern (EnCo) showed a positive and statistically significant direct impact on ETWPI (β = .14, t = 4.743, p < .001, 95% CI [.084, .205]), confirming the relationship proposed in H4. The direct path from Green Trust (GrTr) to ETWPI was positive and statistically significant (β = .08, t = 2.764, p < .01, 95% CI [.024, .148]),

offering empirical support for H5.

Table 6: *ETWPI Structural Model Findings*

Path	Path Coefficient	t-value	95% CI (LL and UL)	VIF	Decision
Att→ETWPI	.30	8.956**	[.238 - .373]	1.087	Supported
SuNo→ETWPI	.27	7.798**	[.201 - .337]	1.072	Supported
PBC→ ETWPI	.39	11.954**	[.331 - .459]	1.061	Supported
EnCo→ ETWPI	.14	4.743**	[.084 - .205]	1.003	Supported
GrTr→ ETWPI	.08	2.764**	[.024 - .148]	1.008	Supported

Note. ** = P < 0.01; Att = Attitude; ETWPI = Electric Two Wheeler Purchase Intention; EnCo = Environmental Concern; GrTr = Green Trust; PBC = Perceived Behavioural Control; SuNo = Subjective Norm; CI = Confidence Interval; LL = Lower Limit; UP = Upper Limit; VIF = Variance Inflation Factor

Source: *Primary Data*

Coefficient of Determination (R^2)

The explanatory power was evaluated using the coefficient of determination (R^2) to conclude the structural model assessment. The R^2 metric quantifies the proportion of variance in an endogenous construct accounted for by its antecedent variables, serving as a primary measure of the model's in-sample predictive capacity (Hair et al., 2019). The structural model demonstrated substantial explanatory capability for the target construct, explaining 49.30% of the total variance in Electric Two-Wheeler Purchase Intention (ETWPI R^2 = .493). According to established benchmark guidelines in consumer behavior and technology adoption research (Hair et al., 2021), an R^2 value approaching .50 reflects strong predictive power. This confirms that the conceptual framework, comprising Attitude (Att), Environmental Concern (EnCo), Green Trust (GrTr), Perceived Behavioral Control (PBC), and Subjective Norm (SuNo) provides a robust and statistically sound explanatory basis for university students' intention to purchase electric two-wheelers. The visual representation of the structural paths, item loading patterns, and overall variance explained is presented in Figure 2.

To better estimate the explanatory value of each exogenous variable in the model, the change in R^2 is estimated if a given exogenous construct is omitted from the model. This measure is referred to as effect size (f^2). The effect size is the measure of the influence of each independent variable on the dependent variable. In a PLS path model, when an

independent variable is excluded from the model, it measures the variation in squared correlation values and ascertains whether the excluded independent variable has a strong effect on the value of the dependent variable.

Table 7: *Explanatory Power*

Predictor(s)	Outcome	R Square	f Square	Q Square
Attitude	ETWPI	0.493	0.172	0.478
Subjective Norm			0.135	
Perceived Behavioural Control			0.289	
Environmental Concern			0.043	
Green Trust			0.015	

Source: *Primary Data*

The impact of a predictor variable is high at the structural level if f^2 is 0.35 and it is medium if $f^2$is 0.15 and small if f^2 is 0.02 (Cohen 1988). The model's f^2 (effect size) shows how much an exogenous latent variable contributes to an endogenous latent variable's R^2 value. In simple terms, effect size assesses the magnitude or strength of the relationship between the latent variables. The results (Table 7) revealed that the f-square effect size ranged from 0.015 (small) for GrTr to 0.289 (Medium) for PBC. Finally, the Q^2 value for the endogenous construct (ETWPI) was greater than zero (0.478), hence, predictive relevance was established.

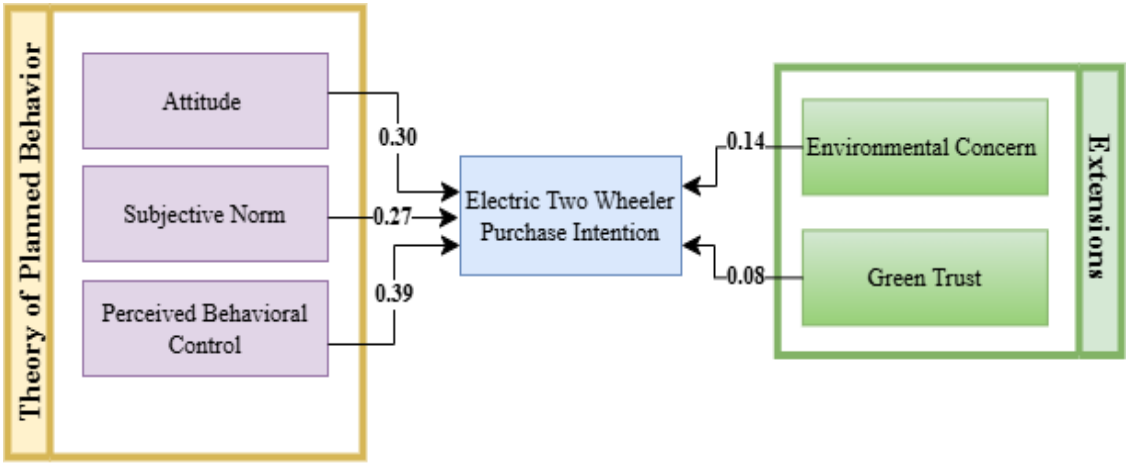


Figure 3: *Path Analysis Results*

DISCUSSION

This research aimed to examine the behavioural factors influencing the purchase intentions of electric two-wheelers (ETWPI) of university students in Kerala, India. Knowing the relatively slow acceptance of electric vehicles (EVs) in the Kerala market, the research adopted an Extended Theory of Planned Behaviour (TPB). TPB is a well-established model for understanding behavioural intentions. As a result, the model was adopted to better understand consumer intention related to the adoption of sustainable transportation technologies, particularly in the student demographic.

To ensure the model fit, both reliability and validity assessments were conducted.

The results of Cronbach's alpha, CR, and AVE demonstrated the instrument's effectiveness in precisely assessing ETWPI. Structural Equation Modelling (SEM) further validated the hypothesised relationships among the variables. These findings not only align with previous studies but also reflect a growing intention toward sustainable consumption behaviour among Kerala university students, thus supporting sustainability practice in Kerala state. In line with India's Sustainable Development Goals.

First, the hypothesis "H1: Attitude has a positive and significant effect on Electric Two-Wheeler Purchase Intention" (t value 8.956, which is > 2.58 and p value < 0.001) was supported. Our findings indicate that a one-unit increase in participants' attitudes (Att) towards ETWPI positively influences their ETWPI by 0.30 units. This result aligns with prior studies in the literature (Shalender et al., 2021; Vafaei-Zadeh, 2022).

Second, "H2: Subjective Norm has a positive and significant effect on Electric Two Wheel Purchase Intention" (t value 7.798, which is > 2.58, and p value < 0.001) was supported. The finding shows that Subjective Norm significantly influences ETWPI. This result aligns with the study result of Dutta, B. 2021. Still, some prior researchers have indicated that Subjective Norm has no significant influence on consumers' behavioural Intention (Yadav, R. 2019; Chen, S.-C. 2016). Being influenced by one's surroundings and experiencing pressure from outside sources is referred to as a subjective norm. The buying intention of ETWs was significantly positively impacted by external pressure for our participants.

Third, "H3: Perceived Behavioural Control has a positive and significant effect on Electric Two Wheeler Purchase Intention" (t value11.954, which is > 2.58 and p < 0.001) was supported. The result shows that ETWPI increased by 0.39 units for every unit increase in perceived behavioural control. This result is in line with earlier research in the literature (Shalender, K. 2021; Shalender, K. 2018). The challenges of buying ETW instead of traditional vehicles (habit changes, price comparisons, innovative actions, functional challenges, and psychological etc.) do not appear to stop consumers' thoughts, evaluations, or intentions for this behaviour, given the correlation between their PBC and ETWPI. PBC had the biggest effect on ETWPI out of all the parameters.

Fourthly, "H4: Environmental Concern has a positive and significant effect on Electric Two Wheeler Purchase Intentions" (t value is 4.743, which is > 2.58 and P < 0.01) was supported. The result shows that ETWPI is positively impacted by an increase of 0.14 units for every unit of Environmental Concern. This result adds to the existing literature by confirming earlier research that applied the TPB extended with Environmental Concern. We conducted a thorough review of the literature. Furthermore, our study supports Wang, M. et al.'s 2021 findings on environmental concern in China, which are relevant and justifiable for Kerla. In this sense, legislators ought to make an effort to increase public understanding of consumers' environmental duties and to voice environmental concerns.

The final hypothesis, "H5: Green Trust has a positive and significant effect on Electric Two Wheel Purchase Intention" (t value is

2.764, which is > 2.58 and p < 0.01), was supported. The study indicates that ETWPI increased by 0.08 units for each unit increase in Green Trust, which is in line with the results of Yadav, R. et al. 2019 and Wang, Y.M. 2022. Through this hypothesis, we were able to determine how Green Trust directly affects the intention to adopt ETWs. We have therefore illustrated a crucial connection that might be utilized to influence Kerala University students to embrace electric two-wheelers. Establishing a sense of ecological trust can help to increase the desire to purchase an electric two-wheeler.

Theoretical Implications

The goal of the study is to encourage the use of electric two-wheelers (ETWs), which are widely recognised for their role in promoting green energy usage and reducing environmental pollution, key priorities in Kerala's plan for sustainable development. Notably, this study goes beyond the conventional Theory of Planned Behaviour by integrating Environmental Concern (EnCo) and Green Trust (GrTr) to examine students' purchase intentions for Electric Two-Wheelers (ETWs) in Kerala, India. The researcher makes a substantial contribution to the existing body of knowledge on EV adoption by presenting this comprehensive model.

The findings lay the groundwork for future studies on ETW adoption, green energy, and sustainable development, not only in Kerala. First, the majority of the research related to ETWs predominantly focuses on developed countries, neglecting developing economies like India, specifically Kerala. By addressing this gap, our research provides valuable empirical evidence that can support scholars investigating this relationship in similar contexts. Second, although prior research on green product adoption highlights the positive and significant impact that Green Trust has on behavioural intentions, its direct impact on ETWPI, despite ETWs being classified as green products that utilize renewable energy and promote environmental sustainability, has not been previously explored. The findings bridge this gap, offering new insights on consumer trust in green mobility solutions.

Practical Implications

Practical insights given below, based on the findings for policymakers, industry leaders, and stakeholders, will have a significant help in designing effective incentives and awareness campaigns to accelerate electric two-wheeler (ETW) adoption. By promoting ETWs, this research contributes to reducing air pollution, lowering carbon footprints, protecting the environment, and decreasing Kerala's dependence on diesel, which is becoming increasingly costly. Integrating behavioral insights into EV adoption strategies enhances decision-making for authorities and stakeholders, fostering a more sustainable transportation ecosystem in Kerala.

The findings highlight the importance of raising awareness about environmentally sustainable transportation to encourage ETW adoption. Since trust in green products and environmental concern significantly impact purchasing decisions, marketing efforts should emphasize these aspects. Promotional campaigns, including print and digital advertisements, smartphone notifications, and public service announcements, can reinforce the environmental benefits of ETWs. By

effectively communicating their role in reducing fossil fuel dependency, consumer perceptions can be improved, ultimately boosting adoption. These insights support Kerala's sustainable development goals and provide a strategic direction for increasing ETW uptake.

Limitations and Future Research Directions

This study has limitations in spite of its empirical and theoretical contributions. The findings may only be applicable to customer segments with similar demographic characteristics. Additionally, since the research was conducted exclusively in Kerala, India, its applicability may be restricted to this specific region. Future studies may explore ETW adoption across different Indian states and demographic groups to have generalised perspective about the behaviour of ETW users. In addition, the sample was taken only from three universities, which will limit the generalizability of the findings. So, future studies may expand the sample by including other universities and make the results more comprehensive.

Applying the extended TPB model multiple times can yield more robust findings. Future studies could examine ETW adoption across diverse demographic groups within India or extend the framework by incorporating additional behavioral constructs. Cross-cultural comparisons with countries that share similar socio-economic characteristics could further enhance the understanding of ETW adoption dynamics. Expanding research in these directions would contribute to a broader perspective on sustainable mobility solutions.

The sample features a pronounced gender skew (65.8% female). While this distribution accurately reflects the baseline enrollment demographics across public universities in Kerala (KSHEC, 2024), it may limit the direct generalizability of the findings to more gender-balanced populations. Furthermore, because the data were pooled without a formal multi-group measurement invariance check across the gender strata, future research should implement multi-group analysis (MGA) to evaluate measurement invariance and explicitly compare the structural paths between male and female consumers.

CONCLUSION

This study examined the variables affecting the purchase intentions of Electric Two-Wheelers (ETWs) among university students in Kerala, India. By integrating Environmental Concern and Green Trust into the TPB, which includes "Attitude (Att), Perceived Behavioural Control (PBC), and Subjective Norm (SuNo)", the study gave us a broad understanding of ETW adoption. The findings contribute to Kerala's transition toward green energy by identifying key behavioural determinants and offering practical recommendations based on empirical evidence.

Li (2017) emphasized the need for further research regarding the association between attitude and EVPI. This study extends that perspective within the Kerala context, specifically focusing on ETW adoption. The results indicate that university students demonstrate greater adaptability in terms of PBC and Attitude toward ETWs. Notably, PBC emerged as the strongest predictor of ETWPI among the TPB constructs. Schiffman (2010)

suggested that an individual's attitude can be reshaped through positive societal perceptions. In this context, cultivating a favourable image of ETWs can enhance consumer attitudes in Kerala, thereby increasing adoption rates. Previous studies (Yadav et al., 2016; Petty et al., 1986) have shown that consumers tend to avoid extensive research when making purchasing decisions. Consequently, accurate and transparent communication from automotive industry executives and marketers regarding ETW benefits can mitigate misinformation and enhance consumer confidence. The findings also confirm that GrTr has a significant impact on students' ETWPI. Although the GrTr ETWPI relationship exhibited the lowest path coefficient, its significance remains crucial in ETWPI. A lack of Green Trust can lead to consumer uncertainty, making ETWPI more challenging. Prior research in green behavioural intention studies supports this finding. To address this issue and increase customer trust in ETWs, government authorities and marketers should implement appropriate communication strategies. Doubt increases perceived risks associated with ETWs, potentially hindering adoption. Applying effective communication strategies can help eliminate these uncertainties (Gunawan et al., 2022; Bandura, 1986).

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Author Contributions

Mr. Habtamu Kebede Worku: Conceptualization, Methodology, Data collection, Data curation, Formal analysis, Writing – original draft.

Dr. Ambeesh Mon S.: Conceptualization, Methodology, Supervision, Validation, review & editing.

Dr. K. S. Chandrasekar: Validating the research design, providing critical resource oversight, and participating in the high-level review and editing of the final manuscript.

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models are available from the corresponding author upon reasonable academic request.

Artificial Intelligence (AI) Usage Disclosure

The authors declare that generative artificial intelligence (AI) tools were used only to assist with language editing, grammar improvement, and manuscript formatting where necessary. All research activities, including study design, data collection, statistical analysis, interpretation of results, and scientific conclusions, were performed solely by the authors. The authors have carefully reviewed and take full responsibility for the accuracy, originality, and integrity of the submitted manuscript.

Appendix (A): Pre-Test Results of the Scale

Table A: *The Measurement Quality Evaluation*

Constructs	Cronbach's Alpha	CR	AVE
Att	0.926	0.94	0.74
PBC	0.947	0.95	0.77
SuNo	0.830	0.87	0.57
EnCo	0.762	0.84	0.57
GrTr	0.903	0.92	0.75
ETWPI	0.867	0.97	0.64