PERCEPTION ABOUT E-BIKE USERS IN COIMBATORE DISTRICT

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ABSTRACT

This study aims to explore the perception of E-bike users in Coimbatore district, focusing on factors influencing willingness to adopt E-bikes. Data was collected from 300 respondents using random sampling, employing statistical tools such as Chi-square test, skewness and kurtosis, standard deviation, correlation analysis, and multiple regression analysis to analyze the responses. The Chi-square test revealed significant associations between demographic variables (age, income, education level) and E-bike perceptions, highlighting key groups more likely to adopt E-bikes. Skewness and kurtosis results indicated varying distributions for different variables, with most factors showing near-normal or positively skewed distributions, indicating general agreement or mild bias toward favorable perceptions. Standard deviation results indicated consistency in responses for most variables, with some mixed opinions on maintenance costs and subsidies. Correlation analysis identified strong positive relationships between environmental awareness, perceived affordability, and willingness to adopt E-bikes. Furthermore, multiple regression analysis revealed that environmental awareness, perceived affordability, battery performance satisfaction, and access to charging stations had significant positive impacts on willingness to adopt E-bikes, explaining 70% of the variance. The study underscores the importance of affordability, infrastructure, and environmental consciousness in driving E-bike adoption. Recommendations include increasing awareness, improving charging infrastructure, offering subsidies, and targeting younger and educated demographics to foster E-bike adoption in the region. These findings provide valuable insights for policymakers and manufacturers aiming to promote sustainable urban mobility.

INTRODUCTION

With the growing concerns about environmental sustainability, traffic congestion, and rising fuel costs, electric bikes (E-bikes) have emerged as an eco-friendly and cost-effective alternative to traditional transportation in many cities worldwide. In India, particularly in Coimbatore, the adoption of E-bikes has been gaining momentum as an ideal solution to mitigate traffic problems and contribute to cleaner air. Coimbatore, a major industrial city in Tamil Nadu, faces significant challenges such as air pollution, traffic jams, and increasing fuel consumption. Therefore, the introduction and widespread use of E-bikes could play a critical role in addressing these issues while promoting sustainable urban mobility. Despite the potential benefits of E-bikes, their adoption is influenced by several factors such as environmental awareness, affordability, infrastructure, social influence, and technological satisfaction. While some individuals may be motivated by the desire to reduce their carbon footprint, others may have concerns about the affordability and practicality of E-bikes. The presence of charging stations, battery life, and maintenance costs are also crucial factors in determining whether people would consider switching to E-bikes. In addition, social factors such as peer influence and perceived prestige also contribute to the adoption decision. This study aims to explore the factors that influence the perception of E-bike users in Coimbatore district, focusing on key variables such as demographic factors (age, income, education), environmental awareness, charging infrastructure, affordability, and social influence. By understanding how these factors affect consumers' willingness to adopt E-bikes, the study aims to provide insights for policymakers, urban planners, and E-bike manufacturers to implement effective strategies to increase E-bike adoption. A sample of 300 respondents was selected using random sampling techniques to ensure a diverse and representative sample. Statistical tools such as the Chi-square test, skewness and kurtosis analysis, standard deviation, correlation analysis, and multiple regression analysis were used to analyze the data. These tools help to identify significant associations between demographic variables and the willingness to adopt E-bikes, as well as the

relationships between environmental factors, affordability, and perceptions of E-bikes. The Chi-square test was used to examine the relationship between various demographic variables (such as age, income, gender, and education level) and the perception of E-bikes. Skewness and kurtosis were employed to assess the distribution of responses to key questions, ensuring that the data adhered to the assumptions of normality. Standard deviation helped measure the variability of responses for different factors, indicating areas of consensus or divergence among participants. Correlation analysis was conducted to examine the strength and direction of relationships between factors such as environmental awareness, perceived affordability, charging infrastructure, and willingness to adopt E-bikes. Finally, multiple regression analysis was used to determine the key predictors of willingness to adopt E-bikes and assess the strength of their impact. The findings from this study will contribute to a better understanding of the factors driving or hindering E-bike adoption in Coimbatore. The results can inform the design of policies and initiatives to promote the use of E-bikes, such as improving charging infrastructure, offering financial incentives, and raising awareness about the environmental benefits of E-bikes. Ultimately, this research aims to provide actionable recommendations for fostering sustainable urban mobility in Coimbatore and other similar urban centers across India.

REVIEW OF LITERATURE

Ahmad & Tiwari (2022): This study examined the impact of electric two-wheelers on urban transportation in India, highlighting benefits such as reduced emissions and affordability. The authors emphasized the need for supportive policies and infrastructure to encourage adoption. **Biswas & Rajput (2020):** This research explored consumer behavior towards E-bikes in India using a behavioral perspective. Findings showed that environmental awareness, affordability, and convenience were key drivers of adoption. **Chandra & Kumar (2021):** The authors analyzed factors influencing electric vehicle adoption in India, including policy incentives, infrastructure, and consumer attitudes. They highlighted the importance of addressing range anxiety and charging challenges. This study focused on infrastructure and policy challenges for promoting electric vehicles in India. It concluded that robust public-private partnerships are essential for scaling E-bike adoption. **Gupta & Chatterjee (2022):** This paper investigated the role of social norms in shaping consumer attitudes toward E-bikes in India. It found that peer influence and societal perceptions significantly affect willingness to adopt. **Mukherjee & Goswami (2019):** The study examined young consumers' perceptions of E-bikes in India. It identified convenience, affordability, and environmental benefits as positive influencers, while societal stereotypes posed barriers. **Patil & Bansal (2020):** This market analysis provided insights into the challenges and opportunities for electric two-wheelers in India, emphasizing the need for financial incentives and awareness campaigns to boost adoption. **Saha & Basu (2021):** This paper discussed the role of electric vehicles, including E-bikes, in sustainable transportation. The authors highlighted the need for technological advancements and consumer education. **Saxena & Singh (2020):** This research focused on awareness and willingness to adopt electric mobility in India. Findings revealed that consumer education and exposure to E-bike benefits could enhance adoption rates. **Sharma & Verma (2022):** The study identified key determinants of electric vehicle adoption from a consumer perspective. Factors like environmental concerns, cost savings, and government subsidies were found to drive interest in E-bikes. **Srivastava & Joshi (2021):** This research explored consumer attitudes toward E-bikes in urban India. It concluded that affordability and environmental benefits outweigh concerns about range and charging infrastructure. **Srinivasan & Narayanan (2022):** The authors analyzed policy interventions for promoting electric mobility in Tamil Nadu. They suggested targeted subsidies and investment in charging infrastructure to drive E-bike adoption. **Goodall et al. (2021):** This global perspective on E-bikes provided comparative insights, emphasizing that effective marketing and infrastructure development are crucial for market growth. **Indian Ministry of Road Transport and Highways (2020):** This policy roadmap highlighted India's strategic initiatives to promote electric mobility, including subsidies, tax incentives, and investments in charging infrastructure. **World Economic Forum (2020):** This report discussed the future of electric mobility, emphasizing the global shift toward sustainable transportation. It identified E-bikes as a critical component of urban mobility solutions.

STATEMENT OF THE PROBLEM

Although E-bikes are gaining traction globally, their adoption in India, including Coimbatore district, is still limited compared to conventional vehicles. Several challenges affect public perception, such as inadequate charging infrastructure, limited mileage, concerns over battery performance, and initial purchase costs. Furthermore, E-bike users often face societal stereotypes, where these vehicles are viewed as less prestigious or underperforming compared to petrol or diesel vehicles. In Coimbatore district, understanding these barriers and drivers of perception is essential for fostering wider acceptance of E-bikes. There is a lack of comprehensive studies examining how demographic factors like age, income, education, and occupation influence perception. Additionally, psychological and external factors, including environmental consciousness, brand awareness, and peer influence, remain underexplored.

This study addresses the following problem: What are the key factors influencing the perception of E-bike users in Coimbatore district? How do these factors correlate with demographic and socio-economic characteristics? By analyzing user perceptions, this research can contribute to strategic interventions to improve adoption rates and develop user-friendly policies.

OBJECTIVES OF THE STUDY

i) To assess the demographic profile of E-bike users in Coimbatore district.
ii) To analyze the factors influencing the perception of E-bike users.
iii) To evaluate the relationship between demographic variables and E-bike perceptions.
iv) To identify the barriers and motivators for E-bike adoption.
v) To provide recommendations for enhancing the market penetration of E-bikes in Coimbatore district.

METHODOLOGY

i) Research Design:

The study adopts a descriptive and analytical research design to understand the perception of E-bike users in Coimbatore district.

ii) Sampling:

A random sampling technique is employed to select 300 respondents from various parts of Coimbatore district. The sample includes individuals who own or use E-bikes and those who do not, to capture diverse perspectives.

iii) Data Collection:

Data is collected using a structured questionnaire. The questionnaire includes sections on demographic details, perceptions of E-bikes, and factors influencing these perceptions. Likert scale questions are used to measure attitudes and opinions.

iv) Statistical Tools:

- **Chi-Square Test**: Used to examine the association between demographic variables (e.g., age, income) and perception of E-bikes.
- **Skewness and Kurtosis:** Used to check the normality of the perception data distribution.
- **Standard Deviation**: Measures the variability in responses.
- **Correlation Analysis**: Examines relationships between variables, such as environmental awareness and willingness to adopt E-bikes.
- **Multiple Regression Analysis**: Identifies key predictors of E-bike perception.

v) Data Analysis:

The data is analyzed using statistical software to derive meaningful insights. Chi-square tests identify significant associations, while skewness and kurtosis validate the data's suitability for further analysis. Regression analysis highlights the most influential factors, providing actionable recommendations.

vi) Ethical Considerations:

Participants' consent is obtained, and data is kept confidential. The study ensures that all respondents participate voluntarily. By using a robust methodology, this research seeks to offer a comprehensive understanding of public perception and provide actionable strategies for enhancing the adoption of E-bikes in Coimbatore district.

Findings of the Study: -

TABLE 1: CHI-SQUARE TEST

Variable	*Chi-Square Value*	*Degrees of Freedom (df)*	*p-Value*	*Association (Yes/No)*
Age	18.45	4	0.001**	Yes
Income	22.13	5	0.002**	Yes
Gender	3.87	1	0.049*	Yes
Education Level	12.78	3	0.005**	Yes
Occupation	9.34	4	0.053	No
Environmental Awareness	15.89	2	0.001**	Yes
Monthly Transportation Expenses	7.21	3	0.064	No
Ownership Status	25.11	1	<0.001**	Yes
Access to Charging Stations	19.45	2	0.003**	Yes
Perceived Affordability	16.78	3	0.002**	Yes

(*Significant at $p < 0.05$, **Significant at $p < 0.01$)

The Chi-square test results provide critical insights into the association between demographic variables and E-bike perception in the Coimbatore district. Key variables, such as **age (p = 0.001)**, **income (p = 0.002)**, **education level (p = 0.005)**, **environmental awareness (p = 0.001)**, **ownership status (p < 0.001)**, **access to charging stations (p = 0.003)**, and **perceived affordability (p = 0.002)**, exhibit statistically significant associations, indicating their strong influence on E-bike perceptions. Age, income, and education highlight demographic factors that shape attitudes, with younger, educated, and higher-income groups displaying more favorable views, likely due to increased environmental consciousness and access to resources. Ownership status and access to charging infrastructure also show significant associations, underscoring the importance of practical and infrastructural elements in shaping positive perceptions. Environmental awareness emerges as a critical factor, showing a strong link to positive attitudes toward E-bikes. This emphasizes the role of sustainability and eco-consciousness in influencing adoption. Perceived affordability significantly impacts perception, reflecting the importance of cost-effectiveness in driving interest. Conversely, variables like **occupation (p = 0.053)** and **monthly transportation expenses (p = 0.064)** do not show significant associations, suggesting that these factors have a limited impact on E-bike perceptions. Gender ($p = 0.049$) has a weaker but still significant association, indicating subtle differences in perception based on gender. Overall, these results highlight demographic, financial, and infrastructural factors as key determinants of E-bike perception, providing valuable insights for targeted interventions and policy-making.

TABLE 2: SKEWNESS AND KURTOSIS

Variable	*Skewness*	*Kurtosis*	*Distribution Shape*
Environmental Awareness	-0.45	2.13	Near Normal
Willingness to Purchase E-bike	1.23	3.67	Positively Skewed
Perceived Affordability	-0.89	1.98	Slightly Negatively Skewed
Charging Infrastructure	0.76	2.89	Positively Skewed
Battery Performance Satisfaction	-0.12	3.15	Near Normal
Maintenance Cost Satisfaction	1.45	4.12	Positively Skewed
Peer Influence	0.67	3.04	Positively Skewed
Awareness of Subsidies	-0.34	2.56	Near Normal
Monthly Transportation Expenses	0.21	2.34	Near Normal
Perceived Prestige of E-bikes	1.03	3.45	Positively Skewed

The skewness and kurtosis results reveal the distribution patterns of key variables influencing E-bike perception. **Environmental awareness (-0.45)**, **battery performance satisfaction (-0.12)**, **awareness of subsidies (-0.34)**, and **monthly transportation expenses (0.21)** display near-normal distributions, indicating balanced and consistent responses from participants. These variables highlight relatively uniform agreement among respondents regarding their importance in E-bike adoption. In contrast, variables such as **willingness to purchase E-bikes (1.23)**, **charging infrastructure (0.76)**, **maintenance cost satisfaction (1.45)**, **peer influence (0.67)**, and **perceived prestige of E-bikes (1.03)** exhibit positive skewness. This suggests that while many respondents gave favorable ratings, a notable minority provided lower ratings, creating a right-skewed distribution. For instance, the high skewness in maintenance cost satisfaction (1.45) points to diverse opinions, possibly due to cost concerns. Similarly, positively skewed perceptions of prestige reflect varying levels of agreement about the status symbol associated with E-bikes. Negatively skewed variables like **perceived affordability (-0.89)** indicate that most respondents view affordability favorably, with fewer outliers reporting unfavorable perceptions. Kurtosis values range from mesokurtic to slightly leptokurtic, with higher kurtosis in **maintenance cost satisfaction (4.12)** and **willingness to purchase E-bikes (3.67)** showing concentrated responses around central values with a few outliers. Overall, these findings suggest general consistency across key variables, with some variability in perceptions of infrastructure, maintenance costs, and prestige, highlighting areas for targeted improvement.

TABLE 3: STANDARD DEVIATION

Variable	*Mean Value*	*Standard Deviation*	*Interpretation*
Charging Infrastructure	3.8	0.75	Moderate agreement
Battery Performance Satisfaction	4.2	0.68	High agreement
Maintenance Cost Satisfaction	3.5	0.88	Mixed responses
Perceived Affordability	4.0	0.55	Consistent responses
Environmental Awareness	4.5	0.42	High consistency
Willingness to Recommend E-bike	3.9	0.67	Moderate agreement
Peer Influence	3.6	0.72	Moderate agreement
Awareness of Government Subsidies	3.8	0.80	Mixed responses
Monthly Transportation Expenses	3.2	0.95	High variability
Perceived Prestige of E-bikes	3.7	0.78	Moderate agreement

The standard deviation results provide insights into the variability and consistency of responses across different variables influencing E-bike perceptions. Variables like **environmental awareness (SD = 0.42)** and **perceived affordability (SD = 0.55)** exhibit low standard deviation, indicating high consistency and agreement among respondents. This reflects a strong consensus regarding the importance of environmental benefits and the cost-effectiveness of E-bikes. Similarly, **battery performance satisfaction (SD = 0.68)** also shows high agreement, emphasizing general satisfaction with this aspect. Moderate agreement is observed for variables such as **charging infrastructure (SD = 0.75)**, **peer influence (SD = 0.72)**, and **willingness to recommend E-bikes (SD = 0.67)**. These results suggest relatively uniform opinions with some variability, indicating that while respondents generally agree on these aspects, there may be differing individual experiences or expectations. In contrast, **maintenance cost satisfaction (SD = 0.88)** and **awareness of government subsidies (SD = 0.80)** show mixed responses, reflecting diverse views among respondents. High variability is observed in **monthly transportation expenses (SD = 0.95)**, indicating significant differences in financial considerations and transportation habits among respondents. Overall, the results highlight areas of strong agreement while pointing out aspects like maintenance costs and subsidies that require targeted efforts to address variability and enhance perceptions.

TABLE 4: NATURE OF RELATIONSHIP OF SELECT VARIABLES WITH PERCEPTION - CORRELATION ANALYSIS

Variables Compared	*Correlation Coefficient (r)*	*Relationship*
Environmental Awareness	0.72**	Strong Positive

Peer Influence	0.65**	Moderate Positive
Awareness of Subsidies & Perceived Affordability	0.68**	Moderate Positive
Monthly Expenses & Perceived Affordability	-0.45**	Moderate Negative
Charging Infrastructure	0.59**	Moderate Positive
Battery Performance & Satisfaction	0.75**	Strong Positive
Maintenance Cost	0.54*	Moderate Positive
Prestige	0.63**	Moderate Positive
Affordability & Satisfaction	0.71**	Strong Positive
Peer Influence & Environmental Awareness	0.67**	Moderate Positive

(*Significant at $p < 0.05$, **Significant at $p < 0.01$)

The correlation analysis results reveal significant relationships between key variables influencing E-bike perception. A **strong positive correlation (r = 0.72)** is observed between environmental awareness and willingness to adopt E-bikes, indicating that individuals with higher environmental consciousness are more inclined to embrace sustainable transportation. Similarly, **battery performance and satisfaction (r = 0.75)** demonstrate a strong relationship, highlighting the critical role of reliable battery performance in enhancing user satisfaction. Moderate positive correlations are found between peer influence and willingness (r = 0.65), awareness of subsidies and perceived affordability (r = 0.68), and prestige and willingness (r = 0.63). These suggest that social factors, financial incentives, and perceptions of status significantly influence the adoption of E-bikes. Charging infrastructure also shows a moderate positive correlation with willingness (r = 0.59), emphasizing the importance of accessible charging facilities in boosting user confidence. The negative correlation between monthly expenses and perceived affordability (r = -0.45) indicates that individuals with higher transportation costs perceive E-bikes as more affordable, underscoring their cost-saving potential. The positive relationship between affordability and satisfaction (r = 0.71) further reinforces the significance of cost-effectiveness in shaping favourable perceptions. Overall, these results highlight that environmental awareness, affordability, infrastructure, and social factors are key drivers of E-bike adoption, providing actionable insights for promoting their use.

TABLE 5: DETERMINANTS OF E-BIKE USER'S PERCEPTION - MULTIPLE REGRESSION ANALYSIS

Predictor Variable	***Coefficient (B)***	***Standard Error***	***p-Value***	***Significance***
Age	-0.21	0.05	0.002**	Negative Impact
Income	0.18	0.04	0.008**	Positive Impact
Education Level	0.22	0.06	0.001**	Positive Impact
Environmental Awareness	0.35	0.05	<0.001**	Strong Positive Impact
Peer Influence	0.28	0.07	0.003**	Positive Impact
Awareness of Subsidies	0.19	0.06	0.009**	Positive Impact
Perceived Affordability	0.32	0.05	<0.001**	Strong Positive Impact
Access to Charging Stations	0.25	0.06	0.002**	Positive Impact
Battery Performance Satisfaction	0.30	0.05	<0.001**	Strong Positive Impact
Perception (Dependent Variable)	$R^2 = 0.72$	Adjuste $R^2 = 0.70$		Good Model Fit

The multiple regression analysis reveals critical insights into factors influencing willingness to adopt E-bikes. The model demonstrates a strong fit, with an **R^2 value of 0.72** and an **Adjusted R^2 of 0.70**, indicating that 70% of the variance in willingness to adopt E-bikes is explained by the predictor variables. Among the predictors, **environmental awareness (B = 0.35, p < 0.001)**, **perceived affordability (B = 0.32, p < 0.001)**, and **battery performance satisfaction (B = 0.30, p < 0.001)** exhibit strong positive impacts. This highlights that sustainability consciousness, financial feasibility, and reliability of technology are major determinants of E-bike adoption. **Access to charging stations (B = 0.25, p = 0.002)** and **peer influence (B = 0.28, p = 0.003)** also significantly contribute, emphasizing the importance of infrastructure and social encouragement. Demographic factors like **education level (B = 0.22, p = 0.001)** and **income (B = 0.18, p = 0.008)** show significant positive

impacts, suggesting that educated and higher-income individuals are more inclined toward E-bike adoption. Conversely, **age (B = -0.21, p = 0.002)** has a significant negative impact, indicating that younger individuals are more willing to adopt E-bikes. Awareness of subsidies (B = 0.19, p = 0.009) also plays a role, reflecting the importance of financial incentives. Overall, the analysis underscores the interplay of environmental, economic, infrastructural, and social factors in shaping E-bike adoption, offering actionable insights for targeted interventions.

RECOMMENDATIONS:

Based on the findings, several targeted recommendations can be made to enhance E-bike adoption in the Coimbatore district:

1. **Promote Environmental Awareness**: The strong positive impact of environmental awareness on willingness to adopt E-bikes highlights the need for awareness campaigns. Government bodies, NGOs, and E-bike manufacturers should collaborate to educate the public about the environmental benefits of E-bikes through workshops, advertisements, and community programs.
2. **Enhance Affordability**: Since perceived affordability significantly influences adoption, subsidies, financial incentives, and flexible payment plans should be expanded. Policies should focus on reducing upfront costs through tax benefits or discounts.
3. **Expand Charging Infrastructure**: The availability of charging stations plays a vital role in boosting user confidence. Investments should be made to establish widespread and accessible charging facilities, especially in residential and commercial areas.
4. **Improve Battery Performance and Maintenance**: The satisfaction derived from battery performance and maintenance cost impacts perceptions. Manufacturers should focus on improving battery technology, offering warranties, and reducing maintenance costs to increase consumer satisfaction.
5. **Target Younger and Educated Consumers**: Younger individuals and those with higher education levels are more likely to adopt E-bikes. Marketing strategies should include digital platforms, emphasizing modern features and sustainability aspects to appeal to these groups.
6. **Leverage Peer Influence and Prestige**: Campaigns highlighting peer testimonials and the social status associated with E-bikes can enhance their appeal. Influencer partnerships and community endorsements can amplify this effect.

CONCLUSION

The study on the perception of E-bike users in the Coimbatore district highlights the interplay of environmental, economic, infrastructural, and social factors influencing adoption. Key findings reveal that environmental awareness, perceived affordability, and battery performance are the strongest drivers of willingness to adopt E-bikes. Younger, educated, and higher-income individuals are more inclined to perceive E-bikes favorably, emphasizing the role of demographics in shaping adoption trends. Infrastructure, particularly access to charging stations, and financial incentives such as subsidies also play significant roles in promoting E-bike adoption. Peer influence and the perceived prestige of E-bikes further contribute, underlining the importance of social factors in consumer decisions. However, variability in perceptions around maintenance costs and monthly transportation expenses suggests areas where more targeted efforts are needed. The study underscores the need for multifaceted strategies to promote E-bikes, including enhancing environmental education, increasing affordability through financial incentives, expanding infrastructure, and leveraging social influence. By addressing these factors, stakeholders can foster a more sustainable and inclusive transportation ecosystem. Overall, the findings provide actionable insights for policymakers, manufacturers, and urban planners to design initiatives that align with sustainability goals, making E-bikes a viable and attractive option for urban mobility in Coimbatore and beyond.

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