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Factors Influencing Consumer Adoption of Eco-Friendly Two-Wheelers in Warangal Tri-Cities: A Study

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Abstract:
The rising focus on environmental sustainability, escalating fuel costs, and mounting urban congestion have heightened the demand for eco-friendly transportation options in India. Among personal mobility solutions, two-wheelers remain the most prevalent, particularly in tier-II cities. Electric scooters and motorcycles, as eco-friendly alternatives, present a viable and sustainable substitute for conventional petrol-powered vehicles. This research explores the determinants influencing consumer adoption of eco-friendly two-wheelers within the Warangal tri-cities of Telangana—Warangal, Hanamkonda, and Kazipet. Key dimensions examined include environmental consciousness, economic viability, government incentives, technological advancements, and social influence. Based on primary data collected through a structured questionnaire and supplemented by secondary sources, the findings indicate that heightened environmental awareness, reduced operating expenses, and supportive policy measures significantly drive adoption. Conversely, high upfront costs and insufficient charging infrastructure continue to pose substantial challenges. The study offers valuable implications for policymakers, manufacturers, and marketers seeking to advance sustainable urban mobility in emerging urban centers.

Keywords: Consumer Adoption, Eco-Friendly Two-Wheelers, Electric Vehicles, Sustainable Mobility, Warangal Tri-Cities

1. Introduction:

Sustainable transportation has become an urgent global priority in response to escalating environmental pollution, intensifying climate change concerns, and the continued reliance on fossil fuels. The transportation sector is widely recognized as a dominant contributor to greenhouse gas emissions, with India's urban mobility patterns—particularly the prevalence of two-wheelers—playing a significant role in this challenge. As cities expand and commuting demands grow, the transition toward eco-friendly two-wheelers is not merely a technological shift but a critical pathway to reducing ecological footprints and aligning with broader sustainable development goals.

Within this context, the Warangal tri-cities in Telangana present a compelling case study. Characterized by rapid urbanization, increasing population density, and the presence of diverse educational and commercial establishments, the region exemplifies the dynamics of a semi-urban

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environment undergoing transformation. These socio-economic and infrastructural developments create fertile ground for examining consumer adoption behavior toward eco-friendly two-wheelers. Understanding the factors that influence purchase decisions—ranging from environmental awareness and cost considerations to technological trust and social influence—can provide valuable insights into how sustainable mobility solutions can be effectively promoted in similar semi-urban regions across India.

2. Review of Literature:

Several studies on green consumer behavior indicate that environmental awareness and perceived environmental benefits significantly influence consumers' adoption of eco-friendly products. Research on electric vehicle adoption highlights the importance of economic benefits such as fuel savings and reduced maintenance costs in shaping consumer decisions.

Previous studies in the Indian context suggest that government incentives, technological reliability, and social influence play a positive role in encouraging electric two-wheeler adoption. However, barriers such as high upfront costs, lack of charging infrastructure, and concerns regarding battery life continue to limit widespread adoption, particularly in tier-II and tier-III cities.

Literature also emphasizes the role of demographic variables such as age, education, and income level in influencing adoption behavior, with younger and more educated consumers showing greater acceptance of eco-friendly mobility solutions.

3. Objectives of the Study:

The present study aims to achieve the following objectives:

1. To analyze the level of awareness regarding eco-friendly two-wheelers among consumers in Warangal tri-cities.
2. To identify the key factors influencing consumer adoption of eco-friendly two-wheelers.
3. To examine the barriers affecting the adoption of eco-friendly two-wheelers.
4. To provide suggestions for promoting eco-friendly two-wheeler adoption in the study area.

4. Research Methodology:

The study adopts a **descriptive research design**.

- **Primary Data:** Collected through a structured questionnaire administered to consumers in Warangal, Hanamkonda, and Kazipet.
- **Secondary Data:** Collected from academic journals, government reports, industry publications, and online resources related to eco-friendly vehicles and consumer behavior.

Sampling Technique: Convenience sampling

Sample Size: 120 respondents

Tools for Analysis: Percentage analysis and descriptive interpretation

5. Factors Influencing Consumer Adoption:

5.1 Environmental Awareness and Concern:

Environmental awareness is a significant factor influencing consumer adoption. Consumers who are conscious of air pollution and climate change show a stronger preference for eco-friendly two-wheelers as they perceive them as a responsible and sustainable choice.

5.2 Economic Considerations:

Lower operating and maintenance costs of eco-friendly two-wheelers compared to petrol-driven vehicles positively influence adoption. However, high initial purchase cost acts as a major deterrent for price-sensitive consumers.

5.3 Government Incentives and Policies:

Government subsidies, tax benefits, and supportive policies play an important role in encouraging adoption. Awareness of such incentives enhances consumers' willingness to consider eco-friendly two-wheelers.

5.4 Technological Factors:

Technological aspects such as battery life, charging time, vehicle range, and reliability significantly affect consumer confidence. Limited charging infrastructure and concerns over battery replacement costs remain critical challenges.

5.5 Social Influence:

Social factors, including peer influence, family recommendations, and social image, positively impact adoption, especially among younger consumers who view eco-friendly two-wheelers as modern and innovative.

6. Data Analysis and Interpretation:

Table 1: Demographic Profile of the Sample Respondents:

Particulars	Category	No. of Respondents	Percentage
Gender	Male	78	65
	Female	42	35
Total		120	100
Age	Below 30 years	52	43
	31–40 years	38	32
	Above 40 years	30	25
Total		120	100
Education	Graduate	56	47
	Postgraduate	44	37
	Others	20	16
Total		120	100

Source: Primary Data Collected through questionnaire.

Interpretation:

The table shows that the majority of respondents are male (65%) and below 30 years of age (43%). Graduates and postgraduates together constitute 84%, indicating that educated consumers dominate the sample and are more likely to be aware of eco-friendly mobility solutions.

Table 2: Awareness Level of Eco-Friendly Two-WheelersBy the respondents:

Awareness Level	Respondents	Percentage
High	46	38
Moderate	52	43
Low	22	19
Total	**120**	**100**

Source: Primary Data Collected through questionnaire.

Interpretation:

A significant proportion of respondents (81%) have moderate to high awareness of eco-friendly two-wheelers. This reflects increasing exposure through advertisements, social media, and government initiatives.

Table 3: Factors Influencing Adoption of Eco-Friendly Two-WheelersBy the respondents:

Factors	Respondents Agreeing	Percentage
Environmental Concern	88	73
Low Operating Cost	82	68
Government Subsidies	76	63
Technological Advancement	64	53
Social Influence	58	48

Source: Primary Data Collected through questionnaire.

Interpretation:

Environmental concern is the most influential factor (73%), followed by low operating cost (68%). Government subsidies also play a vital role in encouraging adoption, indicating the importance of policy support.

Table 4: Barriers to Adoption of Eco-Friendly Two-WheelersBy the respondents:

Barriers	Respondents	Percentage
High Initial Cost	86	72
Lack of Charging Infrastructure	80	67
Battery Life Concerns	70	58
Limited-Service Centres	60	50

Source: Primary Data Collected through questionnaire.

Interpretation:

High initial cost and lack of charging infrastructure are the most significant barriers. Battery and service-related concerns further reduce consumer confidence, particularly among middle-income groups

Table 5: Willingness to Adopt Eco-Friendly Two-WheelersBy the respondents:

Response	Respondents	Percentage
Willing	68	57
Not Willing	32	27
Undecided	20	16
Total	**120**	**100**

Source: Primary Data Collected through questionnaire.

Interpretation:

More than half of the respondents (57%) are willing to adopt eco-friendly two-wheelers, indicating strong future market potential if existing barriers are addressed.

6. Findings:

1. Majority of respondents are young and educated consumers.
2. Awareness levels are reasonably high in Warangal tri-cities.
3. Environmental concern and economic benefits drive adoption.
4. High initial cost and inadequate charging infrastructure are major barriers.
5. A positive willingness toward adoption exists among consumers.

7. Suggestions:

- Expansion of charging infrastructure in tri-cities

- Reduction in initial cost through subsidies and financing schemes
- Awareness campaigns highlighting long-term savings
- Improvement in battery technology and service support

8. Conclusion:

The study concludes that eco-friendly two-wheeler adoption in Warangal tri-cities is gaining momentum due to rising environmental awareness and economic benefits. However, infrastructural and cost-related challenges continue to restrict mass adoption. Strategic policy intervention, technological improvements, and consumer awareness programs are essential to promote sustainable urban mobility.

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