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Customer Adoption and Preferences in Green Transportation: An Empirical Study

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Abstract

This empirical study investigates customer adoption and preferences regarding green transportation, with a particular focus on managerial and policy implications. Using primary survey data, the research examines how factors such as environmental awareness, cost efficiency, convenience, and the availability of infrastructure influence adoption decisions. The findings reveal that while environmental concern motivates consumer interest, economic incentives and perceived usability play equally critical roles in shaping adoption behaviour. Consumers are more likely to embrace green transportation options when they perceive tangible benefits, such as cost savings, ease of use, and reliable accessibility. The study further highlights the importance of targeted communication strategies, user-friendly platforms, and supportive infrastructure in encouraging sustainable mobility choices. These insights provide actionable guidance for businesses seeking to enhance customer engagement and for policymakers aiming to design effective

interventions that accelerate the transition to low-emission transport systems. Importantly, the results suggest that efforts in promoting green transportation are moving in the right direction, as increasing awareness, improved infrastructure, and strategic incentives are positively influencing adoption trends. By addressing both behavioural and structural factors, stakeholders can reinforce the momentum toward more sustainable urban mobility. Overall, this research contributes to a deeper understanding of consumer behaviour in the context of environmentally friendly transportation and underscores the potential for coordinated strategies to foster widespread adoption, thereby supporting global sustainability goals.

Key words Green Transportation, Customer Adoption, Consumer Preferences, Sustainable Mobility, and Environmental Awareness

I. INTRODUCTION

Green transportation has emerged as a critical solution to environmental degradation, air pollution, and rising energy concerns. Understanding customer adoption and preferences is essential for the successful implementation of sustainable transport systems, as consumer behaviour largely determines the effectiveness of such initiatives. This empirical study examines the factors influencing customer adoption of green transportation and analyses user preferences across different modes, including personal vehicles, two-wheelers, and urban mass transit. Recent developments in the mobility landscape reflect this shift: in 2021, Ola's electric scooter launch—despite initial challenges such as battery fire incidents—sparked widespread interest in personal electric vehicles, highlighting both the potential and the risks associated with emerging technologies. Globally, major automotive brands like Audi have accelerated their transition to electric vehicles (EVs**)**, demonstrating strong industry commitment to reducing carbon emissions and promoting cleaner alternatives. At the same time, urban mass transit solutions are evolving, with cities like Chennai introducing and expanding electric-powered metro services, providing efficient, low-emission alternatives to conventional public transport. These developments illustrate the growing diversity of sustainable transportation options and emphasize the need to align infrastructure, policy, and consumer preferences. By examining real-world adoption trends and the factors driving user choices, this study aims to provide actionable insights for policymakers, businesses, and stakeholders to design environmentally sustainable and customer-centric transportation solutions. Understanding these dynamics is crucial for fostering wider acceptance of green transportation and supporting the transition to a more sustainable, low-carbon mobility ecosystem.

Objective

- **To examine** the level of customer awareness and perception toward green transportation.
- **To identify** the key factors influencing customer adoption of green transportation systems.
- **To analyse** customer preferences across different modes of green transportation.
- **To assess** the challenges and barriers affecting the adoption of green transportation.

Scope

- The study focuses on customer adoption and preference patterns related to green transportation such as Electric vehicles (EVs)**,** Public transit powered by clean energy**,** Non-motorized transport**,** Hybrid vehicles**,** Alternative fuels**,** Carpooling and ride-sharing**.**
- It examines the influence of demographic factors on the adoption of green transportation
- The study relies on primary data collected through surveys within a defined geographical area.
- The study can be extended to compare customer adoption and preferences for green transportation across different regions or countries, including emerging green transportation technologies.

Review of Literature

1. Chongguang Wang (2025)

Green Transportation: An Overview

This paper examines green transportation as a key strategy for addressing resource limitations, environmental pressures, and rapid urbanization. Through a systematic review of global literature, it outlines core features such as sustainability, integration, efficiency, and people-centered planning. The study identifies major research themes including emissions reduction, travel behavior, transit-oriented development, and carbon assessment, while highlighting growing attention to health, equity, and innovation. It also discusses evaluation challenges, policy effectiveness, regional disparities, and future directions for supporting low-carbon urban development.

2. Tamakloe, R, Caesar, L.D. (2026)

Factors associated with incentive-prioritizing electric vehicle buyers

This study explores how consumer characteristics shape the importance placed on incentives when purchasing electric vehicles. Using California survey data on

hydrogen fuel cell and plug-in EV users, it applies data mining techniques to identify patterns among incentive-focused buyers. Results reveal differences in vehicle preferences, refueling and charging behaviors, cost perceptions, and gender trends. Despite infrastructure and price concerns, most buyers report positive experiences. The findings help policymakers design better-targeted incentives to encourage broader EV adoption.

3. Shah, Kinjal J, Shu-Yuan Pan (2021)

Green transportation for sustainability: Review of current barriers, strategies, and innovative technologies

This study explores the challenges and opportunities in advancing sustainable transportation amid growing urbanization and vehicle dependence. It reviews existing barriers, including infrastructure limitations, high costs, and behavioral resistance, while highlighting strategies to promote greener mobility. Emphasizing the **ASI framework**—*Avoid, Shift, Improve*—the paper evaluates technological innovations, policy interventions, and integrated management approaches that can reduce environmental impacts. The review also synthesizes global case studies demonstrating effective implementation, providing a comprehensive understanding of pathways toward low-emission, sustainable transport systems.

4. Mao, Yumeng, Xuemei Li (2023)

A Review of Research on the Impact Mechanisms of Green Development in the Transportation Industry

This study explores the mechanisms through which green development influences the transportation industry, emphasizing environmental, economic, and social dimensions. It reviews existing research on sustainable policies, technological innovations, and management strategies that promote low-carbon and energy-efficient transport systems. The study highlights how green development drives emission reduction, operational efficiency, and sustainable urban mobility while identifying barriers such as high costs, policy gaps, and stakeholder resistance. By synthesizing theoretical and empirical findings, it provides a comprehensive understanding of pathways for advancing sustainable transportation.

5. Moghdani, Reza (2021)

The green vehicle routing problem: A systematic literature review

This study explores the green vehicle routing problem (G-VRP), focusing on integrating environmental objectives, such as minimizing fuel consumption and carbon emissions, into traditional vehicle routing models. It systematically reviews existing methodologies, including exact, heuristic, and metaheuristic approaches, highlighting their advantages, limitations, and application contexts. The study identifies key trends, challenges, and research gaps, particularly in multi-objective

optimization and real-world implementation, providing a comprehensive framework for future research on sustainable and environmentally friendly logistics operations.

Methodology

This study on green transportation adoption used online questionnaires **with** close-ended questions to collect primary data through convenience sampling. Additionally, secondary data from existing research and reports supported the literature review. Analysis focused on factors like environmental awareness, cost, convenience, and infrastructure to understand customer preferences and adoption trends.

Sampling method	**Convenient Sampling**
Sample Size	106
Data Collection	Convenient Sampling
Methodology	Cross Tabulation Analysis, Correlation Analysis, Percentage Analysis
Tools used	Spss, Excel

Analysis and Interpretation

Cross Tabulation

Table 1

Cross tabulation between Monthly Income and preference in EV adoption

No of respondents	**Less than ₹20,000**	**₹20,001 – ₹40,000**	**₹40,001 – ₹60,000**	**₹60,001 – ₹80,000**	**More than ₹1,00,000**	**Grand Total**
Yes, definitely	9	9	14	5	7	44
Maybe, depending on cost and convenience	2	3	2	-	1	8
No, I prefer traditional vehicles	15	11	13	11	4	54
Grand Total	26	23	29	16	12	106

Interpretation

The cross tabulation indicates that most respondents (54 out of 106) are conditionally willing to pay more for green transportation, depending on cost and convenience. A significant portion (44) are definitely willing, while only 8 prefer

traditional vehicles. Higher income groups show relatively greater willingness to pay compared to lower income groups.

Correlation Analysis

1. Income vs Willingness to Pay More for Green Transportation

Table 2

Correlation between Monthly Household Income and Willingness to Pay More

Variables	Monthly Household Income	Willingness to Pay More
Monthly Household Income	1	0.104
Willingness to Pay More	0.104	1
Sig. (2-tailed)	—	0.291
N	106	106

The Pearson correlation between monthly household income and willingness to pay more for environmentally friendly transportation is r = 0.104 with p = 0.291 (N = 106).

This indicates a very weak positive relationship between income and willingness to pay. However, since the significance value (p > 0.05), the relationship is not statistically significant.

Interpretation:

Higher-income respondents show only a slight tendency to pay more for green transportation, but income does not significantly influence willingness to pay. Pearson correlation analysis indicates a weak positive relationship (p > 0.05), suggesting that cost sensitivity and perceived **value** are more important factors driving adoption than household income alone.

2. Convenience vs Use of Green Transportation

Table 3

Correlation between Convenience and Use of Green Transportation

Variables	Convenience of Green Transport	Used Green Transport (6 months)
Convenience of Green Transport	1	-0.064
Used Green Transport (6 months)	-0.064	1
Sig. (2-tailed)	—	0.516
N	106	106

The Pearson correlation between perceived convenience of green transportation and usage in the past 6 months is $r = -0.064$ with $p = 0.516$ ($N = 106$).
This shows a very weak negative relationship, and the significance level indicates the relationship is not statistically significant.

Interpretation

The **Pearson correlation** between perceived convenience and green transportation usage shows a very weak negative relationship that is not statistically significant ($p = 0.516$). This indicates that respondents who perceive green transportation as convenient are not necessarily the ones using it, suggesting that factors like availability, cost, awareness, or infrastructure may **influence actual adoption behaviour**.

Findings

- **Income and willingness to pay:** Higher-income respondents show only a slight tendency to pay more for green transportation, but income does not significantly influence willingness to pay. Pearson correlation indicates a weak, non-significant relationship ($p > 0.05$), suggesting cost sensitivity and perceived value drive adoption more than income.
- **Perceived convenience and usage:** The relationship between perceived convenience and actual usage of green transportation is very weak and not statistically significant ($p = 0.516$). This indicates that perceiving transportation as convenient does not necessarily increase usage, and factors such as availability, cost, awareness, or infrastructure may play a greater role in adoption.
- **Age and adoption:** The majority of respondents (20–29 years) suggest that young adults are the primary users of green transportation. However, due to the unequal distribution of age groups in the sample, this finding may not fully represent usage patterns across all age categories.
- **Usage of green transportation and ownership:** Public transport powered by clean energy is the most commonly used mode among respondents, followed by electric vehicles. Despite this, only 18.9% of respondents reported owning an electric vehicle**,** indicating that usage is higher than personal ownership.
- **Influence of fuel costs and adoption:** A significant portion of respondents (**50.9%**) are unsure about adopting green transportation, while **41.5%** are willing to switch if conventional fuel prices rise. This highlights the strong impact of fuel costs **on adoption decisions.**
- **Willingness to pay and pricing:** Most respondents (**61.3%**) are open to paying more for environmentally friendly transportation depending on the

price difference, while **25.5%** consider cost the most critical factor, highlighting the importance of pricing in adoption decisions.

II. CONCLUSION

The study conducted in urban Chennai, characterized by a substantial migrant population, reveals that public transport remains the predominant mode of travel, while green transportation is still in its emerging stage, with overall adoption remaining neutral. Respondents' willingness to pay a premium is conditional on price, underscoring cost as a critical adoption factor. Policy measures such as government subsidies, the expanding portfolio of electric vehicle offerings by the automobile industry, and the emergence of the electric metro reflect tangible progress in sustainable mobility. These trends indicate that with continued infrastructure, affordability, and awareness initiatives, Chennai is moving decisively in the **right direction** toward green transportation adoption.

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