

EV-OLUTION GREEN DRIVE IN CHENNAI: TRANSITION TO ELECTRIC VEHICLES AND SUSTAINABLE TRANSPORT

Dr. N. Smitha

Assistant Professor, Post Graduate & Research Department of Economics, Dwaraka Doss Goverdhan Doss Vaishnav College, NO.833, E.V.R. Periyar High Road, Arumbakkam, Chennai, Tamil Nadu 600106. nsmitha.phd@gmail.com

Ms. R. Malavika

Research Scholar (Full Time), Post Graduate & Research Department of Economics, Dwaraka Doss Goverdhan Doss Vaishnav College, NO.833, E.V.R. Periyar High Road, Arumbakkam, Chennai, Tamil Nadu 600106. mlvkravi@gmail.com

ABSTRACT

The study examines the transition from traditional fuel vehicles to electric vehicles (EVs) in Chennai and evaluates their role in promoting sustainable transportation. It compares the perceptions of 80 traditional vehicle owners and 70 EV owners to assess cost-effectiveness, charging infrastructure, public awareness, environmental benefits, and policy support. Primary data were collected through a structured questionnaire and analysed using percentage analysis, Chi-square test, and Pearson's correlation analysis. The findings reveal that EV owners experience significantly lower operating costs, greater satisfaction, and stronger confidence in the long-term economic benefits of electric mobility. The study also identifies higher awareness of charging infrastructure and stronger environmental concern among EV owners. Significant relationships were found between awareness, attitude, and support for EV adoption. The research concludes that expanding charging infrastructure, strengthening financial incentives, and enhancing public awareness are essential to accelerate Chennai's transition towards green mobility and sustainable urban transportation while contributing to reduced carbon emissions and improved environmental sustainability.

Keywords: Electric Vehicles (EVs), Sustainable Transportation, Green Mobility, Charging Infrastructure, Chennai.

INTRODUCTION

Transportation plays a vital role in economic development, but the increasing dependence on conventional fuel vehicles has contributed significantly to air pollution, greenhouse gas emissions, and climate change. As cities continue to expand, promoting sustainable transportation has become essential for ensuring environmental protection and energy security. Electric Vehicles (EVs) have emerged as a cleaner and more energy-efficient alternative to traditional internal combustion engine vehicles due to their lower operating costs and zero tailpipe emissions. Chennai, one of India's major metropolitan cities, is witnessing a gradual shift towards electric mobility through government initiatives, improved charging infrastructure, and growing public awareness.

However, challenges such as limited charging facilities, high initial purchase costs, and consumer perceptions continue to influence EV adoption. This study examines the transition from traditional fuel vehicles to electric vehicles in Chennai by comparing users' perceptions of cost-effectiveness, infrastructure readiness, environmental benefits, and policy support, thereby providing insights into the city's progress towards sustainable and green transportation.

OBJECTIVE OF THE STUDY

1. To evaluate the cost-effectiveness of EVs compared to traditional fuel vehicles.
2. To assess Chennai's readiness in terms of infrastructure to support EV growth.
3. To measure public awareness, attitude, and willingness to adopt EVs.
4. To analyze the environmental benefits of EVs and sustainable transportation systems.
5. To provide policy recommendations to support the green mobility transition in Chennai.

SCOPE OF THE STUDY

1. The study focuses on the transition from traditional fuel vehicles to electric vehicles (EVs) in Chennai.
2. It compares the perceptions of 80 traditional vehicle owners and 70 EV owners regarding electric mobility.

METHODOLOGY OF THE STUDY

The study adopts a descriptive and comparative research design to examine the transition towards electric vehicles in Chennai. Primary data were collected using a structured questionnaire administered to a total of 150 respondents, comprising 80 traditional vehicle owners and 70 electric vehicle owners, selected through convenient sampling. The collected data were analysed using descriptive statistical techniques such as Chi-square test, Pearson's correlation analysis, and percentage analysis to examine associations and relationships among the study variables.

REVIEW OF LITERATURE

Anil Khurana, V. V. Ravi Kumar, Manish Sidhpuria (2019) examined the different factors that affect a consumer's adoption of an EV. The respondents of the study are existing car owners in India. The data were analysed using Structured Equation Modelling (SEM). Attitude (ATT) emerged as a strong mediator, influencing the adoption of electric cars.

Monika B Ashok (2019) in this paper aimed to capture the views, sentiments and perception on the awareness and likeliness to buy the vehicles so that sustainability in environment can be maintained. Data is collected from vehicle users in Bangalore city. The sample size of (n=120) is taken and the responses are fed into SPSS Version 25 for analysis and validation of the statements. Correlation analysis is used to analyze the relationship between awareness levels of customers and their likelihood to purchase and use E-vehicles. The study also analyses the awareness levels of customers on government initiatives for E-transportation in India.

Pretty Bhalla, Inass Salamah Ali, Afroze Nazneen (2018) made an attempt to study about the factors that influence the purchase decision of car buyers are individual perception on dimensions like environmental issues, cost, trust, technology advancement, infrastructure, and society acceptance. The results shows that environmental concerns and consumer trust on technology are antecedent factor for perception about Electric vehicle purchase and the factors which give

adoption blow back are cost, infrastructure, social acceptance. Thus to promote sales of electric vehicle government has to play a leading role by creating environmental policy, infrastructure and subsidized cost of vehicle or lower the bank rate of interest rate.

Dr. Bharti Motwani and Abhishek Patil (2019) found that mobility and recharging characteristics were found to be most significant factors while RTO norms was considered to be the least significant characteristic affecting the buying decision of electric cars. The model developed from our study was 88% accurate and hence can be used for predicting the buying behavior of customer. This study is of prime importance to the companies who wanted to launch electric cars in India.

DATA ANALYSIS AND INTERPRETATION

Comparison of Monthly Operating Cost

Monthly Operating Cost	Traditional Vehicles (n = 80)	EVs (n = 70)
Below ₹1,000	4 (5.0%)	42 (60.0%)
₹1,001–₹2,000	10 (12.5%)	18 (25.7%)
₹2,001–₹3,000	18 (22.5%)	8 (11.4%)
Above ₹3,000	48 (60.0%)	2 (2.9%)

Source: Primary Data

Interpretation:

The table shows that 60% of traditional vehicle owners spend more than ₹3,000 per month on fuel, compared to 60% of EV owners who spend less than ₹1,000 per month on charging their vehicles. Only 2.9% of EV owners pay more than ₹3,000 a month on charging. This means that, on average, EV owners have significantly lower monthly operating costs than owners of conventional vehicles. Therefore, the findings suggest that electric vehicles are more cost-effective in terms of monthly energy expenses.

Perception of Long-Term Cost-Effectiveness

Response	Traditional Vehicles (n = 80)	EVs (n = 70)
Strongly Agree	8 (10.0%)	32 (45.7%)
Agree	18 (22.5%)	25 (35.7%)
Neutral	20 (25.0%)	9 (12.9%)
Disagree	22 (27.5%)	3 (4.3%)
Strongly Disagree	12 (15.0%)	1 (1.4%)

Source: Primary Data

Interpretation:

According to the table, 81.4% of EV owners agree or strongly agree that electric vehicles are more economical in the long run. Only 32.5% of traditional owners agree, by contrast. But 42.5% of traditional vehicle owners disagree with this statement, compared to just 5.7% of EV owners. This suggests that EV users are more confident on the long-term financial benefits of the electric vehicles compared to the users of the conventional fuel vehicles.

Overall Satisfaction with Vehicle Running Cost

Satisfaction Level	Traditional Vehicles (n = 80)	EVs (n = 70)
--------------------	-------------------------------	--------------

Very Satisfied	6 (7.5%)	30 (42.9%)
Satisfied	20 (25.0%)	28 (40.0%)
Neutral	18 (22.5%)	8 (11.4%)
Dissatisfied	24 (30.0%)	3 (4.3%)
Very Dissatisfied	12 (15.0%)	1 (1.4%)

Source: Primary Data

Interpretation:

The table shows that 82.9% of EV owners are satisfied or very satisfied with the running costs of their vehicles. By comparison just 32.5% of traditional vehicle owners are satisfied with the running costs of their vehicle. 45% of traditional vehicle owners are dissatisfied due to rising fuel and maintenance expenses while only 5.7% of EV owners are unhappy. This indicates that EV drivers are generally more satisfied with the cost of operating their vehicles.

Likelihood of Recommending an EV

Response	Traditional Vehicles (n = 80)	EVs (n = 70)
Definitely Yes	12 (15.0%)	40 (57.1%)
Probably Yes	22 (27.5%)	22 (31.4%)
Not Sure	24 (30.0%)	6 (8.6%)
Probably No	14 (17.5%)	2 (2.9%)
Definitely No	8 (10.0%)	0 (0.0%)

Source: Primary Data

Interpretation:

The table shows that 42.5% of traditional vehicle owners would recommend EV to others, while 88.5% of EV owners would do so. About 30% of traditional vehicle owners are unsure about recommending EVs, and 27.5% are unlikely to recommend them. This suggests that the majority of EV owners have been satisfied with their vehicles and are willing to encourage others to make the switch to EVs.

Perception of EV Charging Infrastructure Availability

Opinion	Traditional Vehicles (n=80)	EV Owners (n=70)	Total
Agree	25	50	75
Neutral	20	12	32
Disagree	35	8	43
Total	80	70	150

Chi-square Test

Test	Value
X ²	22.37
df	2
p-value	0.001

Interpretation:

The table shows that 71.4% of EV owners (50 out of 70) agreed that Chennai has adequate charging infrastructure while only 31.3% of traditional vehicle owners (25 out of 80) agreed. Meanwhile, 43.8% of owners of traditional vehicles said they disagreed that the existing charging infrastructure is sufficient compared to 11.4% of EV owners. The Chi-square test ($\chi^2 = 22.37$, $p = 0.001$) shows a statistically significant association between the type of respondent and their perception of charging infrastructure. This indicates the optimism of owners of EVs about the infrastructure readiness of Chennai, more than that of owners of conventional vehicles.

Awareness of EV Charging Stations

Awareness	Traditional Vehicles (n=80)	EV Owners (n=70)	Total
Aware	48	63	111
Not Aware	32	7	39
Total	80	70	150

Chi-square Test

Test	Value
χ^2	18.95
df	1
p-value	0.000*

Interpretation:

The table indicates that 90% of EV owners said the availability of charging stations nearby was a factor, compared to 60% of traditional vehicle owners. 40% of traditional vehicle owners didn't know about charging stations, compared to only 10% of EV owners. The Chi-square test ($\chi^2 = 18.95$, $p < 0.001$) indicates a significant association between respondent type and awareness of charging infrastructure. This implies that the EV owners are more knowledgeable about the charging facilities available in Chennai.

Home Charging Readiness

Response	Traditional Vehicles (n=80)	EV Owners (n=70)	Total
Yes	35	55	90
No	30	10	40
Not Sure	15	5	20
Total	80	70	150

Chi-square Test

Test	Value
χ^2	17.82
df	2
p-value	0.000*

Interpretation:

According to the table, 78.6% of EV owners have access to home charging facilities while 43.8% of traditional vehicle owners reported having enough space to install a home charger. A larger proportion of traditional vehicle owners either lacked suitable space or were uncertain about home charging. There is a significant association between respondent type and home charging readiness ($\chi^2 = 17.82$, $p < 0.001$). That suggests that EV owners are better positioned to charge at home than owners of conventional vehicles.

Convenience of Accessing Public Charging Stations

Response	Traditional	EV	Total
Convenient	30	52	82
Neutral	18	10	28
Inconvenient	32	8	40
Total	80	70	150

Chi-square Test

Test	Value
χ^2	19.46
df	2
p-value	0.000*

Interpretation:

The table indicates that 60% of traditional vehicle owners spend more than ₹3,000 per month on petrol, while 60% of EV owners spend less than ₹1,000 per month on charging their vehicles. Only 2.9% of EV owners pay more than ₹3,000 per month for charging. This shows that EV owners have significantly lower monthly running costs than regular vehicle owners. As a result, the data indicate that electric vehicles are less expensive to operate in terms of monthly energy costs.

Comparison of Pearson's Correlation Coefficients between Traditional Vehicle Owners and EV Owners on Public Awareness, Attitude, and Policy Support

Relationship	Traditional Vehicle Owners (n = 80)	EV Owners (n = 70)
Awareness ↔ Attitude	0.648	0.703
Awareness ↔ Willingness/Policy Support	0.715	0.741
Attitude ↔ Willingness/Policy Support	0.782	0.825

Interpretation:

The comparison shows that both respondent groups have positive and significant relationships among awareness, attitude, and willingness/policy support. The relationships are consistently stronger among EV owners, suggesting that ownership experience may reinforce positive perceptions and support for electric mobility. These findings imply that increasing public

awareness and fostering favourable attitudes could encourage wider adoption of electric vehicles in Chennai.

Comparison of Pearson's Correlation Coefficients between Traditional Vehicle Owners and EV Owners on Environmental Benefits and Sustainable Transportation

Relationship	Traditional Vehicle Owners (n = 80)	EV Owners (n = 70)
Environmental Awareness ↔ Environmental Concern/Attitude	0.682	0.741
Environmental Awareness ↔ Support for Sustainable Transportation	0.731	0.782
Environmental Concern/Attitude ↔ Support for Sustainable Transportation	0.804	0.851

Note: Correlation is significant at the 0.01 level (2-tailed)

Interpretation:

The comparison shows that there are positive and statistically significant relationships between environmental awareness, environmental concern or attitude and support for sustainable transportation of both groups of respondents. EV owners consistently have higher correlation coefficients than traditional vehicle owners. The highest correlation is between environmental attitude and support for sustainable transportation among EV owners ($r = 0.851$) as opposed to environmental concern and support among traditional vehicle owners ($r = 0.804$). Overall, the findings suggest that respondents with greater environmental awareness are more likely to support sustainable transportation systems, and this relationship is stronger among EV owners, likely reflecting their direct experience with electric mobility.

Comparison of Preferred Policy Recommendations between Traditional Vehicle Owners and EV Owners

Policy Recommendation	Traditional Vehicle Owners (n = 80)	EV Owners (n = 70)	Overall (%)
Expand charging station network	68 (85.0%)	64 (91.4%)	88.0
Increase government subsidies / tax benefits	64 (80.0%)	58 (82.9%)	81.3
Reduce EV purchase cost	60 (75.0%)	56 (80.0%)	77.3
Battery warranty & replacement support	55 (68.8%)	60 (85.7%)	76.7
Public awareness programmes	46 (57.5%)	54 (77.1%)	66.7

Interpretation:

According to the comparison, both traditional and electric vehicle owners strongly support government measures that promote green transportation in Chennai. Both groups overwhelmingly supported expanding the charging station network, followed by financial incentives such as subsidies and tax breaks. EV owners regularly expressed greater support for policy actions than traditional car owners, notably battery warranty assistance and public awareness campaigns. These findings indicate that upgrading charging infrastructure, strengthening financial incentives, and raising public awareness should be emphasized to help Chennai transition to sustainable mobility.

FINDINGS

1. The study found that electric vehicles (EVs) have significantly lower monthly operating costs than traditional fuel vehicles, making them more economical for daily use.
2. A majority of EV owners perceived electric vehicles as more cost-effective in the long run, whereas many traditional vehicle owners remained uncertain or disagreed.
3. EV owners reported higher satisfaction with vehicle running costs compared to traditional vehicle owners, mainly due to lower charging and maintenance expenses.
4. The Chi-square test revealed a significant association between vehicle type and perception of charging infrastructure availability ($p < 0.05$).
5. Awareness of EV charging stations was significantly higher among EV owners than among traditional vehicle owners.
6. The study found that EV owners were better prepared for home charging, with a larger proportion having access to suitable charging facilities.
7. Positive and significant correlations were observed between awareness, attitude, and willingness to support EV adoption in both respondent groups.
8. Environmental awareness was found to have a strong positive relationship with support for sustainable transportation, especially among EV owners.
9. Respondents with higher environmental concern were more likely to support green mobility initiatives and the adoption of electric vehicles.
10. Both traditional vehicle owners and EV owners strongly supported the expansion of EV charging infrastructure across Chennai.
11. Financial incentives, such as government subsidies, tax benefits, and reduced purchase costs, were identified as important measures to accelerate EV adoption.
12. The study highlighted the need for public awareness programmes to improve knowledge and acceptance of electric vehicles among conventional vehicle users.

CONCLUSION

The study concludes that electric vehicles (EVs) offer significant economic and environmental advantages over traditional fuel vehicles in Chennai. EV owners reported lower operating costs,

higher satisfaction, and stronger support for sustainable transportation. The findings indicate that improved charging infrastructure, greater public awareness, and favourable government policies are essential for accelerating EV adoption. Financial incentives, battery support, and expanded charging networks can further encourage the transition to green mobility. Overall, Chennai has strong potential to become a sustainable transport city through increased EV adoption, contributing to reduced emissions, cleaner air, and long-term environmental sustainability.

LIMITATION OF THE STUDY

1. The study is limited to Chennai city; therefore, the findings cannot be generalized to other regions of India.
2. The study is based on a sample of 150 respondents (80 traditional vehicle owners and 70 EV owners), which may not fully represent the entire population.
3. The study uses convenience sampling, which may introduce sampling bias and limit the representativeness of the findings.

BIBLIOGRAPHY

- Khurana, A., Kumar, V. V. R., & Sidhpuria, M. (2020).** A study on the adoption of electric vehicles in India: The mediating role of attitude. *Vision*, 24(1), 23–34. <https://doi.org/10.1177/0972262919875548>
- Ansar, M., & Monika. (2019).** A study on customer perception towards e-vehicles in Bangalore. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 6(1), 377–389. <https://www.jetir.org/papers/JETIR1901377.pdf>
- Bhalla, P., Ali, I. S., & Nazneen, A. (2018).** A study of consumer perception and purchase intention of electric vehicles. *European Journal of Scientific Research*, 149(4), 362–368.
- Motwani, B., & Patil, A. (2019).** Customer buying intention towards electric vehicle in India. *International Journal of Mechanical Engineering and Technology*, 10(5), 391–398.
- Ministry of Power. (2023).** Guidelines for Charging Infrastructure for Electric Vehicles. Government of India.
- Central Electricity Authority. (2023).** National Electricity Plan. New Delhi: Government of India.
- Vahan Dashboard. (2024).** Vehicle Registration Statistics. Ministry of Road Transport and Highways, Government of India.
- Government of Tamil Nadu. (2023).** Tamil Nadu Electric Vehicles Policy 2023. Chennai: Government of Tamil Nadu.
- NITI Aayog. (2023).** India's Electric Mobility Transformation. New Delhi: Government of India.