A STUDY ON CONSUMER PERCEPTION TOWARDS GREEN E-VEHICLE WITH SPECIAL REFERENCE TO LUCKNOW CITY

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Abstract:

With the rise in earth temperature, mother earth has given us an alarming signal to be alert towards the climate change . Climate change is affecting not only the conditions of living but also the way of living. The most important element of this change are the natural recourses those who are in scarcity. So, we have to find some ways to use them smartly, so we can conserve them. The scarcity on supply side and hike on demand side gives a birth to rise in prise. Day by day we are losing our most of the scare resources. Movement in anything is very important if something is not moving it is considered to be dead or not useful. A human life is using vehicles for their movement. To keep them moving we need fuel. Because of huge demand of petrol, the prise are rising day by day. With the decrease of fossil fuels and its price rise, there is a need for another energy resource to move the vehicle. The automobile industry is considering Electric Vehicle as a current solution to the industry and environment. However, the current market penetration of EV is relatively low in spite of governments Electric Vehicle policies.

This paper is based on sample size 100 primary data and secondary data both. This paper will focus upon the consumers buying perception towards the Electric Vehicle in the reason of Lucknow a district of Uttar Pradesh. This paper will conclude with suggestion to be get improved by this sector.

Keywords: -

Green Electric Vehicle; Climate change; Price rise; Consumers buying perception.

Introduction

With the development of the living style of the human, resources are being depilated day by day. Fossil fuel is one of them which is being depilated day by day. The increase in air pollution in urban areas of India is a causing concern for Manufacturers. There are more than 20 major Indian cities among the 100 most polluted urban areas in the country World-Nation. The cause for the production of air pollution in urban areas is associated with several of Sources but the petrol and diesel vehicles are giving biggest contribution to it. The hostile influence of air quality on human health and the economy is well known and, in this sense, producers are dreaming about reducing the impact on earth on a couple of options.

Electric cars, electric scooters and electric bikes are seen as a potential choice for transportation, what is in addition, a few national governments have successfully revised innovation development plans. Indigenous governments are swift to advance electric vehicles as a green alternative for portability, moreover find it a realistic solution to the elimination of air emissions in urban areas.

There are some foreign examples of how to tackle challenges and initiate best practices. China for example, bigly took hybrid cars for cycling and commuting. Metropolitan areas in the UK, such as London are providing rewards. For example, for the procurement of new electric cars, except blocking charges and leave fees for electric cars in certain jurisdictions free or reduced

In India, electric 3-wheelers have almost replaced several transport options but still very little distribution of electrical power constraining them. Vehicles existed between two wheelers; four wheelers are another option for transport in urban areas. Techno-funding anyway, tests show that

electric bikes can be financially feasible. Minister of defence power it has also set an ambitious goal of being 100% electric by 2030. Alternative programs, in particular, the Minister of Road Transport and Highways made a powerful proclamation to the society of Indians Automobile Manufactures (SIAM) annual custom that has terrified the car industry. Anyway, definition of strategies would require contributions to terms of dimension of help required, suggestions for spending plans of government, approach instruments required and utilizing the private part. In Lucknow city people has recently adopted electric vehicles with a big heart. This paper has focused on the perception of customer towards the electric vehicle's options.

Electric Vehicles

Introduction: - An electric vehicle is that operates on an electric motor, instead of an internal-combustion engine that generates power by burning a mix of fuel and gases. Therefore, such as vehicle is seen as a possible replacement for current-generation automobile, in order to address the issue of rising pollution, global warming, depleting natural resources, etc. Though the concept of electric vehicles has been around for a long time, it has drawn a considerable amount of interest in the past decade amid a rising carbon footprint and other environmental impacts of fuel-based vehicles.

In India, the first concrete decision to incentivise electric vehicles was taken in 2010. According to a Rs. 95-crore scheme approved by the Ministry of New and Renewable Energy (MNRE), the government announced a financial incentive for manufacturers for electric vehicles sold in India. The scheme, effective from November 2010, envisaged incentives of up to 20 per cent on ex-factory prices of vehicles, subject to a maximum limit. However, the subsidy scheme was later withdrawn by the MNRE in March 2012.

In 2013, India unveiled the 'National Electric Mobility Mission Plan (NEMMP) 2020' to make a major shift to electric vehicles and to address the issues of national energy security, vehicular pollution and growth of domestic manufacturing capabilities. Though the scheme was to offer subsidies and create supporting infrastructure for Green E-vehicles, the plan mostly remained on papers. While presenting the Union Budget for 2015-16 in Parliament, then finance minister Arun Jaitley announced faster adoption and manufacturing of electric vehicles (FAME), with an initial outlay of Rs 75 crore. The scheme was announced with an aim to offer incentives for clean-fuel technology cars to boost their sales to up to 7 million vehicles by 2020.

In 2017, Transport Minister Nitin Gadkari made a statement showing India's intent to move to 100 per cent electric cars by 2030. However, the automobile industry raised concerns over the execution of such a plan. The government subsequently diluted the plan from 100 per cent to 30 per cent.

In February 2019, the Union Cabinet cleared a Rs 10,000-crore programme under the FAME-II scheme. This scheme came into force from April 1, 2019. The main objective of the scheme is to encourage a faster adoption of electric and hybrid vehicles by offering upfront incentives on purchase of electric vehicles and also by establishing necessary charging infrastructure for EVs.

Uttar Pradesh EV Policies & Subsidies

The state government looks forward to rolling out a total of 1 million EVs throughout all segments by 2024. There are plans of deploying 1000 electric buses in the state by 2030, 200,000 charging stations to be put up and a goal to turn 70% of the public transportation to EVs by 2030 under the 10 identified green routes.

Uttar Pradesh Electric Vehicles Manufacturing and Mobility Policy, 2019

* Rolling out 1 million EVs combined across all segments by 2024.
* The goal of 1,000 electric buses deployed in the state by 2030.
* The target of achieving 70% electrification of public transportation by 2030 on Identified green routes in 10 identified EV cities (Noida, Ghaziabad, Meerut, Mathura, Agra, Kanpur, Lucknow, Allahabad, Gorakhpur, and Varanasi).

- Set up around 0.2 million slow and fast charging and swapping stations by 2024.
- Establishes a single-window system in place for all approvals
- Required for EV and battery manufacturing units.

LUCKNOW

About District

Lucknow is the capital city of Uttar Pradesh and it has always been a multicultural city. Courtly manners, beautiful gardens, poetry, music, and fine cuisine patronized by the Persian-loving Shia Nawabs of the city are well known amongst Indians and students of South Asian culture and history.

At a Glance

- Area:2528 sq.km
- Language: Hindi , Urdu
- Villages:961
- Population:4589838
- Male:2394476
- Female:-2195362

Objectives of the Study

➤ To test consumer awareness about Green E-vehicles.
➤ To spread awareness about Green E-vehicles.
➤ To research the factors driving customers to buy electric vehicles.
➤ To understand the various government e-transportation initiatives in India

Research Methodology

➤ **Research Design:**-Secondary Research and Primary research will be descriptive survey research.
➤ **Sources of Data:** -Secondary data sources from Google scholar, Google websites, government sites, company sites, magazines, textbooks, newspapers etc. Primary survey from online digital survey through Google form, or through offline survey by approaching target consumer.
➤ **Data Collection Method:** Primary survey method.
➤ **Population:** Lucknow city target consumers age group 18 to 55.
➤ **Sampling Method:** Random Sampling, Convenience sampling, quota sampling.
➤ **Data Collection Instrument:** Questionnaire; Structured Schedules; Personal interviews

Limitations

➤ Data was collected only from Lucknow
➤ There was limitation of time.
➤ In future further research should be done with more varied samples and in detail with more geographically spread.
➤ As the data is collected through the questionnaire on online mode there may be possibility of they may not fully loyal in answering the questions.

SUMMARY OF DATA COLLECTION

Gender		Responses
Male		56
Female		42
Other		02
Grand Total		100

Age	Responses
20-30	82
30-40	14
40-50	02
More than 50	02
Grand Total	100
Occupation	Responses
Business	25
Employee	55
Household	06
Student	14
Grand Total	100

Income	Responses
Rs. 3,00,000 - Rs. 5,00,000	62
Rs. 5,00,000 - Rs. 10,00,000	26
More than Rs. 10,00,000	12
Grand Total	100

Literature Review

As a means of halting climate change and encouraging environmentally friendly transportation, the introduction of electric vehicles (EVs) has garnered increasing interest in recent years. India is no different, with the government having established aggressive goals for EV adoption and infrastructure spending for charging stations. Research on market viability and consumer attitudes towards electric vehicles in India is expanding in this context.

Eric Molin, Bert van et al., as well as Fanchao Liao (Fanchao Liao, 2017)- We undertake the literature review to determine whether EV characteristics—including car characteristics, infrastructural systems, and EV promotion strategies—and aspects of its service system have an effect on the usefulness of EV. Identifying the individual-related factors that influence a person's choice for EV is another goal of our research. Because it offers a framework that is easily able to handle the impact of both vehicle attributes and individual characteristics on EV selection, the majority of research that examined both of these two areas used the stated choice approach.

Peter Slowik, Lingzhi Jin, et al. (Lingzhi Jin, 2017)- It provides a summary of the literature that recognises and explores the significance of consumer awareness, particularly how it supports the switch to electric driving. In addition to a review of five case studies that go into greater detail and offer new perspectives on some of the more advanced consumer-focused awareness and outreach programmes, the paper contains an overview of outstanding consumer awareness initiatives in top electric car markets.

Inass Salamah Ali, et al. Pretty Bhalla, 2018)- Incentives from the government, infrastructure needs, availability of charging stations, and other factors all play a significant part in the decision to buy an electric vehicle, and studies already in existence have looked at their effects. Customer choice Depending on their opinion about electric vehicles, people may decide if they wish to buy one. According to the study's findings, perceived financial rewards and staff innovation have a big impact on people's intentions to buy electric cars. While criteria like perceived cost, perceived danger, and perceived environmental benefit do not significantly affect the intention to purchase an electric vehicle. Additionally, we looked into the effects of gender and demographic characteristics on the likelihood that people will buy electric cars, and we discovered that neither aspect had a very big effect.

A survey of potential EV customers was used in a study by Chaturvedi and Garg et al. (2019)- To evaluate the factors affecting EV adoption in India. They discovered that pricing and charging infrastructure were the most crucial elements, followed by range anxiety and battery performance. The research also revealed that customers are ready and eager to shell out more money for electric cars with greater ranges and quicker charging periods.

A discrete choice experiment was employed in a Purohit and Singh (2020) study to examine Indian customers' willingness to pay (WTP) for electric vehicles. The findings indicate that consumers are willing to pay more for EVs with more range, faster charging periods, and less expensive running costs. A discrete choice experiment was employed in a Purohit and Singh et al. (2020)-Study to examine Indian customers' willingness to pay (WTP) for electric vehicles. The findings indicate that consumers are willing to pay more for EVs with more range, faster charging, and less expensive running costs. The research also found that when customers have access to charging infrastructure and when there are government incentives for EV adoption, they are more likely to choose EVs.

Rahman et al.'s (2021)- study looked at the influence of environmental sentiments on Indian consumers' attitudes towards electric automobiles. They discovered that customers' perceived behavioural control and subjective standards were mediating factors in the effect that consumers with higher levels of positive environmental awareness were more inclined to contemplate buying an electric vehicle. Additionally, we discovered that consumers were less inclined to consider buying an EV if they believed EVs were pricey and inconvenient.

In 2022, R. Hema, M.J. Venkata Rangan-India offers the world's largest untapped EV market. The Multiple potential market barriers limit the growth of the EV industry, necessitating the development of sophisticated charging infrastructure. The "Make in India" initiative urges companies to produce parts locally. In particular, lithium-ion batteries must be made in India. To speed up the adoption of EVs, a new business model that allows for high infrastructure utilisation for both charging and swapping options must be discovered. Recent laws, like the battery swapping legislation, that

Table 1 -AWARENESS OF E- VEHICLES

		Agree	Neutral	Disagree	Mean Scores
I know that E-Vehicles reduce the emissions that contribute to climate change and smog, improving public health and reducing ecological damage.	Awr_1	54	29	17	1.525
I am environment conscious and if given a chance will take initiatives for better environment	Awr_2	46	41	13	1.558
I think there are enormous benefits of owning an E Vehicle	Awr_3	25	36	39	1.950
I am aware of all the Government Initiatives regarding E Vehicles	Awr_4	19	26	55	2.133
With the growing pollution in Metropolitan cities , I think EVehicless serve the purpose	Awr_5	41	38	21	1.667

were passed to promote a shift towards green energy generation and decentralisation are likely to result in the development of a well-established EV infrastructure across the country.
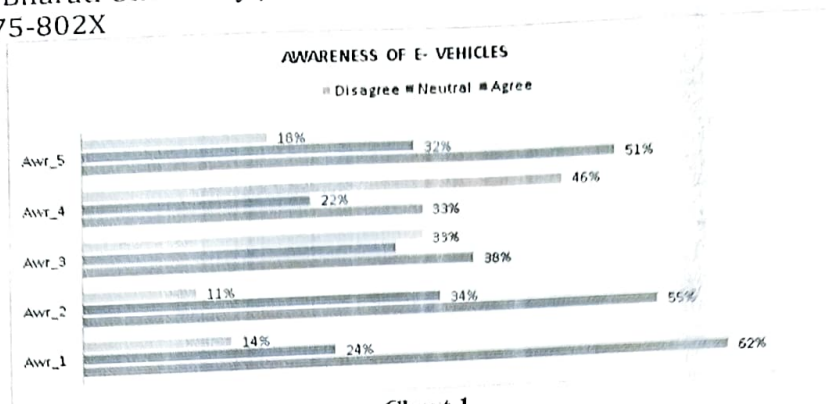
Chart 1

A series of questions were formulated to gather responses regarding customers' awareness of E-Vehicles. These questions employed a three-level grading system with the values 1 for "Agree," 2 for "Neutral," and 3 for "Disagree." The results were presented in both tabular and graphical formats, displaying response counts and percentages, respectively. Mean scores were computed to determine the average response of the survey participants. The data revealed the following insights: 62% of respondents indicated agreement with the notion that E-Vehicles play a role in reducing emissions linked to climate change and air pollution, thereby improving public health and mitigating ecological harm. 55% of respondents expressed their environmental consciousness and a willingness to take action. However, 46% of respondents disagreed with item Awr_4..

Purchase Preference Of The Respondents

|		Agree	Neutral	Disagree	Mean scores
Table 2- PURCHASE PREFERENCE OF THE RESPONDENTS					
I prefer to buy an E- Vehicle in near future	Pref_1	25	21	54	2.075
A hybrid Vehicle is more preferable compared to E-Vehicle	Pref_2	68	12	20	1.433
I feel investment In E- vehicles is risky due to lack of infrastructure	Pref_3	58	31	11	1.442
I feel E- Vehicle is not reliable for long distance travels	Pref_4	65	34	1	1.300
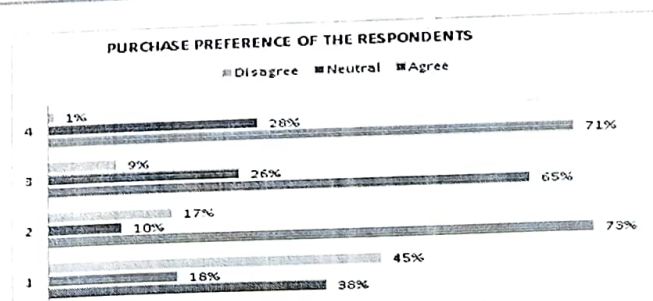
Chart 2

We formulated a set of questions aimed at gathering responses concerning the public's awareness of government initiatives related to E-Vehicles. A three-level grading system, with values of 1 for "Supportive," 2 for "Neutral," and 3 for "Unsupportive," was employed to analyze the responses. The results were presented in both tabular form, indicating response quantities, and graphically, displaying response percentages. Additionally, mean scores were computed to determine the average response of the respondents. The outcomes of the survey revealed the following insights. A significant majority, totaling 74% of the respondents, expressed support for the idea of controlling air pollution through 100% electrification of trains. In contrast, only 56% of the respondents agreed that the installation of charging stations might be beneficial. Overall, the mean scores for the responses fell within the range of 1.3 to 1.5. This suggests that the public possesses a moderate level of awareness regarding the promotion of E-Vehicles through government initiatives.

HYPOTHESIS TESTING

H1 : There exists a statistically significant relationship between awareness levels of consumers and their purchase pattern

Awr_1			Awr_2	Awr_3	Awr_4	Awr_5	Pref_1	Pref_2	Pref_3	Pref_4
Awr_1	Pearson Correlation	1	.938	.861	-.258	.972	.056	.956	.996	.980
	Sig. (2-tailed)		.226	.340	.834	.150	.965	.189	.060	.127
	N	3	3	3	3	3	3	3	3	3
Awr_2	Pearson Correlation	.938	1	.630	-.578	.993	-.295	.795	.966	.988
	Sig. (2-tailed)	.226		.566	.608	.076	.809	.415	.166	.099
	N	3	3	3	3	3	3	3	3	3
Awr_3	Pearson Correlation	.861	.630	1	.270	.717	.556	.972	.809	.743
	Sig. (2-tailed)	.340	.566		.826	.491	.624	.151	.400	.467
	N	3	3	3	3	3	3	3	3	3
Awr_4	Pearson Correlation	-.258	-.578	.270	1	-.477	.950	.036	-.347	-.444
	Sig. (2-tailed)	.834	.608	.826		.684	.201	.977	.774	.707
	N	3	3	3	3	3	3	3	3	3
Awr_5	Pearson Correlation	.972	.993	.717	-.477	1	-.180	.861	.990	.999*
	Sig. (2-tailed)	.150	.076	.491	.684		.885	.339	.091	.023
	N	3	3	3	3	3	3	3	3	3
Pref_1	Pearson Correlation	.056	-.295	.556	.950	-.180	1	.345	-.038	-.143
	Sig. (2-tailed)	.965	.809	.624	.201	.885		.776	.976	.908
	N	3	3	3	3	3	3	3	3	3
Pref_2	Pearson Correlation	.956	.795	.972	.036	.861	.345	1	.925	.879
	Sig. (2-tailed)	.189	.415	.151	.977	.339	.776		.249	.316
	N	3	3	3	3	3	3	3	3	3

Pref_3	Pearson Correlation	.996	.966	.809	-.347	.990	-.038	.925	1	.994
	Sig. (2-tailed)	.060	.166	.400	.774	.091	.976	.249		.067
	N	3	3	3	3	3	3	3	3	3
Pref_4	Pearson Correlation	.980	.988	.743	-.444	.999*	-.143	.879	.994	1
	Sig. (2-tailed)	.127	.099	.467	.707	.023	.908	.316	.067	
	N	3	3	3	3	3	3	3	3	3

*. Correlation is significant at the 0.05 level (2-tailed).

Null hypothesis accepted. There is enough substantiation from the above table to accept the null hypothesis and declare that There exists a statistically significant relationship between awareness levels of consumers and their purchase pattern.

Chi-square Test

The Chi-square test aims to verify the probability that an observed distribution is due to chance. It is also known as the "goodness of fit" statistic because it measures how well the observed distribution of the data fits the expected distribution if the variables are independent. The chi-square statistic is determined by the level of significance.

H0: Significant are not more prefer as a Green E-vehicle.
H1: Significant are more prefer as a Green E-vehicle.

Table 1 Calculation of observed data

Table 1 Calculation of observed data Observed (fo)	Mahindra	Hyundai	Tata motors	MG	Other	Total
Electric Car	06	16	21	10	13	66
Electric Bike	07	08	07	05	07	34
Total	13	24	28	15	20	100

Table 2. Calculation of Expected data

Expected (fe)	Mahindra	Hyundai	Tata motors	MG	Other	Total
Electric Car	8.58	15.84	18.48	9.9	13.2	66
Electric Bike	4.42	8.16	9.52	5.1	6.8	34
Total	13	24	28	15	20	100

Table 3 Calculation of Observed & Expected data

Chi-square	Mahindra	Hyundai	Tata motors	MG	Other	Total
Electric Car	0.775804196	0.001616162	0.34363636	0.0010101	0.003030303	1.125097121
Electric Bike	1.505972851	0.003137255	0.66705882	0.0019608	0.005882353	2.184012079

Total					3.3091092

Table 4 .Cal. of Df, CV, P-value

Df = (r-1)(c-1)	CV →	9.487729037
Df = 4	P-value →	0.507490283

Interpretation: Here Chi-Square value < Critical Value. Hence, we fail to reject H0. OR p value is 0.507490283 & alpha is 0.05. Since p value > 0.05. Hence, we fail to reject H0. So, the conclusion is that Significant are not more prefer as an E-vehicle.

Findings

Awareness of Environmental Benefits:
Approximately 54% of respondents are aware that E-Vehicles can effectively reduce emissions that contribute to climate change and smog, leading to an improvement in public health and a reduction in ecological damage. This indicates a moderate level of awareness among the surveyed individuals.

Environmental Consciousness and Willingness to Take Initiative:
Nearly half of the respondents, around 46%, express environmental consciousness and a willingness to take initiatives for a better environment. This shows a significant proportion of environmentally conscious individuals within the surveyed group.

Perception of E-Vehicle Benefits:
A substantial portion of respondents, about 25%, agrees that there are enormous benefits to owning an E-Vehicle. This suggests a relatively positive perception of E-Vehicles among a minority of the respondents.

Awareness of Government Initiatives:
In contrast to the other questions, a significant portion of respondents, approximately 55%, disagreed that they are aware of government initiatives related to E-Vehicles. This indicates a considerable lack of awareness regarding governmental efforts in this area.

E-Vehicles as a Solution to Urban Pollution:
A substantial number of respondents, around 41%, believe that E-Vehicles can address the growing pollution problem in metropolitan areas. This highlights a moderate level of optimism about E-Vehicles as a solution to urban pollution.

Preference to Buy E-Vehicles:
- Only 25% of the respondents expressed a preference to buy an E-Vehicle in the near future.
- 21% were neutral on this question.
- A significant majority of 54% disagreed with this preference.
- The mean score for this question was 2.075, indicating a relatively low level of willingness among respondents to purchase E-Vehicles in the near future.

Preference for Hybrid Vehicles:
- A significant majority of respondents, approximately 68%, indicated a preference for hybrid vehicles over E-Vehicles.
- 12% were neutral on this topic.
- 20% disagreed with this preference.
- The mean score for this question was 1.433, highlighting a strong preference for hybrid vehicles among the surveyed individuals.

Perceived Risk of E-Vehicle Investment:

- A majority of 58% of respondents felt that investing in E-Vehicles is risky due to the lack of necessary infrastructure.
- 31% were neutral regarding this perception.
- Only 11% disagreed with the idea that it is a risky investment.
- The mean score for this question was 1.442, indicating a significant level of concern about the investment risk associated with E-Vehicles.

Reliability of E-Vehicles for Long-Distance Travel:

- A majority of 65% of respondents believed that E-Vehicles are not reliable for long-distance travel.
- 34% were neutral on this issue.
- Only 1% disagreed with the notion that E-Vehicles are unreliable for long journeys.
- The mean score for this question was 1.300, indicating a notable level of skepticism about the reliability of E-Vehicles for extended travel.

Awareness of Operating Electric Buses:

- 52% of the respondents were aware that the government was working on operating electric buses in the Lucknow City to help combat increasing air pollution.
- 31% were uncertain or neutral on this initiative.
- 17% considered it not helpful.
- The mean score for this question was 1.542, indicating a moderate level of awareness and support for this particular government initiative.

Opinion on Constructing Charging Stations:

- 47% of respondents viewed it as a good idea that the government is planning to construct 100 charging stations to boost EV usage.
- 41% were neutral on this idea.
- 12% did not find it helpful.
- The mean score for this question was 1.542, reflecting a moderate level of approval and awareness of this initiative.

Opinion on Subsidies for Charging Stations:

- 57% of respondents supported the idea of providing subsidies to encourage the setup of e-vehicle charging stations, as proposed by Union Power Secretary A K Bhalla.
- 21% were uncertain or had a neutral opinion.
- 22% considered it not helpful.
- The mean score for this question was 1.542, indicating a moderate level of approval for this subsidy proposal.

Views on Electrification of Railways:

- A substantial 69% of respondents expressed support for the electrification of railways in India, which is expected to reduce the fuel bill and pollution.
- 22% were neutral in their views.
- Only 9% disagreed with this initiative.
- The mean score for this question was 1.333, signifying a strong level of support and awareness regarding the electrification of railways.

- By applying statistical tool, we found that chi-square test is failed to reject null hypothesis. It means that we have to accept the null hypothesis. Null hypothesis is that the significant are not more prefer as a Green E-vehicle. It means consumers are not more prefer as a Green E-vehicle. Overall, we can say that consumers are more prefer other than Green E-vehicle.

Conclusion

We can say that consumers are more prefer other than Green E-vehicle. From the questionnaire's question we can also conclude that people more prefer electric car as compared with electric bike or electric scooter. People consider positive environmental effect, price, low noise level and new trends for buying Green E-vehicle. Most of the respondents think that electric cars are very expensive. Most of the respondents are agree that electric cars can replace regular cars in terms of satisfying consumer needs. Many of the consumers expect changes like travel efficiency, comfort, maintenance, average and durability from Green E-vehicle rather than regular vehicle. Overall, based on analysis we can say that the most of the people are not more prefer as an Green E-vehicle, they prefer other than Green E-vehicle. The major thing we find that there is lack of awareness amongst the customer about Green E-vehicles effectiveness and working. Price of the Green E-vehicle products is very high so the people don't choose them. Charging stations are also very less. So there is lots of work that are needed to be done to make the customer adopt the Green E-vehicle. A noteworthy preference for hybrid vehicles over E-Vehicles is evident. Nevertheless, the strong support for specific government initiatives, including the operation of electric buses, the construction of charging stations, and subsidies for charging station setup, as well as the electrification of railways in India, underscores the potential for positive change in the E-Vehicle landscape. In light of these findings, there is a clear need for increased public education and infrastructure development to address the concerns and preferences of potential consumers, ultimately fostering the broader adoption of E-Vehicles.
The study's conclusion is that there is hope for the market viability of green electric vehicles in India. The move towards Green EVs is being driven by rising consumer awareness, government support, and technological advancements. To ensure widespread adoption, issues like high upfront costs and a lack of adequate charging infrastructure must be resolved. India has the potential to become a global leader in consumer education, industry collaboration, and policy focus.

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