

## **Public Perception towards Electric Vehicles in Chennai**

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**Abstract:** In this research, the concept of consumer attitudes towards electric vehicles has been studied. With the current drop of fossil fuels and its cost/price hike, there is an urgent need for another energy resource in order to run the vehicles. For that case, the automobile sector is looking at Electric Vehicles as a remedy to the industry as well as the environment and surrounding in India. However, in India, even though governments implement EV policies, the current market progress of EV is relatively low. In this research, this paper adopted an empirical study, which focused on influencing factors of the consumer on the acceptance of electric vehicles. Understanding the individual respondent response, a high usage rate of these vehicles in the public and a broad acceptance is found. Using a general approach towards the public, a questionnaire study was carried out in which respondents were requested to indicate the level of acceptance and the intention to use electric vehicles. The questionnaire items were taken from several general groups. The final outcomes show that the traditional car is perceived as much more comfortable and easier and receives a greater truthfulness in comparison to electric vehicles. In addition, respondent diversity in terms of age and gender was found to considerably higher benefits and barriers. Female respondents and also aged persons show a higher level of acceptance, which might be due to their higher environmental consciousness in contrast to male respondents and younger respondents. Through this research paper, a potential scope of Electric vehicles in Chennai will be studied and Consumer perception for the Electric vehicles in Chennai will be analysed.

**Keywords:** Electric vehicles, Automobile industry, Fossil Fuel, Environmental, Government policies, EV Policies.

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### **Introduction**

India is a developing country with the third-largest road network in the world. Tamilnadu is one of the states in India whose capital is Chennai which has more population who uses road travel. Road travel seemed to be a preferred choice in Chennai with over 65 % of the total population using their own or shared vehicles to travel. Conventional or traditional vehicles are a major cause in the increase of global warming and environmental air pollution. All forms of vehicles produce pollution and dust from brakes, tires, and road wear. The basic diesel vehicle has a worse effect on the air quality than the normal gasoline vehicle. But both gasoline and diesel vehicles pollute more than electric vehicles. So that Governments started using Financial programs such as road tax, to discourage the purchase and use of further contaminating buses. Green tax is assessed while-registering the vehicle after 15 times of use to make people discontinue the use of contaminating vehicles and encourage them for energy-effective and less contaminating vehicles. Fuel taxes may act as an incentive for the product of more effective, less contaminating vehicles and the development of indispensable energies. High fuel taxes may give an important incentive for consumers to buy lighter, lower, energy-effective vehicles, or to not drive.

The FAME India Scheme is an incentive scheme for the creation of electric and cold-blooded hybrid vehicles. It aims to promote electric vehicles and gives fiscal impulses for enhancing EV products and the creation of electric transportation structures. In 2015 the Ministry of Heavy Industries and Public Enterprises launched FAME to incentivize the electric product and creation of eco-friendly vehicles including EV and Cold-blooded hybrid vehicles. This proposed scheme is for establishing a charging structure and to save the environment. The National Electric Mobility Mission Plan (NEMMP) 2020, a National Mission document furnishing the vision and thus the roadmap for the brisk relinquishment of EVs and its manufacturing is nourished. This plan has been designed to boost public energy security, to supply affordable and environmentally friendly transportation and to enable the Indian automotive assiduity to attain global manufacturing leadership.

### **Objectives**

The objective of this paper is

- To understand consumer perception for the purchase of EVs in India.
- To analyse the factors important for the purchase of EVs in India.
- To protect the environment by bringing up more eco-friendly fuels.

- To study the Governmental EV policies.
- To know and give awareness among the general public.

### **Review of Literature**

Electric Vehicles A Conflation of the Current Literature with a Focus on Profitable and Environmental Viability Marcello Contestabile, Dr Gregory Offer, Dr Robin North: A research concludes that the longer term uptake of EVs will depend heavily on progress in battery technology, to bring down costs and increase energy viscosity, and on the provision of a suitable recharging structure. (“**All-Electric Vehicles and Range-Extended Electric Vehicles**” 2014) Implicit Need for Electric Vehicles, Charging Station Structure and its Challenges for the Indian Market by Praveen Kumar and Kalyan Gusto, India should invest in small scale mounts to manage the cargo issues locally rather than going for an enormous change. Home charging should be encouraged. (**Schlesinger 2014**) Proper planning of place, population, business viscosity and safety should be considered before enforcing the massive scale charging structure. The integration of conditioning within the energy and transport fields is important. (**E. Nanaki 2020**) Development pretensions through different innovative programs and programs, for example, motorists of electrical buses are offered a fiscal consumer incentive, like duty credits, purchase subventions, blinked sacrifices, free parking, and access to defined trace lanes will help the request to grow. (**Ren, Zhang, and Chen 2022**)

Conventional, Mongrel, or Electric Vehicles Which Technology for an Civic Distribution Centre by Philippe Lebeau, Cedric De Cauwer, Joeri Van Mierlo, Cathy Macharis, Freight transport has a major impact on civic movement. Experimenter explored the possible integration of electric vehicles in civic logistics operations. A line with different technologies has the occasion of reducing the costs of the last afar. Experimenter presented a line size and blend vehicle routing problem with time windows for EVs. (**Ji and Liu 2022**) The main donation of the authors was considering the variability of the range of EVs. In the parts of small vans, EVs are frequently the most competitive technology. (**Steadman and Higgins 2022**) In the number of large vans, diesel has seen the most intriguing result from a fiscal point of view as electric vehicles would need to cover a longer distance to be cost-competitive. Mongrel vehicles are chosen in the number of exchanges as its handling costs and fixed costs are lower than the diesel truck. (**Zhang et al. 2022**) Consumer preferences for electric vehicles by Fanchao Liao, Eric Molin & Bert van Wee, Wide relinquishment of EVs may contribute to lessening of problems like environmental pollution, global warming and canvas reliance. Still, this penetration of EV is comparatively low in malignancy of governments enforcing strong creation programs. (**Gryz, Karpowicz, and Zradziński 2022**)

They presented a comprehensive review of studies on consumer preferences for EV aiming to convey policy-makers and give direction to further probe. They compared the profitable and cerebral approach towards consumer preference for Electric vehicles. (**Zhao 2022**) The impact of fiscal and specialized attributes of EV on its mileage is generally planned to be significant, including its purchase and operating cost, driving range, charging duration, vehicle performance and brand diversity on the request. The viscosity of charging stations also appreciatively affects the mileage and creation of EV. (**Herrmann and Rothfuss 2015**) The impact of incitement programs, duty reduction is relatively effective. Study on Electric Vehicles in India Openings and Challenges by Mohamed M, G Tamil Arasan, and G Sivakumar, The relief of ICE with electric machines will reduce pollution to a great extent and be profitable to consumers. Numerous countries have enforced this technology and are contributing to the enhancement of the terrain. (**Aziz 2017**) The experimenter saw the openings and challenges faced in India over enforcing EVs. Openings like Government Enterprise, Batteries, Diligence, and Environment have been considered. With these challenges like cost of EVs, effectiveness of EVs in India and demand for EVs were taken into consideration. The perpetration of EVs in India aims primarily to gauge back hothouse emigrations and cut canvas charges. (**Denton 2020**) The government should make the foremost eschewal of the openings available and find suitable ways to attack the challenges.

Electric Vehicles in India Market Analysis with Consumer Perspective, Programs and Issues Pritam. Gujarathi, VarshaA. Shah, MakarandM. Lokhande, Indian Script is different because the current request share of EV/ PHEV is around, Presently nearly all vehicles consider fossil energy- grounded transportation. (**Luigi and Tarsitano 2012**) These contaminate the atmosphere by the emigration of hothouse feasts & causes global warming. The gap between domestic petroleum products and consumption is widening. India has around 70% of canvas needed per annum. (**Nur 2017**) Hence there is a critical need to probe factors and challenges for sustainable and cleaner druthers. Perception and Mindfulness Position of Implicit Guests towards Electric Buses Masurali.A, Surya P, India contributes around 18 in transport sector alone in terms of carbon emigration. (**Kurzweil 2015**) The Electric Vehicle (EV) is one of the foremost doable indispensable results to beat the heads. Several automotive companies are introducing EVs and are expanding their portfolio. Promoting EVs can help reduce energy dependence and pollution and salutary for both consumers and the nation. The education of people has significantly advanced influence over their mindfulness position on EVs. Piecemeal from

manufacturers, Government should strive hard to spread mindfulness and influence positive perception among implicit guests. (Sarin et al. 2020)

A Study of Consumer Perception and Purchase Intention of Electric Vehicles Enough Bhalla, Inass Salamah Ali, Afroze Nazneen, Choice of buses depends upon environmental concern, cost, comfort, trust, technology, social acceptance, structure vacuity. These arguments have been tested for both conventional buses and EVs. They assume that these factors have direct influence on individual choice of vehicle. (Perner and Vetter 2015) They plan that EV manufacturers and Government have to invest more in social acceptance of the vehicle by creating further infrastructural installations, putting further thrust on technology to produce trust. The analysis depicts that the population is well apprehensive of the environmental benefits. The responsibility lies on the shoulders of the Government and manufacturers to invest in the manufacturing of vehicles. Electric Vehicles for India Overview and Challenges by Rakesh Kumar, Dr. Sanjeevikumar Padmanaban, Global pollution is on the rise and each trouble made, is to cut back the CO2 emigrations and save the earth. One similar problem is the preface of EVs. The transport sector is one of the largest emitters of CO2 and hence it's important to reduce it. The government has come up with ambitious plans of introducing EVs to the Indian request and confine pace with the event of EVs encyclopedically. (Ayodele 2019) The National Electric Mobility Mission Plan 2020 has included an in- depth report on the EVs. India encompasses a huge challenge in shifting the transportation sector from ICE machines to EVs. This needs lots of planning along with R&D. Charging structure must be adequately made to deal with range anxiety. It's vital to form demand generation by making all government motorcars electric and offering duty immunity for particular EV possessors.

Openings and Scope for Electric Vehicles in India by Janardan Prasad Kesari, Yash Sharma, Chahat Goel, Developing an aggressive strategy for the relinquishment of EVs in India and icing a well- executed perpetration is a challenge but vital for the government. The terrain and diversity of India will present problems that bear thoughtful results. (Pistoia 2010) Public procurement is anticipated to be an important driver of growth of EVs, with the purchase of four-wheeled vehicles for government services, three-wheeled vehicles and motorcars for public transport. Investments by line drivers similar to Ola and Uber, and drivers of food distribution services, are also anticipated to boost the original growth of two- and four- wheeled electric vehicles. Still, the private EVs may take 5-6 times to gain fashionability and acceptance. Indian Electric Vehicles Storm in a demitasse Yogesh Aggarwal, Vivek Gedda and Kushan Parikh, Druggies of scooters, who need only to travel short distances, may consider an EV, but those, who need to travel longer distances and formerly own bikes like a Hero Splendor, may find it delicate to move to an e-2W. (E. A. Nanaki 2021) For buses, it's fairly simple to ameliorate the range with increased battery size. For electric 2Ws however, every increase in kWh may give a redundant 30 km in range, but the increase in weight is around 10 kg, roughly a 10 increase in the total weight of the bike. This weight issue is indeed more pronounced in lower bikes (lower than 150cc).

### Materials and Methods

This research has been adopted empirical study. Empirical research is based on observed and measured phenomena and derives knowledge from actual experience rather than from theory or belief. Key characteristics for this empirical research is Electric vehicles, Automobile industry, Fossil Fuel, Environmental, Government policies, EV Policies. Specific research questions to be answered And Description of the process used to study this population or phenomena, including selection criteria, controls, and testing instruments (such as surveys). SPSS graphics and diagrams are attached in this research work. There are totally 202 samples collected for this study. **Independent variables** were Name, age, gender, income, educational qualification, occupation. **Dependent variables** were about the study on the choice of vehicles and how it affects the development of the environment and also to know the awareness of EV policies among the general public.

### Analyses and Interpretation

#### Test 1: Relationship between Choice of vehicle and Gender

**H0:** There is no difference of age on the choice of vehicle.

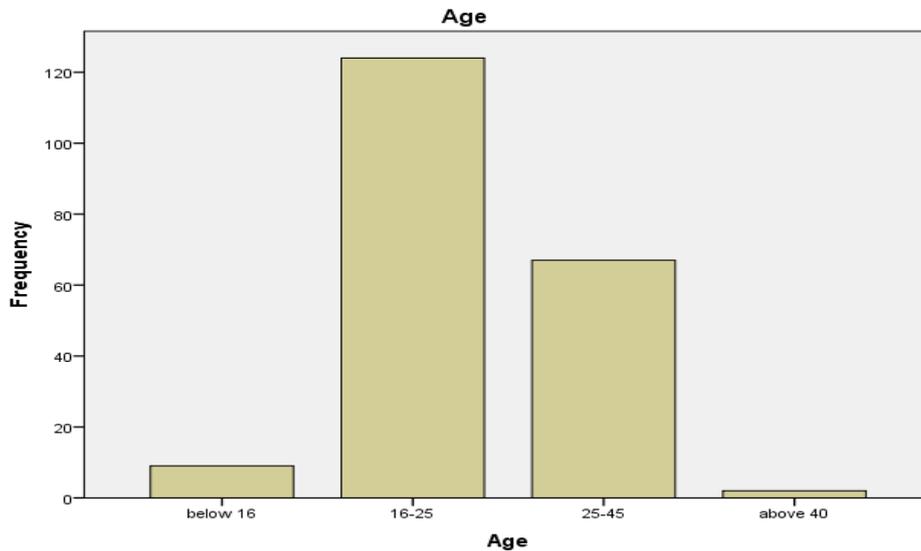
**Ha:** There is a significant difference of age on the choice of vehicle.

| Age   |          | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|----------|-----------|---------|---------------|--------------------|
| Valid | below 16 | 9         | 4.5     | 4.5           | 4.5                |
|       | 16-25    | 124       | 61.4    | 61.4          | 65.8               |
|       | 25-45    | 67        | 33.2    | 33.2          | 99.0               |
|       | above 40 | 2         | 1.0     | 1.0           | 100.0              |

|       |     |       |       |
|-------|-----|-------|-------|
| Total | 202 | 100.0 | 100.0 |
|-------|-----|-------|-------|

**Legend:** P value is greater than 0.05, we do not reject H0, but this does not necessarily imply that H0.

**Result:** We can conclude that H0 is true or false but our experiment and statistical test were not “strong” enough to lead to a p-value lower than 0.05.



**Test 2: Relationship between choice of vehicle and gender**

**H0:** There is no significant difference in the gender of people and their choice of vehicle.

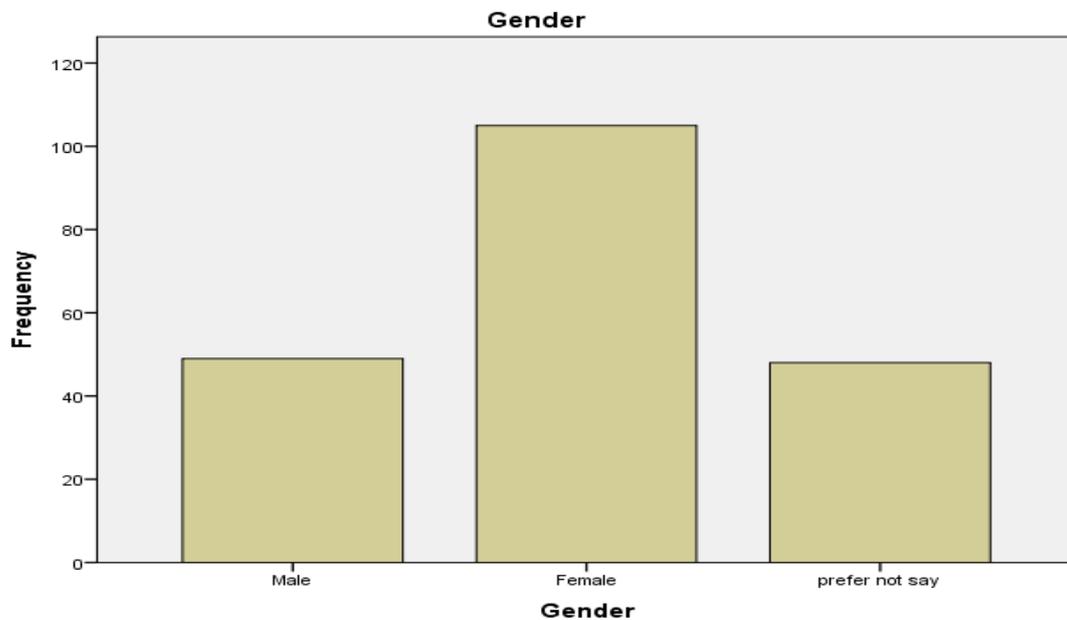
**H1:** There is a significant difference in the gender of people and their choice of vehicle.

**Gender**

|                      | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid Male           | 49        | 24.3    | 24.3          | 24.3               |
| Valid Female         | 105       | 52.0    | 52.0          | 76.2               |
| Valid prefer not say | 48        | 23.8    | 23.8          | 100.0              |
| Total                | 202       | 100.0   | 100.0         |                    |

**Legend:** By the above table, it is calculated as the number of respondent responses based upon their gender.

**Result:** P value is smaller than 0.05 thus we reject H0 & accept H1 i.e. there is significant difference of gender on the choice of vehicle.



**Do you think it is too early for electric cars, that they are not reliable enough?**

|                    | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------|-----------|---------|---------------|--------------------|
| Valid yes          | 85        | 27.7    | 27.7          | 27.7               |
| Valid no           | 56        | 42.1    | 42.1          | 69.8               |
| Valid not answered | 61        | 30.2    | 30.2          | 100.0              |
| Total              | 202       | 100.0   | 100.0         |                    |

**Chi-Square Tests**

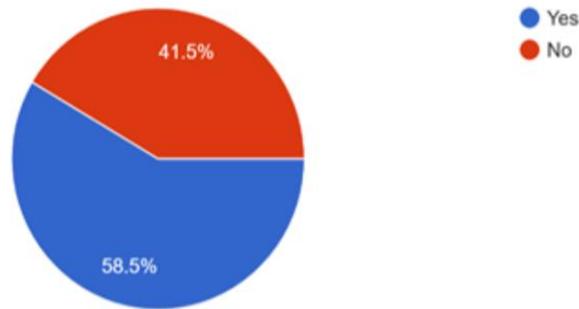
|                              | Value               | df | Asymp. Sig. (2-sided) |
|------------------------------|---------------------|----|-----------------------|
| Pearson Chi-Square           | 55.144 <sup>a</sup> | 9  | .000                  |
| Likelihood Ratio             | 34.382              | 9  | .000                  |
| Linear-by-Linear Association | 3.258               | 1  | .039                  |
| N of Valid Cases             | 202                 |    |                       |

a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .15.

**Legend:** Considering the current infrastructure and development of electric vehicles in India, the majority of respondents considers that it is early for EVs to launch.

**Result:** Respondents were being asked about the various factors which influence the purchase decision of a vehicle. Majority of respondents consider performance, fuel efficiency, price, technical features and environment friendly as very influential, whereas they consider style, size and brand as moderately influential factors.

Do you think it is too early for electric cars, that they are not reliable enough?



How much should be the cost of electric vehicles in the Indian market?

|                        | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|--------------------|
| Valid 15 lakhs & above | 56        | 27.7    | 27.7          | 27.7               |
| 5 to 10 lakhs          | 85        | 42.1    | 42.1          | 69.8               |
| 10 to 15 lakhs         | 61        | 30.2    | 30.2          | 100.0              |
| Total                  | 202       | 100.0   | 100.0         |                    |

Chi-Square Tests

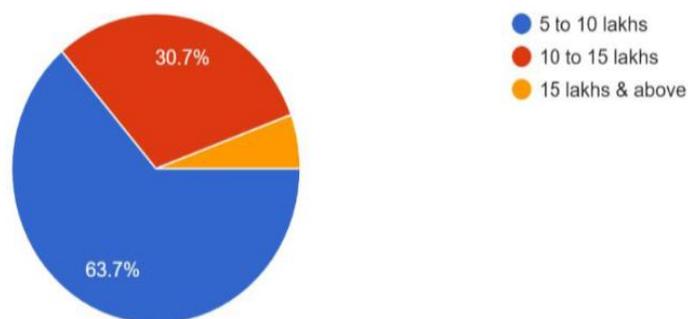
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a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .15.

**Legend:** This table shows the cost of electric vehicles in the Indian market and it is easy for the people who are working in order to calculate their annual income.

**Result:** Cost being an important factor, customers expects EVs in 5-10 lakhs range.

How much should be the cost of electric vehicles in the Indian market?



**If wants to change/buy, would you prefer an eco-friendly vehicle?**

|                   | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| yes               | 119       | 58.9    | 58.9          | 58.9               |
| Valid no          | 69        | 34.2    | 34.2          | 93.1               |
| not prefer to say | 14        | 6.9     | 6.9           | 100.0              |
| Total             | 202       | 100.0   | 100.0         |                    |

**Chi-Square Tests**

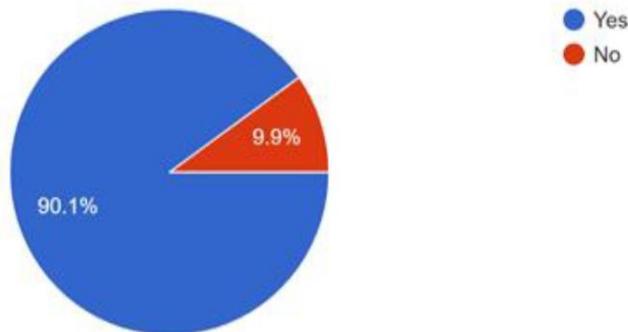
|                              | Value               | df | Asymp. Sig. (2-sided) |
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| Pearson Chi-Square           | 55.144 <sup>a</sup> | 9  | .000                  |
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| Linear-by-Linear Association | 3.258               | 1  | .039                  |
| N of Valid Cases             | 202                 |    |                       |

a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .15.

**Legend:** 90.1% were in favour of eco-friendly vehicles and 9.9% favoured conventional vehicles.

**Result:** Respondents are aware of climate conditions and ready to change their preference to eco-friendly cars.

If wants to change/buy, would you prefer an eco-friendly vehicle?



**Which of the following would you prefer?**

|         | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|-----------|---------|---------------|--------------------|
| 1       | 15        | 7.4     | 7.4           | 72.3               |
| 2       | 20        | 9.9     | 9.9           | 82.2               |
| Valid 3 | 146       | 72.3    | 72.3          | 92.6               |
| 4       | 21        | 10.4    | 10.4          | 100.0              |
| Total   | 202       | 100.0   | 100.0         |                    |

**Chi-Square Tests**

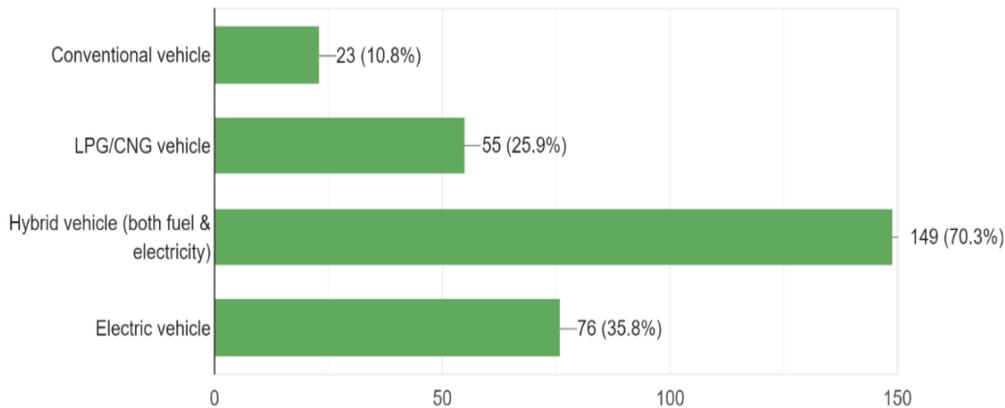
|                              | Value               | df | Asymp. Sig. (2-sided) |
|------------------------------|---------------------|----|-----------------------|
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| Likelihood Ratio             | 34.382              | 9  | .000                  |
| Linear-by-Linear Association | 3.258               | 1  | .039                  |
| N of Valid Cases             | 202                 |    |                       |

a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .15.

**Legend:** The above table describes the preference of the public towards the conventional vehicle, LPG or CNG vehicle, hybrid vehicle that is both electrical and fuel and electric vehicle.

**Result:** When asked regarding choice of vehicle, respondents majorly selected hybrid vehicles.

Which of the following would you prefer?



### Result

To find the consumer perception it's important to find out the factors for selecting EV. Respondents consider less carbon emissions, less dependency on fossil fuels, inexpensive to run as important factors. Respondents consider recharging time, limited charging stations, difficulty in charging as major drawbacks/limitations to consider EVs in current situations. Respondents were being asked about the various factors which influence the purchase decision of a vehicle. Majority of respondents consider performance, fuel efficiency, price, technical features and environment friendly as very influential, whereas they consider style, size and brand as moderately influential factors.

### Discussion

The respondents are apprehensive of global climate conditions and are ready to change their preference from conventional to eco-friendly vehicles. The respondents considered cost is an important factor while considering the purchase of EV. The public perceptions are willing to consider EVs as their unborn purchase option, if proper structure is available. Original cost of purchase, less number of charging stations and the time needed to recharge the battery is creating limitations in boosting consumer confidence. This study has concentrated on both primary and secondary data of electric vehicles in chennai.

### Limitation

The major limitation of my study is the sample frame. The sample frames in bus stands have no root for crime samples. The various schemes implemented by each state being in the state list is also one of the major drawbacks. The restrictive area of sample size is also another major drawback. The physical factors are the most impactful and a major factor limiting the study.

### Conclusion

With the reduction of fossil energies and constant hike in energy prices, there's a need for energy transition in vehicles in India. The Government has taken action to fight pollution situations by promoting EVs and giving subventions on purchase. To boost its product, Govt has eased the FDI morals. Colorful arising brands are launching EVs in India. The Government and manufacturers should join their hands to make the structure and produce positive terrain for EVs. The respondents are apprehensive of global climate conditions and are ready to change their preference from conventional to eco-friendly vehicles. Cost is an important factor while considering the purchase of EV. Repliers are willing to consider EVs as their unborn purchase option, if proper structure is available. Original cost of purchase, less number of charging stations and the time needed to recharge the battery is creating limitations in boosting consumer confidence. This study has concentrated on both primary and secondary data of electric vehicles in India. Though the exploration plant is an implicit

compass of Electric vehicles in India, still there's a compass for in- depth study with lesser number of samples and further factors. The understanding of individual beliefs and general stations are of pivotal impact as the public opinion also vastly impacts on the cognitive mind setting of unborn druggies. Thus, we named a relatively oblivious sample of a wide age range, to get a broad sapience into stations. In unborn studies though we will examine expert druggies and explore also stations towards electric mobility in the environment of public transport.

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