A study on

THE CONSUMER BEHAVIOUR TOWARDS ELECTRIC VEHICLES WITH REFERENCE TO KOCHI CITY

Project Report

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Under the guidance of

Ms. NIMA DOMINIC

In partial fulfillment of the requirement for the Degree of

BACHELOR OF COMMERCE

ST. TERESA'S COLLEGE ESTD 1925

ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

COLLEGE WITH POTENTIAL FOR EXCELLENCE

Nationally Re-Accredited with A++ Grade

Affiliated to

Mahatma Gandhi University

Kottayam-686560

March-2024

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CERTIFICATE

This is to certify that the project titled **"A STUDY ON THE CONSUMER BEHAVIOUR TOWARDS ELECTRIC VEHICLES WITH REFERENCE TO KOCHI CITY"** submitted to Mahatma Gandhi University in partial fulfillment of the requirement for the award of Degree of Bachelor in Commerce is a record of the original work done by **Ms. Nooha Mariyam**, **Ms. Biya Babu, Ms. Irene Sara Jacob,** under my supervision and guidance during the academic year 2021-24.

Project Guide

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DECLARATION

We Ms. Nooha Mariyam, Ms. Biya Babu, Ms. Irene Sara Jacob, final year B.Com students, Department of Commerce (SF), St. Teresa's College (Autonomous) do hereby declare that the project report entitled A STUDY ON THE CONSUMER BEHAVIOUR TOWARDS ELECTRIC VEHICLES WITH REFERENCE TO KOCHI CITY submitted to Mahatma Gandhi University is a bonafide record of the work done under the supervision and guidance of MS. Nima Dominic, Assistant Professor of Department of Commerce (SF), St. Teresa's College (Autonomous) and this work has not previously formed the basis for the award of any academic qualification, fellowship, or other similar title of any other university or board.

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ACKNOWLEDGEMENT

First of all, we are grateful to God Almighty for his blessings showered upon us for the successful completion of our project.

It is our privilege to place a word of gratitude to all persons who have helped us in the successful completion of the project.

We are grateful to our guide **Ms. Nima Dominic**, Department of Commerce (SF) of St. Teresa's College (Autonomous), Ernakulam for her valuable guidance and encouragement for completing this work.

We would like to acknowledge **Dr. Alphonsa Vijaya Joseph**, Principal of St. Teresa's College (Autonomous), Ernakulam for providing necessary encouragement and infrastructure facilities needed for us.

We would like to thank **Smt. Jini Justin D'Costa**, Head of the Department, for her assistance and support throughout the course of this study for the completion of the project.

We will remain always indebted to our family and friends who helped us in the completion of this project.

Last but not the least; we would like to thank the respondents of our questionnaire who gave their precious time from work to answer our questions.

Nooha Mariyam

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CHAPTER – I

INTRODUCTION

INTRODUCTION: -

An electric vehicle, unlike a conventional vehicle, is quite flexible. This is because of the smaller number of moving parts that are required in the workings of a conventional vehicle. In an electric vehicle, the number of moving parts is limited to one, the motor. It can be run by different control mechanisms. In recent times, electric vehicles have been on the rise, and there are many reasons behind it. The most prominent one is their contribution to reducing pollution. In 2009, the transportation sector was accountable for 25% of the greenhouse gases produced by energy-related sectors.

India, the world's third-largest energy consumer after the United States and Republic of China, is working towards building a green and sustainable economy and plans to achieve 175 gigawatts (GW) of renewable energy capacity by the year 2022 as part of its mission and commitments under the global climate change accord. Of this, 100GW comes from solar. "This industry (EV) is starting to uplift itself and its still a small percentage of the overall vehicle market but it's starting to reach a point where it can have a very strong and profound impact globally," Such a shift to renewable energy makes good sense for India which paid Rs4.16 trillion to buy 202.85 million tons of crude oil in 2015-16. Electric vehicles‟ impact on the environment has been considered many times without any serious steps taken in that direction. Our economic model is original because it hopes to examine rational consumers‟ choice between switching to electric vehicles (EVs) and purchasing all other goods. We were able to explore the environmental impact of adoption of electric vehicles, which will supplement our argument for whether consumers purchase electric vehicles as a choice, for the economy in a particular area and the prospects of electric vehicles in that area.

STATEMENT OF THE PROBLEM:-

Electric vehicles made their proper debut into the commercial vehicle market in the year 2019 with Revolt RV400 which is still the most loved/preferred electric bike in the market and after RV400, Tata launched their Nexon EV which was the next super hit product in the EV market and after that with the entrance of countless EV making startups (like Ola, Ather, Pure EV, Hero electric) the EV market in India never looked back. The records indicate that only 1.8% population adopted EV in India till 2020-2021 in India. This study focuses on knowing the factors responsible for slow

pace of EV penetration in the market and the consumer behavior towards purchase of sustainable vehicles over its cost.

OBJECTIVES OF THE STUDY :-

1. To study the willingness of buyers to consider electric/hybrid vehicles as practical commuting options in Kochi city.

2. The schemes launched, and several steps taken by the government to promote adoption of electric vehicles in India.

3. To study the reasons for the potential shift of consumers from traditional vehicles to EV's and how this will lead to their potential growth in the future.

4. To study the current threats that would cause slow growth of electric/hybrid vehicles.

SIGNIFICANCE OF THE STUDY :-

The study of Electric Vehicles in Kochi is significant for several reasons. It helps understand the practical implementation of EVs in a real-world urban setting, assesses their impact on reducing pollution and carbon emissions, evaluates infrastructure requirements like charging stations, and provides insights into public acceptance and usage patterns. This study contributes valuable data and insights for policymakers, urban planners, and businesses looking to enhance sustainable transportation initiatives.

RESEARCH METHODOLOGY :-

1. **Type of Research Design:** The study is descriptive in nature
2. **Collection of Data:** Both primary and secondary data were used for data collection.
3. **Primary Data**: They were collected through conducting surveys through the distribution of questionnaires by google forms
4. **Secondary Data**: They were collected from published sources like websites, journals, books etc.
5. **Sampling Design**: A convenient random sampling was used to analyze the objectives of the study
6. **Population**: The population was limited to Kochi city.
7. **Sample Size**: A total of 80 is the sample size

SCOPE OF THE STUDY :-

The study aims to assess consumer willingness toward adopting electric/hybrid vehicles in Kochi, analyzing government initiatives promoting their adoption. It explores reasons driving the shift from traditional vehicles to EVs and anticipates market growth. Additionally, it evaluates threats hindering the expansion of electric/hybrid vehicles in the region.

LIMITATIONS OF THE STUDY :-

1. The study is limited to Kochi city only.

2. The study is limited only to passenger electric vehicles by road

3. Period of the study is only for one month. Hence, in depth study could not be undertaken.

4. Chance of biased responses from the study. It might not represent complete accurate information rather it provides a general analysis of consumers who use EV as well as consumers who are potential consumers of EV's.

5. Sample size – The sample size selected for the study is 80 samples.

CHAPTER – II

REVIEW OF LITERATURE

PABITRA KUMAR DAS, MOHAMMAD YONUS BHAT (JAN 27, 2022)

The aim of the study is to get an overview of the electric vehicle policies of the government of India and its state governments to find out their relevance and impact on EV adoption in India. Exploratory research is used in present case to carry out the study. The Government of India has framed policies such as "NEMMP 2020," "FAME-I," "FAME-II," and the Vehicle Scrappage Policy. Seventeen of its state governments have framed EV policy. These policies facilitated various types of incentives, including infrastructure development, fund allocation, research and development, production, and sales. However, lack of policy and technology availability in the domain of disposal and reprocessing of Li-ion batteries is found to be a future limitation of EVs.

SUSHIL KUMAR DIXIT, ASHIRWAD KUMAR SINGH (MAY 18, 2022)

The challenges for EV include increasing dependence on fossil fuels, environmental concerns, challenges posed by rapid urbanization, urban mobility, and employment. Marketers from the electric vehicle (EV) industry are finding it difficult to identify genuine buyers for their products. In this context, the present study attempts to develop a machine learning model to predict whether a person would "Buy" or "Won't Buy" an electric vehicle in India. To develop the model, an exploration of EV context was done first by conducting a text analysis of online content relating to electric vehicles. The objective was to find frequently occurring words to gain a meaningful understanding of the consumer's interests and concerns relating to electric vehicles. The machine learning model indicates that age, gender, income, level of environmental concerns, vehicle cost, running cost, vehicle performance, driving range, and mass behaviour are significant predictors of electrical vehicle purchase in India.

MR. A. RAKESH KUMAR, DR. SANJEEVIKUMAR PADMANABAN (MASURALI.A, 2018)

India contributes around 18% in transport sector alone in terms of carbon emission Delhi annual co2 emission of 69.4 million tonnes is equal to co2 emission of Bengaluru, Hyderabad and Chennai put together. The Electric Vehicle (EV) is one of the foremost feasible alternative solutions to beat the crises and electronic vehicles will help India to reach the net zero carbon emission by 2070. Promoting EVs can help reduce fuel dependence and pollution and beneficial for both consumers,

and the nation. The education of people has a significantly higher influence on their awareness level of EVs. Global pollution is increasing, and every attempt is being made to reduce CO2 emissions and rescue the planet. The introduction of electric vehicles is one such initiative. Because transportation is one of the greatest CO2 emitters, it is critical to cut emissions. An in-depth report on EVs was included in the National Electric Mobility Mission Plan 2020.India faces a significant hurdle in transitioning from internal combustion engines to electric vehicles. It's critical to create demand by electrifying all government buses and providing tax breaks to personal electric vehicle owners.

SANSUTI NATH (2021)

The journal mentioned the government of India amended the current FAME-II (Faster Adoption and Manufacturing of Electric Vehicles-II) initiative in June of this year. The government narrowed the price difference between petrol-powered two-wheelers and electric two-wheelers by boosting the subsidy rate for electric two-wheelers from Rs 10,000/kWh to Rs 15,000/kWh, as well as capping incentives at 40% of vehicle costs, rather than 20% previously. This policy also supports about 2,700 charging stations in the largest cities, other cities with over a million in population, smart cities, and cities in hilly states across the country, with the objective of having at least one charging station in every 3 km x 3 km grid. In addition, charging stations are planned for every 25 km on highways. India aims to switch 30 percent of private cars, 70 percent of commercial vehicles, and 80 percent of two and three-wheelers to EVs by the year 2030.

K. NANDINI TORNEKAR (2020)

The journal stated the eight possible reasons for the slow growth of EVs in India. He mentioned charging time, price of an EV, range depending on battery capacity, charging infrastructure, limited life of batteries, fear of new technology, government incentives, lack of advertisements, and awareness campaigns as the obstacles to EVs growth in India. As people are habituated to use conventional ICE vehicles, they do not want to take a risk with the range. The EVs have high purchase price when compared to ICE vehicles. An electric vehicle costs you between 1.5x to 2.5x of the ICE equivalent model. No incentives are provided to four-wheeler (for personal use) under the FAME II Scheme.

CHATURVEDI AND GARG ET AL. (2019).

To evaluate 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 EV's with more range, faster charging periods and less expensive running costs.

PUROHIT AND SINGH ET AL. (2020)

Study to examine the Indian customers willingness to pay (WTP) for electric vehicles. The findings indicate that consumers are willing to pay more for EV's 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 attitude towards electric automobiles. They discovered that consumers perceived behavioral control and subjective standards were mediating factors in the effect that consumers with higher levels of positive environmental awareness were inclined to contemplate buying an electric vehicle. Additionally, we discovered that consumers were less inclined to consider buying an EV if they believed EV's were pricey and inconvenient.

R. HEMA, M.J VENKATA RANGAN (2022)

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.

Lithium-ion batteries must be made in India. To speed up the adoption of EVs, a new business model that allows for high infrastructure utilization for both charging and swapping options must be discovered. Recent laws, like the battery swapping legislation, that were passed to promote a shift towards green energy generation and decentralization are likely to result in the development of a well-established EV infrastructure across the country.

MOHAMED M, G TAMIL ARASAN AND G SIVAKUMAR (2018)

Over the years, the exploitation and pollution of natural resources have created the need for renewable and environment-friendly products. One of these products is Electric Vehicles. Electric Vehicles are the replacement for petroleum-based vehicles. They are one of the emerging technologies as well as eco-friendly and viable. The replacement of internal combustion engines with electric engines will reduce pollution to a great extent and be profitable to consumers. Many countries around the globe have implemented this technology and are contributing towards amelioration of the environment. We are going to see the opportunities and challenged faced in India over implementing electric vehicles.

EVANTHIA A. NANAKI (2021)

It highlights the dominance of battery electric vehicles (BEVs), led by Tesla, Chevrolet, and Nissan, for their efficiency and lower emissions. It also touches on fuel cell electric vehicles (FCEVs) by Hyundai, Toyota, and Honda, indicating a diverse future for electric transport, especially in heavy-duty and niche applications. Overall, it showcases a dynamic landscape with ongoing innovations in battery technology and alternative electric vehicle options.

JOHN E DOER 2021

Chapter 1 of the book, charted that to achieve sustainable transportation, the goal is to shift from fossil fuel vehicles to a zero-emissions fleet by 2050. Electric vehicles (EVs) have made progress, accounting for nearly 9% of new car sales globally. However, overcoming challenges in pricing, availability and charging infrastructure is crucial for EVs to capture a larger market share. Achieving a significant reduction in transportation emissions—6 gigatons—requires phasing out the current combustion vehicle fleet.

HYUNG MIN KIM, SOHEIL SABRI AND ANTHONY KENT OCTOBER 5, 2020

"Smart Cities for Technological and Social Innovation" is an insightful exploration of the evolving landscape where technology and urban development converge. This book meticulously navigates the multifaceted terrain of smart city initiatives, emphasizing not only the integration of cutting-edge technology but also the crucial role of social innovation in reshaping urban environments. It sheds light on the complexities surrounding data privacy, the digital divide, and the importance of not solely relying on technological solutions without considering their broader social impacts. This comprehensive approach makes it a valuable resource for anyone seeking a deeper understanding of the intricate interplay between technology, social innovation, and the development of smarter, more sustainable cities.

XIAOMIN LI, XIAOLEI ZHAO, DONG XUE, QIANQIAN TIAN

EVs may face problems such as a large reduction in cruising range, slow charging and poor safety, which decrease the attractiveness of EVs to consumers and hinder the EV adoption. Based on the panel data of electric vehicle sales in 20 Chinese provinces from 2010 to 2018, this paper uses interaction fixed effect (FE) model to test the effect of temperature on the EV adoption and explains the causes of regional differences in EV adoption. The study has the following findings. Firstly, EV sales show an inverted U-shaped trend with the change of temperature. Secondly, compared to extreme high temperature, extreme low temperature has a greater negative impact on the EV adoption. Thirdly, the negative impact of extreme temperature on battery electric vehicles (BEVs) is greater than that of plug-in hybrid electric vehicles (PHEVs). Finally, temperature will make consumers' behavior adaptive by affecting their expectations. EV technology and quality inspection department, non-governmental organizations, and EV manufacturer, aiming at accelerating the market proliferation of EVs, with theoretical basis and targeted insights.

ZIEGLER, N ABDELKAFI, JOURNAL OF CLEANER PRODUCTION 2022

Business models that served conventional cars may not be appropriate for electric vehicles because of technological limitations such as shorter driving range and long charging cycles as well as higher acquisition cost. Electric mobility is multi-dimensional. It is a systemic innovation (Abdelkafi and Hansen, 2018), as it calls for the involvement of many stakeholders whose

contributions are important to make the whole system work. They assign the articles to five business model elements: value proposition, value creation, value delivery, value capture, and value communication.

This article demonstrates that the business model approach contributes to the identification of possible solutions against barriers in front of the wide market diffusion of electric vehicles. We argue that business models can stimulate the creation of new ideas to cope effectively with the limitations of technology.

CHAPTER – III

THEORETICAL FRAMEWORK

CUSTOMER SATISFACTION

A measurement of a client's happiness with a company's goods, services, and capabilities is called customer satisfaction. consumer satisfaction is how satisfied or fulfilled a consumer feels with a product or service after using it, based on how well they feel it meets their expectations and is of a higher quality. It concerns the opinion of the consumer regarding whether the good or service fulfilled, surpassed, or failed to live up to their expectations. In consumer behavior studies, customer satisfaction holds significant importance for several reasons:

1. **Repeat Purchases and Loyalty**: Customers that are happy with a brand are more likely to show brand loyalty and make more purchases. Satisfied experiences foster trust and increase the probability of returning to the same business or product.
2. **Positive Word-of-Mouth**: Satisfied consumers are more likely to spread the word about their positive experiences, which helps with word-of-mouth advertising. This affects how prospective clients see things and make judgments.
3. **Brand Image and Reputation**: Excellent customer satisfaction rates provide a favorable reputation and image for a brand. It affects the brand's overall success as well as how the market views it.
4. **Reduced Churn and Complaints**: Customers who are happy with a product or service are less likely to complain or go to a competitor. By doing so, companies can lower their churn rate and save money on expenses relating to client retention and service recovery.
5. **Profitability and Business Growth**: Customer satisfaction can result in more sales, lower marketing expenses from recommendations, and chances for business growth, all of which can boost profitability.

CUSTOMER SATISFACTION AND AUTOMOBILE INDUSTRY

In the automotive industry, customer satisfaction holds immense significance as it profoundly influences purchasing decisions and impacts various aspects of the industry:

1. **Brand Loyalty and Retention**: In the car industry, happy consumers are more likely to display brand loyalty. Customers are more likely to continue with a brand or car model for subsequent purchases if they have a positive experience with it, which raises retention rates.

2. **Word-of-Mouth and Reputation**: Content consumers spread the word about a company to friends, family, and online communities, acting as brand ambassadors. Their suggestions have a big impact on what prospective customers decide to buy, which helps a brand's standing in the marketplace.
3. **Repeat Sales and Customer Lifetime Value**: In the car sector, client satisfaction frequently results in recurring business. Positive encounters increase the lifetime worth of a customer since those who are satisfied are more likely to come back for repairs, upgrades, or new car purchases.
4. **Market Competitiveness and Differentiation**: Having clients who are satisfied turns into a competitive advantage. Companies that constantly provide excellent customer service set themselves apart from rivals, drawing in new business and keeping hold of current clients.
5. **Product Development and Innovation**: Positive consumer feedback offers insightful information for new and improved products. Automotive firms can improve their offers to better match customer wants and preferences by having a deeper understanding of the features or experiences that increase customer happiness.
6. **Service Quality and After-Sales Support**: After-sales care is just as important to customer happiness as the initial transaction. A satisfying maintenance, repair, and customer service experience has a big impact on overall satisfaction and encourages future purchases.

In overall, brand perception, sales, customer loyalty, and product development plans are all significantly influenced by consumer satisfaction in the automobile sector. For automotive firms to remain competitive and prosper in the market, this is a crucial measure that they regularly watch.

CONSUMER PREFERENCE AND ENVIRONMENTAL CONSIDERATION

Consumer preferences in the automotive industry have evolved beyond traditional functional aspects of vehicles to encompass experiential and environmental considerations due to several key factors:

1. **Rising Environmental Awareness**: Customers are looking for more environmentally friendly transportation options as a result of growing awareness of environmental issues including air pollution and climate change. A growing interest in cars with lower emissions and less of an impact on the environment is indicative of this transition.

2. **Government Regulations and Incentives**: Consumer decisions have been impacted by strict pollution restrictions and incentives supporting renewable energy. Governments all throughout the world are pushing customers to think about ecologically friendly solutions by offering subsidies, tax breaks, and infrastructure development as means of boosting the adoption of electric and hybrid vehicles.
3. **Technological Advancements**: Rapid technical breakthroughs have benefited the automotive industry, resulting in the creation of more efficient and environmentally friendly cars. These days, consumers are drawn to cutting-edge technologies that improve environmental benefits, like smart energy management systems, regenerative braking, and electric propulsion.
4. **Changing Consumer Lifestyles and Values**: Conscious consumerism and sustainability are two developing trends. Customers are beginning to place a higher value on experiences and goods that are consistent with their moral principles, especially decisions that benefit the environment.
5. **Evolution of Mobility Services**: The advent of mobility services such as car-sharing and ride-sharing has expanded the views of consumers. Not only does having a car play a role, but having easy access to environmentally friendly transportation options can also sway preferences in favour of more sustainable forms of mobility.
6. **Perception of Ownership Experience**: Beyond only the operation of the vehicle, consumers are now taking the whole ownership experience into account. When making a purchase, considerations such as accessibility, convenience of use, environmental impact over the course of the vehicle's lifecycle, and charging infrastructure for electric vehicles are crucial.

The automotive industry is changing as a result of this shift in consumer tastes, with factors other than just performance and functionality now influencing purchase decisions. Because of this, automakers are putting more of an emphasis on producing cars that satisfy the changing needs of their customers for environmental responsibility as well as experiential fulfilment.

DEFINITION AND STRUCTURE OF BATTERY ELECTRIC VEHICLES

In the end, new energy vehicles are defined as those that are formed in practical application with new technology, mechanical structure with new structure, and vehicles with unconventional fuels like oil and natural gas as a conventional fuel but in the drive power plant such as power output control and vehicle driving with a new type or new technology.

Fuel cell electric vehicles (FCEVs), battery electric vehicles (BEVs), hybrid electric vehicles (PHEVs, HEVs), and other cars utilizing non-conventional energy sources as fuel-driven products are examples of new energy vehicles.

The three components that now distinguish a battery-electric vehicle from a regular engine automobile are the battery, the motor, and the associated electronic control system. Other basic components are comparable to those of a traditional engine vehicle. Originally, battery electric vehicles used conventional internal combustion engines with gasoline tanks that connected to a motor drive and power battery pack. However, the structure of these vehicles was complicated and did not support the motor's performance, which led to low efficiency. The most evident differences between it and a typical car are in the energy source, transmission type, motor arrangement, and variable speed device. The present battery-electric vehicle is classified into four varieties based on the drive motor's characteristics: conventional, no transmission, no differential, and electric wheel type.

The automobile industry's collective push to lessen its environmental effect and adopt cleaner energy alternatives is the reason for the growing interest in electric vehicles (EVs) as a sustainable transportation choice. Growing awareness of climate change and the damaging environmental effects of conventional combustion engine vehicles is driving this interest. Because they produce no emissions when in use, electric vehicles (EVs) present a viable alternative that can drastically lower air pollution and greenhouse gas emissions. Furthermore, a conducive atmosphere for the rise of EVs has been created by developments in battery technology in conjunction with government regulations and activities that boost EV adoption. The increasing appeal of electric vehicles (EVs) signals a significant shift in consumer preference towards environmentally sensitive and sustainable mobility options. This growing interest is a symptom of a paradigm shift in the automobile industry toward the acceptance of creative, sustainable, and technologically sophisticated vehicles, as well as a need for cleaner energy.

TYPES OF ELECTRIC VEHICLES

There are three types of electric vehicles available:

1) **Battery Electric Vehicle (BEV):** These are fully powered by electricity. These are more efficient compared to hybrid and plug-in hybrids. BEVs are also known as All-Electric Vehicles (AEV). Electric Vehicles using BEV technology run entirely on a battery-powered

electric drivetrain. The electricity used to drive the vehicle is stored in a large battery pack which can be charged by plugging into the electricity grid. The charged battery pack then provides power to one or more electric motors to run the electric car.

BENEFITS:

Battery Electric Vehicles (BEVs) offer a quiet and cost-efficient operation while being environmentally friendly due to zero exhaust emissions during operation. However, their higher initial cost compared to other EV types is primarily due to the larger battery size and the accompanying onboard charging system. Although BEVs traditionally had a shorter travel range per charge compared to conventional vehicles per tank, advancements in newer EV models are steadily increasing this range. Additionally, the ongoing advancements in high-powered charging infrastructure are narrowing this gap. The actual travel range of BEVs can significantly vary based on several factors such as extreme temperatures, driving conditions (city or highway), and the weight carried.

2) Hybrid Electric Vehicle:

- Hybrid Electric Vehicle (HEV): HEVs are also known as series hybrid or parallel hybrid. HEVs have both engine and electric motor. The engine gets energy from fuel, and the motor gets electricity from batteries. The transmission is rotated simultaneously by both engine and electric motor. This then drives the wheels. The vehicle uses both the internal combustion (usually petrol) engine and the battery-powered motor powertrain. The petrol engine is used both to drive and charge when the battery is empty. These vehicles are not as efficient as fully electric or plug-in hybrid vehicles.

BENEFITS:

Hybrids utilize a battery and electric motor to propel the vehicle and can enable the engine to turn off when the vehicle stops, like at a traffic light or stop sign. These types of Hybrid Electric Vehicles (HEVs) cannot solely rely on electricity for power and typically have lower fuel efficiency compared to full hybrids. However, they often come with lower initial costs.

- Plug-in Hybrid Electric Vehicle (PHEV): The PHEVs are also known as series hybrids. They have both an engine and a motor. You can choose from the fuels, conventional fuel (such as petrol) or alternative fuel (such as biodiesel). It can also be powered by a rechargeable battery pack. Uses both an internal combustion engine and a battery charged from an external socket (they have a plug). This means the vehicle's battery can

be charged with electricity rather than the engine. PHEVs are more efficient than HEVs but less efficient than BEVs.

BENEFITS:

The advantage of a Plug-in Hybrid Electric Vehicle (PHEV) compared to a Battery Electric Vehicle (BEV) is its ability to switch to fuel when unable to reach a charging point, appealing to those hesitant to fully commit to a BEV. However, due to its dual systems, maintenance costs might be higher. When the smaller battery is depleted, the cost and environmental advantages are lost until it's recharged. Typically, a fully charged PHEV battery can travel around 40-80km, suitable for most Australian needs and surpassing the range of non-plug-in hybrid EVs. Yet, for frequent long-distance travelers, the internal combustion engine (ICE) activates after this range, potentially losing some emission benefits. Despite the limited electric range, PHEVs still offer reduced operating costs and fuel consumption compared to traditional vehicles, regardless of whether they operate on electricity partially or entirely. Additionally, their environmental impact varies depending on the frequency of all-electric mode usage.

3) **Fuel Cell Electric Vehicle (FCEV):** FCEVs are also known as Zero-Emission Vehicles. They employ 'fuel cell technology' to generate the electricity required to run the vehicle. The chemical energy of the fuel is converted directly into electric energy. Electric energy is produced from chemical energy. For example, hydrogen FCEV.

BENEFITS:

Fuel Cell Electric Vehicles (FCEVs) share similar advantages with other EVs, such as higher efficiency compared to traditional internal combustion engine vehicles and quick refueling times of approximately 3-5 minutes. As they primarily use hydrogen as fuel, they offer the added benefit of often having a greater travel range than BEVs. Some of the current FCEV models can travel over 700km between refueling sessions.

ADVANTAGES OF ELECTRIC VEHICLES:

Battery electric vehicles, in comparison with the traditional car, have many advantages:

1.In the discharge, they can achieve zero or near zero emissions.

2. Reduce the traditional car in a variety of tubing such as oil, brake oil and other oil emissions handling brought about by environmental pollution.

3. High energy conversion efficiency can improve the energy use of the economy.

4.To improve driving efficiency.

5.Driving to achieve smooth ride, accelerate linear, low noise.

DISADVANTAGES OF ELECTRIC VEHICLES

1.BATTERIES REQUIRE RARE METALS- The batteries for electric cars use lithium metal, the lightest metal and lightest solid element at normal conditions. Chile produces the largest amount of Lithium (8,800 tons per year). Other big producers are Argentina and China. Other metals include copper, cobalt, aluminum, nickel and sometimes manganese along with conductive non-metal graphite. There are rich cobalt deposits in countries like Republic of Congo. India mainly relies on imports to fulfill its demand for the elements required to manufacturing li-ion cells used in EV batteries due to lack of raw materials on our shores.

2. MAKING ELECTRIC CARS CREATES MORE EMISSIONS- The raw materials for making the cars have to be mined and the process of mining creates a lot of greenhouse gas. Refining the raw materials for further use adds to greenhouse gas. Considering the whole production process, making a petrol or diesel car releases about 7 to 10 tons of CO2. Making an electric car release about the same amount of CO2 but then you must add in the production of the battery.

3. ELECTRIC CARS CAN BE EXPENSIVE TO PURCHASE- The purchase price of an electric car does seem to be higher than a petrol- or diesel-powered engine of the same version. But this is where the increased costs end. A 30-minute fast recharge from a dedicated point at a service station costs around $6- not much more than a gallon diesel or petrol and in some cases, it is free. An overnight charge from a dedicated charging point installed at someone's home can provide around 100 miles of driving for $2. In the longer-term ownership rather than initial purchase price, electric cars can be cheaper than their petrol or diesel counterparts.

4. LACK CHARGING POINTS- At the end of 2022, there were 33996 electric vehicle charging stations across 20534 locations. By 2025, the number of sockets is set to increase to 80000. This compares reasonably well with the 8,378 petrol stations currently across the UK. Many people have their own charging point installed at home. But, that's not really an option for people living in streets of terraced housing where they must park their car at some distance from their house. India has an active network of 934 active public charging stations.

TECHNOLOGY ACCEPTANCE MODEL(TAM)

A theoretical framework called the Technology Acceptance Model (TAM) is used to analyse and forecast how users will accept and embrace new technology. It highlights how a user's intention to utilize a specific technology is influenced by perceived usefulness and perceived ease of use. regarded ease of use relates to how easy the technology is regarded to use by the user, whereas perceived usefulness refers to the user's opinion that the technology would improve their performance. According to TAM, a technology's chance of being adopted increases with perceptions of its utility and usability.

When it comes to customer uptake and acceptance of electric vehicles (EVs), the Technology Acceptance Model (TAM) can provide important information. Perceived utility and perceived ease of use, two key concepts in the TAM, can be used to analyse consumer attitudes and intentions toward EV adoption.

According to the TAM framework, perceived utility is the conviction that utilizing a specific technology will improve one's performance or simplify one's life. Customers evaluate the perceived utility of electric vehicles (EVs) in light of several aspects. For example, they could assess if driving an electric vehicle (EV) would save them money on gas, help the environment, or fit in with their sustainability principles. Customers are more likely to adopt an EV if they believe that using one will save them money, have a positive influence on the environment, or be more convenient. This increases the perceived usefulness of the vehicle.

Furthermore, the technology's perceived ease of use (PAM) measures how simple a technology is regarded by the user. Perceived ease of use can be strongly impacted by worries about the infrastructure for charging EVs, range anxiety, and general usability. Higher perceived ease of use is a result of features including EVs' intuitive user interfaces, ample range coverage, and simple access to charging stations. Consumers' inclination to embrace electric cars (EVs) is positively influenced when they believe these vehicles to be convenient and user-friendly.

The application of the TAM framework to EV adoption emphasizes how crucial it is to address perceived utility and perceived usability in order to persuade customers to buy EVs. Automakers and legislators may more effectively encourage the adoption of electric vehicles and advance a more environmentally friendly form of transportation by comprehending and addressing these problems, emphasizing the advantages of EV ownership and guaranteeing user-pleasant experiences.

GOVERNMENT INITIATIVES

The Indian government along with the Kerala state government have launched several subsidies and schemes to promote the adoption of electric vehicles (EVs) throughout the country, including Kochi.

CENTRAL GOVT. INITIATIVES:

The Ministry of Heavy Industries has introduced three programs to encourage the manufacture of electric and hybrid vehicles in the nation, according to a written response provided by Union Minister of State for Heavy Industries, Shri Krishan Pal Gurjar, to a question posed in the legislative assembly today. Here are their specifics:

i. FAME INDIA SCHEME: With a budgetary outlay of Rs. 10,000 crores for a five-year period starting on April 1, 2019, the government announced the Faster Adoption and Manufacturing of Electric Vehicles in India Phase II (FAME India Phase II) Scheme to promote hybrid and electric technology in transportation in an effort to lessen reliance on fossil fuels and address issues with vehicle emissions. Regarding e-Buses, e-three-wheelers (e-3W), and e-four-wheelers (e-4W), the program offers financial assistance to automobiles utilized for either commercial or public transportation. A subsidy is also offered to privately owned automobiles for electric two-wheelers (e-2W). FAME II intends to support 7,090 e-Buses, 5 lakh e-3 Wheelers, 55,000 e-4 Wheeler Passenger Cars (including Strong Hybrid) and 10 lakh e-2 Wheelers.

   The details of electric vehicles (EVs) sold under FAME India Scheme Phase-II are as under as on 21.07.2023

SL.NO	WHEELER TYPE	REGISTERED & REVALIDATED MODELS	REGISTERED OEMS	TOTAL NO. OF VEHICLE SOLD UNDER FAME-II AS ON 21.07.2023
1.	2-Wheeler	45	25	7,40,722
2.	3-Wheeler	96	28	83,420
3.	4-Wheeler	34	3	8,982
TOTAL		175	56	8,32,824

Under the first phase of the FAME India Scheme, 520 infrastructure and charging stations have been approved by the Ministry of Heavy Industries. Additionally, under Phase II of the FAME India Scheme, this Ministry has approved 2,877 electric vehicle charging stations in 68 cities across 25 States and UTs as well as 1,576 charging stations across 9 expressways and 16 highways.

In addition, the Ministry of Heavy Industries has approved a capital subsidy of Rs. 800 Cr. to the three Oil Marketing Companies (OMCs) under the Ministry of Petroleum and Natural Gas (MoPNG) for the purpose of establishing 7,432 public charging stations for electric vehicles.

ii. PRODUCTION LINKED INCENTIVE: With a budgetary allocation of ₹ 25,938 crore, the Production Linked Incentive (PLI) Scheme for the Automobile and Auto Component Industry offers financial incentives to promote local manufacturing of Advanced Automotive Technology goods, including electric vehicles and their components. Up to 18% of qualified sales of electric vehicles and their parts are eligible for incentives under the program.

iii. PRODUCTION LINKED INCENTIVE (PLI) SCHEME FOR ADVANCED CHEMISTRY CELL (ACC): The government has authorized the ₹ 18,100 crore PLI Scheme to manufacture ACC domestically. The program encourages the construction of 50 Giga Watt hour (GWh) ACC manufacturing facilities on a giga scale within the nation. These ACCs will be utilized in batteries designed to encourage the general use of electric vehicles.

In addition, the government has implemented the subsequent measures to encourage the nation to use electric vehicles:

i. GOODS AND SERVICES TAX (GST) RATE CUT FOR EVS: The GST on Electric Vehicles has been lowered from 12% to 5%, and the GST on electric vehicle chargers and charging stations has been lowered from 18% to 5%.

ii. With effect from June 11, 2021, the demand incentive for electric two-wheelers has been raised to Rs. 15,000/KWh from Rs. 10,000/KWh, and the cap on the cost of electric vehicles has been raised from 20% to 40%. These changes have brought the cost of electric two-wheelers up to par with that of internal combustion engine (ICE) two-wheeler vehicles.

iii. Ministry of Road Transport and Highways (MoRTH) announced that battery-operated Vehicles will be given green license plates and be exempted from permit requirement for carrying passengers or goods.

iv. MoRTH has also advised states to waive road tax on EV, it would help in reducing the initial cost of EV.

v. INCOME TAX DEDUCTION FOR EV LOANS: EV owners are eligible to claim tax savings of up to ₹1.5 lakh on the interest paid on their EV loan under Section 80EEB of the Income Tax Act. However, keep in mind that the 80EEB deduction is subject to a number of limitations and requirements that concern the loan issuer and EV. Once the loan is approved, an owner of an electric vehicle can claim the tax deduction benefits between January 1 and March 31.

ELIGIBILITY CRITERIA FOR SECTION 80EEB FOR GETTING TAX BENEFITS ON EV:

Under the tax code, a person who has applied for a loan to purchase an EV may be able to claim the deduction. To be eligible to make a claim, one must be:

- An eligible taxpayer must be an individual (AOP, HUF, a Partnership firm, or a company).
- The loan must be utilised to buy the EV
- Loans from approved NBFCs and banks are only considered for rebates
- The loan must be applied from April 1, 2019, to March 31, 2023

iv. 'Go Electric' Campaign: The central government has launched the "Go Electric" campaign to spread awareness on the benefits of e-mobility and EV charging infrastructure.

FEATURES OF THE CAMPAIGN:

1. To accelerate the nation's transition to clean, safe, and 100% electric mobility and cooking.
2. To raise knowledge throughout all of India and lessen the reliance on imports.
3. To advance toward a low-carbon economy to protect both the nation and the environment from the damaging effects of climate change.

IMPLEMENTATION:

The Ministry of Power's Bureau of Energy Efficiency (BEE) has been tasked with launching an awareness campaign to promote public charging, e-mobility, and its ecosystem.

ABOUT E-MOBILITY-

With the ability to charge externally, e-mobility replaces the current carbon-emitting fossil fuels with electricity from electrical power sources, such as the National Grid.

India uses 94 million tons of oil and petroleum products exclusively for transportation now, a number that is predicted to quadruple by 2030. India presently has an import bill of Rs. 8 lakh crores for fossil fuels.

It includes driving fully electric, plug-in hybrid, conventional hybrid, and hydrogen-fueled automobiles.

The Indian government has launched several programs to encourage the production and use of electric vehicles (EVs) in the country. The "Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME-India)" Scheme is one such endeavour.

Electricity as a Fuel Alternative:

1. One important substitute for fossil fuels is electric fuel.

2. The electric fuel is less expensive, produces less emissions, and is locally produced than conventional fuels.

3. Public transportation electrification is not only cost-effective but environmentally sustainable.

4. Just 10,000 electric cars in Delhi might result in monthly savings of Rs. 30 crores.

KERALA GOVT. INITIATIVES:

KERALA ELECTRIC VEHICLE POLICY 2019

INTRODUCTION:

The State's motorized transportation system was mostly reliant on fossil fuels. In light of the health risks and environmental degradation caused by the widespread use of fossil fuels, research into alternative energy sources becomes important.

In addition to increasing air pollution and traffic accidents, Kerala State's huge car population—more than 10 million vehicles—has made transportation difficult. Given these concerning circumstances, the State of Kerala, being a pioneer in numerous reforms and innovations, took the

first steps toward creating the state's electric vehicle policy road map. Another advancement is e-mobility, sometimes known as electric vehicles (EVs). In keeping with its development mindset, the State made the decision to switch to electric vehicles.

Modern shared transportation schemes like e-Autorickshaws and electric buses are anticipated to minimize the number of cars on the road. They will offer a ride that is relaxed and fatigue-free, free of harmful gasses, and with far less noise and vibration. This will encourage owners of vehicles to switch to shared mobility. As stated by the NITI Aayog, the State intends to implement an EV no-subsidy policy.

The State Government intends to guarantee a strong infrastructure for electric vehicles, comprising a network of charging stations, sufficient power supply, and a competitive power rate. KSEBL will offer reliable power for a variable price depending on the time of day and season all year long, 24 hours a day.

KEY POLICY DRIVERS:

The EV drive for Kerala has been triggered by many reasons viz.

1. Support the Nation’s commitment to cut greenhouse gas emissions.
2. Enriching the air, particularly in urban areas.
3. Encouraging clean transportation and shared mobility.
4. Operational efficiency and savings for the transport utility (KSRTC) and the transportation industry in general;
5. Strategic aim to increase hardware and software production in the State;
6. Balancing the electric utility's peak and off-peak power demand (KSEBL).

AWARENESS CREATION AND PROMOTION:

1. ELECTRIC VEHICLES EXPO:

   The State Government will take the initiative to host an Electric Vehicles Expo where the EVs will be presented in order to provide a venue for EV producers to present their new products as well as to raise public awareness and familiarity.
2. CREATION OF E MOBILITY ZONES (PILOT REGIONS):

A few areas will be designated as "e-mobility zones" in order to educate the public about the benefits and uses of e-mobility as well as to establish early demonstration hubs. The possible domains consist of:

- Tourist destinations (such as Munnar, Kovalam, etc.) - e-autos, e-scooters, and e-bikes.
- Technology hubs (such as Technopark/Infopark): e-bikes, e-scooters, e-autos.
- CBD of Kozhikode, Kochi, and Trivandrum: e-autos, e-buses, and e-scooters
- Urban transportation networks' last-mile connectivity (e.g. KMRL) e-cars, e-scooters, and e-bikes

3. SUPPORT SCHEMES FOR EARLY ADOPTION:

The following promotional programs are suggested in an effort to raise public awareness of EVs and encourage their adoption:

- Incentives for three-wheelers purchased from appointed vendors (under the scheme for promotion of EVs) of Rs. 30,000 or 25% of the EV, whichever is lower.
- Additional financial incentives for EVs include free permits for fleet drivers, exemptions from road taxes, and state tax rebates.
- Non-fiscal rewards like free parking, waivers from tolls, etc.

4. ELECTRICITY TARIFF:

In order to facilitate the deployment of E-vehicles, KSEB will provide energy to public and bulk charging stations at a discounted rate for the first three years. It is not necessary to extend the concession from 18:00 to 22:00 in order to control consumption during peak hours. The rate will be 75% and 150%, respectively, of the regular Energy rate during peak hours and off-peak hours (22:00 to 6:00 hours).

CHARGING STATIONS

A charging station is a power supply device that provides electrical power for recharging plug-in electric vehicles, including battery electric vehicles, electric trucks, electric buses, neighbourhood electric vehicles, and plug-in hybrid vehicles. It is also referred to as a charge point or electric vehicle supply equipment (EVSE). Charging stations provide connectors that are compliant with numerous international standards. Public charging stations are often found on streets, in shopping

centres, at government buildings, and in other parking lots. Most hotels, workplaces, and residences have private charging stations.

Standard SAE J1772, first created in 2001, specifies the general physical, electrical, communication, and performance criteria for EV charging systems used in North America. It is maintained by the Society of Automotive Engineers (SAE International). The power distribution type, standards, maximum power, and other factors determine the differences between the four charging levels that SAE J1772 defines, two for AC and two for DC suppliers.

1. AC EV CHARGING: The AC charging technique is a modest, easy-to-install, and practical way to charge an electric vehicle at home. AC chargers are perfect for many locations, including offices and shopping malls, and are usually used in slow charging applications. An AC charger feeds electricity into the vehicle's onboard charger, which converts it into DC power to charge the battery. It takes these slow chargers six or eight hours to fully charge a car. Vehicle onboard charging circuitry is connected directly to the AC supply via AC charging stations.
    i. LEVEL 1: Depending on the capacity of a dedicated circuit, AC Level 1 can offer 6–16 A (0.7–1.92 kW) of power. It connects straight to a typical 120 V North American socket.
    ii. LEVEL 2: At AC Level 2, electricity is supplied between 6 and 80 A (1.4–19.2 kW) using either 208 V (three phase) or 240 V (single phase) power. Compared to AC Level 1 charging, it offers a significantly faster charging rate.
2. DC EV CHARGING: DC To swiftly charge the vehicle, high-capacity DC chargers are used. DC chargers expedite the charging process for electric vehicles by transmitting DC power directly to the battery, unencumbered by the low-capacity conversion of onboard chargers. Because they can fully charge the cars in under an hour, they are ideal for fleet managers and public EV charging stations that may be found in cities and on public roadways. DC charging is classified differently under the SAE standard, despite being mistakenly and widely referred to as "Level 3" charging based on the outdated NEC-1999 terminology. DC fast-charging circumvents the need for an AC-to-DC converter inside the car by using grid AC power that is first converted to DC in the station and then to the battery.

i. LEVEL 1: A maximum of 80 kW can be supplied at 50–1000 V with DC Level 1.
ii. LEVEL 2: A maximum of 400 kW at 50–1000 V with DC Level 2.

Majority of the SAE J1772 standard was adopted by the International Electrotechnical Commission (IEC) in 2003 as part of IEC 62196-1 for global application.

Alternatively, charging in modes is defined by the IEC (IEC 61851-1):

a. MODE 1: gradual charging using a standard plug (single- or three-phase AC)
b. MODE 2: gradual charging using a standard AC outlet combined with EV-specific safety features (such as PARVE or Park & Charge systems).
c. MODE 3: utilizing an EV multi-pin socket with control and protection features (such as SAE J1772- and IEC 62196-2) to charge an electric vehicle slowly or quickly
d. MODE 4: Fast DC charging with the use of a particular charging interface (i.e., IEC 62196-3, like CHAdeMO).

The following three scenarios describe the relationship between an electric vehicle supply equipment (EVSE) and the electric grid (IEC 61851-2):

a. CASE A: any charger that is linked to the mains and typically associated with modes 1 or 2 (the charger's mains supply cord is normally attached to it).
b. CASE B: an onboard car charger that typically uses mode 3 and has a mains supply cable that is detachable from both the supply and the car.
c. CASE C: Dedicated DC charging station. As in mode 4, the mains supply cable can be fixedly connected to the charging station.

The cost of installing an EV charging station in India might vary depending on a number of factors. Some of these elements are:

a. TYPE OF CHARGING STATION: As was previously said, installing a DC charging station is more expensive than installing an AC charging station.
b. CAPACITY OF THE CHARGING STATION: The cost of setting up a charging station increases with its capacity.
c. PLACE: Installing a charging station in a major metropolis would be more expensive than in a rural location.

d. INFRASTRUCTURE REQUIREMENTS: Depending on the location and other considerations, the cost of land, an electricity connection, and civil works may vary.

The EV charging networks operating in Kochi are as follows:

1. Tata Power - Sree Gokulam Motors Charging Station, Kolancherry, NO - S-375 2-2, Block No 43, Puthupanam, Puthrikka Panchayat, Puthen Cruz.
2. CESL - KTDC Tourist Charging Station, KTDC Tourist Reception Centre, Shanmugham Road, Ernakulam, Marine Drive.
3. KSEBL Palarivattom Charging Station, Executive Engineer, Electrical Division
4. Incheon Kia Charging Station, Plot No.11/336, NH47 Bypass, Near Nettoor Palli
5. Cherthala South Charging Station, SN Puram Post Salem, State Highway 66, Cherthala South, Kerala.
6. Tata Power - Amritara the Poovath Heritage (Private -Charger), 1, 246, Dutch Cemetery Rd, Fort Kochi.
7. Zeon Charging: Grand Mall Charging Station, Grand Mall, Panvel-Kochi-Kanyakumari Highway, Toll Junction, Edapally.
8. United Charging Station, Ground Floor, NH 47 Edapally.

FUTURE SCOPE OF EV

The future scope of electric vehicles (EVs) looks promising. Advancements in battery technology, infrastructure development, and increased demand for sustainable transportation indicate a growing market for EVs. Governments worldwide are also investing in EV incentives and regulations to promote their adoption, contributing to a positive outlook for their future.

The robust and swift adoption of electric vehicles in India would benefit both the common citizens and the government.

1. More than 90% of India's 2.3 million EVs are two-wheelers, making it one of the fastest-growing markets.
2. India sold 277,910 electric two-wheelers between April and September of 2022, a 404% increase over the same time the previous year when 55,147 units were sold.

3. H1FY 2022-23 saw 18,142 electric three-wheelers sold, up 268%.
4. EV car models increased to 500 in 2022, more than quadruple the amount in 2018.

Large OEMs are taking the initiative to enter the EV component market to reduce reliance on imports and meet the 50% localization requirement for government subsidies. A significant infrastructure that is affordable, accessible, and serves all consumer groups, combined with a strong financing ecosystem, policy incentives, and technological advancements, is likely to position the EV market for significant growth over the next decade.

CHAPTER – IV

DATA ANALYSIS AND INTERPRETATION

DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS:-

4.1.AGE OF THE RESPONDENTS:

TABLE 4.1

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Below 18	7	9%
18-25	54	68%
26-35	11	14%
Above 35	8	10%
Total	80	100%

Source: Primary Data

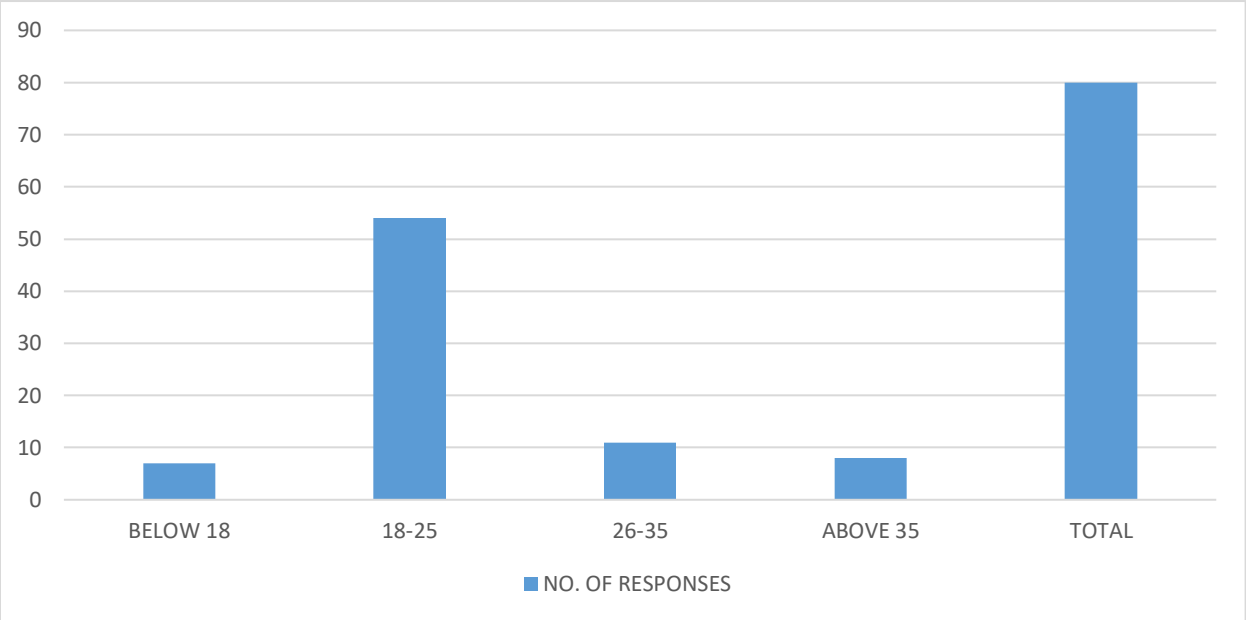

FIGURE 4.1

INTERPRETATION:-

Out of the 80 respondents, 9% of the respondents come under the age category of below 18. 68% of the respondents come under 18-25. 14% of the respondents come under the age group of 26-35 and the remaining 10% of the respondents come under the age above 35.

4.2.GENDER OF THE RESPONDENTS:

TABLE4.2

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Male	32	40%
Female	45	56%
Prefer not to say	3	4%
Total	80	100%

Source: Primary Data

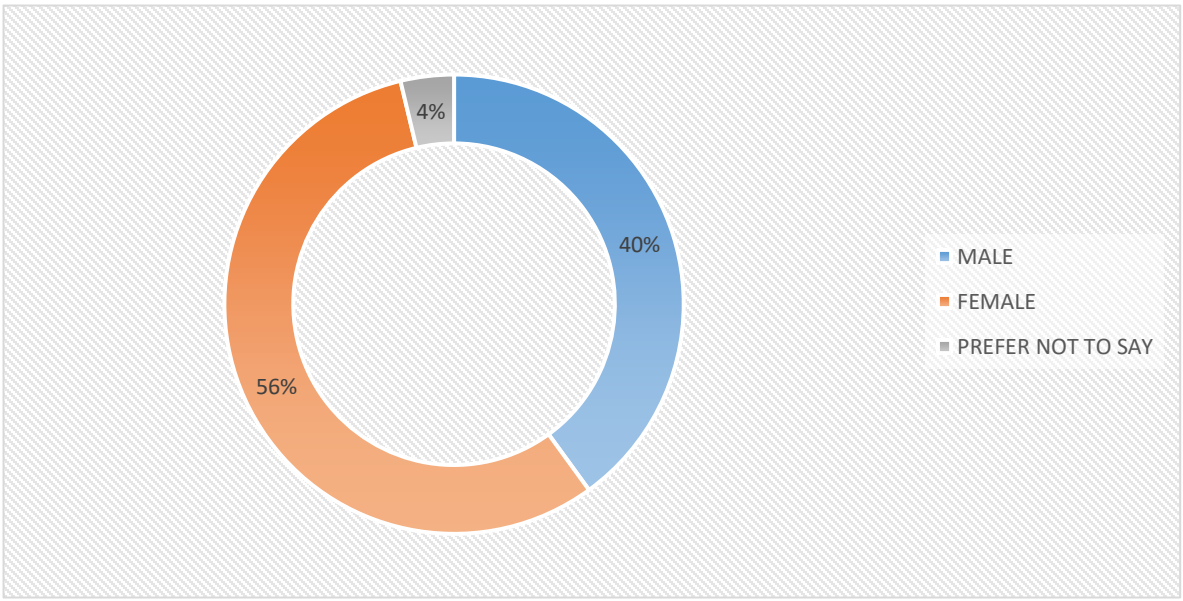

FIGURE 4.2

INTERPRETATION:-

Out of the 80 respondents, 40% of the respondents are male. 56% of the respondents are female and 4% prefer not to reveal their gender.

4.3.OWNERSHIP OF VEHICLES BY RESPONDENTS:

TABLE 4.3

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Yes	29	36%
No	51	64%
TOTAL	80	80%

Source: Primary Data

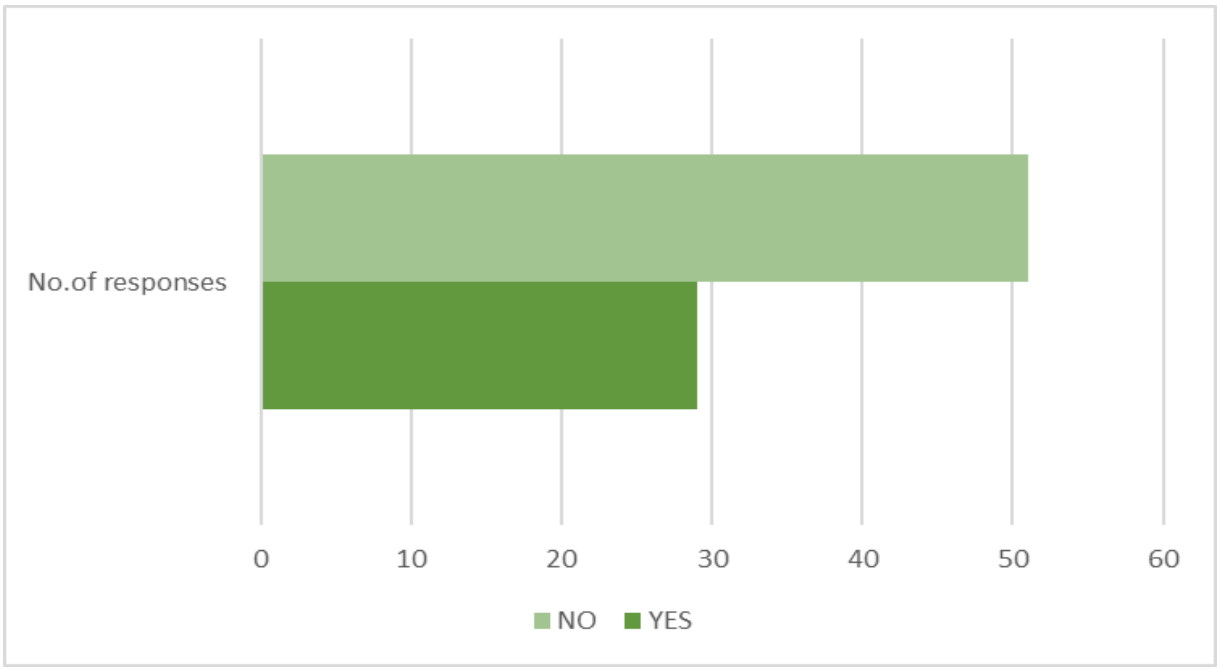

FIGURE 4.3

INTERPRETATION:-

Out of 80 respondents, 36% own a vehicle and 64% doesn't own a vehicle.

4.4.TYPE OF VEHICLE OWNED BY RESPONDENTS:

TABLE 4.4

CATEGORY	NUMBER OF RESPONSES	PERCENTAGES
Two-wheeler	32	40%
Three-wheeler	5	6%
SUV	18	23%
MUV	2	3%
None	23	29%
TOTAL	80	100%

Source: Primary Data

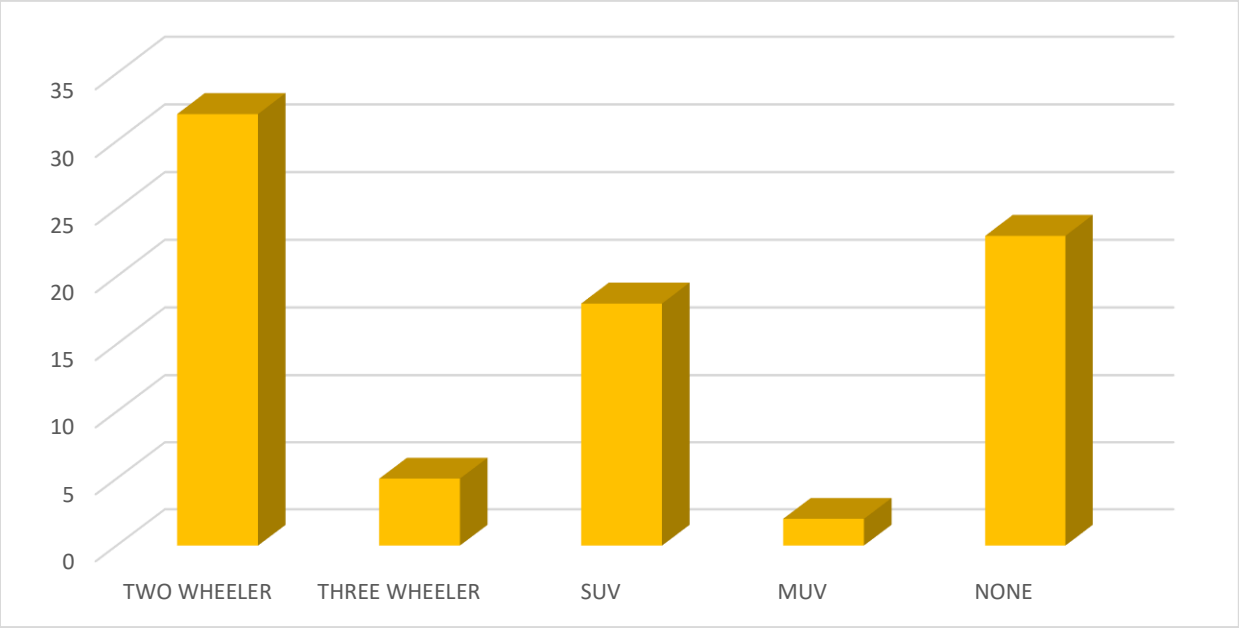

FIGURE 4.4

INTERPRETATION:-

Out of 80 respondents, 40% owns two-wheelers. 6% owns three-wheelers. 23% of the respondents owns SUVs(Sports Utility Vehicles), 3% owns MUVs(Multi Utility Vehicles) and the remaining 29% do not own any type of vehicles.

4.5.CONCERN ABOUT ENVIRONMNETAL IMPACT OF TRADITIONAL VEHICLES:

TABLE 4.5

CATEGORY	NUMBER OF RESPONES	PERCENTAGE
Not concerned	4	5%
Least concerned	6	8%
Neutral	38	48%
Concerned	19	24%
Very concerned	13	16%
TOTAL	80	100%

Source: Primary Data

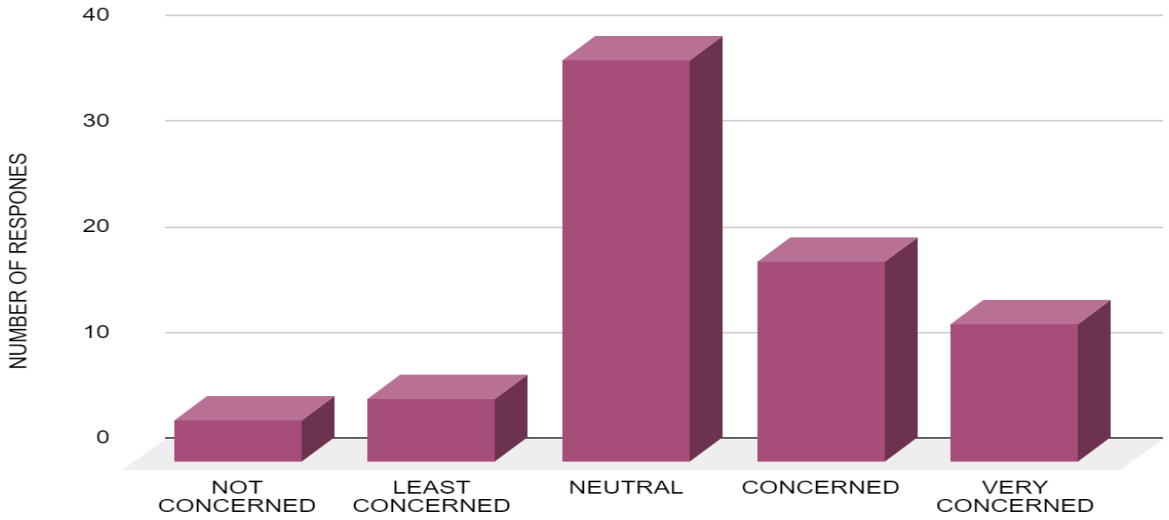

FIGURE 4.5

INTERPRETATION:-

Out of 80 respondents, 5% are not concerned at all about the environmental impact of traditional vehicles. 8% are least concerned. 48% has decided to remain neutral. 24% are concerned about the impact and 16% are very concerned about the environmental impact of traditional vehicles. Majority of the respondents remain neutral.

4.6.FAMILIARITY WITH ELECTRIC VEHICLES

TABLE 4.6

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Very familiar	18	23%
Familiar	16	20%
Neutral	21	26%
Unfamiliar	14	18%
Not at all familiar	11	14%
TOTAL	80	100%

Source: Primary Data

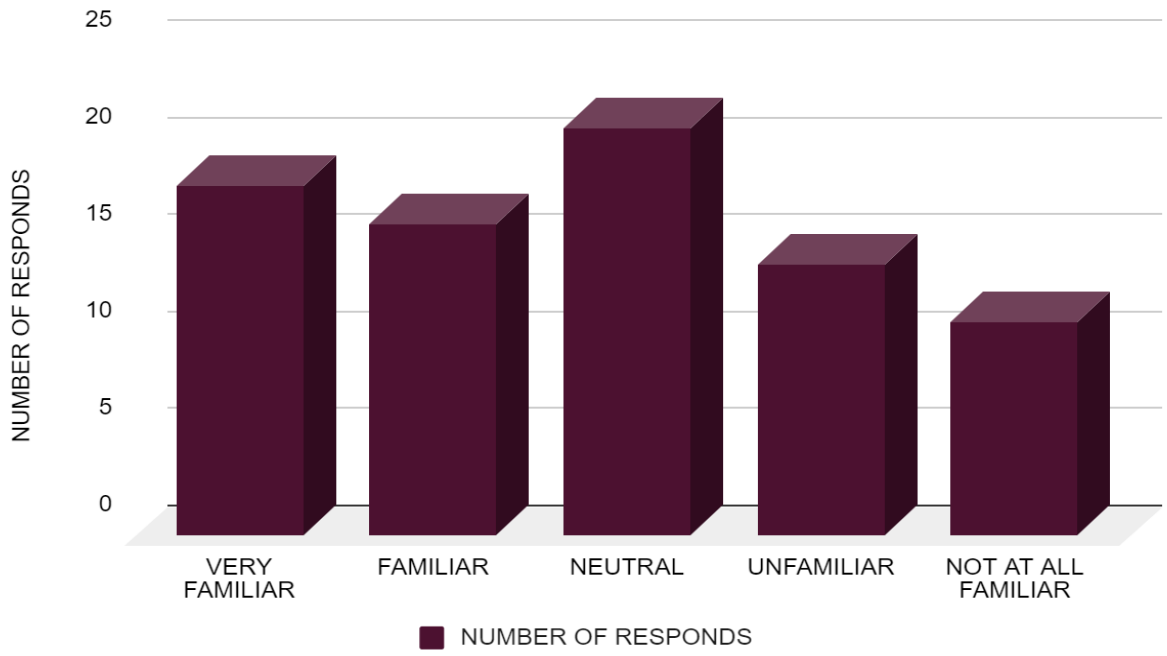

FIGURE 4.6

INTERPRETATION:-

Out of the 80 respondents, 23% are very familiar with electronic vehicles. 20% are somewhat familiar with the term electronic vehicles. 26% are neutral. 18% are unfamiliar and the remaining 14% are not at all familiar with electronic vehicles.

4.7.INTEREST IN OWNING OR CONVERTING TO ELECTRIC VEHICLES

TABLE 4.7

CATEGORY	NUMBER OF RESPONSES	PERCENTAGES
Yes	30	38%
No	21	26%
Maybe	29	36%
TOTAL	80	100%

Source: Primary Data

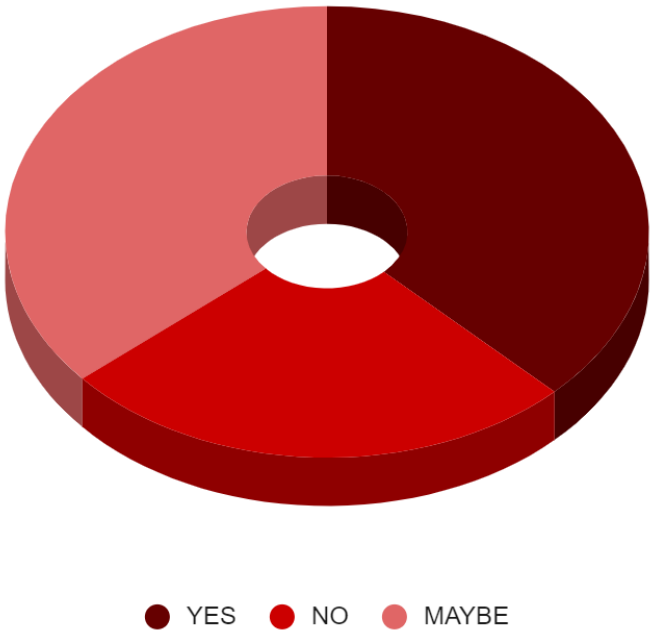

FIGURE 4.7

INTERPRETATION:-

Out of the 80 respondents, 38% are interested in owning or converting to electronic vehicles. 26% are not interested and the remaining 36% may or may not convert to electric vehicles in the future.

4.8.EXPECTED PRICE OF E-SCOOTERS

TABLE 4.8

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Rs.40,000-1 lakh	39	49%
1- 2.5 lakh	34	43%
2.5- 5 lakh	7	9%
TOTAL	80	100%

Source: Primary Data

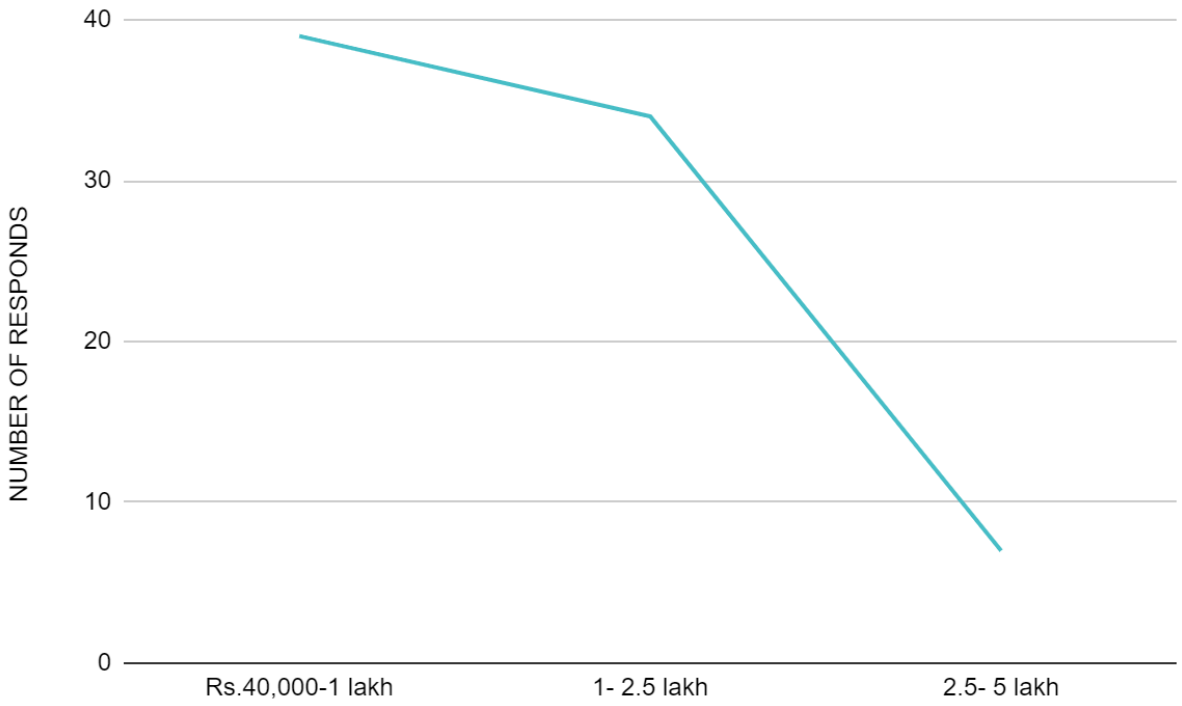

FIGURE 4.8

INTERPRETATION:-

Out of the 80 respondents, 49% prefer e-scooters between the range 40,000 to 1lakhs. 43% prefer e-scooters between the price 1 to 2.5 lakhs and the remaining 9% prefer between 2.5 to 5 lakhs.

4.9.EXPECTED PRICE OF E-CARS

TABLE 4.9

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Rs.5-10 lakh	29	36%
Rs.10-17 lakh	40	50%
Above 17 lakhs	11	14%
TOTAL	80	100%

Source: Primary Data

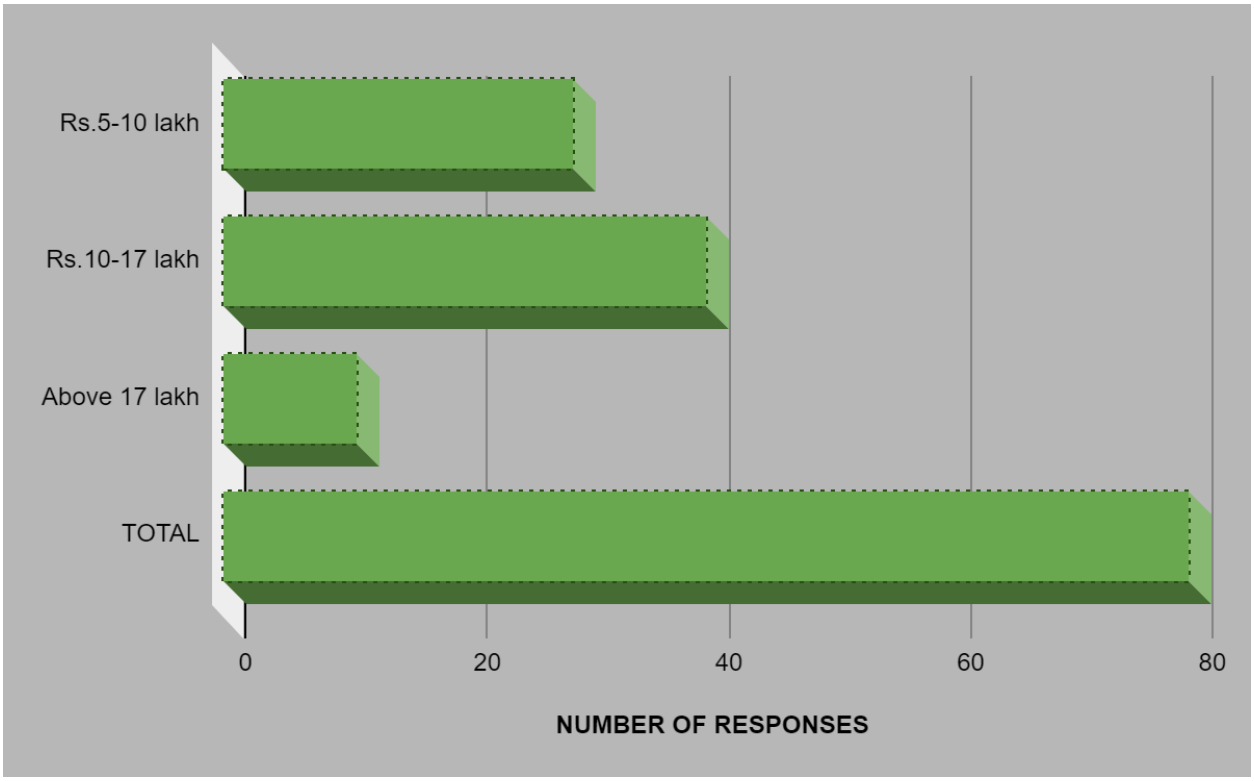

FIGURE 4.9

INTERPRETATION:-

Out of the 80 respondents, 36% prefer e-cars of the price range 5 to 10 lakhs. Majority(50%) prefer range 10 to 17 lakhs and the remaining 14% prefer e-cars above 17 lakhs.

4.10.EXPECTED MAXIMUM SPEED OF AN ELECTRIC VEHICLE

TABLE 4.10

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Upto 80KMPH	11	14%
80 - 150KMPH	62	78%
150 -200KMPH	7	9%
TOTAL	80	100%

Source: Primary Data

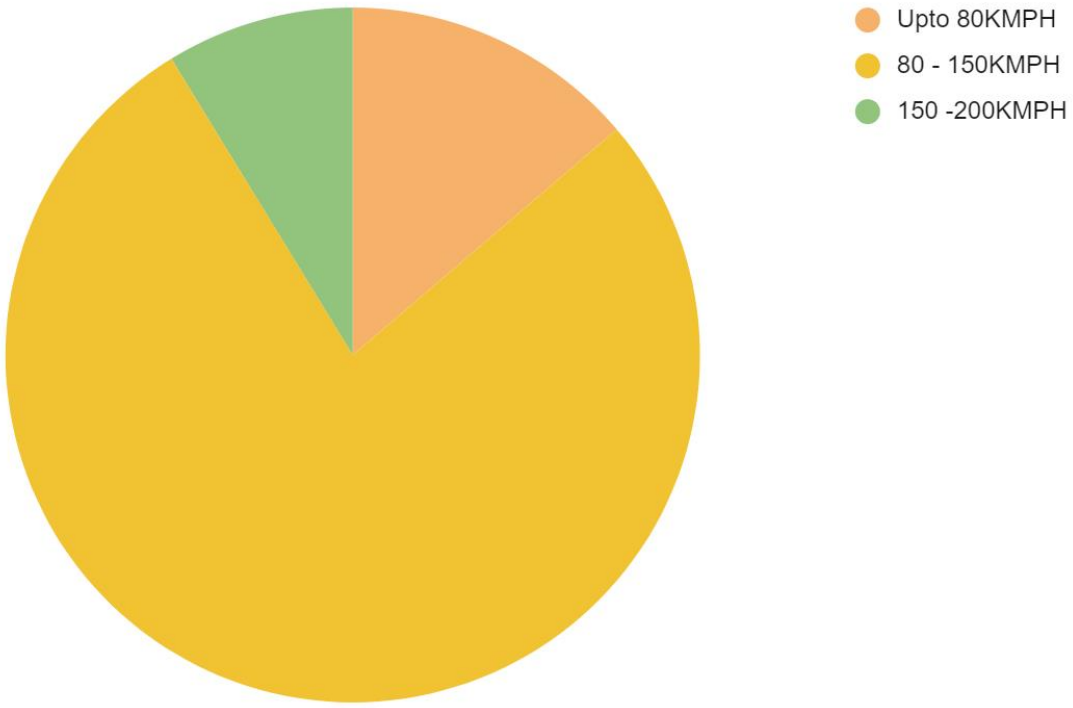

FIGURE 4.10

INTERPRETATION:-

Out of 80 respondents, 14% expect a maximum speed upto 80 KMPH. 78% expect maximum speed between 80 to 150 KMPH. 9% expect a maximum speed between the range 150 to 200 KMPH. The majority expect a maximum speed upto 80KMPH.

4.11.FACTORS INFLUENCING THE RESPONDENT'S DECISION TO CONSIDER ELECTRIC VEHICLE FOR COMMUTING

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Environmental impact	55	69%
Cost savings	59	74%
Govt. Initiatives	16	20%
Charging infrastructure	24	30%
Range of vehicles	27	34%
Technological features	40	50%
Battery life	1	1%

Source: Primary Data

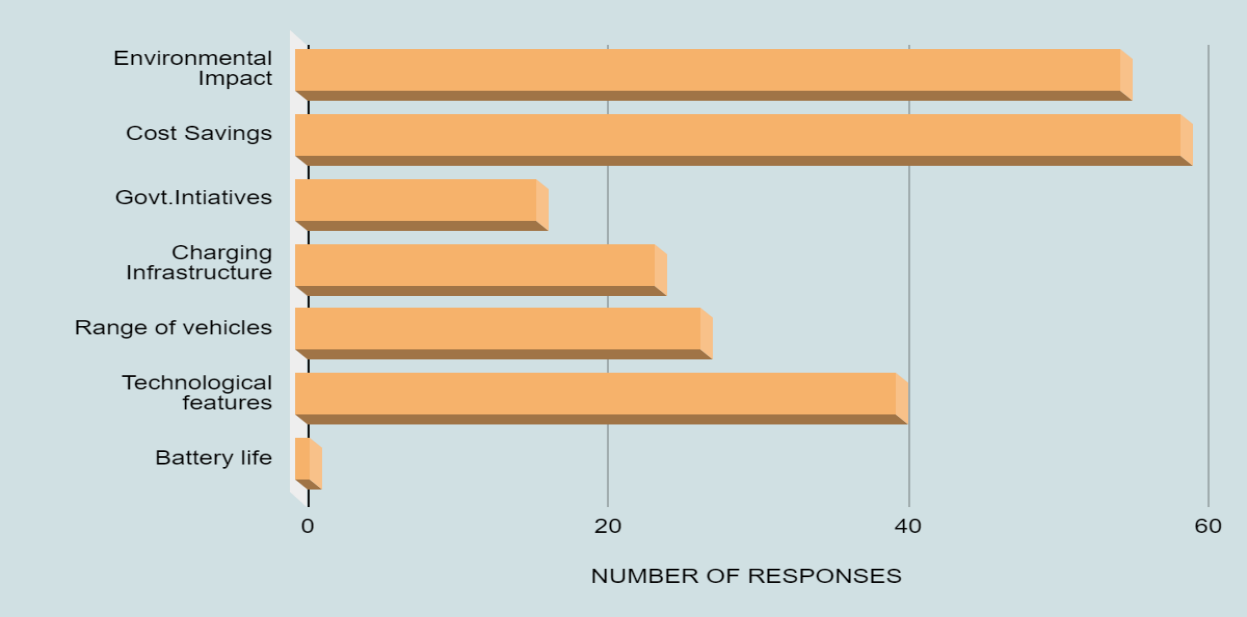

FIGURE 4.11

INTERPRETATION:-

The 3 major factors influencing a respondent's decision for selecting EV for commuting is cost savings(74%), environmental impact(69%) and the technological features(50%). Other factors influencing the decision is Govt. initiatives(20%), charging infrastructure(30%) and the range of vehicles(34%). The least important factor influencing the decision of selecting EV for commuting is the battery life(1%).

4.12.POTENTIAL BARRIERS OR CHALLENGES FOR CONSIDERATION OF ELECTRIC VEHICLES FOR COMMUTING

TABLE 4.12

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
High initial cost	50	63%
Limited charging infrastructure	64	80%
Range anxiety	38	48%
Lack of knowledge about technology	27	34%
Limited vehicle operation	28	35%
Noiseless feature	1	1%

Source: Primary Data

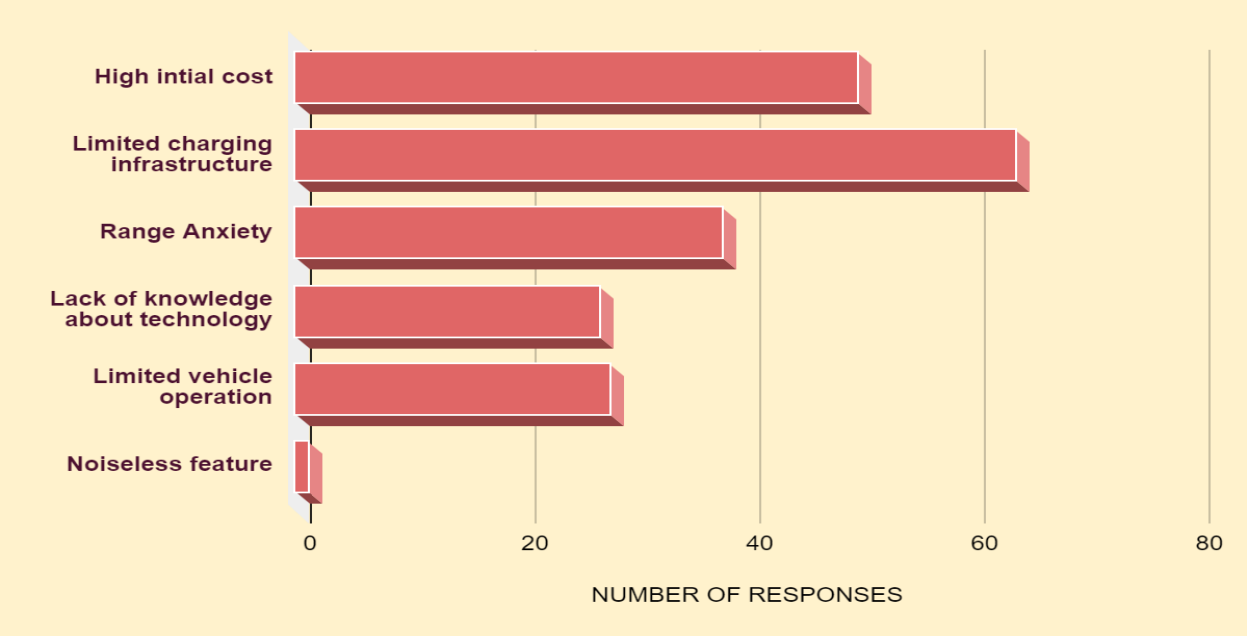

FIGURE 4.12

INTERPRETATION:-

The 2 major challenges or barriers for considering EV for commuting is the limited charging infrastructure(80%) and the high initial cost(63%). The other barriers affecting the decision is the range anxiety(48%), limited vehicle operation(35%) and lack of knowledge about the technology(34%). The least affecting factor is the noiseless feature of EV(1%).

4.13.AWARNESS OF GOVERNMENT INITIATIVES FOR PROMOTION OF EV IN INDIA

TABLE 4.13

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Yes	14	18%
No	48	60%
Maybe	18	23%
TOTAL	80	100%

Source: Primary Data

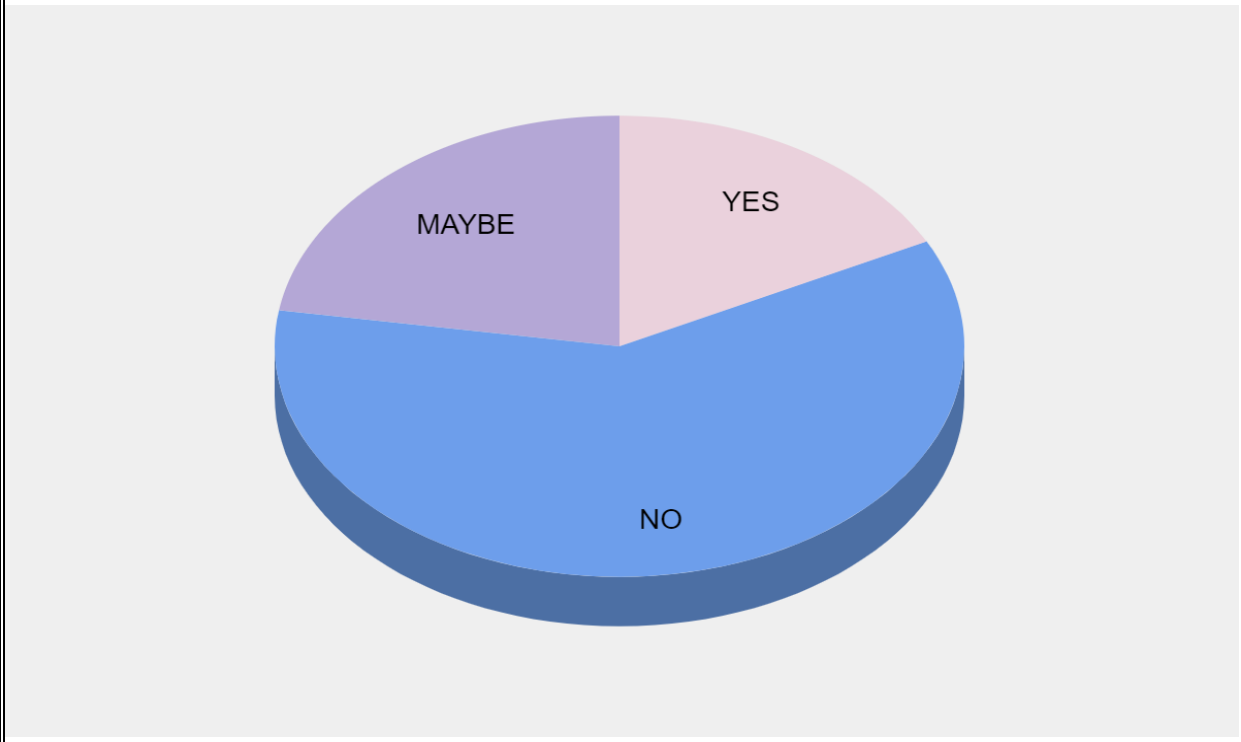

FIGURE 4.13

INTERPRETATION:-

Out of 80 respondents, 18% are aware of the govt. initiatives promoting EV. 60% are not aware of any govt. initiatives and 23% may or may not have heard of any govt. initiatives.

4.14. AMOUNT THAT WOULD BE SPENT FOR REPLACING BATTERIES

TABLE 4.14

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Rs.15,000	19	24%
Rs.25,000	38	48%
Rs.75,000	15	19%
Rs.100,000	8	10%
TOTAL	80	100%

Source: Primary Data

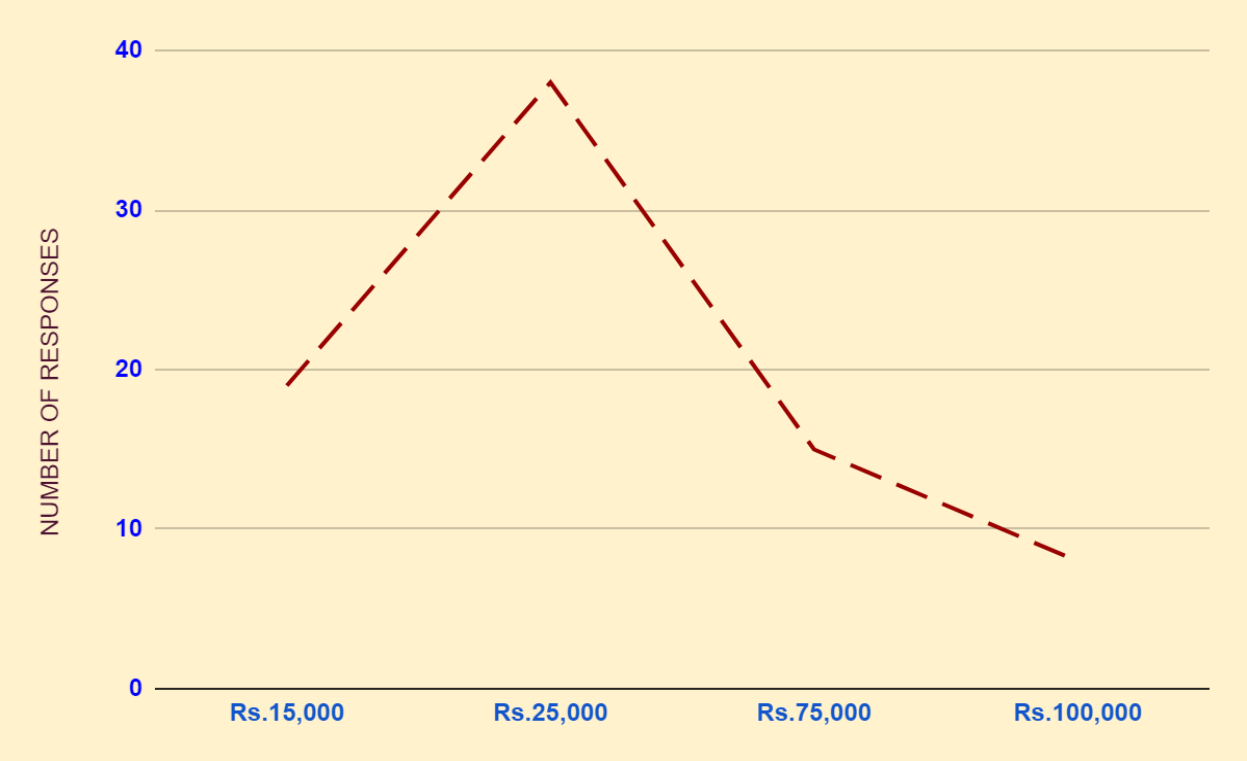

FIGURE 4.14

INERPRETATION:-

Out of 80 respondents, majority(48%) are willing to spent Rs.48,000 for replacing batteries. 24% are willing to spent Rs.15,000 for replacing it. 19% are willing to spent Rs.75,000 and only 10% of the respondents are willing to spent Rs. 1,00,000 for replacing the batteries of EV.

4.15.PLACE OF PREFERENCE FOR CHARGING ELECTRIC VEHICLE

TABLE 4.15

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Home	47	59%
Work	9	11%
Public charging facilities	24	30%
TOTAL	80	100%

Source: Primary Data

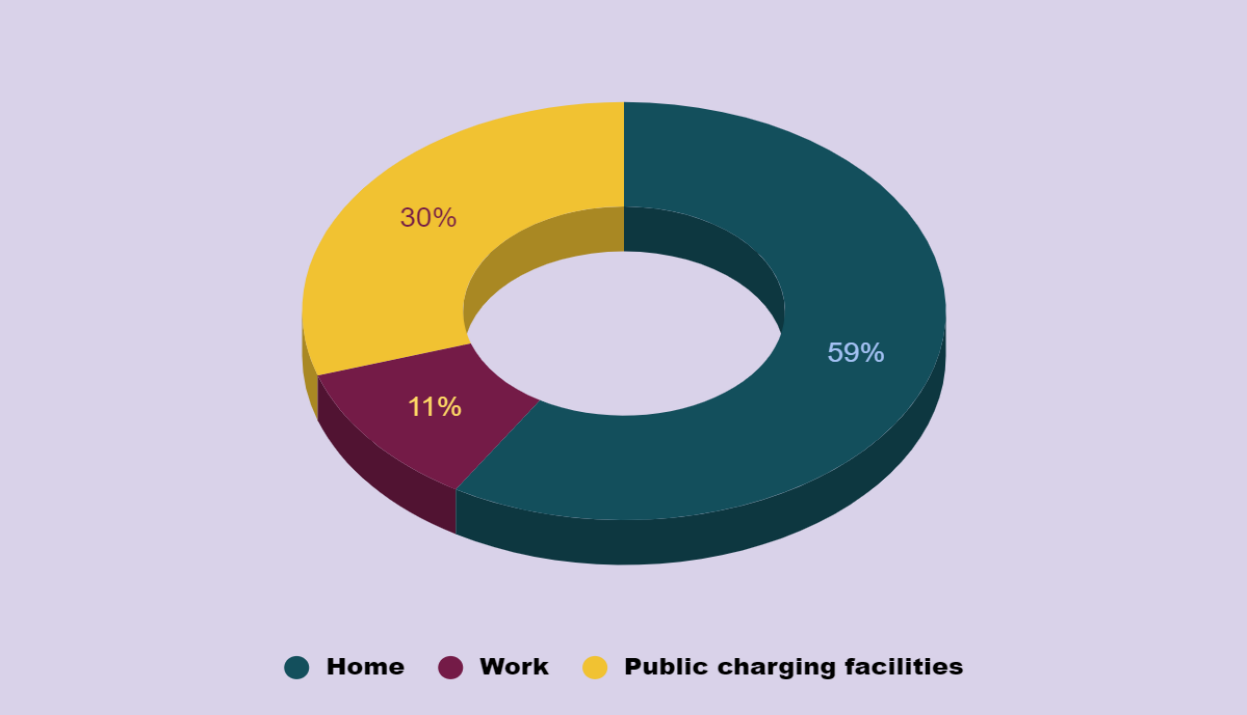

FIGURE 4.15

INTERPRETATION:-

Out of 80 respondents, 59% prefer charging their EV's at home. 30% prefer it at public charging facilities and the rest 11% prefer to charge it at work.

4.16.AMOUNT OF PREMIUM THAT WILL BE PAID FOR ADDITIONAL DEVELOPMENT OF AN EV

TABLE 4.16

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
Rs.25000	43	54%
Rs.50000	24	30%
Rs.75000	10	13%
Rs.100000	3	4%
TOTAL	80	100%

Source: Primary Data

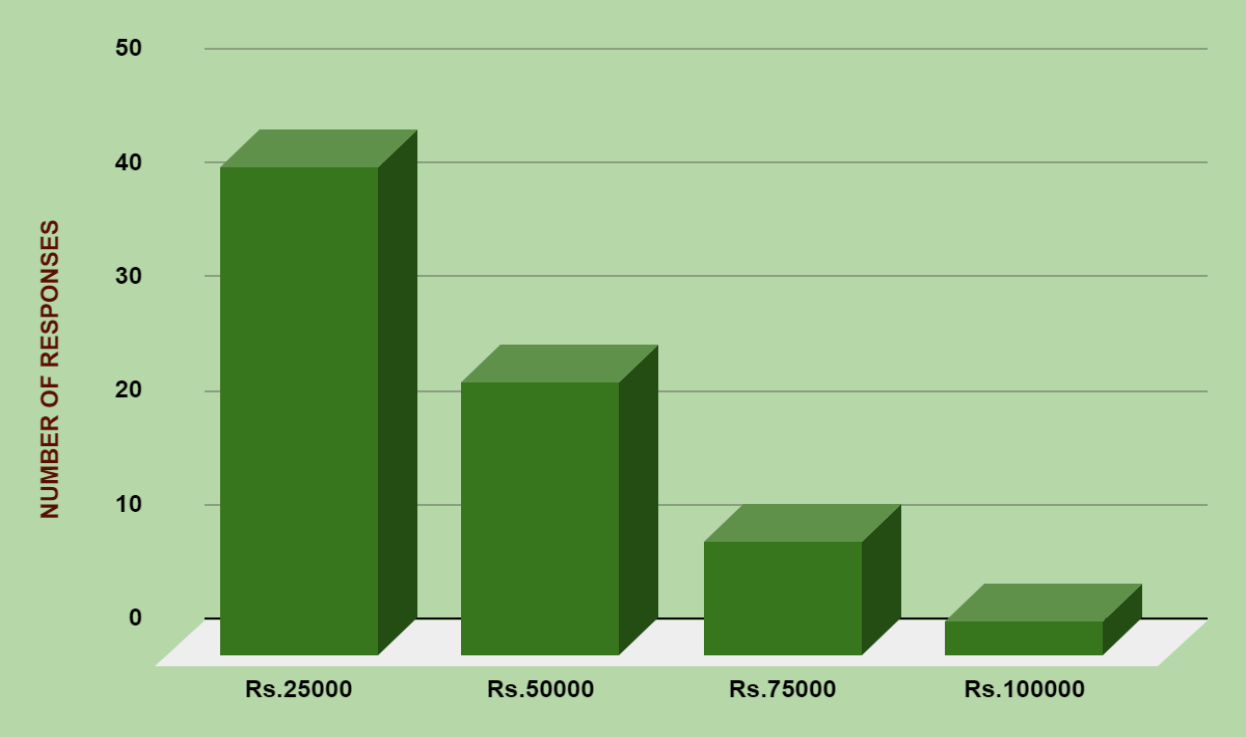

FIGURE 4.16

INTERPRETATION:-

Out of the 80 respondents, 54% are willing to pay premium of Rs.25,000 for additional development of their EV. 30% are willing to pay Rs.50,000. 13% are willing to pay Rs.75,000 and the only 4% are willing to pay Rs.1,00,000.

4.17.EXPECTED SUBSIDY FROM THE GOVERNMENT ON THE PRICE OF BATTERIES FOR EV

TABLE 4.17

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
10%	8	10%
20%	43	54%
40%	29	36%
TOTAL	80	100%

Source: Primary Data

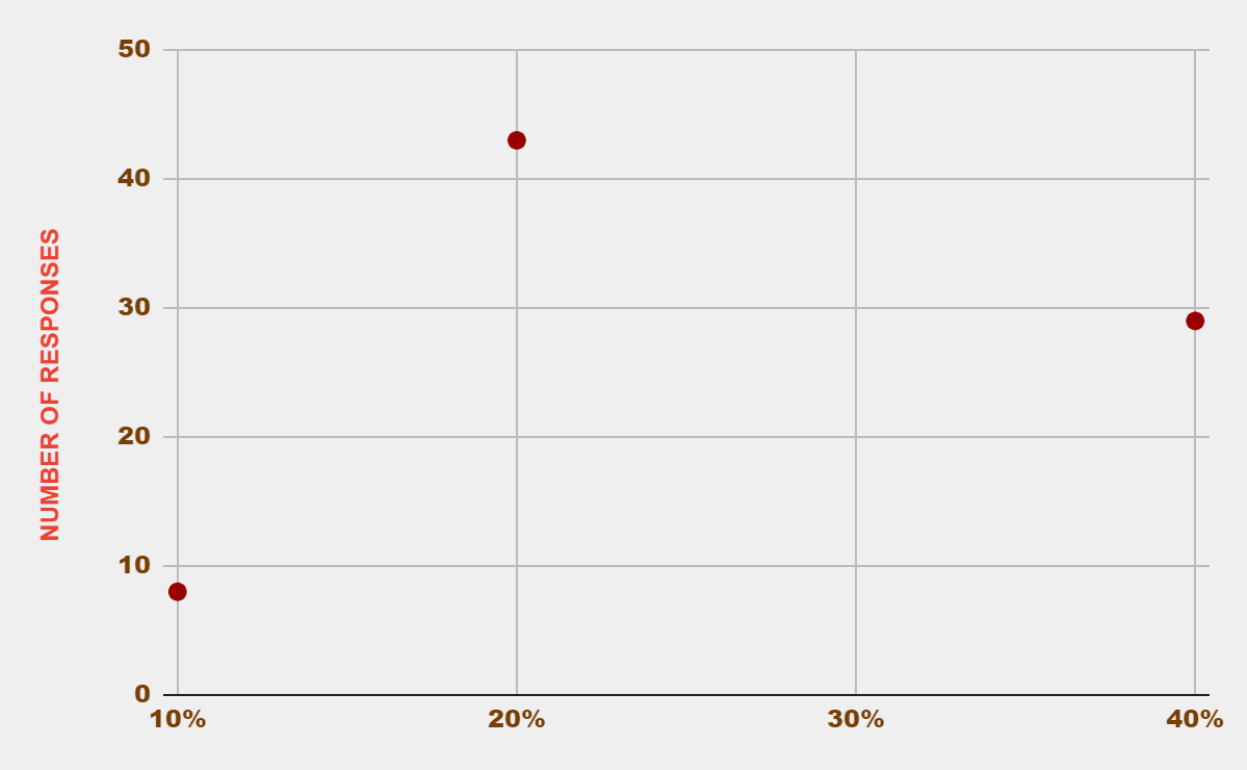

FIGURE 4.17

INTERPRETATION:-

Out of 80 respondents, 10% expect a 10% subsidy from the govt. on the price of batteries. Majority of the respondents(54%) expect a 20% subsidy and 36% expect a 40% govt. subsidy on the price of batteries of an EV.

4.18.CONSIDERATION OF EV FOR FUTURE COMMUTING NEEDS

TABLE 4.18

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
YES	30	38%
NO	14	18%
MAYBE	36	45%
TOTAL	80	100%

Source: Primary Data

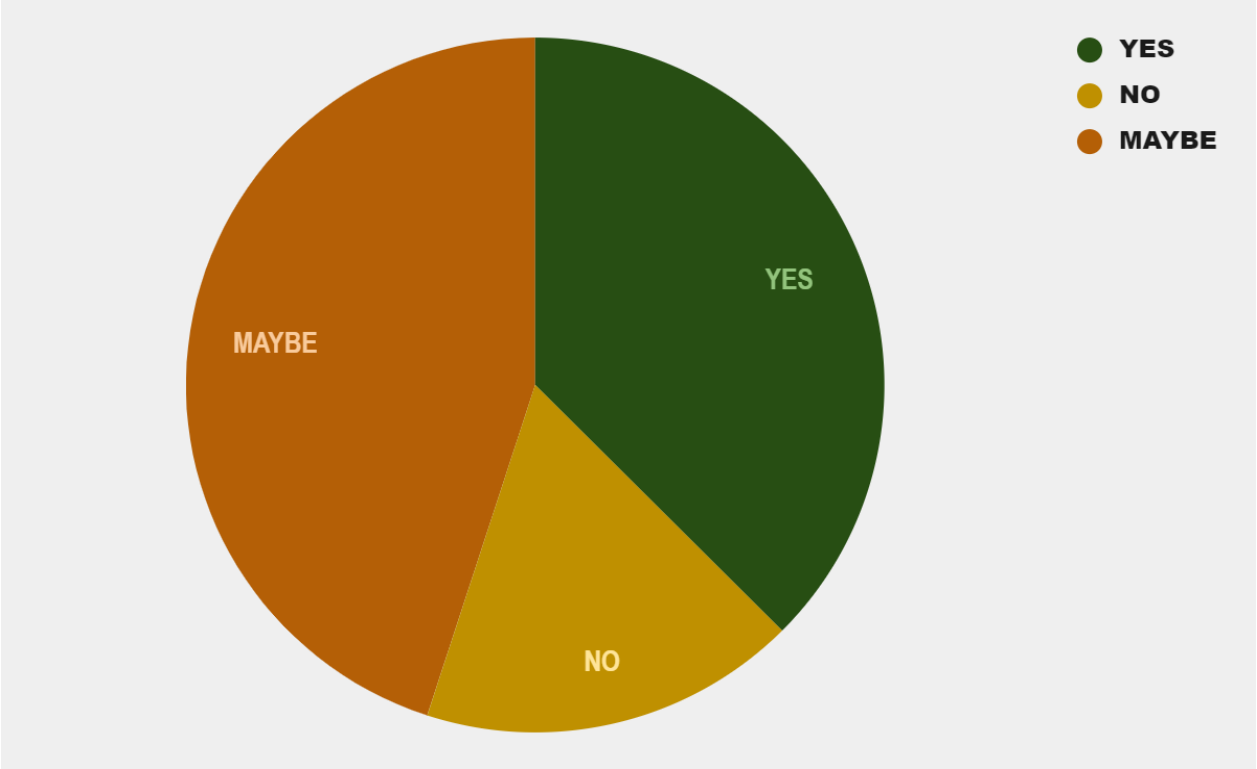

FIGURE 4.18

INTERPRETATION:-

Out of 80 respondents, 38% will consider EV for future commuting needs. 18% have decided to use traditional vehicles itself and 45% may or may not consider an EV for their future commuting needs.

4.19.EXPECTED TIME PERIOD FOR ELECTRIC VEHICLES TO COMPRISE TOTAL CARS OWNED

TABLE 4.19

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
15 YEARS	40	50%
25 YEARS	23	29%
30 YEARS	10	13%
ABOVE 30 YEARS	7	9%
TOTAL	80	100%

Source: Primary Data

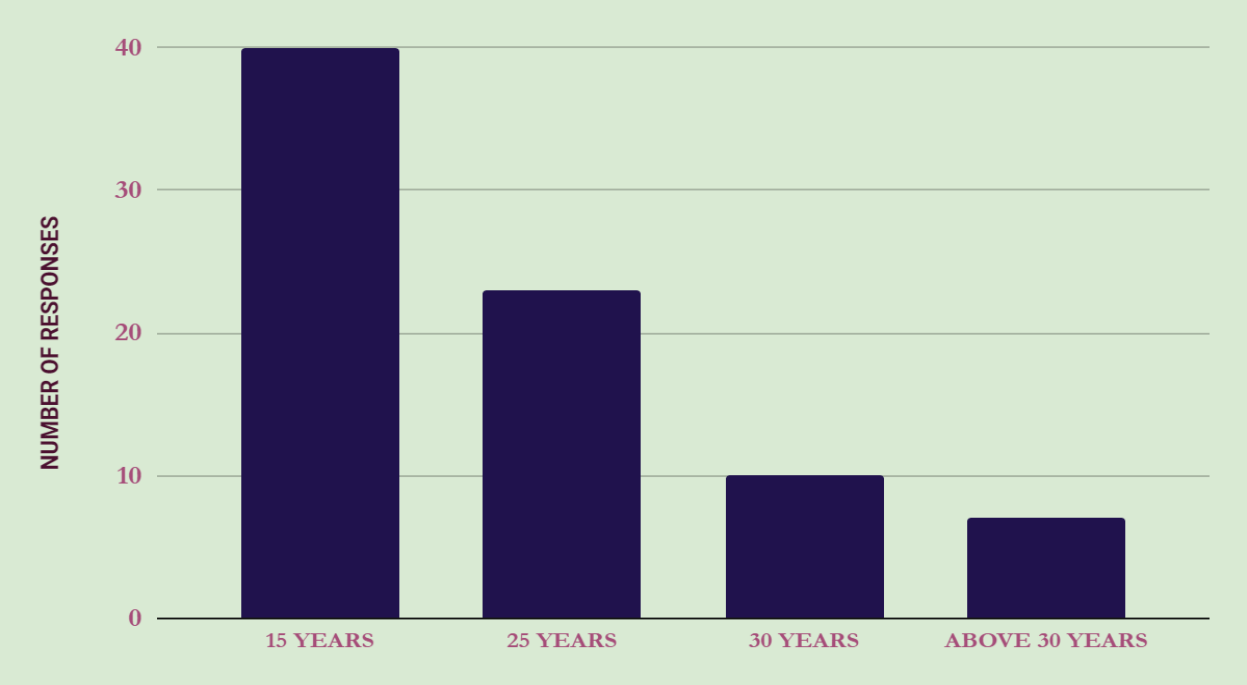

FIGURE 4.19

INTERPRETATION:-

Out of 80 respondents, 50% believe EV will comprise of total cars owned by 15 years. 29% believe it will take 25 years. 13% think it will take upto 30 years and 9% think it will take more than 30 years for EVs to comprise total cars owned.

4.20.RECOMMENDATION OF EV TO ANY FRIENDS OR RELATIVES

TABLE 4.20

CATEGORY	NUMBER OF RESPONSES	PERCENTAGE
YES	60	75%
NO	20	25%
TOTAL	80	100%

Source: Primary Data

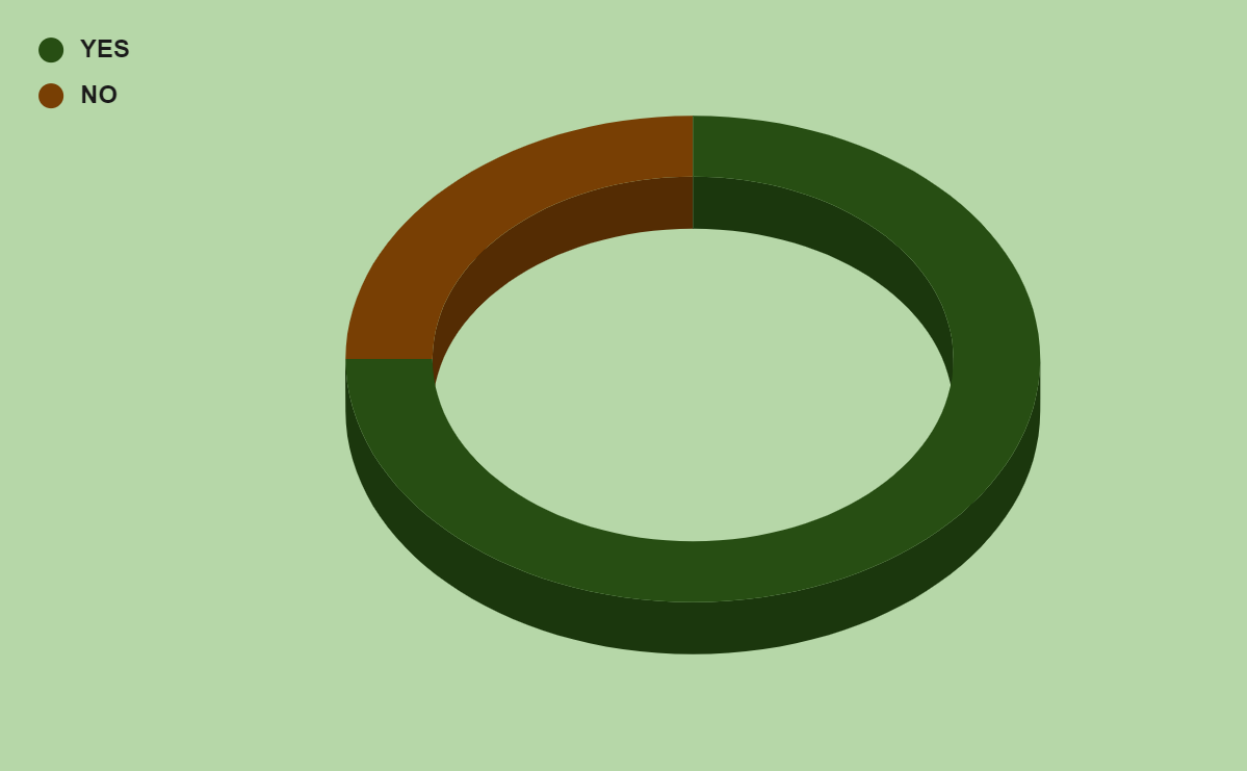

FIGURE 4.20

INTERPRETATION:-

Out of 80 respondents, 75% will recommend EV to their friends and relatives and 25% will not recommend EV to their friends and relatives.

CHAPTER – V

FINDINGS, SUGGESTIONS AND CONCLUSION

FINDINGS:

1. Out of the majority doesn't own a vehicle.
2. 40% of the respondents are owning two-wheelers.
3. Most of the people are neutrally concerned about environmental impact of traditional vehicles.
4. Also, majority is neutrally familiar with electric vehicles.
5. But, most of them are interested in owning or converting into electric vehicles.
6. 49% of the respondents are expecting approximately Rs.40,000 to Rs.1,00,000 for electric scooters.
7. 50% of the respondents are expecting approximately Rs.10,00,000 to Rs.17,00,000 for electric cars.
8. 78% of the people are expecting a maximum speed of 80 to 150 KMPH for an electric vehicle.
9. For 74% of the respondents, cost savings is the factor that influencing their decision for considering the electric vehicles.
10. 80% of the respondents are considering limited charging infrastructure as the potential barriers or challenges for consideration on electric vehicles for commuting.
11. 60% of the respondents aren't aware of government initiatives for promotion of electric vehicles in Kochi
12. 48% of the respondents in Kochi is ready to spend approximately Rs.25,000 for replacing batteries.
13. 59% of the respondents are preferring their own house for charging electric vehicles in Kochi.
14. 54% of the respondents are ready to spend approximately Rs.25,000 as the premium that will be paid for additional development of electric vehicles.
15. 54% of the respondents are expecting 20% subsidy from the government on the price of batteries for electric vehicles.
16. 45% of the respondents are considering electric vehicles for their future commuting.
17. 50% of the respondents are expecting a time period of 15 years for electric vehicles to comprise total cars owned.
18. 75% of the respondents would recommend electric vehicles to any friends and relatives.

SUGGESTIONS:

1. Through financial incentives, grid modernization investments can enable expanded EV adoption, guarantee a dependable charging network, and encourage EV ownership.
2. Decreased registration costs and special parking rights for electric vehicles (EVs) can promote ownership and usage.
3. Focused public awareness initiatives can be extremely effective in informing consumers about the financial and environmental advantages of electric vehicles.
4. To guarantee that the electricity needed to charge electric vehicles (EVs) comes from clean sources and to maximize the environmental advantages, investigate joint ventures with renewable energy providers.
5. One way to greatly reduce range anxiety and increase customer confidence in EVs is to give priority to the installation of public charging stations.
6. Encourage the installation of charging stations in apartment buildings and places of employment to meet the demands of inhabitants without private garages for overnight charging.
7. Work with nearby states and cities to create EV charging corridors beside key roads, enabling confident long-distance driving.
8. Developing and disseminating public awareness campaigns that promote Kochi's charging station locations and accessibility.
9. To make EVs more affordable compared to gasoline-powered vehicles, municipal or state governments may provide tax reductions or subsidies for EV purchases.
10. Dispelling falsehoods about battery lifecycle costs and range can attract more prospective electric vehicle purchasers.
11. For recycling batteries will help allay worries about disposing of end-of-life batteries and advance the development of a sustainable electric vehicle (EV) ecosystem.
12. Introduce electric car sharing systems and pilot programs to give locals access to EVs without requiring them to purchase a vehicle outright.
13. Plan public gatherings and exhibits that highlight the newest EV innovations, charging strategies, and city success stories.
14. Provide workshops or online resources on battery care, troubleshooting, and EV maintenance.

15. Create a single hub for EV data that offers up-to-date details on the availability of charging stations, wait times, and any discounts or other incentives for EV usage.

CONCLUSION:

Our study on Kochi City's customer behaviour regarding electric cars (EVs) suggests a promising environment. The market is open to adopting electric mobility, as seen by the high demand in long-range EVs and the readiness to pay more for quicker charging.

Still, a major obstacle is worries about the accessibility and availability of the infrastructure needed for charging. This emphasizes how vital it is to take a multifaceted approach to move Kochi City closer to sustainable transportation in the future.

Kochi City could lead India's electric vehicle revolution by recognizing customer preferences and taking proactive measures to overcome current issues. Seizing this chance will establish Kochi City as a progressive and forward-thinking urban hub, in addition to guaranteeing healthier air and a less carbon footprint. The future may be electric, but Kochi City can guarantee a sustainable and easy journey to a greener future with the appropriate strategy.

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SPEED AND SCALE BY L. JOHN DOERRS

ANNEXURE

CONSUMER BEHAVIOR TOWARDS EV IN KOCHI

Dear participant,
We are final year B.com students from St. Teresas College, Ernakulam. As part of our final year project, we are doing a study on 'Consumer behaviour towards electric vehicles (EV) in Kochi '. This survey will take only 5-10mins of your time and is voluntary. The data collected will be confidential. The data collected will be strictly used for the purposes of this study and will not be shared with anyone else.

Thankyou,
Irene Sara
Biya Babu
Nooha Mariyam

* Indicates required question

1. Name *

2. Age *

3. Gender *

Mark only one oval.

- ◯ Male
- ◯ Female
- ◯ Prefer not to say

4. Do you own a vehicle? *

Mark only one oval.

- ◯ Yes
- ◯ No

5. What type of vehicle do you own?

Mark only one oval.

- ◯ Two-Wheeler
- ◯ Three-Wheeler
- ◯ SUV
- ◯ MUV
- ◯ Other: _____

6. On a scale of 1 to 5, how concerned are you about the environmental impact of traditional vehicles? *

(1 being not concerned at all, 5 being very concerned)

Mark only one oval.

	1	2	3	4	5	
Not Concerned	◯	◯	◯	◯	◯	Very Concerned

7. How familiar are you with electric vehicles? *

(1 being very familiar, 5 being not familiar at all)

Mark only one oval.

	1	2	3	4	5	
Very Familiar	◯	◯	◯	◯	◯	Not Familiar

8. Are you interested in owning/ converting to electric vehicles? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

9. If yes, how much would you expect to be the price of an e-scooters? *

Mark only one oval.

- ◯ 40,000-1L
- ◯ 1L-2.5L
- ◯ 2.5L-5L

10. If yes, how much would you expect to be the price of an e-cars? *

Mark only one oval.

- ◯ 5-10L
- ◯ 10L-17L
- ◯ Above 17L

11. What should be the expected maximum speed of an EV(in approx.)? *

Mark only one oval.

- ◯ Upto 80kmph
- ◯ 150kmph
- ◯ Other: _____

12. What factors would influence your decision to consider an Electric vehicle for commuting? (Select all that applies) *

Tick all that apply.

- [ ] Environmental Impact
- [ ] Cost Savings
- [ ] Govt. Incentives
- [ ] Charging Infrastructure
- [ ] Range of the vehicles
- [ ] Technological features
- [ ] Other: _____

13. What do you think could be potential barriers or challenges for people considering electric vehicles for commuting? (Select all that applies) *

Tick all that apply.

- [ ] High initial cost
- [ ] Limited charging infrastructure
- [ ] Range anxiety
- [ ] Lack of knowledge about technology
- [ ] Limited vehicle options
- [ ] Other: _____

14. Are you aware of any Govt. Initiatives or incentives promoting EV adoption in India? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Somewhat

15. How much would you spent on changing the batteries once it gets exhausted? *
Mark only one oval.

- 5,000
- 15,000
- 25,000
- 50,000

16. Where would you prefer to charge your EV if you were to buy one in the future? *
Mark only one oval.

- At home
- At work
- Using public charging facilities

17. How much premium would you pay for additional development or manufacturing cost of infrastructure for an EV?(in INR approx.) *
Mark only one oval.

- 25,000
- 50,000
- 75,000
- 1,00,000

18. How much subsidy do you expect from the govt. On the price of batteries of EV? *
Mark only one oval.

- 10%
- 20%
- 40%

19. Would you be open to considering an EV for your future commuting needs? *

Mark only one oval.

- Yes
- No
- Maybe

20. When do you think EV will compromise the majority of the total cars owned? *

Mark only one oval.

- 15 years
- 25 years
- 30 years
- Over 35 years

21. Would you recommend EV to any of your friends or relatives? *

Mark only one oval.

- Yes
- No