CONSUMER PREFERENCE TOWARDS ELECTRIC VEHICLES OVER GASOLINE FUELLED VEHICLES: A COMPARATIVE ANALYSIS

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By

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CERTIFICATE

This is to certify that the dissertation titled "CONSUMER PREFERENCE TOWARDS ELECTRIC VEHICLES OVER GASOLINE FUELLED VEHICLES: A COMPARATIVE ANALYSIS" submitted in partial fulfilment of the requirement of MA Degree in Economics to St. Teresa's College (Autonomous), affiliated to the Mahatma Gandhi University, Kottayam, is a record of bona fide research work done by the candidate under my supervision and guidance.

Head of the Department **Guide and Supervisor**

DECLARATION

I hereby declare that this dissertation titled"CONSUMER PREFERENCE TOWARDS ELECTRIC VEHICLES OVER GASOLINE FUELLED VEHICLES: A COMPARATIVE ANALYSIS" is a bonafide work done by me and this work has not been previously formed the basis for the award of other Academic qualification, fellowship of other similar title of any other university or board.

Signature of the supervisor	**Signature of the candidate**
DR SWATHY S VARMA	HANNAH GRACE JOSEPH

ACKNOWNLEGEMENT

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EV	Electric vehicle
EEA	European Economic Area
ICE	Immigration and customs enforcement

CHAPTER 1
INTRODUCTION

CONSUMER PREFERENCE TOWARDS ELECTRIC VEHICLES OVER GASOLINE FUELLED VEHICLES: A COMPARATIVE ANALYSIS

1.1 Introduction

India is a country with the third-largest road network in the world. Road travel seemed to be a preferred choice in India with over 60 percentage of the population using personal or shared vehicles to commute (Statista, 2020). And automobiles are thought of as one of the vital methods of transportation for individuals, labour and products for about 100 years. Automobile industry has contributed greatly towards the advancement of the world. This technique for transportation is so incomprehensibly utilized everywhere.[1]

According to the literature, conventional vehicles are a major cause of global warming and environmental air pollution. All types of vehicles produce dust from brakes, tires, and road wear. The average diesel vehicle has worse effect on air quality than any other vehicles. But both gasoline and diesel vehicle pollute more than the electric vehicle (EEA, 2018).As against this, Electric Vehicles (EV) have low running cost as they have fewer moving parts for maintenance and also very environmentally friendly as they use little or no fossil fuels compared to petrol/diesel fuelled vehicles. Vehicles that run on electric current using an electric motor are classified under the category of electric vehicles. Electric vehicles are either partially or fully powered on electric power.

As contamination has turned into a central issue, electric vehicles are a welcome help. Electric vehicles are greatly improved for the climate, taking into account a variety of advantages. Then again, the fuel vehicle discharges destructive gases like carbon because of petroleum or diesel. Notwithstanding, electric vehicles radiate less ozone depleting substances and cause less air contamination than fuel vehicles. For an examination among EV and fuel vehicles, there is seen a developing interest in buying electric vehicles. As per European Energy Agency research, driving an electric vehicle transmits 17-30% less fossil

[1] Statista Research Department, May 11, 2022

fuel by-products than driving a gas or diesel vehicle. At the point when low-carbon power is utilized, the emanations from power age are additionally decreased.

The critical advantage of an electric vehicle is the manner by how much eco-accommodating they are in comparison with petroleum or diesel fuelled vehicles. Electric vehicles run exclusively on power, there is no utilization of petroleum derivatives which basically wipes out your fuel costs. There will be charges in using charging hotspots but not as much as expensive as other vehicles.Worldwide car sales grew to around 66.7 million automobiles in 2021, up from around 63.8 million units in 2020.

Electric vehicles are a lot calmer, and mileage can be significantly better contrasted with petroleum or diesel motors, particularly while driving at low paces in urban communities and developed regions. Generally, the absolute expense of possession for electric is a lot lower than customarily fuelled vehicles as they don't need the support and oil changes that gasoline fuelled

1.2 Review of literature

1. **Mr. OmkarTupe, Prof. Shweta Kishore, Dr.ArlophJohnvieira (2020)** on their study **"Consumer perception of electric vehicles in India"** talked about the ongoing consumption of petroleum products and its cost climb and further explained that there is a requirement for one more energy asset to run the vehicle. The automobile sector is thinking about Electric Vehicle as an answer for the business and better climate in India. The ongoing business sector of electric vehicles is moderately low despite states carrying out good strategies. In this paper possible extent of Electric vehicle in India has emerged and consumer's insight for same has been investigated.

2. **Akshat Bansal and Akriti Agarwal's (2018)** article was on **"Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle"**. Their examination is focussing on the exploration of current situation of the purchasers and the position of automobile industry in India. The head of the report is a relative exploration of electric vehicle and ordinary vehicles. Furthermore, the exploration centres on the cost of responsibility for electric vehicle rather than the traditional vehicle in the Indian market. The exploration

additionally stresses on industrial viewpoint by figuring out the best section to bring an electric vehicle in India.

3. **Filippo Emanuele Ciarapica, Dominik Tobias Matt, Matteo Rossini and Pasquale Russo Spena's** article on **"Quality, environmental and economic factors influencing electric vehicles penetration in the Italian market"**. Their examination endeavours to determine which figures, for example, decreases fuel expenses and global warming reduction, motivating forces on the price tag, road tax, and vehicle protection, could support the reception of electric vehicles rather than ordinary ones. Their study likewise endeavours to find out which vehicle ensure the fulfilment of client needs by giving the normal quality. Different inquiries pose to respondents to show their number one electric vehicle, body style and to demonstrate which fuel utilization is thought of as productive for a cross breed vehicle. At last, this exploration analyses the fundamental boundaries to the electric vehicles market presentation.

4. **Xiaoliang Zhang, Bing Zhang, Lei Chen, Jianrong Liu, ZhishanZhong (2020)** on **"Influence Factors of Purchase Intention of Pure Electric Vehicle"**; discusses the ways to lessen auto fumes contamination, how government divisions ought to plan transportation approaches to advance the advocacy of unpolluted electric vehicles, and viable transportation arrangements require an exhaustive comprehension of the variables that impact the purchase of electric vehicles. In view of explorer's current circumstance including conduct and climate appearance, voyagers' ecological mindfulness is acquired through the Raschmodel in this article. The outcome shows that the natural attention to voyagers emphatically affects the buy aim of all around good electric vehicles; the vehicle buying limitation strategy of oil-energized car and the development of charging heap and other foundation can build explorers' buy aim of overall good electric vehicles.

5. **Robbert Slot (2017)** on **"Factors Influencing the Adoption of Electric Vehicles in the Netherlands"** explains in further those nations all around the world are attempting to handle the issue of a worldwide temperature alteration. The case that human exercises altogether add to this peculiarity has brought state run administrations to revaluate their green plan. The transportation area is a major supporter of the ozone depleting substance

impact and is accordingly under expanding strain to change. The unmistakable option for petroleum derivative vehicles is the electric vehicle, as it creates no destructive contaminations through the tailpipe. The Netherlands has chosen to push for a green transformation and has conveyed the aggressive objective of 1 million EVs in 2025. In any case, while the quantities of EVs is developing, it is still exceptionally far away from the ideal mass reception. Purchasers are as yet purchasing ICEs over EVs. The study makes use of variables that impact the pace of EV reception in the Netherlands.

6. **ArpitRastogi, Rohaan George Thomas and Abhijeet K. Digalwar**on **"Identification and analysis of social factors responsible for adoption of electric vehicles in India"** explains the Natural emergency and energy security concerns that have constrained specialists to search for a cleaner method of transportation. Thorough endeavours are on to make electric vehicles (EVs) plausible for business use, regarding mechanical headways and financial practicality. Regardless of being among the top auto fabricating nations on the planet, the reception pace of EVs in India has been poor. There is a need to get the social adequacy and manageability of EVs. To overcome this issue, the current review recognizes the social variables answerable for slow reception of EVs in India. The outcomes might help in arranging the producers and leaders towards quicker reception of EVs. This study helps analysts to get a superior comprehension of the elements answerable for slow reception of EVs in India. The Government of India could benefit in its objective to accomplish its aggressive objective projected in the FAME India conspire.

7. **Gómez Vilchez, J., Harrison, G., Kelleher, L., Smyth, A., Thiel, C. (2017)** on **"Quantifying the factors influencing people's car type choices in Europe"** discusses the reasons, the respondents mentioned for not buying electric cars, which were: lack of recharging infrastructure, short range, little model choice. Policies may help to overcome these challenges.

8. **Liao, Fanchao; Molin, Eric; van Wee, Bert (2017)** on **"Consumer preferences for electric vehicles: a literature review"**. This paper presents a comprehensive review of studies on consumer preferences for EV, aiming to better inform policy-makers and give direction to further research.

9. **AravindHarikumar, Aakansha Jain, Palak Thakur** on **"faster adoption of electric vehicles in India: perspective of consumers and industry"** explains that the objective of this report is therefore to do a comprehensive analysis on significance of electric vehicles (EV) as a solution, steps taken by government to promote the same, challenges to its adoption and evaluate solutions to promote faster adoption of EVs.

10. **ZameelIsmail and Aly Al-Saeeady (2020)**on **"Consumer behaviour towards the purchase and usage of electric vehicles by swedishmillinneals".**The authors were interested in studying the different purchasing intentions of millennials in regard to traditional fossil fuel and Electric Vehicles and the authors asked the following research questions :
    - What are the purchasing intentions of millennials on Electric Vehicles in Sweden?
    - What characteristics influence millennials perceptions between EV's and Fossil fuel vehicles?

1.3 STATEMENT OF PROBLEM

Automobiles are considered as one of the key modes of transportation for people, goods and services for the past 100 years. This industry has contributed massively towards the development of the modern world from personal travels to moving enormous structures. This higher demand for transportation has resulted in a ramp in production of newer automobiles in fact a statistic between 2000 to 2018 shows that the production of new automobiles has doubled from approximately 50 million units in the year 2000 to 100 million units in 2018, worldwide (Car production). This influx of automobile production has in return caused the production and consumption of fossil fuels which power these automobiles, to increase dramatically. According to the report (Co2 emissions from cars; the facts) the result of this dilemma has contributed abundantly, to the increase of over a quarter of all greenhouse gasses in the

atmosphere, the report further states that the consumption has been increasing at a faster phase since 2001[2].

In this scenario, electric cars are better for the environment. India is one of the biggest vehicle markets on the planet, and the electric vehicles market has promising development potential.

According to recent research by Accelerated e-Mobility Revolution for India's Transportation (e-amrit) portal in India, only 7,96,000 Electric vehicles have been registered till December 2021, and the installation of 1,800 charging stations on public places. Around 25 upcoming electric cars EQA, R2, eKUV100, Altroz EV, EV6 will be launched in India in 2022-2024.

So, the present study attempts to ascertain Kerala State consumer's preference and perspective towards purchase of electric vehicles instead of conventional ones.

1.4OBJECTIVES

1. To analyze the trends and factors determining the purchase of electric vehicles.
2. To know the perception of public towards electric vehicles.
3. To compare the benefits of electric vehicles over gasoline fueled vehicles.

1.5 SIGNIFICANCE OF THE STUDY

Transport is a fundamental requirement of modern life, but the traditional combustion engine is quickly becoming outdated. Petrol or diesel vehicles are highly polluting and are being quickly replaced by fully electric vehicles. Fully electric vehicles (EV) have zero tailpipe emissions and are much better for the environment.

The major benefit of electric cars is the contribution that they can make towards improving air quality in towns and cities. With no tailpipe, pure electric cars produce no carbon dioxide emissions when driving. This reduces air pollution considerably.

[2]European Federation for Transport and Environment AISBL, 2018).

This study would bring forward consumers opinion, perceptions and knowledge about electric vehicle which could be of benefit to others. The study will be relevant to those who are intending to purchase a vehicle. The study may uncover the main reasons why consumers would want to shift to this alternative technology.

1.7 METHODOLOGY

1.7.1. Sources of Data:

Primary as well as secondary data were used in the study. Primary data were collected through google forms with the selected sample with the help of a structured questionnaire. Secondary data includes information collected from various books, magazines, journals and research works.

1.7.2. Area of Study:

Sample units: The population used for the study was collected from Ernakulam district.

Sample size: The study was conducted with the help of 60 samples.

1.7.3Statistical tools:

Statistical tools were used for arranging the collected data systematically. Simple diagrams and tables are used to explain data.

1.7.3. Period of Study:

All data were collected during the period from 2021-2022.

1.7.4. Types of Analysis

The present study is both descriptive and analytical. It is descriptive in the sense that it studies the preferences of consumers towards electric vehicles over gasoline fuelled vehicles. It is analytical in the sense that it analyses and interprets the data.

1.8THEORETICAL FRAMEWORK

1. **Consumer theory**

   Consumer theory is the study of how people decide to spend their money based on their individual preferences and budget constraints. Building a better understanding of individuals' tastes and incomes is important because these factors impact the shape of the overall economy. Consumer theory is not flawless, though, as it based on a number of assumptions about human behaviour.[3]

   In the study consumer's preference are taken into account to identify the comparison between Electric and Gasoline fuelled vehicles.

   The theory of consumer choice assumes consumers wish to maximise their utility through the optimal combination of goods – given their limited budget.

1.9 SCHEME OF THE STUDY

The study is organized in four chapters:

The first chapter provides a brief introduction of the study. It includes review of literature, objectives, and statement of the problem, significance of the study, methodology, theoretical background, and limitations.

The second chapter deals with an outlay of consumer preferences towards electric vehicles.

The third chapter deals with the results of the comparative study between electric vehicles and gasoline fuelled vehicles.

The fourth chapter presents findings, recommendations and conclusions.

1.10. LIMITATIONS OF THE STUDY

The study has the following limitation:

- The study had all the limitations of purposive sampling.
- The sample size is restricted to 60, so the results may not represent the whole population.

[3] Investopedia

CHAPTER 2

CONSUMER PREFERENCE TOWARDS ELECTRIC VEHICLES OVER GASOLINE FUELLED VEHICLES- AN OVERVIEW

2.1 HISTORY OF AUTOMOBILE INDUSTRY

Automobile industry is the multitude of organizations and are engaged with the production of engine vehicles, including most parts, like motors and bodies, however barring tires, batteries, and fuel. The business vital items are traveller autos and light trucks, including pickups, vans, and game utility vehicles. The plan of current auto vehicles is examined in the articles auto, truck, transport, and bike; car motors are portrayed in gas motor and diesel motor.

The historical backdrop of the automobile industry, however short contrasted and that of numerous different ventures, has excellent interest due to its consequences for history from the twentieth century. The industry began in Europe in the late nineteenth century, the United States totally ruled the world business for the initial portion of the twentieth century through the development of large scale manufacturing methods. In the final part of the century the present circumstance adjusted forcefully as western European nations and Japan became significant makers and exporters.

Technology has its own way of emergence and it works hand in hand with the automobile industry. Every day there is new technology and innovation comes as a result. Today, automobile inventors are more likely to produce environment-friendly vehicles keeping in mind the reduction of fossil fuels. Probably they are looking for a renewable source of power for the vehicle. For this, electric vehicles are a more suitable option as they are non-polluting and reliable in terms of linear performance. The performance of the electric vehicle is the main factor. Whereas, fuel vehicles have their own features and benefits. As fuel vehicles need little time to be powered, but electric vehicles need a long time to get charged.

2.1.1ELECTRIC VEHICLE AND FUEL VEHICLE

As the growing pollution has become a serious concern, electric cars are quite a relief. And, according to the research electric cars are better for the environment. Whereas, the fuel vehicle such as petrol or diesel fuelled emits harmful gases like carbon. But electric vehicles produce fewer greenhouse gases and air pollution than petrol. That is why interest in purchasing an electric vehicle is increasing. It is important to know how electric vehicles impact nature. As per the research by the European Energy Agency, the carbon emissions of

an electric car are around 17-30% lower than driving a petrol or diesel car. When low carbon electricity is used, the emissions from electricity generation improve.

Energy saving is the one explanation individuals think about while moving to electric vehicle in India. However, a few variables individuals ought to consider while buying is the expense of fuel and maintenance and the general price tag of the vehicle according to the electric vehicle market in India. Nowadays, electric vehicles will quite often be more costly and these vehicles are turning out to be more normal with an assortment of model choices to look over. Additionally, location is one of the elements for the expense of buying and working the new vehicle alongside brand name and type. Another component that is considered to be the difference among electric and regular vehicles is the means by which how quick and fast a vehicle takes between the boarding and objective. Where electric vehicles create more energy that drives vehicles quicker.

The basic difference between electric vehicles that also called EV and fuel which is categorized as Standard Internal Combustion Engine Models or ICE is that gasoline is used by fuel vehicles and electricity is required for electric vehicles. Mile per Gallon or MPG is the concept used to measure the fuel efficiency of ICE vehicles. However, the price of gas or fuel varies from time to time. And, fuel vehicles need to be filled up about every 250-300 miles of the journey. There are a variety of sources available for Electric vehicles to be powered by electricity. The electricity is produced by the burning gas or coal, or from renewable sources, such as hydropower, wind and solar.

"As electric vehicles are gaining popularity, you can find sufficient charging stations in public spaces especially in urban areas or at highway stops. According to the guidelines of the Ministry of Power, allowing various charger types to be developed at public charging stations, settled the issue of charging standards''[4]. The Development of Heavy Industries' scheme of setting up more than 2,600 public charging stations in various cities and more than 1,700 along highways is a step in the right direction. Such policies and guidelines provide a positive boost for EV adoption in the country to take off. Still, one or more charges are needed for long journeys. The benefit of electric vehicles is low maintenance as ICE vehicles need to add up the fluid transmission, coolant, and engine oil. However, both EV and ICE vehicles need to spend motor insurance, structural repair, brake, and tyre changes. However, if one is planning to buy an electric vehicle or fuel one, keeping all the important things in mind is good. Get a recommendation from automobile experts or people who are using an

[4]thehindubusinessline.com

electric vehicle. Several factors like overall cost, emissions, and vehicle selection should be focussed.

2.2 Consumer behaviour and preference towards EV

Consumer behaviour is the study of customers select and use products within a specified market environment. Consumer behaviour defines the several interactions of the target market with the product of a company or a specified brand. Several different studies have taken place on consumer behaviour regarding the automobile purchase trends describing the different factors that influence consumer purchase decisions. Sambandam and Lord (1995) suggest that a lot of changes have taken place in the automobile industry with respect to consumer behaviour.

Consumer behaviour and preferences are constantly changing as a result of the interplay of several factors within the business environment. Several factors influence consumer choices with reference to cars as suggested by Vidyavathi (2012). Lifestyle, financial status and other demographic properties have largely determined the choice of automobile consumers. The factors that influence consumer behaviour can be divided into three main categories that include psychological, social, and personal factors. Consumer behaviour falls into different classifications that give rise to different types within an industry.

Consumer behaviour is a very significant aspect in determining the consumption of a product in a specified market segment. The millennials are a demographic classification of consumers within any economy ("Understanding the new generation," 2017). The product under study is the electrical car purchased and used within the country. Millennials are characterized by different consumer behaviours that can be described by different theoretical models that have been helpful in describing and understanding varied markets over time.

There is no distinct consumer behaviour especially with regards to automobile products that have a very high involvement. The market experiences a variety of consumer behaviours including the complex, dissonance reducing, and variety-seeking consumer behaviours. Electric vehicles are products that demand a very high involvement and includes several documentations, because of these reasons, it is not purchased frequently. The different variables involved in the purchase of electric vehicles complicates the consumer behaviour (Wu, et al., 2019).

Different brands of electric vehicles have flooded in the market and these consumers have to make choices between these products. The purchase behaviour of these consumers will involve extensive research in an attempt to avoid making purchase mistakes, this makes the consumer behaviour dissonance-reducing in nature. Finally, many consumers within the market also look out for variety to make informed choices. The search for variety amongst the electric vehicle products within the market results in a variety-seeking behaviour. These different types of consumer behaviours constituting the market depends on the product and the customers themselves.

2.3Consumer Perception towards EV

Consumer perception is how the customers that are targeted by a business organization see the company and its products. The impression that a company forms in the minds of the customers is crucial in enhancing their participation in the purchasing of the company's products. A variety of factors interplay in creating an augmented reaction to the perception that consumers have on a given brand or a company (Rubenstein, 2014). Price is one of the most significant factors that influence the perception of any consumer. Highly priced brands are commonly associated with luxury or quality, which is absent in low-priced brands. However, lower prices can also attract consumers who look out for cheaper brands. Product packaging also plays a primary role in influencing how the consumers perceive a product. Valued products are strongly and sturdily packaged with high quality material and sometimes recyclable substances. Quality of material used to manufacture a product which consequently determines its quality largely influences how the consumers perceive a brand. Low quality material can negatively portray a product in the eyes of the consumers contrary to high quality products that attract and maintain customers and encourage brand loyalty.

Brand reputation and history determine to a larger extent how consumers perceive a brand. What other consumers say about a brand determine how other consumers will perceive the same brand, influencers play a key role in this direction (Matsumoto, Chinen& Endo, 2017). Brands that have stayed in the market longer are also perceived more positively by the consumers compared to newer brands. Online presence also plays a key role in how consumers perceive a brand, consumers will look at brands with a strong online presence more positively compared to those that operate offline.

Maintaining the consumer perception is very important by the electric car manufacturers to ensure continuous and increased sales. According to the perception theory, a consumer will

always look at a product as an opportunity or a threat (Chen, Fay, and Wang, 2011). It is important the manufacturers appeal to the instincts of the consumers (Wang, Huscroft, Hazen, and Zhang, 2018). Consumers are able to partake in the product when the marketing strategies are able to influence the decision-making process of the consumers towards the purchase of electric cars.

2.4 Consumer Purchase Intentions

Consumer purchase intentions are primarily informed by their behaviour with respect to a given product or brand within the market. Most purchasing intentions depend on an individual's cognitive ability and how they feel about a product. Consumer purchase intentions vary from one group of consumers to the next depending on the market factors that are in play. An important theory that clearly explains the consumer purchase intentions is the Theory of Planned Behaviour (TPB). According to TPB, the beliefs of an individual regarding a certain concept would influence their response towards the concept.

The theory of planned behaviour has three main determinants that influence the consumer purchase intentions. The consumer attitude towards the products largely influence their intentions to make purchases, therefore, developing a positive customer attitude concerning the product can boost the electric car sales. Many consumers within market have a positive attitude towards electric cars, an idea that influences their intentions to make purchases of the same vehicles (Hasan and Nasreen, 2012). The subjective norm is the second perspective to planned behaviour of the consumers. The different electric car manufacturers have been able to improve the image of their products in the eyes of their target consumers which has resulted in positive response from the customers. The different customers feel that the cars are meant to help solve their problems improving their chances of them buying the product. Finally, the perceived behaviour control of the products also influences the consumer intentions to make purchases.

Consumer behaviour, purchase intentions, and perceptions are some of the key marketing aspects that have influenced the purchase of electric cars within several markets. These markets are comprised of a large portion of urban residents who accommodate change and appreciate dynamic viewpoints within the automobile industry (Lawan and Zanna, 2013).

Different theories explain the consumer relationships giving clear understanding to how consumers regard the different products within their environments and markets.

2.5 Comparison of conventional cars vs electric vehicles

Fromthe outside, the electric vehicle looks like a gasoline powered vehicle with the exception that the electric vehicle does not have a tail pipe. Internally, it is quite a different. According to CALSTART[5], the advanced transportation consortium in California, 70% of an electric vehicle's component parts may be different from a gasoline-powered vehicle. The electric vehicle has several unique components that serve the same function as the more common components in gasoline-powered vehicle.

Another significant difference between electric vehicles and gasoline-powered vehicles is the number of moving parts. The electric vehicle has one moving part, the motor, whereas the gasoline-powered vehicle has hundreds of moving parts. Fewer moving parts in the electric vehicle leads to another important difference. The electric vehicle requires less periodic maintenance and is more reliable. The gasoline-powered vehicle requires a wide range of maintenance, from frequent oil changes, filter replacements, periodic tune ups, and exhaust system repairs, to the less frequent component replacement, such as the water pump, fuel pump, alternator, etc. The electric vehicle's maintenance requirements are fewer and therefore the maintenance costs are lower.

The electric motor has one moving part, the shaft, which is very reliable and requires little or no maintenance. The controller and charger are electronic devices with no moving parts, and they require little or no maintenance. State-of-the-art lead acid batteries used in current electric vehicles are sealed and are maintenance free. However, the life of these batteries are limited and will require periodic replacement. New batteries are being developed that will not only extend the range of electric vehicles, but will also extend the life of the battery pack which may eliminate the need to replace the battery pack during the life of the vehicle. Not only are electric vehicles easier and cheaper to maintain, they are also more efficient than the gasoline engine and are therefore cheaper to operate.

[5] An organization that advances clean transportation in industry sectors.

While the electric vehicle will be cheaper to operate and maintain, a number of challenges still exist for the owner of an electric vehicle. First and foremost is the limited range available with current battery technologies. The driving range between recharging using existing batteries is between 50 to 150 miles. New battery systems are being developed that will increase this range, and prototypes of these batteries have demonstrated ranges of recharging.Another challenge facing the owners of electric vehicles is the availability of skilled service technicians to service and maintain the electric vehicle. Training programs are being developed and offered to upgrade the conventional automotive technician with the skills needed to maintain an electric vehicle, and a two-year associate degree program has been developed to train high school graduates to become skilled electric vehicle technicians. Also needed is the infrastructure to recharge the batteries. The most significant element of the recharging infrastructure already exists: electric power is available in almost all locations. The remaining element needed is to ensure that charging stations, with the proper types of service (i.e., maximum voltage and current), are available at strategic locations to support the electric vehicle. Arrangements must also be made to ensure off-peak charging to get the lowest utility rates.

2.5.1Conventional Cars vs. Electric Cars

1. Easier Maintenance

Obviously, vehicles of any sort require maintenance and upkeep. However, when it comes to conventional cars vs. electric cars, conventional ICE vehicles end up needing more maintenance over time for a few reasons.

First, the mechanical parts within an internal combustion engine and the drivetrains require lubrication to keep them from creating friction as the pieces rub against each other. For this reason, engines require oil changes every 3,000 to 12,000 miles depending on the vehicle, and the drivetrains should be serviced with new fluids every couple of years. Even if you don’t drive often, these fluids need to be changed out because they can break down over time.

Then there’s build-up that can occur because of the nature of the fluids themselves. Scattered pieces of remains in gasoline can coat fuel injectors, decreasing their ability to deliver gas to

the engine. This can lead to poor engine performance and the need to clean or replace the fuel injectors.

This can be one of the leading costs and benefits of investing in electric cars vs. conventional vehicles, as the regular services required by ICE vehicles aren't required in electric vehicles. Because EVs don't use gasoline or have an internal combustion engine, they don't have fuel injectors and don't need regular oil changes. EVs typically have about two dozen fewer moving parts than an ICE vehicle, decreasing the amount of lubrication needed throughout the car. This doesn't only save money—it also saves you time. No more realizing you're overdue for an oil change and wondering how long you can go before you absolutely need to make time for the shop.

2. **Air Quality**

Similarly, electric cars have shown to have a positive impact on air quality vs. conventional cars. A study released in February 2020 looked at the impact of EVs on air quality in northern, central and southern Taiwan. They found that not only did EVs reduce air pollutants that are commonly associated with ICE emissions, but the health benefits of better air quality would be more than $43 billion USD annually.

Although the engineers of ICE vehicles are actively working to decrease the amount of emissions caused by conventional cars and local ordinances can require proof of emissions testing, the levels are still higher than electric cars. And if you do opt to lower emissions for your conventional vehicle, it's likely you're adding one more piece of maintenance you wouldn't need for an electric vehicle.

3. **Safety**

EVs generally have increased safety precautions in the event of an accident. For one, they're tested for safety across the same metrics as ICE vehicles, so they must pass the same requirements for the road. But because EVs run on a battery, the power is able to cut out when the airbags are deployed, cutting the power and decreasing how far it will continue to

travel after a crash. Plus, because they don't run on gasoline, there is little possibility of a car fire in the event of a collision.

4. Environment

EVs do have an effect on the environment through their dependence on electricity and the need to recycle the batteries. However, research and innovations are ongoing, continuously lowering EVs carbon footprint to zero. As Jessika Trancik, associate professor of energy studies at M.I.T., said to the New York Times, "The reason electric vehicles look like an appealing climate solution is that if we can make our [energy] grids zero-carbon, then vehicle emissions drop way, way down. Whereas even the best hybrids that burn gasoline will always have a baseline of emissions they can't go below." Similarly, ICE vehicles will also have a baseline of emissions that are impossible for them to surpass because of the nature of fossil fuels.

5. Noise Pollution

Noise is something most people don't notice until the neighbour's dog won't stop barking or the garbage truck comes by, but noise pollution is a serious issue. Studies have shown noise pollution not only increases the likelihood of damaged hearing, but can raise blood pressure, increase stress, and decrease sleep.

If you have a conventional vehicle with a good muffler and a well-maintained engine, you may not notice your car's noise, especially from the inside where the sound is dampened. But even the newest vehicles are going to make more noise than EVs due to the way combustion engines work and with all of the gears and mechanical pieces required to keep the car moving.

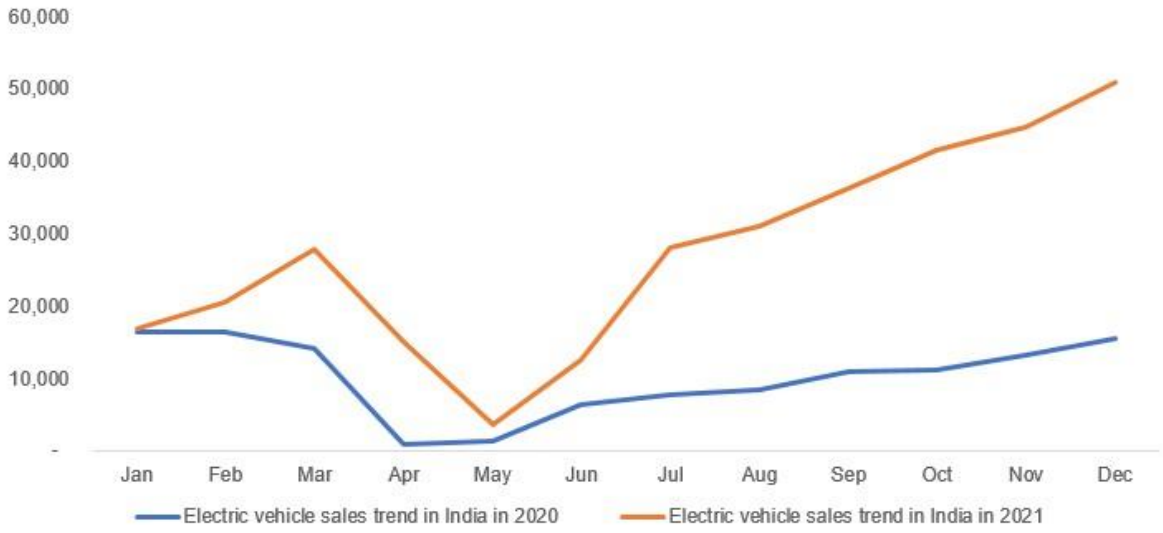
While the quietness of EVs have been a running joke since they first were introduced, the reduced sound decreased noise pollution, leading to healthier, happier communities. When it comes to the comparison between conventional cars vs. electric cars, electric cars have the upper hand in combating noise pollution.

2.6 India’s necessity for EV’s

- **Controlling Pollution**: According to the International Council for Clean Transportation (ICCT), an expected 74,000 unexpected losses were inferableto air contamination from transportation tailpipe outflows in India in 2015.Likewise, many top dirtied urban communities on the planet are from India. For instance,NewDelhi.
- **Relieving Climate Change**: In December 2019, in the Climate Risk Index2020 delivered by the climate think tank, Germanwatch, India's position hasdeteriorated from the fourteenth spot in 2017 to fifth in 2018 in the worldwide vulnerability ladder. This makes it even more justification for India to make electric vehicles and vehicles a need in the battle against the dependence on petroleum products.
- **Maintainable Energy Options**: Shifting towards EVs will assist India with diminishingoil reliance while tackling the test of energy shortage and movingtowards inexhaustible and clean wellsprings of energy.
- **Electric Vehicles are easy to drive and calm**: Electric vehicles don't have gears and are extremely advantageous to drive. There are no confounded controls, only accelerator, brake, and steer. At the point when you need to charge your vehicle, simply plug it in to a home or public charger. Electric vehicles are additionally calm, so they diminish noise contamination that conventional vehicles add to.
- **Accommodation of charging at home:**Imagine being at a fuel station during peak hours, and you are getting late to arrive at your working environment. These issues can undoubtedly be overwhelmed with an electric vehicle. Basically plug your vehicle in at your home charger for 4-5 hours before you intend to go. In the event that you can get a charger where you park at home, arranging your processes in advance is extremely helpful.

2.7 EV Market in India

Figure 2.7 Electric Vehicle Sales Trend in India (2020-21)



The Indian auto industry is the fifth biggest on the planet and is supposed to turn into the third biggest by 2030. According to India Energy Storage Alliance (IESA), the Indian EV industry is supposed to grow at a CAGR of 36%. As populace rises and interest for vehicles develop, reliance on ordinary energy assets is definitely not a supportable choice as India imports near 80% of its raw petroleum prerequisites. NITI Aayog means to accomplish EV deals entrance of 70% for every business vehicle, 30% for private vehicles, 40% for transports and 80% for two and three-wheelers by 2030. This is in accordance with the objective to accomplish net zero fossil fuel by-product by 2070. Throughout recent years, 0.52 million EVs were enlisted in India, as per the Ministry of Heavy Industries. EVs kept strong development in 2021, upheld by the execution of good approaches and projects by the public authority.

In India, Uttar Pradesh held the most noteworthy offer in EV deals in 2021, with the quantity of units sold across all fragments coming to 66,704, trailed by Karnataka with 33,302 units and Tamil Nadu with 30,036 units. Uttar Pradesh overwhelmed the three-wheeler section, while Karnataka and Maharashtra drove the bike portion and four-wheeler fragment, individually.

2.8 National level policies and interventions

- **Fame India scheme** is an incentive scheme that encourages the adoption of electric and hybrid vehicles. The full form of Fame India Scheme is "Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India".

Manufacturers and infrastructure providers of electric vehicles receive this incentive in the form of subsidies. Fame India Scheme is a part of the National Electric Mobility Mission Plan and was launched by the Ministry of Heavy Industries and Public enterprises.

Fame India Scheme operates in two phases. These are,

- Phase 1: The first phase of Fame India Scheme started I 2015 and was functional till 31st March 2019.
- Phase 2: The second phase of this scheme started in April 2019 and will continue till 31st March 2022.

The primary objectives of Fame India scheme are listed below.

1. This scheme encourages electric vehicles manufacturers and related providers to manufacture a higher number of electric vehicles in the country.
2. Its goal is to reduce vehicular emissions and air pollution levels within the country.
3. This scheme also aims to establish an electric charging infrastructure.
4. In addition, Fame India Scheme targets to convert 30% of total transportation into electric vehicles by the year 2030.

The FAME India Scheme is an incentive scheme for promotion of electric and hybrid vehicles. It aims to promote electric mobility and gives financial incentives for enhancing EV production and the creation of electric transportation infrastructure. In 2015 the Ministry of Heavy Industries and Public Enterprises launched FAME to incentivize the production and promotion of eco-friendly vehicles including EV and hybrid vehicles. The scheme is proposed for establishing charging infrastructure (Jose, 2018).

- **Alternative Fuels for Surface Transportation (AFST) Programme:** The AFST programme of the Ministry of New andRenewable Energy promoted all types of BEVs, PHEVs,HEVs and Electric/ Exercise Bike Generator Inverters(E2BI). The programme aimed at providing

supportfor dissemination of such vehicles, their research anddevelopment, pilot projects, and awareness relatedactivities. The programme had been offering CentralFinancial Assistance to all such vehicles since 2010.The programme came to an end in 2012–13; withthe launch of the National Electric Mobility MissionPlan 2020.

- **National Electronic Mobility Mission Plan (NEMMP) 2020**

The National Electric Mobility Mission Plan (NEMMP) 2020, was launched in 2013 by the Ministry of Heavy Industries and Public Enterprises in order to promote the demand of environment-friendly electric vehicle technologies. The primary aim of the Plan was to provide financial and infrastructural support to electric vehicle technologies in India. The budget outlay of the Plan was divided into a) Technology Platforms, b) Demand Incentive, c) Charging Infrastructure, d) Pilot Projects and, e) IEC/Operations (conductive charging) The vision statement of NEMMP is mentioned below: "To encourage reliable, affordable and efficient electric vehicles that meet consumer performanceand price expectations through government-industry collaboration for promotion and development of indigenous manufacturing capabilities, required infrastructure, consumer awareness and technology; thereby helping India to emerge as a leader in the EV two-wheeler and four-wheeler market in the world by 2020, with total EV sales of 6 – 7 million units thus enabling Indian automotive industry to achieve global EV manufacturing leadership and contributing towards national fuel security." NEMMP was targeted to achieve expansion of domestic electric vehicle market, coupled with global leadership in vehicle manufacturing. The primary objective of NEMMP is to provide the initial boost to the EV industry in India which will then in turn stimulate the manufacturing of these vehicles in larger volumes. The four key principles that guide the future roadmap for EVs penetration inNEMMP include the following:

1. Creating consumer acceptability for EVs
2. Developing infrastructure to support ownership and use of EVs
3. Development/acquisition of EV technology
4. Creation of local manufacturing capability

The Plan projected the total potential demand for full range of electric vehicles (mild hybrids to full electric) to be in the range of 5 –7 million units in new vehicle sales by 2020. The bulk of this demand has been anticipated to come from (pure) electric two-wheelers, followed by hybrid electric vehicles (HEVs) and pure electric vehicles or battery electric vehicles (BEVs). In order to achieve the objectives laid out in the NEMMP, the Government of India

announced an incentive scheme, which provides subsidies on purchase of EVs – the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme.

- **National Energy Storage Mission, 2018**

In February 2018, an expert committee under the chairmanship of Secretary, Ministry of New and

Renewable Energy, with representatives from relevant ministries, industry associations, research institutions and experts were constituted by the Ministry of New and Renewable Energy to propose draft for setting up National Energy Storage Mission (NESM) for India. The primary objective of the NESM is to strive for leadership in energy storage sector by creating an enabling policy and regulatory framework that encourages manufacturing, deployment, innovation, and further cost reduction. Furthermore, India's NESM has proposed three-stage solution approach, which is:

- creating an environment for battery manufacturing growth
- scaling supply-chain strategies
- scaling of battery cell manufacturing

The mission also highlights the importance of energy storage with perspective of India in order to provide the much needed thrust to renewables and electric vehicles. The key areas that were identified as a part of the mission were:

1. Integrating renewable energy with distribution and transmission grids.
2. Setting rural micro grids with diversified loadsor stand-alone systems. Developing Storage component of electric mobility plans.

- **National Policy on Electronics,2019**

The policy envisions positioning India as a global hub for Electronics System Design and Manufacturing – (ESDM**)** by encouraging and driving capabilities in the country for developing core components, including chip-sets, and creating an enabling environment for the industry to compete globally. The policy would indirectly affect technological advancements and innovation in the field of electric vehicles. The following are the salient features of NPE 2019:

1. Create eco-system for globally competitive ESDM sector by promoting domestic manufacturing and export in the entire value chain of ESDM by providing incentives and support for manufacturing of core electronic components.
2. Provide special package of incentives for mega projects which are extremely high-tech and entail huge investments, such as semiconductor facilities display fabrication, etc.
3. Formulate suitable schemes and incentive mechanisms to encourage new units and expansion of existing units.
4. Promote industry-led R&D and innovation in all subsectors of electronics, including grass-roots level innovation and early stage start-ups in emerging technology areas such as 5G, loT/ sensors, Artificial Intelligence (Al), machine learning, Virtual Reality (VR), drones, robotics, additive manufacturing, photonics, nano-based devices, etc.
5. Provide incentives and support for significantly enhancing availability of skilled manpower, including re-skilling.
6. Special thrust on Fabless Chip Design Industry, Medical Electronic Devices Industry.

State level Policies

Realizing the important role electric mobility can play in addressing the air pollution and climate change concerns, many states in India have drafted Electric Vehicle Policy to accelerate the uptake of EVs. Karnataka, Telangana, Maharashtra, Uttar Pradesh, Kerala and Tamil Nadu have formulated EV policies promoting EV adoption and manufacturing in their respective states. Delhi has also come up with a draft EV policy. The Table 7 State-level EV policies and their targets, sums up the targets that the state polices have set up for their respective states.

2.9 Mobility scenario in India

In order to evaluate electric mobility as a promisingsolution, an in depth analysis of current and expectedfuture mobility usage is required. According to 2011census, approximately 31% of India's population residedin cities. This number is expected to increase to 40% in 2030 and 50% in 2050. Analysis of travel pattern in Indian cities

shows that two-wheelers are very popular. Two-wheelers provide alifeline to majority of citizens in absence of an affordableand reliable public transport infrastructure. Twowheelerownership is at 45–50% of households in TierII and Tier III cities and close to 30% for households inTier I cities. Census data also shows that two-wheelersremain the most popular motorized mode to travel towork, even ahead of buses. According to the same data,17% of people in urban areas and 8% in rural areasdepend on two-wheelers for commuting to work. Asmost rural citizens do not have fixed places of workand have mixed transport needs, their dependence ontwo wheelers therefore have not been fully captured inCensus numbers.Analysis of trip lengths shows that 85% two-wheelerowners in rural and 75% two-wheeler owners in urbanuse their vehicles for <20km distance.This report therefore focuses on analysing electrificationof two wheelers, the most popular mode of motorizedtransport in India.

Many governments have initiated and implemented policies to stimulate and encourageelectric vehicle (EV) production and adoption (Sierzchula, Bakker, Maat, & Van Wee, 2014).

The expectation is that better knowledge of consumer preferences for EV can make these policies more effective and efficient. Many empirical studies on consumer preferences for EV have been published over the last decades, and a comprehensive literature review would be helpful to synthesise the findings and facilitate a more well-rounded understanding of this topic. Rezvani, Jansson, and Bodin (2015) give an overview of EV adoption studies; however, they only focus on individual-specific psychological factors which influencepeople's intention for EV adoption and only select some representative studies. Our review complements it in the following ways: first, we review a wider range of influential factors in EV adoption other than psychological constructs only; second, we present a comprehensive picture of current research by collecting all the available academic EV preference studies.

EVs come in different types and can be categorised into hybrid electric vehicles (HEVs) and plug-ins: HEVs have a battery which only provides an extra boost of power in addition to an internal combustion engine and increases fuel efficiency due to recharging while braking; while plug-ins can be powered solely by battery and have to be charged by plugging into a power outlet. Plug-ins can be further divided into plug-in hybrids (PHEVs, which are powered by both a battery and/or engine) or full battery electric vehicles (BEVs). Our review

focuses only on BEV and PHEV, since – unlike HEVs – they require behavioural changes as they require charging. However, studies on HEV were also included when they involve relevant factors which are not yet covered in BEV and PHEV preference studies.

CHAPTER 3

ANALYSIS OF THE STUDY- CONSUMER PREFERNCE TOWARDS ELECTRIC VEHICLES OVER GASOLINE FUELED VEHICLES; A COMPARATIVE STUDY

3.1 INTRODUCTION

An electric vehicle is one that works with the assistance of an electric motor. Such a vehicle is viewed as a substitution for current age automobile.

Selection of vehicles relies on ecological concern, cost, solace, trust, innovation, social acknowledgment, foundation accessibility etc.

The study analysis the following determinants;

3.2 Gender Respondents

Table 3.2: Gender wise classification of the respondents

Gender	Number of respondents	Percentage
Male	37	62
Female	23	38
Total	60	100

Source: survey data

The above table presents the distribution of respondents respective of their genders. It could be observed that the majority 62% had been Male respondents and 38% of female respondents.

3.3 Occupational status of the respondents

Table 3.3: Occupational status

Status	Number of respondents	Percentage
Employed	24	40
Unemployed	4	7
Student	32	53
Total	60	100

Source: Survey data

It could be observed from the above table that 53% of respondents were students and 40% of respondents were employed, further 7% were unemployed.

3.4 Annual Family Income of the respondents

Table 3.4 Annual family income

Income Pattern	Number of respondents	Percentage
≤100000	23	39
100000 - 200000	17	28
200000 - 300000	3	5
300000 - 400000	5	8
≥400000	12	20
Total	60	100

Source: Survey data

It could be observed that 23 of respondents were having annual income less than or equal to 100000rs, 17 had income in between 100000-200000rs, only 3 person had income between 200000-300000rs, 5 people had income in between 300000-400000rs and 12 respondents had income greater than 400000rs.

3.5Type of vehicle used by respondents

Table 3.5 Classification on type of vehicle used by respondents

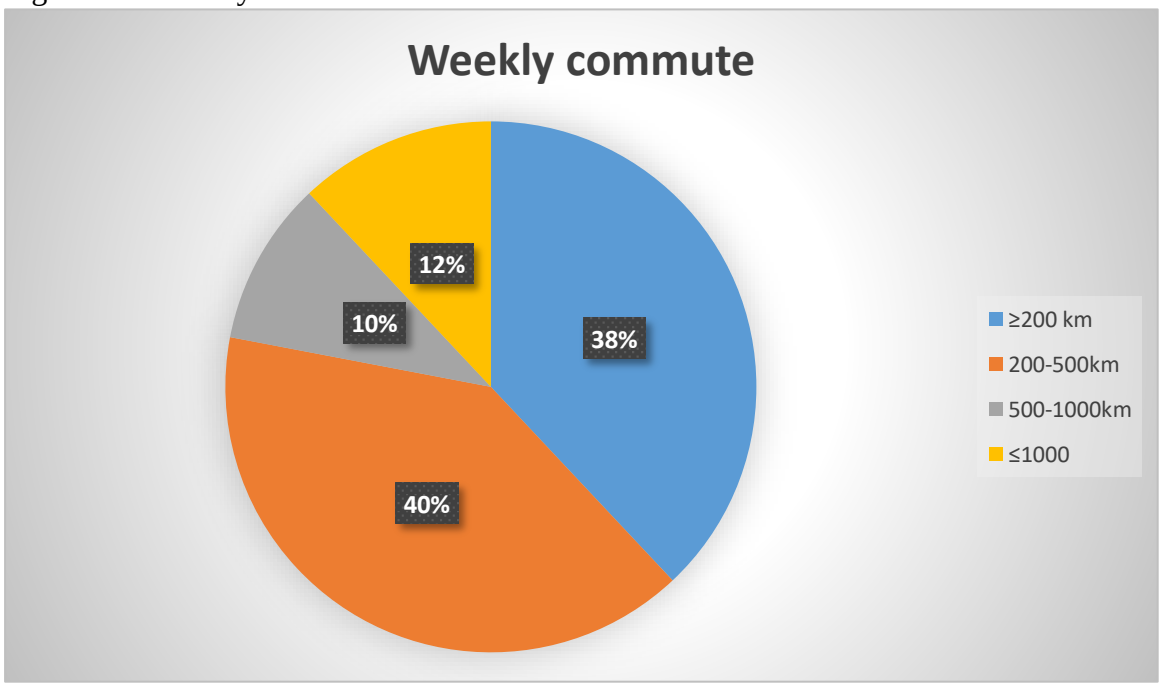
Vehicle	Number of users	Percentage
Electric	9	15
Petrol fuelled	43	71
Diesel fuelled	8	14
Total	60	100

Source: Survey data

It is observed from the table that 71% of the respondents are owning petrol fuelled vehicle, 15% are owning electric vehicles, 14% are using diesel fuelled vehicles.

3.6 Weekly Commute

Figure 3.6: Weekly commute



Source: Survey data

There are 40% of people travelling in between 200- 500 km weekly, followed by 38% of people travelling less than or equal to 200km per week. There are 12% of respondents travelling more than or equal to 1000km per week and 10% are travelling in between 500-1000km weekly.

3.7 Weekly expense on gasoline fuelled vehicles

Table 3.7: Respondents spending on fuel

Price	Number of respondents	Percentage
Below 500	9	15
500-1000	27	45
1000-1500	4	6.7
1500-2000	8	13.3
Above 2000	3	5
None (EV Users)	9	15
Total	60	100

Source: Survey data

It is known from the table that majority of people that is 45% spend 500-1000rs on fuel, 15% spend below 500rs, 13.3% of the respondents spend between 1500-2000rs and 6.7% of the people spend between 1000-1500rs. People who use above 2000rs are only 5% and the rest of the 15% are electric vehicle users.

3.8 Weekly Expense on charging electric vehicles

Table 3.8: Respondents spending on charging EV

Price	Number of respondents	Percentage
Below 500	4	7
500-1000	4	7
1000-1500	1	1
1500-2000	0	0
Above 2000	0	0
None (EV Users)	51	85
Total	60	100

Source: Survey data

The above table shows the spending of respondents on charging electric vehicles. There are 7% of respondent's spending money below 500 and also other 7% are spending between 500-1000rs. There is only one person from the respondents who spend from 1000-1500rs. The rest 85% of the respondents are non-users of electric vehicles.

3.9 Monthly Expense on maintenance/service of the vehicle

Table 3.9: Spending on maintenance

Expense	Number of respondents	Percentage %
Below 5000	54	90
5000-10000	4	7
10000-15000	2	3
Above 15000	0	0
Total	60	100

Source: Survey data

The above findings shows that majority of people that is 90% are spending below 5000rs on the maintenance of their respective vehicle. The 90% also includes all the respondents who are using electric vehicles, which means all EV users are spending below 5000rs on maintenance of their vehicle. 7% spend between 5000-10000rs and only 3% spend between 10000-15000rs. None of the respondents spend above 15000rs.

3.10Factors that are considered while purchasing a vehicle

Table 3.10: Factors considered for the purchase of vehicle

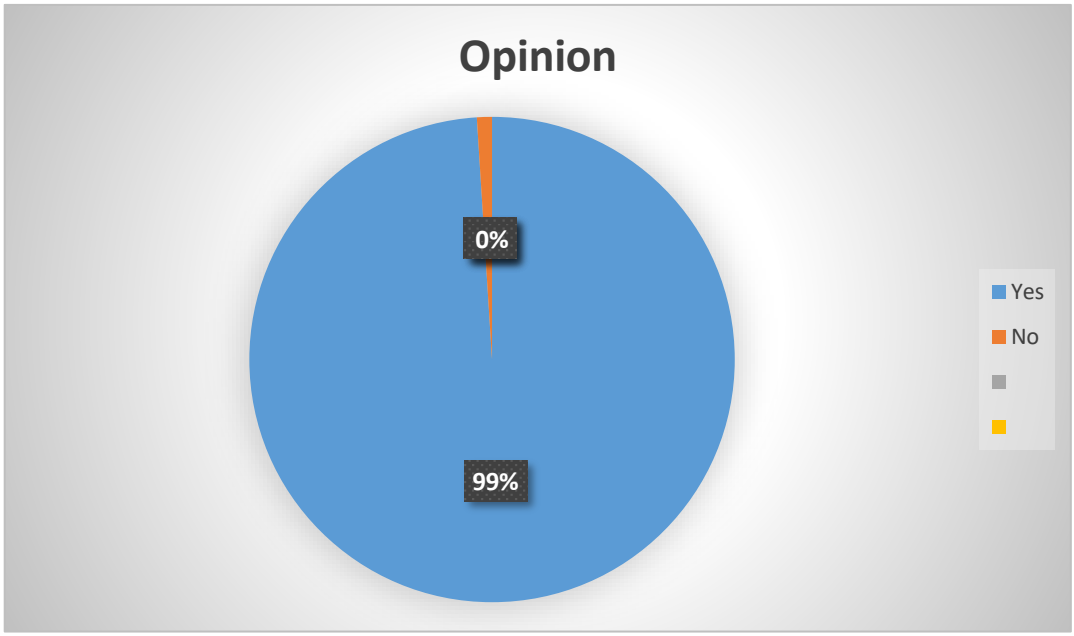
Factors	Number of people
Mileage	51
Safety	40
Performance	48
Brand	28
Price	30
Easy availability of service centres	1

Source: Survey data

The response makes it clear that most of people prefer mileage as the important factor while purchasing a vehicle that is 51 people have voted for it from 60 respondents. The second highest factor which people prefer are the performance of the vehicle which got vote from 48 people. This is followed by safety factor voted by 40 people, 30 people voted for price as a factor. Brand has got a vote of 28 people. Only one person preferred the availability of service centres.

3.11Opinion on fuel price

Table 3.11: Respondents feeling on whether fuel price are high



Source: Survey data

It is clear from the data that almost all that is 59 respondents out of 60 feels that fuel price is high. There is only one person who is feeling that fuel price is not high.

3.12 Reasons for high price

Table 3.12: Reasons for high price

Reasons	Votes
Too many taxes on fuel	51
Oil companies setting high prices	15
Due to demand and supply of fuel	21
Prices are always going up	22
Inflation	19
Ongoing Russia- Ukraine war	1
Governments inability to control fuel price	1

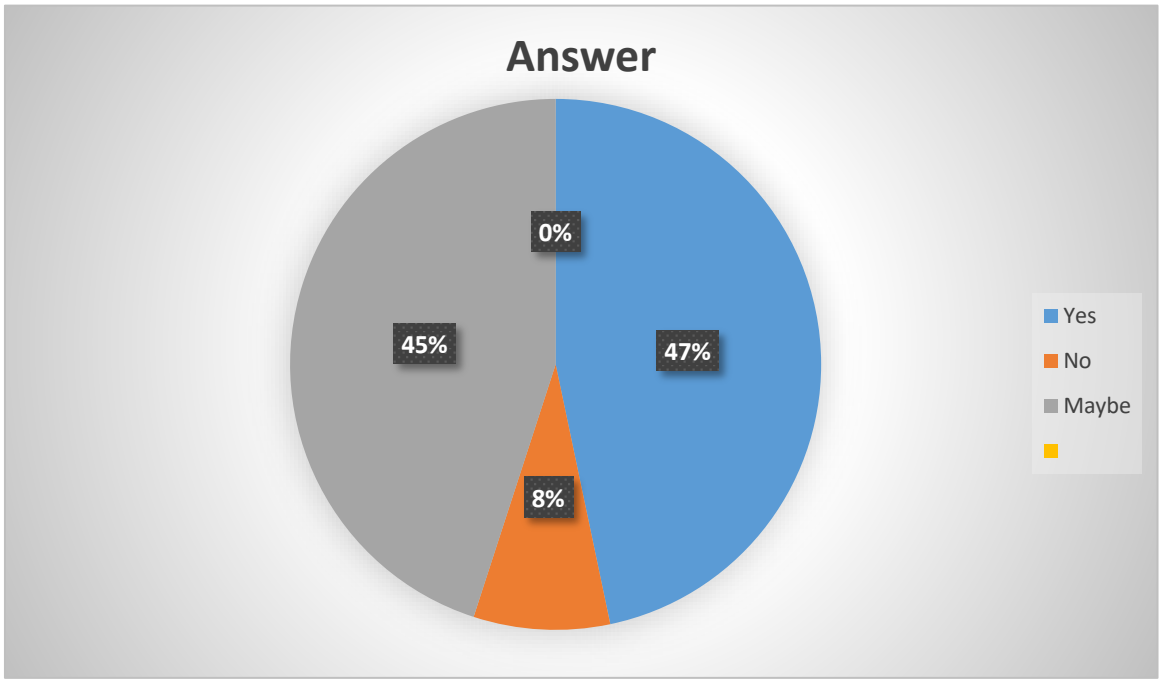
Source: Survey data

Among 60 respondents 51 have the opinion that there are too many taxes on fuel. 22 respondents feels that prices are going up anyways. 21 respondents feels that the reason for high fuel price is due to changing demand supply of fuel. 19 chose inflation as a reason. 15

respondents feels that oil companies are setting high prices. 1 respondent each feels that it is due to ongoing Russia-Ukraine war and Governments inability to control fuel price.

3.13 Percentage of respondents interested/thinking in purchasing an electric vehicle because of fuel price hike.

Figure 3.13: Chart of respondents who are interested in purchasing an electric vehicle because of fuel price hike.



Source: Survey data

Out of 60 respondents 28 people wants to buy an electric vehicle due to fuel price hike. 27 respondents are not sure, they might either buy or not buy one. 5 respondents are not interested in buying electric vehicles.

3.14 Factors that encourage in buying electric vehicle.

Table 3.14 Factors that encourage buying of electric vehicle

Factors	Number of respondents
Price	19
Positive environmental effects	46

Save money	45
References	3
New trend	8
Better financial or insurance option	16
Easy operation	20
Low noise level	33
Promotion	4

Source: Survey data

Positive environmental effects have got the highest votes with 46 votes, 45 respondent's feels that buying an electric vehicle can save money, low noise levels of electric vehicle is encouraging 33 respondents to buy one. 20 have preferred easy operation. Price encourages 19 respondents to buy an electric vehicle. Better financial or insurance option have encouraged 16 respondents. 8 are following new trend, 4 respondents are encouraged due to promotions and 3 are encouraged due to references.

3.15 Factors that discourage in buying electric vehicles

Table 3.15: Factors that lead to discouragement in buying of electric vehicles.

Factors	Number of respondents
Limited range	28
Long recharging time	30
Price	20
Lack of consumer choice	18
Lack of trust to new technologies	15
Unwillingness to change a lifestyle	4
Lack of charging stations	2
Technicians lack of knowledge	1
Sudden firing up of electric vehicles	1
None	7

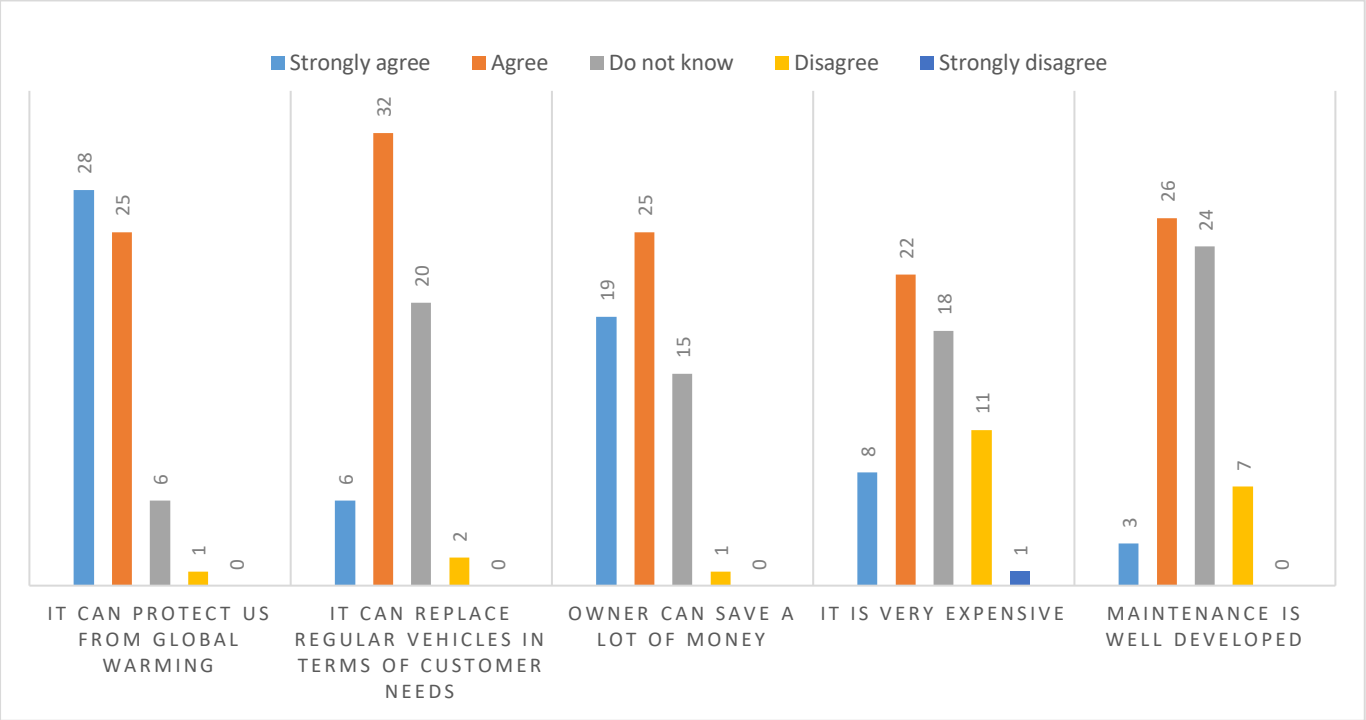
Source: Survey data

The main factor that discourage the buying of electric vehicle as answered by the respondents is long recharging time, it is the first factor with 30 votes. Limited range of vehicles available

is the next factor that discourage the purchase with 28 votes. Price is the next factor with 20 votes. Lack of consumer choice is one factor that discourage the purchase with 18 votes. There are 7 people who believe that there are no factors that discourage the purchase. 4 people prefer to not change their lifestyle. 2 person believes that there are lack of charging stations nearby. 1 person each believes that the factors that affect are technician's lack of knowledge and sudden firing up of electric vehicles.

3.16 Consumer perception about electric vehicles

Figure 3.16: Statements on electric vehicles



Source: Survey data

The first statement was that the electric vehicles can protect us from global warming, from 60 respondents 28 strongly agree to it, 25 agree, 6 people do not know and 1 disagree.

Second statement is that electric vehicles can replace regular vehicles in terms of customer needs in which 32 respondents agree to it, 20 people do not know whether electric vehicles can replace regular vehicles, 6 people strongly agree to the statement and 2 people disagree.

Thirdly the statement says that owners can save a lot of money, 19 people strongly agree to it, 25 people agree to it, 15 respondents do not know if it saves a lot of money and 1 person disagree to the statement.

Fourthly, the statement is that electric vehicle is very expensive, to this 8 respondents have strongly agreed, 22 respondents have agreed to the statement, 18 people do not know about it, 11 respondents disagree and 1 person strongly disagree.

The last statement is that electric vehicles maintenance is well developed, 3 respondents strongly agree, 26 people agree to it, 24 person do not know and 7 person disagree.

3.17: Purchase of electric vehicle in future

Table 3.17: Next purchase of electric vehicle

Period of time	Number of respondents	Percentage%
As soon as possible	14	23.3
In next 5-10 years	14	23.3
Anytime in future	30	50
I do not want to buy one	2	3.3

Source: Survey data

Upon the question on how likely the next vehicle will be an electric one, 14 people are willing to buy one as soon as possible. Other 14 respondents will buy in the next 5-10 years. Majority of respondents that is 30 will be buying an electric vehicle anytime in future. 2 people have chosen not to buy an electric vehicle.

3.18 Comparison between gasoline and electric vehicle

Figure 3.18: Comparison

Source: Survey data

While comparing the both on low fuel/energy consumption, from 60 respondents electric vehicles have got the majority of vote with 49 respondents and 11 respondents have chosen gasoline fuelled vehicles. In respect to comfort level 35 respondents have chosen electric vehicles and 25 chose gasoline fuelled. 42 respondents have voted for electric vehicles and 18 for gasoline in low maintenance cost. When asked on the resale value 44 have chosen gasoline fuelled vehicles and 16 chose electric vehicles. 32 people are happy with the ownership of electric vehicles and 27 are happy owning gasoline fuelled. When asked on which vehicle is better in economic comparison electric vehicles have the majority with 43 respondents and the rest 17 chose gasoline fuelled vehicles.

CHAPTER-4

FINDINGS, RECOMMENDATIONS AND CONCLUSION

4.1. INTRODUCTION

This chapter will give the findings and conclusions of the study suitable suggestions are also recommended in the light of these findings.

4.2. MAJOR FINDINGS

- It could be observed that the majority 61.7% had been Male respondents and 38.3% of female respondents.

- 53% of respondents were students and 40% of respondents were employed, further 7% were unemployed.

- It could be observed that 23 of respondents were having annual income less than or equal to 100000/-, 17 had income in between 100000-200000, only 3 person had income between 200000-300000, 5 people had income in between 300000-400000 and 12 respondents had income greater than 400000.

- It is observed from the survey that 70% of the respondents are owning petrol fuelled vehicle, 15% are owning electric vehicles, 13% are using diesel fuelled vehicles and 1% does not own any vehicles.

- There are38% of people from the study travelling less than or equal to 200km per week, 40% of people travelling in between 200- 500 km weekly. There are 10% travelling in between 500-1000km weekly and
  12% of respondentstravelling more than or equal to 1000km per week.

- It is known from the study that majority of people that is 50% spend 500-1000rs on gasoline, 17% spend below 500rs, 15% of the respondents spend between 1500-2000rs and 7% of the people spend between 1000-1500rs. People who use above 2000rs are only 10% and the rest of the 10% are electric vehicle users.

- Spending of respondents on charging electric vehicles shows that there are 7% of respondent's spending money below 500 and between 500-1000rs each. There is only one person from the respondents who spend between 1000-1500rs. The rest 85% of the respondents are non-users of electric vehicles.

- When asked on the maintenance cost majority of people that is 90% are spending below 5000rs on the maintenance for their respective vehicle. The 90% also includes all the respondents who are using electric vehicles, which means all EV users are spending below 5000 on maintenance of their vehicle. 7% spend between 5000-10000rs and only 3% spend between 10000-15000rs. None of the respondents spend above 15000rs.

- The response makes it clear that most of people prefer mileage as the important factor while purchasing a vehicle as 51 people have voted for it. The second highest factor which people prefer are the performance of the vehicle which got a vote from 48 people. This is followed by safety factor which is voted by 40 people, 30 people voted for price as a factor. Brand has got a vote of 28 people.

- It is clear from the survey that almost all, that is 59 respondents out of 60 feels that fuel price is high. There is only one person who is feeling that fuel price is not high.

- Out of 60 respondents 28 people wants to buy an electric vehicle due to fuel price hike. 27 respondents are not sure, they might either buy or not buy one. 5 respondents are not interested in buying electric vehicles they are satisfied with the gasoline price.

- Positive environmental effects have got the highest votes with 46 votes, 45 respondent's feels that buying an electric vehicle can save money, low noise levels of electric vehicle is encouraging 33 respondents to buy one. 20 have preferred easy operation. Price encourages 19 respondents to buy an electric vehicle. Better financial or insurance option have encouraged 16 respondents. 8 are following new trend, 4 respondents are encouraged due to promotions and 3 are encouraged due to references.

- The main factor that discourage the purchase of electric vehicle as answered by the respondents is long recharging time, it is the first factor with 30 votes. Limited range of vehicles available is the next factor that discourage the purchase with 28 votes. Price is the next factor with 20 votes. Lack of consumer choice is one factor that discourage the purchase which has 18 votes. There are 7 people who believe that there are no factors that discourage the purchase. 4 people prefer to not change their lifestyle. 2 person believes that there are lack of charging stations nearby. 1 person each believes that the factors that affect are technician's lack of knowledge and sudden firing up of electric vehicles.

- When asked on the respondents view on electric vehicles where first statement was that the electric vehicles can protect us from global warming, from 60 respondents 28 strongly agree to it, 25 agree, 6 people do not know and 1 disagree.

  Second statement was that electric vehicles can replace regular vehicles in terms of customer needs in which 32 respondents agree to it, 20 people do not know whether electric vehicles can replace regular vehicles, 6 people strongly agree to the statement and 2 people disagree.

  Thirdly the statement says that owners can save a lot of money, 19 people strongly agree to it, 25 people agree to it, 15 respondents do not know if it saves a lot of money and 1 person disagree to the statement.

  Fourthly, the statement was that electric vehicle is very expensive, to this 8 respondents have strongly agreed, 22 respondents have agreed to the statement, 18 people do not know about it, 11 respondents disagree and 1 person strongly disagree.

  The last statement was that electric vehicles maintenance is well developed, 3 respondents strongly agree, 26 people agree to it, 24 person do not know and 7 person disagree.

- Upon the question on how likely the next question will be an electric vehicle 14 people are willing to buy one as soon as possible. Other 14 respondents will buy one in the next 5-10 years. Majority of respondents that is 30 will be buying an electric vehicle anytime in future. 2 people have chosen not to buy an electric vehicle.

- While comparing electric and gasoline fuelled vehicles on low fuel/energy consumption, from 60 respondent's electric vehicles have got the majority of vote with 49 respondents and 11 respondents have chosen gasoline fuelled vehicles. In respect to comfort level 35 respondents have chosen electric vehicles and 25 chose gasoline fuelled. 42 respondents have voted for electric vehicles and 18 for gasoline in low maintenance cost. When asked on better resale value 44 have chosen gasoline fuelled vehicles and 16 chose electric vehicles. 32 people are happy with the ownership of electric vehicles and 27 are happy owning gasoline fuelled. When asked on which vehicle is better in economic comparison electric vehicles have the majority with 43 respondents and the rest 17 chose gasoline fuelled vehicles.

4.3 Recommendations

For lessening ecological pollution, reducing ozone depleting substances and so on individuals should give more significance to electric vehicles.

Many individuals are unaware of detailed information on various electric vehicles.

By diminishing the underlying expense for electric vehicles, there will be tremendous interest for electric vehicles in future.

Expanding the quantity of charging stations can draw in additional clients for purchasing electric vehicles.

The cost of petroleum is expanding day by day. Electric vehicles can tackle the issue of petroleum climb. Promoting electric vehicles by government also help the country accomplish development later on.

4.4 Conclusion

With the exhaustion of petroleum derivatives and consistent climb in fuel costs, there is a need for energy progress in vehicles in India. Government has stepped up to the plate and battle contamination levels by advancing electric vehicles and giving sponsorships on buy. To support its creation, Government has facilitated the FDI standards. Different arising brands are sending off electric vehicles in India. The Government and makers ought to join their hands to assemble the framework and establish positive environment for EVs. The respondents know about worldwide environment conditions and are prepared to change their inclination from customary to eco-accommodating vehicles. Cost is a significant factor while thinking about the acquisition of EV. Respondents will think about EVs as their future buy choice, assuming that legitimate framework is accessible. Introductory expense of procurement, less number of charging stations and the time expected to re-energize the battery is making restriction in supporting buyer certainty.

4.5 Bibliography

Journals and articles

1. Eric Molin and Bert Van Wee (2016), Consumer preferences for electric vehicles: a literature review.
2. Craig Morton and Jillian Leigh Anable (2016), Exploring consumer preferences towards electric vehicles: The influence of consumer innovativeness.
3. Liao, Fanchao; Molin, Eric; van Wee, BertLiao, Fanchao; Molin, Eric; van Wee, Bert, Consumer preferences for electric vehicles a literature review

Websites

https://vikaspedia.in/energy/energy-efficiency/electric-vehicles-in-india

https://eea.europa.eu/highlights/eea-report-confirm-electriccars

https://www.indianeconomy.net/splclassroom/fame-india-scheme/

www.symboinsurance.com/blogs/car-insurance/evolution-automobileindustry-india/

https://transportpolicy.net/standard/india-regulatory-background/

https://en.wikipedia.org/wiki/Car#Etymology

4.6 Annexure

1. Name

2. Gender

3. Profession

4. If employed, what type?

5. Annual family income

* ≤100000 *100000-200000 *200000-300000 *300000-400000 * ≥ 400000

6. Do you own a vehicle in your household?

7. What is your usual mode of transportation?

*Public transport *Personal vehicle *Autos/cabs

8. What type of vehicle are you owning?

*Electric *Petrol *Diesel *None

9. If electronic, which one?

10. What is the average distance you travel per month?

*≤200kms *200-500kms *500-1000kms *≥1000kms

11. What is your minimum spend for fuelling up your vehicle per week? (Gasoline fuelled vehicle)

*≤500/- *500-1000/- *1000-1500/- *1500-2000/- *≥2000/- *None

12. What is your minimum spend for charging up your vehicle per week? (Electric vehicle)

*≤500/- *500-1000/- *1000-1500/- *1500-2000/- *≥2000/- *None

13. How much do you spend for your vehicle maintenance monthly?

*≤5000/- *5000-10000/- *10000-15000/- *15000-20000/- *≥20000/-

14. What are the main factor you consider while purchasing a vehicle?

*Mileage *Safety *Performance *Brand *Price *Whether service centres are available

15. Do you feel that fuel prices are high?

*Yes *No

16. If you believe that fuel prices are high, what are the reasons for high prices?

* Too many taxes on fuel

* Greedy oil companies

* Oil producing companies setting high prices

* Due to demand and supply of fuel

* Prices are always going up continuously

* Inflation

17. Is petrol rate satisfactory to you?

* Yes * No

18. Are you interested/thinking of purchasing an electric vehicle because of fuel price hike?

* Yes *No *Maybe

19. What factors encourage you to consider buying electric vehicle?

* Price

* Positive environmental effect

* Save money

* References

* New trends

* Beneficial financial or insurance options

* Easy operation

* Low noise level

* Promotion

20. What factors discourage you to consider buying electric vehicles?

* Limited range

* Long recharging time

* Price

* Lack of consumer choice

* Unwillingness to change a lifestyle

* None

21. What do you think of the following statements about electric vehicles?

(Strongly agree, Agree, I do not know, Disagree, Strongly disagree)

* It can protect us from global warming

* It can replace regular cars in terms of satisfaction.

* Owners can save a lot of money

* It is very expensive

* Its maintenance is well developed

22. How likely that your next vehicle will be an electric one?

* As soon as possible

* In next 5-10 years

* Anytime in future

* I do not want to buy one

23. Scale according to what you prefer over others

(Gasoline fuelled, electric vehicles)

* Fuel/Energy consumption

* Comfort

* Maintenance cost

* Resale value

* Happiness of owner

* Economic comparison (comparatively cheaper)

24. How quickly (hours) would it take to fully charge an electric vehicle for you to consider buying one?

25. How far (kms) would you expect to be able to drive an electric vehicle on a fully charged battery for you to consider buying one?